И.А. Щапова

# ОСНОВЫ ОПТОЭЛЕКТРОНИКИ И ЛАЗЕРНОЙ ТЕХНИКИ

## УЧЕБНОЕ ПОСОБИЕ ПО АНГЛИЙСКОМУ ЯЗЫКУ ДЛЯ ТЕХНИЧЕСКИХ ВУЗОВ

ФЛИНТА

**И.А. ЩАПОВА**

# ОСНОВЫ ОПТОЭЛЕКТРОНИКИ И ЛАЗЕРНОЙ ТЕХНИКИ

## Учебное пособие по английскому языку для технических вузов

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Учебное пособие написано в соответствии с программой по иностранным языкам для неязыковых вузов и рассчитано на студентов, обучающихся по специальности «Оптические и оптикоэлектронные системы». Оно может использоваться также при обучении иностранному языку по специальности «Электронные приборы». Данное учебное пособие ставит целью обучение лексике, различным видам чтения специальной литературы, развитие навыков устной речи с профессиональным уклоном, включает тексты-образцы диалогической речи. Тематика текстов определяется требованиями учебной программы. Предполагается, что работа по данному пособию подготовит студентов к переводу оригинальной литературы по основным разделам оптоэлектроники.

Для студентов, аспирантов и преподавателей технических вузов.

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## МЕТОДИЧЕСКАЯ ЗАПИСКА

Настоящее пособие предназначено для студентов, обучающихся по специальности «Оптические и оптико-электронные системы». Оно составлено в соответствии с программой по английскому языку для неязыковых вузов. Учебное пособие состоит из трех разделов, каждый из которых включает четыре части (UNITS). Каждая часть состоит из подразделов (PARTS).

Цель **первого подраздела** развить речевые навыки и умения монологической речи и диалогического общения. Для этих целей в первом подразделе предлагается текст, рассчитанный на изучающее чтение. Перед текстом идут активный словарь, способствующий расширению запаса лексики по специальности, лексические упражнения на закрепление активного словаря и упражнения, направленные на расширение словообразовательного запаса. Грамматические упражнения, связанные с текстом, отражают научно-технический стиль и помогают студентам выполнить задания второго (PART II) раздела. После текста даются лексические и коммуникативные упражнения, которые предусматривают моделирование в учебном процессе ситуаций общения.

**Второй подраздел** направлен на обучение различным видам чтения и переводу. Он включает два текста, которые знакомят студентов с различными аспектами оптоэлектроники, и ряд послетекстовых упражнений, которые помогут студентам осуществить свой поиск информации в текстах.

Данное учебное пособие ставит целью приобретение студентами коммуникативной и профессиональной компетенции на основе обучения лексике, различным видам чтения специальной литературы и развитие навыков устной речи и письменной речи. Оно предназначено для использования на аудиторных занятиях на 2-м курсе в первом семестре.

**Третий раздел** является профессионально ориентированным. Он состоит из познавательного текста, который знакомит студентов с различными аспектами оптоэлектроники, и предназначен для обучения переводу, реферированию и аннотированию при грамотном использовании словарей.

Все замечания по составлению пособия просьба пересылать автору.

## РАЗДЕЛ I:
## ВВЕДЕНИЕ В ОПТОЭДЕКТРОНИКУ.

# UNIT 1.1

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### PART 1

### I. MIND THE PRONUNCIATION OF THE FOLLOWING WORDS:

APPROACH [ə'PRəUʧ] — аппроксимация, приближение, сближение; подход к решению; рассмотрение

BRANCH [BRɑNʧ] — ветвь; отрасль

BRIEFLY ['BRI'FLɪ] — кратко; сжато

CIRCUIT ['Sɜ:KIT] — цепь; замкнутая линия; схема

COAXIAL [KəU'ÆKSIəL] — коаксиальный; имеющий общую ось

COMPUTATION [KOMPJU'TEɪʃ(ə)N] — вычисление, расчет

CONCLUSION [KəN'KLU:ʒ(ə)N] — заключение, результат

CONTEMPORARY [KəN'TEMP(ə)R(ə)RI] — современный; одновременный

DEPTH [DEPθ] — глубина; толщина

EMPHASIS ['EMFəSIS] — придавать особое значение, особенно подчеркивать что-либо

ENVIRONMENT [IN'VAɪR(ə)NMəNT] — окружающая среда

FIBEROPTICS [FAɪBəR'OPTIKS] — волоконная оптика

FLEXIBILITY ['FLEKSə'BILITI] — гибкость

FREQUENCY ['FRI:KWəNSɪ] — частота

FURTHERMORE [FɜːÐə'MOː'] — к тому же; кроме того; более того

GUIDE [GAɪD] — 1. волновод, направляющее устройство; 2. направлять, заставлять двигаться по предписанной траектории

INCREASE [ɪN'KRI’S] возрастать, увеличивать; усиливать

INTIMATELY ['ɪNTɪMəT LY] тесно, плотно; глубоко

INVENTION [ɪN'VEN∫(ə)N] изобретение

LAYER ['LEɪE] слой; пленка; прокладка; разрез

MERELY ['MIəLɪ] только; просто; единственно

NEAR-INFRARED [Nɪə’ɪN'FRə RED] ближняя инфракрасная область (спектра)

PENETRATE ['PENɪTREɪT] проникать внутрь; пронизывать

PROPAGATE ['PRɔPəGEɪT] распространять(ся)

PROVE [PRU’V] доказывать; подтверждать

PURELY ['PJUəLɪ] исключительно; совершенно; вполне; чисто

REMAIN [Rɪ'MEɪN] оставаться

SATELLITE ['SÆTəLAɪT] спутник

SEMICONDUCTOR ['SEMɪKəN'DΛKTə] полупроводник

SHRINKING [∫RɪŊKɪŊ] сокращение; сжатие

SUPPLEMENT ['SΛPLɪMəNT] дополнительный

TRANSISTOR [TRÆN'ZɪSTə] транзистор

VARIOUS ['VεəRɪəS] различный ; разнообразный; разносторонний

VISIBLE ['VɪZəBL] видимый

WAVELENGTH ['WEɪVLEŊθ] длинаволны

## II. READ AND TRANSLATE THE FOLLOWING PHRASES:

THE CARRIERS OF INFORMATION
ATTHE BEGINNINGOF THE EARLY1980S
TOCONTROL THE FLOW OF ELECTRONS
IN CONCLUSION WE WOULD LIKE TO SAY
INFORMATION COMMUNICATION AND PROCESSING
THE ABILITYTO PROPAGATE SIGNALS
THE RELATIVELYSHORT WAVELENGTHS
A NEW LAYER OF FLEXIBILITYOF DESIGN

TO BE CARRIED BYCOAX
TO TAKE PLACE
TO COUPLE ELECTRO
FIT TOGETHER
SATELLITE
ASPECT
OPTOELECTRONIC DEVI
THE FASTEST GROWIN

## III. READ AND GUESS THE MEANING OF THESE WO

BASIC ['BEISIK]
CABLE ['KEIBL]
COMMUNICATION [Kə'MJU'NI'KEIʃ(ə)N]
COMPONENT [Kəm'PəUNəNT]
COMPUTATION ['KɔMPJU'TEIʃ(ə)N]
CONTROL [KəN'TRəUL]
DOMINATE ['DɔMINEIT]
ELECTRONICS ['ELEK'TRɔNIKS]
TECHNOLOGY [TEK'NɔLəʤI]

GIGANTIC ['ʤAI'GÆNTIK]
INFORMATION ['INFə'MEIʃ(ə)N]
METHOD ['MEθəD]
MICROWAVE ['MAIKRə(U)WEIV]
OPTICS ['ɔPTIKS]
OPTOELECTRONIC ['OPTəIIEK'TRɔNIK]
PHOTON ['FəUTɔN]
PROCESSING ['PRəUSESIŋ]

LOOK, READ, REMEMBER!

**-TION** | **-IC**

**V + TION = N** | **N + IC = ADJ.**

COLLECT + TION = COLLECTION ELECTRON + IC = ELECT

INFORM + TION = INFORMATION THEME + IC = THEMATIC

COMPUTE + TION = COMPUTATION MAGNET + IC = MAGN

COMMUNICATE + TION = COMMUNICATION GIANT + IC = GIGANT

INVENT + TION = INVENTION

TRANSLATE + TION = TRANSLATION

**IV. A) MAKE UP NOUNS FROM THE VERBS AND WRITE THEM**

INSTRUCT - ; CONSIDER - ;ABSORB - ; CONNECT - ;

COMBINE - ; OPERATE - ; NOTE - ;REPRESENT - .

**B) MAKE UP ADJECTIVES FROM THE NOUNS AND WRITE TH**

ELECTROMAGNET - ; DYAD - ; ATOM - ;ACLINE - .

**C) FILL IN THE BLANKS WITH SUITABLE WORDS. WR FOLLOWING SENTENCES:**

THERE IS A LARGE ... OF TECHNICAL BOOKS IN THIS LIBRAR (*collect/ collection*) THE ... OF HIS RESEARCH WORK IS SEMICONDUCTOR TECHNOLOGY.(*theme/ thematic*) IN AN ... CIRCUIT, THE INPUT SIGNAL IS USUALLY APPLIED TO THE BASE OF THE TRANSISTOR.(*electron/electronic*) THEY CAN BE A ... OF N-P-N- TYPE MATERIAL OR P-N-P-TYPE MA BONDED TOGETHER AS A THREE-TERMINAL DEVICE.(*combine/combination*) THIS ... HAS BEEN WIDELY ADOPTED BY MANUFACTURI LASERS.(*note/notation*)

GRAMMAR REVIEW.

**INDEFINITE**

**PRESENT INDEFINITE**

VERB FOR **YOU, I, THEY; WE** VERB + (E)S FOR **HE, SHE, IT**

<u>EXAMPLE</u>: I WORK AT THE PLANT. HE WORKS AT THE PLANT.

YOU WORK AT THE PLANT. **BUT** SHE WORKS AT THE PLANT.

WE WORK AT THE PLANT. THAT GROUP OF SCIEN

THEY WORK AT THE PLANT. WORKS AT THE PL

**PAST INDEFINITE**

REGULAR VERB + ED IRREGULAR VERBS (VOCABU

<u>EXAMPLE</u>: THAT FIRM ADVERTISED NEW LASERS. THE COMPUTER WAS OU ORDER YESTERDAY.

**FUTURE INDEFINITE**

(I, WE) SHALL + VERB (HE, SHE, IT, YOU, THEY) WILL + VE

<u>EXAMPLE</u>: I SHALL DO THIS WORK TOMORROW. THEY WILL CHECK THAT DEV NEXT TUESDAY.

**V. PUT THE VERBS IN BRACKETS INTO THE REQUIRED FORM.**

I (*translate*) THIS ARTICLE INTO RUSSIAN TWO DAYS AGO. MY (*be*) A STUDENT TWENTY FIVE YEARS AGO. NOW HE (*be*) AN ENGINEER AND HE (*be*) A PENSIONER IN FIFTEEN YEARS. THEY (*write*) THAT TEXT LAST THURSDAY YOU (*give*) ME VERY INTERESTING MAGAZINES EVERY MONTH. NEXT W LABORATORY (*get*) NEW DEVICES. OUR PROFESSOR AND SOME TEAC (*return*) TO MOSCOW IN A WEEK. NOW THEY (*be*) IN LONDON. THIS STUDENT (*want*) TO STAY A FEW MORE DAYS HERE. WHAT YOU (*do*) LAST SATURDAY? WHO (*read*) THIS BOOK? WITH WHOM WE (*meet*) YOUR FRIEND TOMORROW?

**VI. LEARN TO READ THE WORDS:**

[^] UP, US, SUN, SON, BUT, MUST, MUCH, SUCH, CONDU SUPPLEMENT,

[AI] HIGH, LIGHT, RIGHT, SIZE, RISE, DEVICE, PRIMARY, GUIDE, FIBER, EMPHASIZE

[Æ] AND, AS, CAN, THAT, THAN, ADD, BLACK, SATELLITE

[ə:] HER, FIRST, EARLY, CIRCUIT, FURTHERMORE

**VII. READ AND TRANSLATE TEXT A1.1.SAY WHY OPTOELEC HAS BECOME AND REMAINS ONE OF THE FASTEST GROWING BRA**

## TEXT A 1.1

## PHOTONS AND ELECTRONS MEET TO FORM OPTOELECTRONICS

"FOR THE FIRST NEARLY 30 YEARS AFTER THE INVENTION OF T INFORMATION PROCESSING AND TRANSMISSION MEANT ELECTRO

SEMICONDUCTORS TO CONTROL THE FLOW OF ELECTRONS. BUT BE
EARLY 1980S, ELECTRONICS WAS INCREASINGLY SUPPLEMENTED B
PHOTONS TOOK THEIR PLACE ALONGSIDE ELECTRONS AS THE
INFORMATION.

TODAY, OPTOELECTRONIC DEVICES - THOSE THAT COUPLE ELE
OPTICS - HAVE GROWN TO DOMINATE MUCH OF LONG-
COMMUNICATIONS THROUGH FIBEROPTICS, HAVE GIVEN RISE TO N
OF DISPLAYING INFORMATION AND OF SENSING IT IN THE ENVIRON
BEGINNING TO PENETRATE INTO THE HEART OF INFORMATION P
INFORMATION COMMUNICATION AND PROCESSING BECOMES MOR
INTIMATELY LINKED IN INTEGRATED OPTOELECTRONIC CIRCUIT
OPTOELECTRONIC DEVICES OF THE PRESENT MAY PROVE TO B
TRANSITION TO ALL PHOTONIC COMPUTATION AND COMMUNIC
FUTURE.

IT SHOULD BE EMPHASISED THAT TODAY WE CAN SEE HOW T
BRANCHES OF OPTOELECTRONICS FIT TOGETHER. BUT, IT IS IMPO
BRIEFLY AT TWO BASIC QUESTIONS: WHY HAS OPTOELECTRONIC
IMPORTANT AND WHY DOES IT CONTINUE TO GROW? THE PRIMAR
SIMPLE - SPEED. THERE ARE FUNDAMENTAL PHYSICAL LIMITS T
INFORMATION CAN BE TRANSMITTED PURELY ELECTRONICALLY. A
OF AN ELECTROMAGNETIC SIGNAL INCREASES, THE ABILITY TO
THROUGH AN ELECTRICAL CONDUCTOR DECLINES. THE SIGNAL IS
SMALLER AND SMALLER "SKIN DEPTH", MAKING ELECTRICAL RES
AND HIGHER. EXCEPT FOR VERY SHORT DISTANCES, SIGNALS AT
MUCH ABOVE 100 MHZ MUST BE CARRIED BY COAXIAL CABLES, AN
A CASE, THE DIAMETER MUST GROW AS FREQUENCY INCREASES T
FOR THE SHRINKING SKIN DEPTH.

IN PRACTICE, GUIDED SIGNALS CANNOT BE SENT ALONG COAX
RATES GREATER THAN 1 GHZ. FOR UNGUIDED TRANSMISSIONS, SU
USED BY COMMUNICATION SATELLITES, MUCH HIGHER M
FREQUENCIES, UP TO TENS OF GIGAHERTZ, ARE POSSIBLE.

IN CONTRAST, OPTICAL SIGNALS PROPAGATE THROUGH T
NONCONDUCTING MEDIA AND OPERATE IN THE VISIBLE AND NEAR
WAVELENGTHS. THESE CORRESPOND TO FREQUENCIES THAT AR
THZ, THOUSANDS OF TIMES HIGHER THAN ARE POSSIBLE USIN
ELECTRONIC MEANS. FURTHERMORE, THE RELATIVELY SHORT WA

AND VISIBLE LIGHT - AROUND 1 MKM - MEAN THAT OPTICAL COMPO
THEIR GIGANTIC SPEED CAN BE MINIATURISED RIGHT DOWN TO TH
SIZE OF CONTEMPORARY MICROELECTRONICS.

BECAUSE OPTOELECTRONICS IS BASED ON THE BACK A
TRANSFORMATION OF ELECTRONIC AND OPTICAL SIGNALS, IT IS H
TO INTEGRATE BOTH OPTICAL AND ELECTRONIC DEVICES IN
MONOLITHIC INTEGRATED CIRCUIT. SUCH INTEGRATION HAS TO
FABRICATION PROBLEMS OF PLACING OFTEN INCOMPATIBLE MAT
PROXIMITY TO EACH OTHER, BUT IT GREATLY REDUCES DEVICE COS

THE BEGINNING OF SUCH INTEGRATION HAS, NOT SURPRISINGL
FIRST IN FIBEROPTICS, WHERE DIODE LASERS ARE INTEGRATED ON
WITH MESFET TRANSISTORS THAT CONTROL THE CURRENT TO THE
IMPOSE THE MODULATING SIGNAL. SIMILARLY, PHOTODIODES C
INTEGRATED WITH LASER OSCILLATORS AND CONTROLLING
MONOLITHIC HETERODYNE RECEIVERS.

BUT THE REAL TECHNOLOGY LEAP IS COMING WITH OPT
ELECTRONIC ELEMENTS COMBINED ON LARGE-SCALE INTEGRATE
ADVANTAGE HERE IS THAT THE WIDE BANDWIDTH OF THE OPTI
EASES COMMUNICATION BOTTLENECKS IN MASSIVELY PARALLE
WHERE THE SPACE TAKEN UP BY ELECTRONIC INTERCONNECTS HAS
AND MORE OF A PROBLEM. SUCH OPTOELECTRONIC INTEGRATED C
TURN, A STEPPING STONE TO ALL-OPTICAL COMPUTING ELEMENTS,
LIGHT BEAM INTERACTS WITH A DEVICE TO ALTER ANOTHER
RESEARCH IS NOW UNDER WAY WITH MATERIALS SUCH AS LOW-T
GROWN GALLIUM ARSENIDE (GAAS) TO PRODUCE THE NONLIN
RESPONSE THAT WILL ALLOW THE DEVELOPMENT OF OPTICAL TRA
IN THEORY COULD FUNCTION FAR FASTER THAN ELECTRONIC INTEG

IN CONCLUSION WE WOULD LIKE TO SAY, THE USE OF OPTICAL
TOGETHER WITH ELECTRONICS ADDS A NEW LAYER OF FLEXIBIL
PRODUCING NEW APPROACHES FOR SENSING AND DISPLAY. FO
REASONS OPTOELECTRONICS HAS BECOME AND REMAINS ONE O
GROWING ASPECTS OF INFORMATION PROCESSING AND TRANSFER.'

**VIII. WORD STUDY .**

SUPPLEMENT - THING ADDED TO SMTH ELSE TO IMPROVE OR COMPL
TO COUPLE - TO UNITE OR TO ASSOCIATE TWO THINGS THAT ARE S

FIBEROPTICS - TRANSMISSION OF INFORMATION BY MEANS OF INFRA
SIGNALS ALONG A THIN GLASS FIBER
TO RESTRICT - TO PUT A LIMIT ON SMB/SMTH

**IX. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOLL EXPRESSIONS:**

THE FLOW OF ELECTRONS; AS THE CARRIERS OF INFORMA DISTANCE COMMUNICATIONS; MORE INTIMATELY LINKED; INDEED; COMPUTATION AND COMMUNICATION; IT SHOULD BE EMPHASIS TRANSMITTED PURELY ELECTRONICALLY; THE ABILITY DECLINES; COAXIAL CABLES; GUIDED SIGNALS; THE VISIBLE AND NEA WAVELENGTHS; FURTHERMORE; CONTEMPORARY MICROELECTRO FLEXIBILITY OF DESIGN.

**B) FIND THE EQUIVALENTS OF THE FOLLOWING EXPRESSIONS IN**

центр обработки информации; оптоэлектронные схемы; различные отрасли оптоэлектроники; сконцентрировать внимание; способность передаваться через среду; глубина сжатия оболочки; безволноводная передача; искусственный спутник связи; в противоположность чему-либо; непроводящая среда; в заключение хотелось бы сказать, что...

**X. LOOK THROUGH THE TEXT AGAIN . READ THE FO STATEMENTS AND IF YOU THINK THEY ARE WRONG CORRECT T**

1. ALL BRANCHES OF ELECTRONICS WERE INCREASINGLY SUPPLEM TICS.
2. OPTOELECTRONIC DEVICES HAVE NOT GIVEN RISE TO NEW MET PLAYING INFORMATION AND OF SENSING IT IN THE ENVIRONME
3. THE OPTOELECTRONIC DEVICES OF THE PRESENT CANNOT PROVE A TRANSITION TO ALL PHOTONIC COMPUTATION AND COMMUN FUTURE.
4. THERE ARE TWO BASIC QUESTIONS: WHY HAS OPTOELECTRONIC IMPORTANT AND WHY DOES IT CONTINUE TO GROW?
5. THERE IS NO FUNDAMENTAL PHYSICAL LIMIT TO HOW FAST INFO BE TRANSMITTED PURELY ELECTRONICALLY.
6. GUIDED SIGNALS CAN BE SENT ALONG COAXIAL CABLES AT R THAN1 GHZ.

7. THE USE OF OPTICAL TECHNOLOGY TOGETHER WITH ELECTRONI
LAYER OF FLEXIBILITY OF DESIGN.

**XI. COMPLETE THE FOLLOWING SENTENCES. YOUR ANSW COINCIDE WITH THE TEXT.**

1. PHOTONS TOOK THEIR PLACE ...
2. OPTOELECTRONIC DEVICES HAVE GIVEN RISE ...
3. IT SHOULD BE EMPHASISED THAT ...
4. THE SIGNAL IS RESTRICTED TO ...
5. IN PRACTICE, GUIDED SIGNAL CANNOT BE ...
6. OPTICAL SIGNALS PROPAGATE ...
7. THE USE OF OPTICAL TECHNOLOGY TOGETHER WITH ...

**XII. ANSWER THE FOLLOWING QUESTIONS:**

1. WAS ELECTRONICS INCREASINGLY SUPPLEMENTED BY OPTICS?
2. WHAT PLACE DID PHOTONS TAKE IN INFORMATION PROCESSING?
3. WHAT ARE OPTOELECTRONIC DEVICES?
4. WHY HAS OPTOELECTRONICS BECOME SO IMPORTANT AND W CONTINUE TO GROW?
5. CAN GUIDED SIGNALS BE SENT ALONG COAXIAL CABLES AT RATE 1 GHZ?
6. WHEN CAN OPTICAL COMPONENTS BE MINIATURISED ?
7. WHAT ADVANTAGES DOES THE USE OF OPTICAL TECHNOLOGY TO ELECTRONICS GIVE US?

**XIII. MATCH THE ENGLISH WORDS ON THE LEFT WITH THOSE ON**

| | |
|---|---|
| 1. REAL | 1. несовместимый |
| 2. ANOTHER | 2. единственный |
| 3. OPTICAL | 3. различный |
| 4. SINGLE | 4. простой |
| 5. INCOMPATIBLE | 5. огромный |
| 6. THESAME | 6. параллельный |
| 7. LARGE | 7. низкий |
| 8. PARALLEL | 8. другой |
| 9. NONLINEAR | 9. действительный |
| 10. FAST | 10. оптический |

| | |
|---|---|
| 11. NEW | 11. тот же самый |
| 12. VARIOUS | 12. большой |
| 13. SIMPLE | 13. быстрый |
| 14. GREAT | 14. новый |
| 15. LOW | 15. нелинейный |

**XIV. CHOOSE THE BEST EQUIVALENTS OF THE WORDS ON FROM THE WORDS ON THE RIGHT AND WRITE THEM. (EXAMPL INDIVIDUAL)**

1. SINGLE A) COMMON, B) UNITED, C) BASE, D) INDIVIDUAL
2. RIGHT A) ACTIVE, B) PRACTICAL, C) DETAILED, D) REAL
3. FREE A) ILLOGICAL, B) INDEPENDENT, C) IMPOSSIBLE, D)
4. RESEARCH A) TEST, B) REMEDIABLE, C) TRIED, D) UTILIZATIO
5. SUITABLE A) RIGHT, B) SUBORDINATE, C) EFFICIENT, D) PRO
6. SIMPLE A) OVERDUE, B) NATURAL, C) EASY, D) OPPOSITE
7. JOINT A) COMBINED, B) ABSOLUTE, C) CONSULTATIVE, D) COLLECTIVE
8. PRACTICAL A) EQUIVALENT, B) ECONOMICAL, C) EXPERIMEN D) MENTAL
9. LONG A) PROLONGED, B) ADDITIONAL, C) ROUNDED, D) E
10. REGULAR A) CLOSING, B) FINAL, C) NATURAL, D) PERIODIC

**XV. DEFINE THE MEANING OF THE FOLLOWING WORDS (THE ADJECTIVES OR THE VERBS) IN THESE SENTENCES, TRANSLATE T**

THE REFRACTIVE INDEX IS INCREASED BY A SMALL TERM *proportional* TO THE SQUARE OF THE *electric* FIELD (OR THE POWER LEVEL OF THE *radiation*). THE DISPERSION DUE TO *chromatic* FACTORS CAN BE EXACTLY BALANCED THE KERR EFFECT. SUCH SOLITON-BASED *communication* WOULD BE LIMITED BY *attenuation* ALONE. ASIDE FROM *attenuation*, THE MAIN *limitations* ON THE *information*-CARRYING CAPACITY OF SINGLE-MODE OPTICAL FI THE REMAINING TYPES OF DISPERSION AFTER MULTIMODE DIS REMOVED. BECAUSE THE *fraction* OF POWER IN THE CLADDING VARIES W THE WAVELENGTH OF THE *radiation*, SO DOES THE EFFECTIVE INDEX OF *refraction* AND THUS THE VELOCITY OF *propagation*.

**XVI. GUESS WHAT THESE WORDS MEAN:**

INTEGRATION, CHIP, MATERIAL, TRANSFORMATION, T MODULATION, ELEMENT, TEMPERATURE, NONLINEAR, THEORY.

**XVII. TRANSLATE AND WRITE THE SENTENCES, USING THE F WORDS AND PHRASES:**

OPTOELECTRONIC DEVICES; NOWADAYS; RADIANT POWER; F COMMUNICATION; LASER; HIGH INTENSE LIGHT BEAM; FOCU DIMENSIONAL IMAGE; HOLOGRAPHY.

Из практического применения оптики в наши дни все более важное значение приобретают оптоэлектроника и волоконная оптика. Оптоэлектроника охватывает применение оптического излучения в электронных приборах. В волоконной оптике изучается передача информации по световодам. Появление лазеров позволило разработать ряд методов создания и управления световыми пучками высокой интенсивности, а также получение объемных оптических изображений без применения фокусирующих систем (голография) и др.

**XVIII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

THAT'S RIGHT...; THAT'S WRONG...; TO MY MIND...; IN MY OPIN AGREE WITH YOU...; I THINK SO...

FOR EXAMPLE:

TODAY, OPTOELECTRONIC DEVICES HAVE GROWN TO DOMINAT LONG-DISTANCE COMMUNICATIONS THROUGH FIBEROPTICS.

THAT'S RIGHT, AS IT IS KNOWN, THERE IS THE MOST IM OPTOELECTRONICS TECHNOLOGY - FIBEROPTICS WHICH IS COVE COMPONENTS OF A FIBEROPTICS SYSTEM.

1. OPTOELECTRONICS INCLUDE SOURCES, MODULATORS, MULTIPLE WAVEGUIDES, AMPLIFIERS AND DETECTORS.
2. NOBODY KNOWS THE BASIC PRINCIPLES OF OPTOELECTRONIC INT CIRCUITS.
3. IN PRACTICE, GUIDED SIGNALS CANNOT BE SENT ALONG COAXIAL RATES GREATER THAN 1 GHZ.
4. OPTOELECTRONICS HAS BECOME AND REMAINS ONE OF THE FAST

ASPECTS OF INFORMATION PROCESSING AND TRANSFER.
5. THE USE OF OPTICAL TECHNOLOGY TOGETHER WITH ELECTRONI LAYER OF FLEXIBILITY OF DESIGN, PRODUCING NEW APPROACHES AND DISPLAY.

**XIX. RETELLTEXT A1.1 ACCORDING TO THE SCHEME:**

ELECTRONICS WAS SUPPLEMENTED BY OPTICS

OPTOELECTRONIC DEVICES

TWO BASIC QUESTIONS

OPTICAL COMPONENTS CAN BE MINIATURISED

A SINGLE MONOLITHIC INTEGRATED CIRCUIT AND ITS ADVANTAGE

**XX. READ THE DIALOGUE AND ACT IT OUT. THEN MAKE DIALOGUES OF YOUR OWN AND ROLE PLAY THEM.**

IN THE LIBRARY

*Ted:* HI, NICK! HOW ARE YOU?

*Nick:* FINE, THANKS. AND YOU?

*Ted:* ALL RIGHT. WHAT ARE YOU DOING?

*Nick:* I'M PREPARING FOR THE TALK ON OPTOELECTRONICS. OUR ASKED US TO FIND SOME PAPERS ABOUT SCIENTIFIC AND ACHIEVEMENTS IN OPTOELECTRONIC BRANCH. COULD YO ME?

*Ted:* OF COURSE. TODAY, OPTOELECTRONIC DEVICES ARE BEGI PENETRATE INTO THE HEART OF INFORMATION PROCESS FORMATION COMMUNICATION AND PROCESSING BECOM

AND MORE INTIMATELY LINKED IN INTEGRATED OPTOELEC
CUITS. I'M FOND OF THIS SUBJECT.

*Nick:* OK. LET'S LOOK THROUGH THESE MAGAZINES.

*Ted:* "APPLIED OPTICS"? WELL, IT CERTAINLY HAS SOME INTERE
PAPERS. I READ A PAPER ABOUT FIBEROPTICS IN THIS MAG
LAST TIME.

*Nick:* WHY DO YOU THINK IT IS RIGHT FOR MY THEME?

*Ted:* BECAUSE OPTOELECTRONIC DEVICES HAVE GROWN TO DO
MUCH OF LONG-DISTANCE COMMUNICATIONS TH
FIBEROPTICS AND THEY HAVE GIVEN RISE TO NEW MET
DISPLAYING INFORMATION AND OF SENSING IT IN
ENVIRONMENT.

*Nick:* THAT'S VERY INTERESTING INDEED.

**XXI. CONTINUE THE DIALOGUE AND WRITE IT:**

*Teacher:* IT IS OUR FIRST LESSON WHICH IS DEVOTED TO
OPTOELECTRONICS. I'D LIKE TO ASK YOU SOME QUESTION
BEGIN TO GIVE A LECTURE. THE FIRST ONE IS : WHA
***optoelectronics*** MEAN?

*Student A:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Teacher:* WHERE DO PEOPLE USE OPTOELECTRONIC DEVICES?

*Student B:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Teacher:* WELL. WHAT KINDS OF OPTOELECTRONIC DEVICES DO
KNOW?

*Student A:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Teacher:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Student B:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Teacher:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**XXII. CHOOSE A PARTNER AND TALK ABOUT SOME PROBLEM
ARISE IN ELECTRONICS.**

**XXIII. WRITE A SUMMARY OF TEXT A1.1 LIMIT IT TO 10 SENTEN**

# PART 2

## I. MIND THE PRONUNCIATION OF THE FOLLOWING WORDS:

| | | |
|---|---|---|
| ANNOUNCE | [ə'NAUN(T)S] | объявлять, извещать; публиковать |
| COMPETE | [KəM'PI’T] | конкурировать, соревноваться |
| DERIVE | [DI'RAIV] | получать; происходить; производить; ответвлять |
| DOPE | [DəUP] | добавлять; легировать |
| DRAWBACK | ['DRƆ:BÆK] | препятствие; недостаток |
| FRAME | [FREIM] | строение; каркас; рамка |
| GLOW | [GLəU] | накаляться докрасна; светиться; тлеть |
| HANG | [HÆŋ] | вешать, развешивать |
| HEMISPHERE | ['HEMISFIə] | полушарие; сфера |
| MANUFACTURER | [‘MÆNJU'FÆKʧ(ə)Rə] | промышленник |
| MONOCOLOUR | [MƆNƆ'KʌLə] | одноцветный, однотонный; черно-белый |
| PORTABLE | ['PƆ’TəBL] | портативный, переносной |
| SUFFER | ['SʌFə] | страдать; претерпевать, терпеть; испытывать |
| TOP | [TƆP] | покрывать; превосходить, превышать |
| TRAP | [TRÆP] | улавливать; поглощать |
| VENERABLE | ['VEN(ə)RəBL] | старый; древний |
| WIRE | ['WAIə] | провод; проволока |

**II. READ TEXT B 1.1.**

## TEXT B 1.1

## INFORMATIONDISPLAY

"THE EARLIEST USE OF OPTOELECTRONICS WAS TO INFORMATI
THE RED LEDS THAT GLOWED FROM THE FIRST GENERATION OF
TODAY PORTABLE COMPUTER HAS AN ELECTRO-OPTIC FLAT-PA
GENERALLY BASED ON FAR LESS ENERGY-INTENSIVE LIQUID-CI
(LCD) TECHNOLOGY. BUT NOW, RESEARCHERS AND MANUFACT
COMPETING FOR A MUCH LARGER MARKET - THAT OF COLOUR FLAT
AND, IN PARTICULAR, "WALL TELEVISIONS", POSSIBLY OF GREAT
SIMPLY BE HUNG ON THE WALL LIKE A FRAMED PICTURE.

THERE IS A NUMBER OF COMPETING TECHNOLOGIES THAT COU
AS THE MAIN COLOUR DISPLAY TECHNOLOGY OF THE FUTURE. O
FROM EXISTING LCD SCREENS, USING COLOURED PHOSPHORS IN
PRODUCE A FULL-COLOUR DISPLAY. SUCH APPROACHES, HOWEVE
SUFFER FROM SOME OF THE DRAWBACKS UNIVERSAL TO LCDS - LO
AND LIMITED VIEWING ANGLES. ONE IDEA LINKING FIBEROPTIC
TECHNIQUES IS TO ILLUMINATE FIBERS WITH UV RADIATION MOD
LCD. THE FIBERS ARE TOPPED BY SILICA-GEL MICROSPHERES DO
VARIOUS PHOSPHORS THAT GLOW RED, BLUE, OR GREEN WHEN IRR
UV RADIATION. THE MICROSPHERES EMIT LIGHT OVER AN ENTIRE
AND ARE UP TO TWICE AS BRIGHT AS A COLOUR LCD ARRAY.

ANOTHER APPROACH, CURRENTLY THE MOST ACTIVELY PURS
ON PLASMA PANELS, LONG USED FOR VERY LARGE MONOCOLOU
MILITARY USE. THOMSON, FUJITSU, NEC, AND MATSHUSHITA H
RECENTLY ANNOUNCED FULL-COLOUR PLASMA PANELS. IN SUCH
GAS IS TRAPPED BETWEEN TWO GLASS PLATES EACH HAVING P
WIRES, WITH THE WIRES ON THE TWO PLATES BEING PERPENDICU
OTHER. AN ELECTRIC DISCHARGE THROUGH THE GAS SETS UP A
GLOW, CAUSING DIFFERENT-COLOURED PHOSPHORS ON THE FRO
GLOW. FINALLY, SOME RESEARCHERS HOPE THAT THE VENERABL
WITH BLUE AND GREEN EMITTERS COMING INTO PRODUCTION
COMPETE FOR THE COLOUR FLAT-PANEL-DISPLAY MARKET."[1]

**III. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOLL EXPRESSIONS:**

INFORMATION DISPLAYS; LIQUID-CRYSTAL-DISPLAY (LCD) TEC MUCH LARGER MARKET; COLOUR FLAT-PANEL DISPLAYS; A COMPETING TECHNOLOGIES; LOW BRIGHTNESS; TO IRRADIATE RADIATION; A COLOUR LCD ARRAY; FOR MILITARY USE.

**B) FIND THE EQUIVALENTS OF THE FOLLOWING EXPRESSI TEXT:**

портативный компьютер; дисплей с электрооптической панелью; вешать на стену; LCD экран; предельный угол зрения; сочетание волоконной оптики и LCD техники; такой же яркий, как; плазменная панель; перпендикулярны друг другу.

**IV. FIND A SENTENCE WHICH EXPRESSES THE MAIN IDEA O PARAGRAPH OF TEXT B1.1. ENTITLE EACH PARAGRAPH.**

**V. LOOK THROUGH TEXT B1.1 AND ANSWER THE FOL QUESTIONS:**

1. WHICH DISPLAYS DO PORTABLE COMPUTERS HAVE TODAY?
2. ARE RESEARCHERS AND MANUFACTURERS COMPETING FOR A MU MARKET OF COLOUR FLAT-PANEL DISPLAYS?
3. HOW DO "WALL TELEVISIONS" LOOK LIKE?
4. THERE IS A NUMBER OF COMPETING TECHNOLOGIES THAT COULD THE MAIN COLOUR DISPLAY TECHNOLOGY OF THE FUTURE, ISN'T
5. HOW CAN RESEARCHERS ESCAPE LOW BRIGHTNESS AND LIMITED ANGLES?
6. DO THE MICROSPHERES EMIT LIGHT OVER AN ENTIRE HEMISPHER UP TO TWICE AS BRIGHT AS A COLOUR LCD ARRAY?
7. WHERE DO PEOPLE USE VERY LARGE MONOCOLOUR DISPLAYS?
8. HOW DO PLASMA PANELS WORK?

**VI. FIND KEY WORDS (PHRASES) WHICH EXPRESS THE MAIN EACH PARAGRAPH OF TEXT B1.1. MAKE UP AND WRITE THE SO TEXT B1 USING THE KEY WORDS.**

**VII. MAKE UP AND WRITE YOUR QUESTIONS TO TEXT B1.1 TH BE USED AS A PLAN. ASK YOUR FRIENDS THESE QUESTIONS.**

**VIII. SAY WHAT INFORMATION WHICH YOU READ IN THE TE TO YOU. WHAT INFORMATION HAVE YOU EVER KNOWN?**

**IX. COMPLETE THE FOLLOWING SENTENCES USING THE TEX**

1. TODAY PORTABLE COMPUTER HAS AN ELECTRO-OPTIC...
2. RESEARCHERS AND MANUFACTURERS ARE COMPETING FOR...
3. THERE IS A NUMBER OF COMPETING TECHNOLOGIES THAT COULD
4. ONE IDEA LINKING FIBEROPTIC AND LCD TECHNIQUES IS ...
5. ANOTHER APPROACH, CURRENTLY THE MOST ACTIVELY PURSUED
6. IN SUCH PANELS, XENON GAS IS ...

**X. WRITE SOME SENTENCES ABOUT TEXT B1.1. USE THE FO CONVERSATION PHRASES: I THINK IT IS RIGHT BECAUSE ...; I T IMPORTANT...; IT IS INTERESTING TO KNOW ...**

**XI. USING THE MATERIAL OF THE TEXT ABOVE, WRITE MA ACCORDING TO THE QUESTIONS (VII).**

**XII. WRITE A SUMMARY OF THE TEXT.**

**XIII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

YOU SEE ...; AS FOR ME...; IN MY OPINION...; I CAN SAY THAT...; I SO...

1. THE EARLIEST USE OF OPTOELECTRONICS WAS MEDICINE DEVICES
2. "WALL TELEVISIONS", POSSIBLY OF GREAT SIZE, CAN SIMPLY BE H THE WALL LIKE A FRAMED PICTURE.
3. THERE IS NO COMPETING TECHNOLOGY THAT COULD EMERGE AS COLOUR DISPLAY TECHNOLOGY OF THE FUTURE.
4. APPROACHES GENERALLY SUFFER FROM SOME OF THE DRAWBAC TO LCDS - LOW BRIGHTNESS AND LIMITED VIEWING ANGLES.
5. ONE IDEA LINKING FIBEROPTIC AND LCD TECHNIQUES IS TO ILLU BERS WITH UV RADIATION MODULATED BY AN LCD.

6. THE FIBERS CANNOT BE TOPPED BY SILICA-GEL MICROSPHERES D
VARIOUS PHOSPHORS.
7. THE MICROSPHERES EMIT LIGHT OVER AN ENTIRE HEMISPHERE A
TO TWICE AS BRIGHT AS A COLOUR LCD ARRAY.
8. SOME RESEARCHERS HOPE THAT THE VENERABLE LED CAN ALSO
FOR THE COLOUR FLAT-PANEL-DISPLAY MARKET.

**XIV. CHOOSE A PARTNER AND TALK ABOUT SOME PROBLEM ARISE IN TEXT B1.1. USE CONVERSATION PHRASES.**

FOR EXAMPLE: *A:* WHAT IS THE MAIN IDEA OF ...?
*B:* IT IS KNOWN ...
*C:* WELL, YOU ARE RIGHT. BUT A LOT OF PROBLEMS ARISE
*D:* I'D RATHER ADD ...
*A:* I THINK IT IS ...

**XV. PREPARE THE REPORT ON THE THEME CONNECTED V B1.1.**

**XVI. WRITE TRANSLATION OF THE PARAGRAPH WHICH BE "ANOTHER APPROACH, CURRENTLY THE MOST ACTIVELY..."**

**XVII. READ TEXT C 1.1**

## TEXT C 1.1
## FIBEROPTIC SENSORS

"IN FIBEROPTIC SENSORS, ENVIRONMENTAL CHANGES ALTER PROPERTIES OF A FIBER, CREATING A SIGNAL THAT IS SENT BACK A TO BE ANALYSED OR RECORDED. THE TWO BASIC CLASSES ARE EXT IN WHICH AN EXTERNAL DEVICE IMPRESSES INFORMATION OF TH INTRINSIC ONES, WHERE THE CHANGES ARE GENERATED DIRECT FIBER BY THE ACTION OF THE ENVIRONMENT.

A VERY SIMPLE EXAMPLE OF A HYBRID OR EXTRINSIC SENS POSITION OF VIBRATION SENSOR IN WHICH TWO FIBERS, SLIGHTLY ALLOWED TO MOVE RELATIVELY TO EACH OTHER, THUS ALTERIN LIGHT COUPLED FROM ONE TO ANOTHER. A SIMILAR INTRINSIC SE

THE BENDING OF A FIBER TO SENSE DISTORTION: AS THE FIBER I BEGINS TO LEAK OUT OF IT, DROPPING THE TRANSMITTED INTENS SOPHISTICATED TYPES HAVE BECOME COMMON, SUCH AS THOSE INTERFERENCE OF LIGHTWAVES IN THE FIBER, INCLUDING ULTRA GYROSCOPES.

GIVEN THE INTRINSIC ADVANTAGES OF OPTICAL INFORMAT AND PROCESSING, IT IS ALMOST INEVITABLE THAT OPTOELECTRONI NEARLY SYNONYMOUS WITH ELECTRONICS IN THE COMING DECAI BASIC PRINCIPLES OF THIS KEY FIELD WE WILL BE EXAMINING OV YEAR."[1]

**XVIII. TRANSLATETEXTC1.1.USETHEFOLLOWINGPHRASES:**

волоконно-оптические сенсоры; оптические свойства волокна;примесные сенсоры; собственые сенсоры; свет начинает проникать;основанный на интерференции световых волн; сверхточный; ключевая область.

**XIX. RETELL TEXT C1.1.USE THE FOLLOWING PHRASES:**

IT IS CONSIDERED THAT...; RATHER HARD TO SAY...; MAY BE CALLI ADVISE TO CALL YOUR ATTENTION TO ...; THAT'S QUITE CLEAR ...; I S ...

# UNIT 2.1

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## PART 1

### I. MIND THE PRONUNCIATION OF THE FOLLOWING WORDS:

| | | |
|---|---|---|
| ADVANTAGE | [əD'VɑʼNTɪʤ] | преимущество |
| ARRAY | [ə'REɪ] | цепочка; последовательность; массив |
| ATTEND | [ə'TEND] | сопутствовать; сопровождать |
| ATTRACT | [ə'TRÆKT] | привлекать; притягивать |
| AVAILABLE | [ə'VEɪLəBL] | доступный, имеющийся в распоряжении |
| COMPARE | [KəM'PEə] | сравнивать |
| CONSEQUENTLY | ['KɔNSɪKWəNTLɪ] | следовательно, поэтому, в результате |
| COUPLE | [KΛPL] | 1. пара, два<br>2. соединять, связывать |
| DEVELOPMENT | [Dɪ'VELəPMəNT] | развитие |
| DIODE | ['DaɪəUD] | диод |
| ENORMOUS | [ɪ'Nɔ'MəS] | громадный, огромный |
| EXPAND | [ɪK'SPÆND] | расширять; увеличиватьв объеме |
| HOLD (HELD) | [HəULD] | держать, владеть; иметь |
| IMPROVE | [ɪM'PRU'V] | улучшать, совершенствовать |
| INCLUDE | [ɪN'KLU'D] | заключать; содержать в себе; включать |
| LIFETIME | [LaɪFTaɪM] | время жизни |
| LIKELY | [LaɪKLɪ] | вероятный; подходящий; вероятно |
| MAJOR | ['MeɪʤƏ] | более важный; главный |
| MARKET | ['Mɑ'KɪT] | рынок |

| | | |
|---|---|---|
| MASSIVELY | ['MÆSIVLI] | массивно; тяжело; плотно |
| MOUNT | [MAUNT] | поднимать; устанавливать, монтировать |
| OFFER | ['ƆFƏ] | предлагать |
| ON-WAFER | [ƆN'WEIFƏ] | послойный |
| PIXEL | ['PIKS(Ə)L] | пиксель; точкаизображения |
| POTENTIALLY | [PƏ'TENʃ(Ə)L] | возможно, потенциально |
| PROVIDE | [PRƏ'VAID] | снабжать, обеспечивать |
| SERVE | [SƐ:V] | служить |
| SMART | [SMA:T] | резкий; сильный; быстрый |
| SOURCE | [SƆ:S] | источник |
| SUCCESSFUL | [SƏK'SESF(Ə)L] | успешный; удачный; преуспевающий |
| SUPERIOR | [S(J)U:'PIƏRIƏ] | высший; старший; превосходного качества |
| SURFACE | ['SƐ:FIS] | поверхность |
| SWITCH | [SWIʧ] | переключать |
| THRIVE | [θRAIV] | процветать, преуспевать |
| THROUGHOUT | [θRU:'AUT] | во всех отношениях; совершенно; повсюду; на всем протяжении |
| VERTICAL-CAVITY | ['VƐ:TIK(Ə)L'KÆVITI] | вертикальный резонатор |
| WORKSHOP | ['WƐ:KʃƆP] | мастерская; секция; семинар; симпозиум |

## II. READ AND TRANSLATE THE FOLLOWING PHRASES:

HIGHPRIORITY — THRIVING RESEARCH
LOW-COST DEVICES — ON-WAFER TESTING
EFFECTIVE FIBER COUPLING — ARRAYFABRICATION
THE OBJECT OF INTENSE RESEARCH — EDGE-EMITTING DEVICES
BLUE-LIGHT-EMITTING DIODES AND DIODE LASERS — THE LEVEL OF INTEREST IN TH
IN ADDITION

INFORMATION TECHNOLOGY PROGRAM APPLICATIONS OF SMART
NEW COMPUTER SYSTEMS MACHINE-VISION SYSTEMS
TO BECOME COMMERCIALLY VIABLE
TOO EXTENSIVE TO SUMMARY IN COMPLETE DETAIL
VERTICAL-CAVITYSURFACE-EMITTING LASERS

**III. READ AND GUESS THE MEANING OF THESE WORDS:**

ACTIVE ['ÆKTɪ]
NATIONAL ['NÆʃ(ə)N(ə)L]
ALTERNATIVE [ɔːL'TɜːNətɪV]
PARALLEL ['PÆRəLEL]
CANDIDATE ['KÆNDɪDɪT]
PERPENDICULAR [PɜːP(ə)N'DɪKJUə]
DIODE ['DaɪəUD]
PROGRAM ['PRəUGRÆM]
GROUP [GRU'P]
SYSTEM ['SɪSTəM]
ILLUSTRATE ['ɪLəSTREɪT]
TRADITION [TRə'Dɪʃ(ə)N]
INDICATE ['ɪNDɪKEɪT]

LOOK, READ, REMEMBER !

**-LY**

**ADJ. + -LY = ADV.**

SLOW + -LY = SLOWLY
WARM + -LY = WARMLY
WIDE + -LY = WIDELY
OPTICAL + -LY = OPTICALLY
POTENTIAL + -LY = POTENTIALLY
MASSIVE + -LY = MASSIVELY

**IV. A) MAKE UP ADVERBS FROM THE ADJECTIVES AND THEM:**

VERTICAL - ; RELATIVE - ; CORRESPONDING - ; FINAL - ;
SUCCESSFUL - ; EXTREME - ; CONSEQUENT - ;

**B) FILL IN THE BLANKS WITH SUITABLE WORDS. WRITE THE SENTENCES:**

PRODUCTION RUNS CAN, THEREFORE, MOVE ... FROM LARG SENSORS. (*smooth/smoothly*) THE NEW SYSTEM IS BASED ON AN ALGAAS

LASER ... CONFIGURED AND PRODUCED WITHIN PHILIPS. (*special/specially*) IT IS FREQUENCY DOUBLED IN A ... POLED WAVEGUIDE. (*periodical/ periodically*) PHILIPS IS ONE OF THE WORLD LEADERS IN ... INFOR STORAGE. (*optical/optically*) THE TRANSITION IS FROM SHINY, ... (*full/fully*) REFLECTING PURE YTTRIUM TO ... (*partial/partially*) REFLECTING DIHYDRIDE.

GRAMMAR REVIEW

**CONTINUOUS**

**TO BE + V + ING,**

где **TOBE** – вспомогательный глагол

**V + ING** – смысловой глагол с -ING окончанием

**PRESENT CONTINUOUS:** (IS, ARE, AM) +V + ING

1. NOW. 2. LOOK! LISTEN! 3. IT'S 9 O'CLOCK. (точное указание времени)

EXAMPLES:

1. LOOK! THE ENGINEERS ARE REPAIRING THE DEVICE.
2. I AM TAKING THE EXAMINATION IN MATHEMATICS NOW.
3. IT'S 5 O'CLOCK. SHE IS SITTING IN THE LIBRARY.

**PAST CONTINUOUS:** (WAS, WERE) + V + ING

1. SOMEBODY LOOKED AT (UP) ... SOMEBODY HEARD ...
2. IT WAS 9 O'CLOCK. AT 9 O'CLOCK YESTERDAY. FROM 5 TILL 6 YEST THE WHOLE MORNING.
3. WHEN HE CAME HOME ...
4. WHILE ... (параллельные действия).

EXAMPLES:

1. IT WAS IN THE AFTERNOON. WE HEARD STRANGE NOISE. SOM WAS CRYING IN THE STREET. TEACHER LOOKED AT THE STUDENTS. WRITING THEIR COMPOSITIONS.

2. IT WAS 4 O'CLOCK YESTERDAY. I WAS WAITING FOR MY FRIE HOME.

3. NICK FOUND THAT MAGAZINE WHEN HE WAS LOOKING FOR H BOOK.

4. WHILE I WAS PLAYING COMPUTER GAMES MY SISTERS WERE THEIR HOMEWORK.

**V. A) USE THE SUITABLE FORMOF THE VERBS (GIVEN IN BRAC COMPLETE THE SENTENCES:**

1. IT'S 5 O'CLOCK. WE (MEET) OUR FOREIGN COLLEAGUES AT THE
LOOK! THESE STUDENTS (READ) SCIENTIFIC MAGAZINE "APPLIED
OPTICS". 3. WHEN A PROFESSOR (COME) INTO THE LABORAT
ENGINEER (TEST) THE CONTROL SYSTEM. 4. IT WAS 10 O'CLOCK
HE (SIT) AT THE TABLE AND (WRITE) THE REPORT. 5. THAT DEV
WHEN THEY (DISCUSS) THE IMPORTANT PROBLEM. 6. WHO (DR
PICTURE FROM 9 TILL 12 YESTERDAY? 7. IT'S 11 O'CLOCK. WHAT
YOU (LISTEN) TO? 8. WHILE I (LEARN) NEW RULES MY FRIEND (SO
PROBLEMS.

## ADJECTIVES: COMPARATIVE FORMS

Прилагательное - часть речи, которая употребляется для обозначения признака предмета:

THE MATERIAL SYSTEM - материальная система
A RESEARCH GROUP - исследовательская группа
A HIGH PRIORITY - высокий приоритет

Прилагательные в английском языке имеют три степени сравнения:

POSITIVE DEGREE ['POZITIV DIGRI:] положительную
COMPARATIVE DEGREE [KəM'PæRəTIV DIGRI:] сравнительную
SUPERLATIVE DEGREE [SJU:'Pə:LəTIV DIGRI:] превосходную

1. ADJ(E) - ADJ(E) + -ER - THE ADJ(E) + -EST

LARGE - LARGER - THE LARGEST

.

2. ADJ(Y) - ADJ(I) + -ER - THE ADJ(I) + -EST

FUNNY - FUNNIER - THE FUNNIEST

ADJ(∇Y) - ADJ(Y) + ER - THE ADJ(Y)

GAY - GAYER - THE GAYEST
– A CONSONANT; ∇ - A VOWEL

IF ADJ CONSISTS OF : 1 SYLLABLE; SHORT SOUNDING - L
THEN ADJ(–) – ADJ()-ER - ADJ()-EST

3.
BIG - BIGGER - THE BIGGEST

4. IF ADJ. CONSISTS OF 3 OR MORE SYLLABLES THEN

BEAUTIFUL - MORE BEAUTIFUL - THE MOST BEAUTIFUL

5. REMEMBER!

GOOD – BETTER – THE BEST
BAD – WORSE – THE WORST
LITTLE – LESS – THE LEAST
MUCH/MANY – MORE – THE MOST
FAR – FURTHER – THE FURTHEST

6. USE THE WORD ***than***, WHEN YOU COMPARE DIFERENT THINGS:
THIS ARTICLE MORE INTERESTING ***than*** THAT ONE.
OUR ROOM IS LARGER ***than*** YOURS.

7. THE MORE ..., THE BETTER ...

**THE MORE** WE READ, **THE BETTER** WE KNOW THE WORLD WE LIVE ON.

**V. B) MAKE UP COMPARATIVE AND SUPERLATIVE DEGREE F FOLLOWING ADJECTIVES:**

SAD - ; THIN - ; WONDERFUL - ; FAT - ; STRANGE - ;
LONG - ; INTERESTING - ; WET - ; BAD - ; POPULAR - ;
HIGH - ; LOW - ; LITTLE - ; SMALL - ; ANGRY - ;
SUNNY - ; SERIOUS - ; GOOD - ; CLEAN - ; DRY - .

**C) USE THE SUITABLE FORM OF THE ADJECTIVES (GIVEN IN B TO COMPLETE THE SENTENCES:**

THE (*important*) OF THESE THINGS ARE WAVEGUIDE DISPERSIO MATERIAL DISPERSION. WHICH LAYER OF THE FIBER HAS A (*low*) REFRACTIVE INDEX THAN THE CORE? IS IT (*high*) THE LEVEL OF TRANSPARENCY? THI PROBLEM IS (*important*) THAN THAT ONE. THE (*high*)-FREQUENCY COMPONENTS OF THE PULSE ARE (*high*) ALSO THE AMPLITUDE COMPONENTS. BEING IN SILICA AT WAVELENGTHS (*long*) THAN 1.3 MKM, SOLUTIONS CAN

FORM AND REMAIN STABLE INDEFINITELY. IS THE REFRACTIVE I
ACTIVE STRIPES (*low*) THAN THAT OF THE SURROUNDING MATERIAL?

**VI. LEARN TO READ THE WORDS:**

[α:] ARM, LARGE, MARKET, SMART, HARD, START, PART, PARTNER, I
ARCHITECT, ADVANTAGE

[O:] LONG, ORDER, STORE, ALREADY, QUARTER, ALTERNATIVE

[ɛə ] WHERE, THERE, AREA, REPAIRABLE, COMPARE, STAIRS

**VII. READ AND LEARN THESE GEOGRAPHY NAMES:**

CONTINENTS

| | | |
|---|---|---|
| EUROPE | [JRƏP] | Европа |
| ASIA | ['Eʃə] | Азия |
| AMERICA | [ə'MERIKə] | Америка |
| NORTH AMERICA | [NɔːΘ ə'MERIKə] | Северная Америка |
| SOUTHAMERICA | [SAUΘ ə'MERIKə] | ЮжнаяАмерика |
| AFRICA | ['ÆFRIKə] | Африка |
| AUSTRALIA | [ɔS'TREIIə] | Австралия |
| ANTARCTIC | [ÆNT'ɑːKTIK] | Антарктида |

COUNTRIES

| | | |
|---|---|---|
| GERMANY | ['ʤɜːMəNI] | Германия |
| FRANCE | [FRɑːN(T)S] | Франция |
| SPAIN | [SPEIN] | Испания |
| ICELAND | [ɪSLAND] | ИСландия |
| ITALY | ['ITəLɪ] | Италия |
| BELGIUM | ['BELʤəM] | Бельгия |
| FINLAND | [ɪFINLAND] | Финляндия |
| IRELAND | ['AɪəLəND] | Ирландия |
| SWEDEN | ['SWIːD(ə)N] | Швеция |
| SWITZERLAND | ['SWIT(ə)SəLəND] | Швейцария |

| | | |
|---|---|---|
| SCOTLAND | ['SKɔTLND] | Шотландия |
| POLAND | ['PəULəND] | Польша |
| THE UNITED STATES OF AMERICA | | США |
| THE UNITED KINGDOM OF GREAT BRITAINAND NORTHERNIRELAND | | Объединенное Королевство |
| THENETHERLANDS | ['NEÐəLəNDZ] | Нидерланды |
| THEUKRAINE | [JU'KREɪN] | Украина |
| THE CRIMEA | [KRAɪ'MɪƏ] | Крым |
| THE CONGO | ['KɔŋGəU] | Конго |

CITIES

| | | |
|---|---|---|
| EDINBURG | ['EDɪNBəRə] | Эдинбург |
| GLASGOW | ['GLɑZGəU] | Глазго |
| BERLIN | [Bɜ'LɪN] | Берлин |

**VIII. READ TEXT A 2.1.**

**TEXT A 2.1**

## OPTOELECTRONICS RESEARCH THRIVES IN EUROPE

"OPTOELECTRONICS RESEARCH IN EUROPE, AS IN OTHER AREAS OF A HIGH PRIORITY AND CONSEQUENTLY A THRIVING RESEARCH FU BOTH THE NATIONAL AND EUROPEAN LEVELS, AND SEVERAL EUROPEAN PROGRAMS CONTRIBUTE TO OPTOELECTRONICS RESEA LOPMENT. WHEN DEVICES BECOME COMMERCIALLY VIABLE, FUN INDUSTRIAL SOURCES CARRIES THEM THROUGH FINAL DEVELOPMI MARKET.

AS AN OPTOELECTRONIC SOURCE, VERTICAL-CAVITY SURFACE-E (VCSELS) ARE POTENTIALLY LOW-COST DEVICES FOR OPTIC COMMUNICATIONS SYSTEMS AND OFFER ADVANTAGES SUCH A TESTING, EFFECTIVE FIBER COUPLING, AND ARRAY FABRICATION.

INTENSE RESEARCH IN EUROPE, VCSELS ALSO PROVIDE SUPERIO EFFICIENCY AND LONGER LIFETIME COMPARED TO EXISTING FURTHERMORE, EMISSION FROM VCSELS IS PERPENDICULAR TO TH WHICH MAKES THE DEVICES MOUNTING LESS DEMANDING THAN TYPICAL EDGE-EMITTING DEVICES.

RESEARCH INTO BLUE-LIGHT-EMITTING DIODES AND DIODE LA ACTIVE. THE GALLIUM NITRIDE (GAN) MATERIAL SYSTEM IS ONE CA A BLUE-EMITTING SEMICONDUCTOR LASER. THE FIRST EURO WORKSHOP, HELD IN RIGI, SWITZERLAND, IN JUNE 1996, INDICATES OF INTEREST IN THIS SUBJECT: THE WORKSHOP ATTRACTED ABOUT MORE THAN A QUARTER OF WHOM WERE FROM GERMANY, 15% FR AND AS MANY AS 10% FROM POLAND, WHICH HAS A STRONG G NITRIDE RESEARCH TRADITION. IN ADDITION, OTHER RESEARCHER SUCCESSFULLY DEVELOPING ALTERNATIVE MATERIALS FOR BLU DIODES.

SEVERAL WORLD-CLASS RESEARCH GROUPS THROUGHOUT EUR LOPING PIXELS AND THIS WORK IS LIKELY TO EXPAND AS NEW BECOMES AVAILABLE UNDER THE EUROPEAN INFORMATION PROGRAM. APPLICATIONS OF SMART PIXELS INCLUDE MASSIVE PROCESSING IN NEW COMPUTER SYSTEMS, IMPROVED MACHI SYSTEMS, AND FAST SWITCHING IN TELECOMMUNICATIONS SYSTEM

REPRESENTING ONE OF THE LARGEST RESEARCH GROUPS IN S SCOTTISH COLLABORATIVE INITIATIVE IN OPTOELECTRONIC SCIE IS LED BY DEPARTMENT OF PHYSICS AT HERIOT-WATT UNIVERSITY AND FOCUSES ON THE APPLICATIONS OF OPTOELECTRONICS PERFORMANCE INFORMATION-PROCESSING SYSTEMS (OPTICAL OTHER ORGANIZATIONS IN THE CONSORTIUM INCLUDE GLASGOW EDINBURGH UNIVERSITY, AND ST. ANDREWS UNIVERSITY. AREAS O INCLUDE OPTICAL-PROCESSING SYSTEMS, SEMICONDUCTOR FABRIC LIGHT MODULATOR (SLM) TECHNOLOGY, AND DIODE-PUMPED SOLI DESIGN.

MILESTONES WITHIN SCIOS INCLUDE THE FIRST S-SEED A CAPABLE OF WORKING WITH ND:YLF LASER ILLUMINATION AT WHICH HAVE BEEN FABRICATED WITH MBE-GROWN STRAINED INC STRUCTURES. THIS WORK HAS BEEN TAKEN FURTHER BY DEVEL INGAAS/SI SMART-PIXEL ARRAYS. SMART PIXELS COMBINE THE ADV

OPTICALLY INTERCONNECTED LOGIC ELEMENTS WITH THE PROCES SILICON CIRCUITRY. THIS ALLOWS CONSTRUCTION OF EFFECTIVE OPTOELECTRONIC PROCESSING ELEMENTS.

ONE EXAMPLE OF THIS IS A RECENTLY DEVELOPED ELE ADDRESSED SLM COMPRISING A STRAINED INGAAS OPTICAL M ARRAY, DEVELOPED AT GLASGOW UNIVERSITY, THAT IS FLIP-CHIP- A CMOS CONTROL BACK-PLANE DEVELOPED AT EDINBURGH U READ-OUT IS ACCOMPLISHED USING A ND:YLF LASER, DEVELOPE UNIVERSITY OF ST. ANDREWS, WITH DIFFRACTIVE OPTICS AND OPTOMECHANICAL ASSEMBLY DEVELOPED AT HERIOT-WATTUNIVE

AT THE END OF THIS YEAR THE SCIOS PROJECT MEMBERS EX HAVE BUILT A DEMONSTRATION SYSTEM. AN OPTOELECTRONIC SO THE CMOS/INGAAS SMART PIXELS ALREADY DEVELOPED, IS EXPECT 1024 16-BIT WORDS EVERY 10 MKS. SUCH PARALLEL OPTICAL SYST THE POTENTIAL OF SIGNIFICANTLY OUTPERFORMING ALL-ELECTRO OPEN UP THE PROSPECT OF POWERFUL NEW COMPUTER ARCHITECT

AS THE OPTOELECTRONICS RESEARCH BEING UNDERTAKEN W IS TOO EXTENSIVE TO REVIEW IN COMPLETE DETAIL, THE REPRESE LOPMENTS DESCRIBED HERE WILL SERVE TO ILLUSTRATE THE ENO SCOPE OF THE WORK." [2]

SAY WHAT THRIVING OPTOELECTRONICS RESEARCHES EXIST NATIONAL AND EUROPEAN LEVELS TODAY.

**IX. WORD STUDY.**

TO DEVELOP - GROW GRADUALLY; BECOME OR MAKE MORE MATUR OR ORGANIZED

TO OFFER - PUT FORWARD SMTH (TO SMB) TO BE CONSIDERED AND REFUSED

TO HOLD - TAKE AND KEEP OR SUPPORT (SMB/SMTH)

PIX- PICTURES, ESPECIALLY THOSE USED IN ADVERTISEMENTS, AND MATERIAL OF ANY KIND.

**X. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOLLOWING EX**

A HIGH PRIORITY; TO BECOME COMMERCIALLY VIABLE; VERT SURFACE-EMITTING LASERS; OPTICAL FIBER COMMUNICATIONS S

FABRICATION; PROVIDE SUPERIOR POWER EFFICIENCY; LESS D TYPICAL EDGE-EMITTING DEVICES; TO INDICATE THE LEVEL OF INT WORLD-CLASS RESEARCH GROUPS; MASSIVELY PARALLEL PROC COMPUTER SYSTEMS; FAST SWITCHING IN TELECOMMUNICATIONS S

**B) FIND THE EQUIVALENTS OF THE FOLLOWING EXPRESSIONS IN**

быстро развивающиеся исследования; и на национальном и на европейском уровне; дешевые приборы; кроме того; научно-исследовательская традиция; успешно развивающиеся альтернативные материалы; вероятно; слишком обширное, чтобы охватить взглядом; представленное оборудование.

**XI. LOOK THROUGH THE TEXT "OPTOELECTRONICS RESEARC EUROPE" AGAIN. READ THE FOLLOWING STATEMENTS AND IF THEY ARE WRONG CORRECT THEM.**

1. SEVERAL MAJOR PAN-EUROPEAN PROGRAMS CONTRIBUTE TO OPT RESEARCH AND DEVELOPMENT.
2. VERTICAL-CAVITY SURFACE-EMITTING LASERS CANNOT BE LOWCOST DEVICES FOR OPTICAL FIBER COMMUNICATIONS SYSTE
3. THEY LOSE ADVANTAGES SUCH AS ON-WAFER TESTING, EFFE COUPLING, AND ARRAY FABRICATION.
4. AREAS OF EXPERTISE INCLUDE OPTICAL-PROCESSING SYSTEMS DUCTOR FABRICATION, SPATIAL LIGHT MODULATOR TECHNOLO PUMPED SOLID-STATE LASER DESIGN.
5. SMART PIXELS ELIMINATE THE ADVANTAGES OF OPTICALLY INTE LOGIC ELEMENTS WITH THE PROCESSING POWER OF SILICON CIRC
6. PARALLEL OPTICAL SYSTEMS HAVE THE POTENTIAL OF S OUTPERFORMING ALL-ELECTRONIC SYSTEMS AND OPEN UP THE POWERFUL NEW COMPUTER ARCHITECTURES.

**XII. COMPLETE THE FOLLOWING SENTENCES. YOUR ANSWI COINCIDE WITH THE TEXT.**

1. OPTOELECTRONICS RESEARCH IN ...
2. VERTICAL-CAVITY SURFACE-EMITTING LASERS ARE ...
3. EMISSION FROM VCSELS IS PERPENDICULAR TO THE SURFACE, WH
4. THE WORKSHOP ATTRACTED ...
5. APPLICATIONS OF SMART PIXELS INCLUDE ...

6. THE REPRESENTATIVE DEVELOPMENTS DESCRIBED HERE SERVE .

**XIII. ANSWER THE FOLLOWING QUESTIONS:**

1. WHY DO WE SAY THAT OPTOELECTRONICS RESEARCH THRIVES IN
2. WHERE ARE VERTICAL-CAVITY SURFACE-EMITTING LASERS USUA
3. IS EMISSION FROM VCSELS PERPENDICULAR TO THE SURFACE?
4. WHAT MATERIAL SYSTEM IS A CANDIDATE FOR A BLUE-EMITTING DUCTOR LASER?
5. WHAT CAN YOU SAY ABOUT THE EUROPEAN INFORMATION T PROGRAM?

**XIV. MATCH THE ENGLISH WORDS ON THE LEFT WITH THOSE O**

| | |
|---|---|
| 1. CONSORTIUM | 1. жизнеспособный |
| 2. FABRICATION | 2. участник |
| 3. DESIGN | 3. плотный, сжатый |
| 4. ARRAY | 4. значительный, важный |
| 5. COMPACT | 5. объединение |
| 6. ASSEMBLY | 6. производство |
| 7. SIGNIFICANT | 7. обширный, пространный |
| 8. PROSPECT | 8. семинар, симпозиум |
| 9. CROSSBAR | 9. полупроводник |
| 10. PARTNER | 10. мир |
| 11. WORLD | 11. распорка, поперечина |
| 12. VIABLE | 12. перспектива |
| 13. SEMICONDUCTOR | 13. собрание, сбор |
| 14. WORKSHOP | 14. массив, цепочка |
| 15. EXTENSIVE | 15. проект, план |

**XV. CHOOSE THE BEST EQUIVALENTS OF THE WORDS ON THE THE WORDS ON THE RIGHT AND WRITE THEM. (EXAMPLE: I COMPRISE)**

1. INCLUDE A) LOOK FOR B) COMPRISE C) TWIST D) BEND
2. COMBINE A) SHACKLE B) HIDE C) CONNECT D) REGRET
3. COMPRISE A) ENVELOP B) OVERCOME C) RISE D) LOSE
4. DEVELOP A) UNWIND B) COME C) EXPAND D) SCATTER
5. ACCOMPLISH A) FINISH B) REACH C) ACHIEVE D) MAKE

6. EXPECT A) FORESEE B) LEAD C) INCLUDE D) WAIT
7. PROVIDE A) SECURE B) ENSURE C) REDUCE D) FILL
8. LEAD A) ACHIEVE B) CONDUCT C) HEAD D) DRIVE
9. OFFER A) TURN B) FORESEE C) INVITE D) PROPOSE
10. COUPLE A) BIND B) COMBINE C) COMPRISE D) EXPAND

**XVI. DEFINE THE MEANING OF THE FOLLOWING WORDS (TH THE ADJECTIVES OR THE VERBS) IN THESE SENTENCES, TRANSLA**

A PERFECT ***cancellation*** IS NOT ACHIEVED BECAUSE ZERO DISPERS EXISTS ONLY AT AN ***exact*** WAVELENGTH. AT 1310 NM, CAPACITY IS ***actually*** LIMITED BY ***attenuation*** FOR SINGLE-MODE FIBERS. ***Generally***, A TRIANGULAR-SHAPED DOPING PATTERN IS USED THAT ***minimizes attenuation*** AS WELL. DISPERSION FLATTENING IS ACCOMPLISHED BY FIBERS THAT HAV RINGS OF ***higher-*** AND ***lower-refractive-index*** MATERIAL, PRODUCED BY ***carefully*** CONTROLLING DOPING LEVELS.

**XVII. GUESS WHAT THESE WORDS MEAN:**

INITIATIVE; UNIVERSITY; CONSORTIUM; EXPERTISE; ORGA PROSPECT; ARCHITECTURE.

**XVIII. TRANSLATE AND WRITE THE SENTENCES , USING THE WORDS AND PHRASES:**

OPTOELECTRONIC SYSTEMS; HIGH-PERFORMANCE INFORMATIO SYSTEMS; EFFECTIVE FIBER COUPLING; ARRAY FABRICATION; C INCOHERENT LIGHT SOURCES.

В настоящее время в европейских странах таких, как Великобритания, Франция, Германия, Бельгия, Финляндия, Швеция и других, уделяется огромное внимание разработке и развитию оптоэлектроных устройств и приборов. Как отдельные устройства, так и сложные многоканальные системы оптоэлектроники создаются из отдельных элементов. Основными оптоэлектронными элементами являются источники когерентного и некогерентного оптического излучения, оптические среды, приемники оптического излучения, а также оптические элементы, волоконно-оптические элементы и интегрально-оптические элементы.

**XIX. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

THAT'S RIGHT...; THAT'S WRONG...; TO MY MIND...; IN MY OPIN AGREE WITH YOU...; I THINK SO...

1. WHEN DEVICES BECOME COMMERCIALLY VIABLE, FUNDIN INDUSTRIAL SOURCES CARRIES THEM THROUGH FINAL DEVELOP THE MARKET.
2. THE OBJECT OF INTENSE RESEARCH IN EUROPE CANNOT PROVI POWER EFFICIENCY AND LONGER LIFETIME COMPARED WITH T DEVICES.
3. APPLICATIONS OF SMART PIXELS INCLUDE MASSIVELY PARALLE IN NEW COMPUTER SYSTEMS.
4. AT THE END OF THIS YEAR THE SCIOS PROJECT MEMBERS DON'T HAVE BUILT A DEMONSTRATION SYSTEM.
5. RESEARCH INTO BLUE-LIGHT-EMITTING DIODES AND DIODE LA ACTIVE.

**XX. RETELL TEXT A2.1 ACCORDING TO THE SCHEME:**

MAJOR PAN-EUROPEAN PROGRAM

DEVICES FOR OPTICAL FIBER COMMUNICATION SYSTEMS AND THEIR ADVANTAGES

THE FIRST EUROPEAN GAN WORKSHOP

DIFFERENT RESEARCH GROUPS AND THEIR TASKS

APPLICATIONS OF SMART PIXELS

## THE HYBRID INGAAS/SI SMART-PIXEL ARRAYS

**XXI. READ THE DIALOGUE AND ACT IT OUT. THEN MAKE U DIALOGUES OF YOUR OWN AND ROLE PLAY THEM.**

AT THE FIRST EUROPEAN GAN WORKSHOP.

*Mr. Brown:* HELLO! MR. TOMPSON.
*Mr. Tompson:* HELLO! MR. BROWN. HOW ARE YOU?
*Mr. Brown:* FINE, THANKS. AND YOU?
*Mr. Tompson:* JUST FINE.
*Mr. Brown:* LET ME INTRODUCE MY COLLEAGUE, PROFESSOR GRIES MR. GRIESSEN, THIS IS MY PARTNER, MR. TOMPSON.
*Mr. Tompson;* HOW DO YOU DO?
*Mr. Griessen:* HOW DO YOU DO? GLAD TO MEET YOU.
*Mr. Tompson:* NICE TO MEET YOU. WHERE ARE YOU FROM?
*Mr. Griessen:* I'M FROM THE NETHERLANDS. I WORK AT THE PHYSICS DEPARTMENT AT VRIJEUNIVERSITY IN AMSTERDAM.
*Mr. Tompson:* I'VE HEARD SO MANY NICE THINGS ABOUT YOUR DEPAR HAVE YOU GOT A PROGRAM OF THIS WORKSHOP? DOYOU KN MANY PARTNERS TAKE PART IN THE FIRST EUROPEAN GAN W WHERE ARE THEY FROM?
*Mr. Griessen:* THERE ARE MORE THAN 1000 PARTNERS HERE. THEY AR FRANCE, BELGIUM, FINLAND, GERMANY, IRELAND, SWEDEN, SW LAND , THE UNITED KINGDOM OF GREAT BRITAIN.
*Mr. Tompson:* WHAT ARE YOU GOING TO TALK ABOUT?
*Mr. Griessen:* I'D LIKE TO REPRESENT RESEARCH WORK OF OUR UNIVE PHYSICS DEPARTMENT. IT DEMONSTRATES A NEW TECHNIQUE SWITCHABLE MIRRORS. WE HAVE USED, AS THE BASIS FOR A S CHANGE IN OPTICAL PROPERTIES THAT ACCOMPANIES A TRA METAL TO INSULATOR, OR SEMICONDUCTOR, IN RARE EARTH’S AND THE HYBRIDES.
*Mr. Tompson:* IT IS VERYINTERESTING. WHEN DOES OUR MEETINGBEG
*Mr. Brown:* IT BEGINS AT 11. LET'S GO, WE'LL BE THERE JUST IN TIME.

**XXII. CONTINUE THE DIALOGUE AND WRITE IT:**

*Peter:* HELLO, BEN! I HAVEN'T SEEN YOU FOR AGES.
*Ben:* HI, PETER! IT'S GOOD TO SEE YOU AGAIN.
*Peter:* WHERE HAVE YOU BEEN?
*Ben:* I'VE BEEN TO SCOTLAND.
*Peter:* WHAT DID YOU DO THERE?
*Ben:* . . . . . . . . . . . . . . . . . . . . . .
*Peter:* WHAT PROBLEMS DID THIS GROUP SOLVE?
*Ben:* . . . . . . . . . . . . . . . . . . . . . . . . . . .
*Peter:* . . . . . . . . . . . . . . . . . . . . . . . . .

**XXIII. CHOOSE A PARTNER AND TALK ABOUT SOME NEW RES BEING UNDERTAKEN WITHIN EUROPE.**

**XXIV. WRITE A COMPOSITION ABOUT THE LAST OPTOELE RESEARCH IN ONE OF THE EUROPEAN COUNTRY (BELGIUM, FRANCE, GERMANY, IRELAND, SWEDEN, SWITZERLAND, NETHERLANDS, UNITED KINGDOM). LIMIT IT TO 20 SENTENCES.**

## PART 2

**I. MIND THE PRONUNCIATION OF THE FOLLOWING WORDS:**

CLADDING ['KLÆDɪŋ] покрывающийся

DEPOSITION [ˌDEPə'Zɪʃ(ə)N] осаждение; отложение оседание; нанесение

IMPLANTATION [ˌɪMPLɑ:N'TEɪʃ(ə)N] внедрение

MULTIFILAMENT [ˌMʌLTɪ'FɪLəMəNT] многоволоконный

NEURAL NETWORK ['NJʊər(ə)L 'NETWɜ:K] нейронная сеть (вычислительная или логическая схема, построенная из однородных процессорных элементов, являющихся упрощенными функциональными моделями нейронов).

| | | |
|---|---|---|
| ONGOING | [ˈƆNGƏUɪŋ] | продолжающийся |
| PHENOMENA | [FɪˈNƆMɪNƏ] | явления |
| PHENOMENON | [FɪˈNƆMɪNƏN] | явление |
| STRAIN | [STREɪN] | натягивать; растягивать; напрягать |
| SUPERLATTICE | [ˈSJUːPƏˈLÆTɪS] | сверхструктура |
| SUPPRESSION | [SƏˈPREʃ(Ə)N] | подавление |
| SYNTHESIS | [ˈSɪNƟƏSɪS] | синтез |
| WELL | [WEL] | потенциальная яма |

**II. READ AND TRANSLATE TEXT B 2.1 AND FORMULATE ITS M**

## TEXT B 2.1

## OPTOELECTRONIC RESEARCH IN GERMANY

"IN BERLIN AT THE PAUL DRUDE INSTITUTE, FABRICATIO NANOSTRUCTURED SEMICONDUCTORS AND SYNTHESIS OF NEW MATER MOLECULARBEAM EPITAXY (MBE) IS THE BASIS OF EXPERIMENTAL WO ADDITION TO INVESTIGATING CONVENTIONAL QUANTUM-WELL SUPERLATTICES, AND DIFFERENTLY DOPED STRUCTURES, THE INS ESPECIALLY INTERESTED IN APPLYING ORDERING PHENOMENA DURIN GROWTH TO DEVELOP NOVEL STRUCTURES. THIS WORK LEADS TO A PR RICH IN MONITORING AND MEASURING TECHNIQUES. THE INSTIT CURRENTLY USING SUCH TECHNIQUES TO DEVELOP BETTERWAYS OF FA GAN-BASED LEDS AND LASERS. DEPOSITION ON BOTH GAAS AND SI SUBSTRATES IS BEING EXAMINED IN DETAIL. THERE ARE ALSO O PROJECTS TO DEVELOP MULTIFILAMENT CURRENT STRUCTURES IN N USE IN NEURAL NETWORKS AND TODESIGN AND FABRICATE VCSELS.

THE UNIVERSITY ULM IS HOME TO ONE OF THE LEADING GROU INVOLVED IN THE DEVELOPMENT OF VCSELS, PRIMARILY IN THE SPE REGION BETWEEN 800 AND 1000 NM. THE GROUP USES SOLID-SOURCE M TO FABRICATE MULTI-LAYERSYSTEMS ON A SUBSTRATE OF N-GAAS. TH LAYERCOMPRISES GAAS WITH THREE STRAINED $GA_{0.2}IN_{0.8}AS$ QUANTUM WELLS

IN THE CENTRE, AND THESEPRODUCE LIGHT AT 980 NM. TOP AN
MIRRORS CONTAIN $AL_{0.7}GA_{0.3}AS$/GAAS QUARTER-WAVELENGTH BRAGG ST
CURRENT CONFINEMENT IS ACHIEVED EITHER BY USING DE
IMPLANTATION OR WITH SELECTIVE OXIDATION OF AN EXTRA
DIRECTLY ABOVE THE TOP CLADDING LAYER.

TO DATE, THE BEST PERFORMANCE HAS BEEN ACHIEVED WITH
OXIDIZED 20-MKM-DIAMETER VCSELS. THEY PRODUCE 10-MW OU
POWER WITH A CONVERSION EFFICIENCY OF 47% AND A MAXIMUM
MORE THAN 40MW. CONTINUOUS-WAVE OPERATION IS OBTAINED F
TO +130$^0$C. A SINGLE-MODE LASER PRODUCES 2.7 MW MAXIMUM OU
POWER WITH 50-DB SIDEMODE SUPPRESSION. PROTON-IMPLANTED
ARE NOT AS POWER EFFICIENT. THE RESEARCHERS FOUND THATOX
ARE ABOUT THREE TIMES AS EFFICIENT AS PROTON-IMPLANTED D
SAME WATER, ALTHOUGH THE LATTER DEVICES DO HAVE LO
CAPACITANCES THAT FAVOUR FAST MODULATION."[2]

**III. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOL
EXPRESSIONS:**

ONGOING PROJECTS; TO USE IN NEURAL NETWORKS; NANO
SEMICONDUCTORS; A MOLECULAR BEAM EPITAXY; A CONVERSION
DEVELOP MULTIFILAMENT CURRENT STRUCTURES; TO FABRIC
SYSTEMS; TOP AND BOTTOM MIRRORS; QUARTER-WAVELENGTH
DEEP PROTON IMPLANTATION; A CONVERSION EFFICIENCY; F
MODULATION.

**B) FIND IN THE TEXT THE EQUIVALENTS OF THE FO
EXPRESSIONS:**

Явления, происходящие в течение роста кристалла; приводить к чему-либо; технология измерения и контроля; быть детально исследованным; спектральная область; выходная энергия; непрерывное действие; одномодовый лазер.

**IV. FIND A SENTENCE WHICH EXPRESSES THE MAIN IDEA O
PARAGRAPH OF TEXT B2.1. ENTITLE EACH PARAGRAPH.**

**V. LOOK THROUGH TEXT B2.1 AND ANSWER THE FOL
QUESTIONS:**

1. WHAT SOLID-SOURCE DOES THE LEADING GROUP OF THE UNIV
   USES TO FABRICATE MULTILAYER SYSTEMS ON A SUBSTRATE OF
2. THERE ARE ALSO ONGOING PROJECTS TO DEVELOP MUL CURRENT STRUCTURES IN N-GAASFOR USE IN NEURAL NETWO DESIGN AND FABRICATE VCSELS, AREN'T THEY?
3. WHAT LAYER COMPRISES GAAS WITH THREE STRAINED $IN_{0.2}GA_{0.8}AS$ IN QUANTUM WELLS IN THE CENTRE?
4. WHAT PARTS OF MIRRORS CONTAIN $AL_{0.7}GA_{0.3}AS$/GAAS QUARTER-WAVELENGTH BRAGG STACKS?
5. WHAT OUTPUT POWER WITH A CONVERSION EFFICIENCY OF 47% PRODUCE ?
6. WHAT IS A MAXIMUM POWER?
7. PROTON-IMPLANTED VCSELS ARE NOT AS POWER EFFICIENT, ARE
8. DO THE RESEARCHERS FOUND THAT OXIDIZED DEVICES ARE ABOU AS EFFICIENT AS PROTON-IMPLANTED DEVICES ON THE SAME WA

**VI. FIND KEY WORDS (PHRASES) WHICH EXPRESS THE MAIN EACH PARAGRAPH OF TEXT B2.1. MAKE UP AND WRITE THE SO TEXT B2.1 USING THE KEY WORDS.**

**VII. MAKE UP AND WRITE YOUR QUESTIONS TO TEXT B2.1 TE BE USED AS A PLAN. ASK YOUR FRIENDS THESE QUESTIONS.**

**VIII. SAY WHAT INFORMATION WHICH YOU READ IN THE TE TO YOU. WHAT INFORMATION HAVE YOU EVER KNOWN?**

**IX. COMPLETE THE FOLLOWING SENTENCES USING THE TEX**

1. THIS WORK LEADS TO...
2. THE INSTITUTE IS CURRENTLY USING SUCH TECHNIQUES TO DEVE
3. DEPOSITION ON BOTH GAAS AND SILICON SUBSTRATES IS ...
4. THE ACTIVE LAYER COMPRISES ...
5. TOP AND BOTTOM MIRRORS CONTAIN ...
6. CURRENT CONFINEMENT IS ACHIEVED ...
7. A SINGLE-MODE LASER PRODUCES ...
8. THE RESEARCHERS FOUND THAT ...

**X. WRITE SOME SENTENCES ABOUT TEXT B2.1. USE THE FO CONVERSATION PHRASES: I THINK IT IS RIGHT BECAUSE ... ; I T IMPORTANT... ; IT IS INTERESTING TO KNOW ...**

**XI. USING THE MATERIAL ABOVE THE TEXT, WRITE MAI ACCORDING TO THE QUESTIONS (VII).**

**XII. WRITE A SUMMARY OF THE TEXT.**

**XIII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

YOU SEE ...; AS FOR ME...; IN MY OPINION...; I CAN SAY THAT...; I THIN

1. THE PAUL DRUDE INSTITUTE IS ESPECIALLY INTERESTED IN APPL ING PHENOMENA DURING CRYSTAL GROWTH TO DEVELOP NOVE
2. THIS WORK LEADS TO A PROGRAM RICH IN MONITORING AND ME TECHNIQUES.
3. DEPOSITION ON BOTH GAAS AND SILICON SUBSTRATES ISN EXAMINED IN DETAIL.
4. THERE ARE NO ONGOING PROJECTS TO DEVELOP MULT CURRENT STRUCTURES IN N-GAASFOR USE IN NEURAL NETWOR SIGN AND FABRICATE VCSELS.
5. THE UNIVERSITY ULM IS HOME TO ONE OF THE LEADING GROUPS IN THE DEVELOPMENT OF VCSELS.
6. THE ACTIVE LAYER CANNOT COMPRISE GAAS WITH THREE $IN_{0.2}GA_{0.8}AS$ QUANTUM WELLS IN THE CENTRE.
7. CURRENT CONFINEMENT ISN'T ACHIEVED EITHER BY USING DEEP PLANTATION.
8. THE BEST PERFORMANCE HAS BEEN ACHIEVED WITH MULTIMOD 20-MKM-DIAMETER VCSELS.
9. CONTINUOUS-WAVE OPERATION IS OBTAINED FROM -50 $^{0}$C TO +100 $^{0}$C.
10. A SINGLE-MODE LASER PRODUCES 2.7 MW MAXIMUM OUTPUT WITH 50-DB SIDEMODE SUPPRESSION.

**XIV. CHOOSE A PARTNER AND TALK ABOUT SOME PROBLEM ARISE IN TEXT B2.1. USE CONVERSATION PHRASES.**

FOR EXAMPLE: A: WHAT CAN YOU TELL ME ABOUT THE MAIN IDEA OF ...

*B:* AS WELL-KNOWN ...
*C:* WELL, YOU ARE RIGHT. BUT I HAVE NEVER HEARI
*D:* I'D LIKE TO TELL YOU ...
*A:* I THINK IT IS ...

**XV. PREPARE THE REPORT ON THE THEME CONNECTED V B2.1.**

**XVI. WRITE TRANSLATION OF THE PARAGRAPH WHICH BEGI BERLIN AT THE PAUL DRUDE INSTITUTE, FABRICATION..."**

**XVII. READ TEXT C 2.1.**

**TEXT C 2.1**

**OPTOELECTRONIC RESEARCH IN FINLAND**

"TAMPERE UNIVERSITY OF TECHNOLOGY (TUT; TAMPERE) F SEMICONDUCTOR RESEARCH GROUP OF 25 SCIENTISTS. DESIGNATE OF EXCELLENCE BY THE MINISTRY OF EDUCATION WITH ANNUAI $1.5 MILLION - DERIVED PRIMARILY FROM BUSINESS CONTRACTS DEVELOPS EPITAXIAL COMPOUND SEMICONDUCTOR WAFE OPTOELECTRONIC DEVICES.

ONE OF THE DEVELOPMENTS EMERGING FROM TUT IS PRODU ALUMINIUM-FREE GAINASP 980-NM DIODE LASERS THAT DELIVER U MW OUTPUT POWER IN A SINGLE SPATIAL MODE. ALUMINIUM-FI LASERS OFFER SIGNIFICANT ADVANTAGES, INCLUDING HIGH THRESHOLDS, REDUCED LEAKAGE CURRENT, AND LONGER LIFE-T TESTING OF THE TUT LASERS INDICATES SEVERAL THOUSAND HOU HIGH OPERATING POWER. THE LASER BEAM SHAPE HAS BEEN OPT PUMPING ERBIUM-DOPED FIBER AMPLIFIERS (EDFAS). A FIBER-PI PACKAGED MODULE LAUNCHES MORE THAN 100 MW OF OUTPUT PO FIBER.

VISIBLE LASER DIODES ARE ALSO PRODUCED AT TUT. RED- GAINP LASERS PROVIDE A CW OUTPUT OF 1W FROM A SHALLOW-F

40x1200 MKM. MULTIPLE-EMITTER DIODE-LASER BARS CURRENTI
MAXIMUM CW OUTPUT OF 24W WITH 38% WALL-PLUG EFFICIENCY."[

**XVIII. TRANSLATETEXTC2.1.USETHEFOLLOWINGPHRASES:**

исследовательская группа; министерство образования; ежегодное финансирование; эпитаксиальный слой; пространст-
венная мода; порог повреждения (износа); утечка тока; более длительное время жизни; видимые лазерные диоды; мелко-зернистый чип.

**XIX. RETELL TEXT C2.1.USE THE FOLLOWING PHRASES:**

IT IS WELL-KNOWN THAT...; I'D LIKE TO SAY...; MAY BE CAI
WOULD ADVISE TO CALL YOUR ATTENTION TO ...; IT IS INTEREST
SHOULD SAY THAT ...

# UNIT 3.1

## PART 1

### I. MIND THE PRONUNCIATION OF THE FOLLOWING WORDS:

| | | |
|---|---|---|
| BOW | [BAU] | дуга |
| CONCAVE | ɔŋ['KEɪV] | вогнутый |
| CONVERGE | əN['Kɜ'ʤ] | сходиться |
| CONVEX | [ɔK'N'VEKS] | выпуклый |
| CREDIT | ['KREDɪT] | доверять, верить; приписывать; кредитовать |
| CURVATURE | ɜ'V['Kəʧə] | кривизна, изгиб, искривление |
| DEVISE | ɪ['DAɪZ] | задумывать; изобретать |
| DIVERGE | ɪ['DAɜ'ʤ] | отклоняться |
| ECLIPSE | ['ɪKLɪPS] | затмение |
| EMPIRICALLY | ɪM'P[ɪRɪK(ə)Lɪ] | эмпирически; опытным путем |
| EVAPORATE | ɪ'VÆ[P(ə)REɪT] | испаряться; исчезать |
| EXPOSE | [ɪK'SPəUZ] | выставлять; подвергать |
| FLUX | [FLʌKS] | поток; истекать; очищать; плавить |
| GEOMETRICAL | ʤɪə[METRɪK(ə)L)] | геометрический |
| INCIDENT | ɪN[(T)SɪD(ə)NT] | падающий |
| INCORPORATE | ɪN'K[ɔ'P(ə)ReɪT] | внедрять; включать; охватывать; содержать |
| INCORPORATING | [ɪN'Kɔ'P(ə)ReɪT] | соединенный, объединенный, нераздельный |
| INHERENT | ɪN'[HER(ə)NT] | присущий; неотъемлемый |
| MANIPULATION | ə'N[MɪPJə'LEɪʃ(ə)N] | манипуляция; обращение |
| OBSERVATION | [ɔBZə'VEɪʃ(ə)N] | наблюдение |

PLANE [PLEIN] плоскость

PLANT [PLɑ:NT] растение

PREDICTABLE [PRI'DIKTƏBL] предсказуемый

RATIO ['REIʃIəU] отношение; пропорция; коэффициент; соотношение

REGARDLESS [RI'GɑRDLIS] не обращающий внимания; не думая; не считаясь

REVERSION [RI'Vɜ’ʃ(ə)N] возвращение; переворачивание

SCIENTIFIC [SAIƏN'TIFIK] научный

SHADOW ['ʃÆDəU] тень; затенять

UP-RIGHT [ʌPRAIT] перевернутый

VACUUM ['VÆKJU’M] вакуум; вакуумный

VARY ['VƐƏRI] менять(ся), изменять(ся)

**II. READ AND TRANSLATE THE FOLLOWING PHRASES:**

THE LAW OF REFLECTION BASIC OPTICAL PRINCIPLES
PARAXIAL FORMULAS TO BE DISCOVERED EMPIRICALLY
THEORETICAL EXPLANATION TO GENERATE CHLOROPHYLL
OPTICS TEXTBOOKS MORE SCIENTIFIC TERMS
THE OLDEST OPTICAL ELEMENT THE INCIDENT POWER
A WIDE RANGE THE ANGLE OF REFLECTANCE
ARABIAN OPTICIAN THE INTERSECTION OF THE INCIDEN
REFLECTED RAYS

**III. READ AND GUESS THE MEANING OF THESE WORDS:**

CHLOROPHYLL ['KLɔ’RƏFIL] PARAXIAL [PƏ'RÆKSIƏL]
DISPERSION [DIS'PƐ’ʃ(ə)N] PHILOSOPHER [FI'LɔSƏFƏ]
EUCLID ['JU’KLID] PHYSICS ['FIZIKS]
FORMULA ['Fɔ’MJULƏ] PRINCIPLE ['PRIN(T)SƏPL]
LENS [LENZ] PRISM ['PRIZ(Ə)M]

MANIPULATION [MəˌNIPJʊ'LEɪʃ(ə)N] PYRAMID ['PɪRəMɪD]

PARABOLIC [ˌPÆRə'BƆLɪK((ə)L)] REFRACTION [ɪ'FRÆKʃ(ə)N]

LOOK, READ, REMEMBER !

**-ABLE, -IVE**

**VERB + -ABLE = ADJ**

**- IVE**

READ + ABLE = READABLE
PREDICT + ABLE = PREDICTABLE
ATTRACT + IVE = ATTRACTIVE
AFFIRMAT + IVE = AFFIRMATIVE
COLLECT + IVE = COLLECTIVE
REFLECT + IVE = REFLECTIVE

**IV. A) MAKE UP ADJECTIVES FROM THE VERBS AND WRITE T**

DISTRIBUTE -; SUIT - ; AGREE - ; ALLOW - ; AMEN - ; EXAGGERA
ESTEEM - ; EXCEPT - ; EXCESS - ; EXONERATE - ; OPERATE - ; OPPR

**B) FILL IN THE BLANKS WITH SUITABLE WORDS AND WRITE T FOLLOWING SENTENCES:**

CRYSTALS OF THE MATERIAL CURRENTLY SUFFER FROM (*excess/excessive*) SCATTERING, HOWEVER, WHICH CAUSES LOSS AND MAKES LICA (*attract/attractive*) CANDIDATE FOR LASER SYSTEMS. THE (*effect/effective*) EMISSION CROSS-SECTION OF CR:LISGAF IS APPROXIMATELY 7 CR:LISAF. CRYSTALS OF BOTH MATERIALS HAVE BEEN GROW (*pass/passive*) SCATTER LOSSES OF LESS THAN 0.1 CM.

GRAMMAR REVIEW

## MODAL VERBS

| **PRESENT** | **PAST** | **FUTURE** | |
|---|---|---|---|
| CAN | CAN | COULD | - |
| MUST | MUST | HAD TO | - |
| BE ABLE TO | **IN PRESENT, PAST OR FUTURE INSTEAD OF CAN** | | |
| HAVE TO | HAVE TO | HAD TO | WILL HAVE TO |
| MAY | MAY | MIGHT | - |

SHOULD = OUGHT TO (THEY ARE SIMILAR)
NEED
TO BE TO

**V. REWRITE FOLLOWING SENTENCES TWICE: IN PAST AND IN**

1. YOU MUST REPEAT THESE RULES. 2. ALL-SOLID-STATE FEMTOSE HAVE TO FUEL MUCH OF DEVELOPMENT OF CR:LISAF. 3. WE CANN YOU AT THE RAILWAY STATION. 4. HE MUST EXAMINE THAT DEV STUDENTS MUST TAKE THEIR EXAMINATION IN MATHEMATICS.

**VI. LEARN TO READ THE WORDS:**

[Iə] NEARLY, SUPERIOR, RADIOACTIVE, PARAXIAL, INHERENT, G
[OI] SPOIL, COIN, VOICE, SOIL, TOILS
[Uə] SURE, VACUUM,
[G] GROUP, REGARDLESS

**VII. READ AND TRANSLATE THE TEXT A 3.1.**

**TEXT A 3.1**

**HOW MIRRORS SHAPE LIGHT SYSTEMS**

"SNELL'S LAW OF REFRACTION, THE LAW OF REFLECTION AN DISPERSION - BASIC OPTICAL PRINCIPLES WE MAY HAVE STUDIED THESE PRINCIPLES PLAY CRITICAL ROLES IN THE MANIPULATION O THE MOST COMPLICATED OPTICAL DESIGNS MUST BOW TO THES INCORPORATE EITHER INDIVIDUALLY OR COLLECTIVELY THE ELEMENTS OF OPTICS - MIRRORS, LENSES AND PRISMS.

THESE LAWS WERE DISCOVERED EMPIRICALLY - FROM OBSE REFRACTION OF RAYS OF THE SUN AS IT ROSE AND SET IN THE WATCHING THE FORMATION OF SHADOWS OR THE PHASES OF AN E THEIR OBSERVATIONS, THE EARLY CHINESE, GREEK AND ARABIAN DEVELOPED THE SCIENCE OF GEOMETRICAL OPTICS - A METHOD LIGHT AS RAYS INSTEAD OF WAVES OR PARTICLES. THE RAYS ARE BECAUSE THEY ARE INCIDENT ALONG OR NEAR THE AXIS OF AN O

PARAXIAL FORMULAS HAVE BEEN DEVISED TO EXPLAIN THE BEHA LIGHT RAYS.

THE FORMULAS WITH THEIR THEORETICAL EXPLANATIONS CA MOST OPTICS TEXTBOOKS AND IN CATALOGUES FROM OPTICS MANU

THE MIRROR IS PERHAPS THE OLDEST OPTICAL ELEMENT. LOOK WERE DISCOVERED IN EGYPTIAN PYRAMIDS BUILT IN 1900 BC. PLAN MIRRORS ARE FOUND IN PRACTICALLY EVERY HOME TODAY. S PARABOLIC, MIRRORS ARE OFTEN USED IN OPTICAL SYSTEMS INSTE

WHEN A RAY OF LIGHT IS INCIDENT UPON A SURFACE, COMP THE LIGHT ARE EITHER ABSORBED OR REFLECTED. WE SEE ONLY THE VISIBLE SPECTRUM THAT IS REFLECTED. AN APPLE APPEAR BECAUSE THE COLOURS (WAVELENGTHS) OF SPECTRUM ARE AB SURFACE EXCEPT FOR RED. A PLANT WOULD DIE IF EXPOSED ONL LIGHT BECAUSE IT REQUIRES THE ABSORPTION OF ALL OTHER W GENERATE CHLOROPHYLL.

THIS PROPERTY INHERENT IN MIRRORS, AS WELL AS LENSES AN REFLECTANCE - THE RATIO OF THE LIGHT REFLECTED FROM A SUR LIGHT REACHING IT. IN MORE SCIENTIFIC TERMS, IT IS THERATIO OF POWER OR FLUXTO THE INCIDENT POWER. REFLECTIVITY CAN VAR RANGE - FROM NEARLY 100% FOR METALS THAT REFLECT VISIBLE WAVELENGTHS TO NEARLY ZERO FOR HIGHLY ABSORBING MATERIA

THE ANGLE OF REFLECTANCE OF A RAY OF LIGHT IS EQUAL TO INCIDENCE. THIS IS THE FIRST LAW OF REFLECTION, ORIGINALLY D EUCLID IN 300 BC. THE SECOND LAW OF REFLECTION, CREDITED TO AN ARABIAN OPTICIAN, SAYS THAT THE INCIDENT RAY, THE REFL THE NORMAL MUST ALL LIE IN THE SAME PLANE. BOTH OF THE REFLECTION ARE CRITICAL WHEN DETERMINING WHERE AN IMAGE

IMAGES FORMED BY MIRRORS ARE EITHER REAL OR VIRTUA PREDICTABLE SIZE AND LOCATION. A REAL IMAGE IS FORMED INTERSECTION OF THE INCIDENT AND REFLECTED RAYS IS IN FRON A FLAT MIRROR PRODUCES A VIRTUAL IMAGE BECAUSE THE FOCA ALL THE INCIDENT PARALLEL RAYS CONVERGE, IS BEHIND THE RE IT MEANS THAT EACH POINT OF AN OBJECT AT GIVEN PERPENDICU FROM THE MIRROR IS IMAGED THE SAME DISTANCE BEHIND THE CHANGE IS A $180^{O}$ ROTATION ABOUT THE OPTICAL AXIS, KNOWN AS REV

IN ADDITION TO FLAT, THE MOST COMMON SHAPES FOR MI CONVEX AND CONCAVE. THESE TERMS REFER TO THE SHAPE OF WHEN LOOKING ALONG THE DIRECTION OF THE INCIDENT LIGH MIRROR, REGARDLESS OF THE POSITION OF AN OBJECT, WILL AL VIRTUAL, UPRIGHT AND REDUCED IMAGE. AN IMAGE PRODUCED B SPHERICAL MIRROR IS DEPENDENT ON THE LOCATION OF THE OBJ TO ITS FOCAL POINT.

A CONCAVE SPHERICAL MIRROR HAS AN AXIS OF SYMMETRY - AXIS - THROUGH ITS CENTER. A POINT ON THIS AXIS EQUIDISTANT POINT ON THE MIRROR'S SURFACE IS THE CENTER OF CURVATU BEYOND THE CENTER OF CURVATURE FORMS A REAL IMAGE BETV POINT AND CENTER OF CURVATURE.

IF AN OBJECT IS PLACED AT THE CENTER OF CURVATURE, THE A REAL IMAGE THAT IS THE SAME SIZE AS THE OBJECT BUT INVE OBJECT IS MOVED CLOSER TO THE MIRROR, THE IMAGE, THOUGH INVERTED, MOVES AWAY FROM THE MIRROR AND IS LARGER THA WHEN THE OBJECT REACHES A POINT HALFWAY BETWEEN THE M CENTER OF CURVATURE - THE FOCAL POINT OF THE MIRROR - THE FROM EACH POINT BECOME PARALLEL AND NO IMAGE IS FORMED. IS MOVED CLOSER TO MIRROR, PAST THE FOCAL POINT, THE RE DIVERGE AND FORM AN UPRIGHT, VIRTUAL IMAGE LARGER THAN T

IN THE PAST, MIRRORS WERE MADE BY COATING GLASS W WHICH IS HIGHLY REFLECTIVE AT UV AND IR WAVELENGTHS. EVAPORATED COATINGS OF ALUMINUM ON HIGHLY POLISHED SU NOW THE ACCEPTED STANDARD FOR QUALITY MIRRORS."[3]

SAY WHAT FUNDAMENTAL ELEMENTS OF OPTICS DO YO DESCRIBE THE BASIC OPTICAL PRINCIPLES.

**VIII. WORD STUDY.**

CONCAVE – CURVED INWARDS LIKE THE INNER SURFACE OF A BALL

INCORPORATE – MAKE SMTH PART OF A WHOLE; INCLUDE

INVERT – PUT (SMTH) UPSIDE DOWN OR IN THE OPPOSITE POSITION OR ARRANGEMENT

**IX. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOLL EXPRESSIONS:**

THE MANIPULATION OF LIGHT; THE PHASES OF AN ECLIPSE; INSTEA OR PARTICLES; EGYPTIAN PYRAMIDS; OPTICS MANUFACTURES; TH THE VISIBLE SPECTRUM; NEARLY ZERO; THE FOCAL POINT; REA KNOWN AS REVERSION; CONVEX AND CONCAVE; REGARDLESS OF T AN OBJECT; THE CENTER OF CURVATURE; VIRTUAL IMAGE LARGER

**B) FIND THE EQUIVALENTS OF THE FOLLOWING EXPRESSIONS IN**

Играть критическую роль; основные элементы оптики; преломление лучей солнца; оси оптической системы; объяснять поведение световых лучей; сильно поглощающие материалы; в той же плоскости; действительное изображение; мнимое изображение; параллельные лучи; наиболее общие формы зеркал; центр кривизны.

**X. LOOK THROUGH THE TEXT "HOW MIRRORS SHAPE LIGHT AGAIN. READ THE FOLLOWING STATEMENTS AND IF YOU THIN WRONG CORRECT THEM.**

1. SNELL'S LAW OF REFRACTION, THE LAW OF REFLECTION AND DISPERSION ARE BASIC OPTICAL PRINCIPLES.
2. THESE LAWS WERE DISCOVERED EXPERIMENTALLY.
3. IF AN OBJECT IS PLACED AT THE CENTER OF CURVATURE, THE AN UPRIGHT, VIRTUAL IMAGE LARGER THAN THE OBJECT.
4. THE EARLY CHINESE, GREEK AND ARABIAN PHILOSOPHERS D THE SCIENCE OF GEOMETRICAL OPTICS.
5. THE RAYS ARE CALLED PARAXIAL BECAUSE THEY ARE INCIDENT THE AXIS OF AN OPTICAL SYSTEM.
6. THE ANGLE OF REFLECTANCE OF A RAY OF LIGHT IS UNEQUAL T INCIDENCE.
7. THIS PROPERTY INHERENT IN MIRRORS, AS WELL AS LENSES AN REFLECTANCE - THE RATIO OF THE LIGHT REFLECTED FROM A TOTAL LIGHT REACHING IT.
8. AN IMAGE PRODUCED BY A CONVEX MIRROR IS DEPENDENT LOCATION OF THE OBJECT IN RELATION TO ITS FOCAL POINT.

9. THE FIRST LAW OF REFLECTION, ORIGINALLY WAS DETERMINED
300 BC.
10. VACUUM-EVAPORATED COATINGS OF ALUMINUM ON HIGHLY P
SUBSTRATES ARE NOW THE ACCEPTED STANDARD FOR QUALITY

**XI. COMPLETE THE FOLLOWING SENTENCES. YOUR ANSWERS M ACCORDING TO THE TEXT.**

1. THESE BASIC OPTICAL PRINCIPLES PLAY CRITICAL ROLES IN ...
2. THESE LAWS WERE DISCOVERED EMPIRICALLY ...
3. THE FORMULAS WITH THEIR THEORETICAL EXPLANATIONS CAN B
4. SPHERICAL, OR PARABOLIC, MIRRORS ARE OFTEN USED IN ...
5. WHEN A RAY OF LIGHT IS INCIDENT UPON A SURFACE, COMPONEN LIGHT ARE ...
6. AN APPLE APPEARS TO BE RED BECAUSE ...
7. A REAL IMAGE IS FORMED WHEN ...
8. A CONCAVE SPHERICAL MIRROR HAS AN AXIS OF ...
9. MIRRORS WERE MADE BY COATING GLASS WITH ...

**XII. ANSWER THE FOLLOWING QUESTIONS:**

1. WHAT ARE THE BASIC OPTICAL PRINCIPLES?
2. HOW WERE THESE LAWS DISCOVERED?
3. WHAT RAYS ARE CALLED PARAXIAL? WHY?
4. THE FORMULAS WITH THEIR THEORETICAL EXPLANATIONS CAN B MOST OPTICS TEXTBOOKS AND IN CATALOGS FROM OPTICS MANU CAN'T THEY?
5. WHERE AND WHEN WERE LOOKING GLASSES DISCOVERED?
6. IS THE ANGLE OF REFLECTANCE OF A RAY OF LIGHT EQUAL TO INCIDENCE?
7. WHAT IMAGE DOES MIRROR FORM IF AN OBJECT IS PLACED AT TH CURVATURE?
8. WHAT IMAGE DOES MIRROR FORM IF THE OBJECT IS MOVED MIRROR, PAST THE FOCAL POINT?

**XIII. MATCH THE ENGLISH WORDS ON THE LEFT WITH THOSE ON**

| | |
|---|---|
| 1. FOCAL | 1. кривизна |
| 2. MIRROR | 2. объединенный |

| | |
|---|---|
| 3. IMAGE | 3. вогнутое |
| 4. ECLIPSE | 4. создавать |
| 5. INSTEAD OF | 5. выпуклое |
| 6. CONVEX | 6. изображение |
| 7. CONCAVE | 7. фокусный |
| 8. REVERSION | 8. зеркало |
| 9. DISPERSION | 9. равный |
| 10. CURVATURE | 10. угол |
| 11. EQUAL | 11. мнимое |
| 12. ANGLE | 12. кроме |
| 13. FORM | 13. переворачивание, реверсия |
| 14. INCORPORATE | 14. затмение |
| 15. VIRTUAL | 15. дисперсия |

**XIV. CHOOSE THE BEST EQUIVALENTS OF THE WORDS ON TH FROMTHE WORDS ON THE RIGHT AND WRITE THEM. (EXAMPLE:**

| | |
|---|---|
| 1. BOW | A) COUNT, B) FOLD, C) BEND, D) SMOOTH |
| 2. DEVISE | A) INVENT, B) RECOGNIZE, C) CREATE, D) EX |
| 3. EXPOSE | A) SUBJECT, B) TAKE, C) REMOVE, D) INFLUE |
| 4. VARY | A) FAIL, B) BETRAY, C) CHANGE, D) RELIEVE |
| 5. CREDIT | A) ATTRIBUTE, B) BELIEVE, C) FINANCE, D) |
| 6. CONVERGE | A) MEET, B) APPROACH, C) NAIL, D) CLOSE |
| 7. DIVERGE | A) BREAK, B) PASS, C) GO, D) DISPERSE |
| 8. EVAPORATE | A) CONDENSE, B) DIE, C) STEAM, D) DISAP |
| 9. POLISH | A) WEAR OFF, B) SMOOTH, C) BUFF, D) GRIN |
| 10. REFLECT | A) REPRESENT, B) REBUFF, C) REPULSE, D) |

**XV. DEFINE THE MEANING OF THE FOLLOWING WORDS (TH THE ADJECTIVES OR THE VERBS) IN THESE SENTENCES, TRANSLA**

IF STARTING MATERIALS OF GOOD QUALITY ARE ***available*** FOR BOTH LISALF AND LISGAF, LISGAF IS MORE ***sensitive*** TO OXYGEN OR MOISTURE ***contamination*** IN THE FURNACE. THIS DISTANCE ALLOWED RAPID, WI ***high-resolution*** COVERAGE WITH ***relative*** SAFETY FROM ENTANGLEMENT DEBRIS FOULING THE PIPE. PIPELINE DEBRIS SUCH AS FISHING HAZARDOUS TO ***conventional*** CAMERA-BASED ***inspection*** SYSTEMS THAT RIDE ***directly*** ON THE PIPE.

**XVI. GUESS WHAT THESE WORDS MEAN:**

CRITICAL; EMPIRICALLY; INDIVIDUALLY; COLLECTIVELY; C
OPTICS; CATALOGUE; SPHERICAL.

**XVII. TRANSLATE AND WRITE THE SENTENCES, USING THE FOLLOWING WORDS AND PHRASES:** OPTICS; GAUSSIAN OPTICS; GEOMETRICAL
CENTERS OF SPHERICAL PLANES; SYMMETRY PLANE; PICTURE P
PLANE; GAUSSIAN IMAGE PLANE.

В 1841 году Гаусс создал общую теорию идеальных оптических систем. Теория идеальной оптической системы - это чисто геометрическая теория, которая устанавливает соотношение между точками, линиями, плоскостями. Линия, соединяющая центры сферических поверхностей, представляет собой ось симметрии центрированной системы и называется главной оптической осью системы. Теория Гаусса устанавливает ряд кардинальных точек и плоскостей, задание которых полностью описывает все свойства оптической системы. Идеальная система имеет две главные плоскости. Все точки этих плоскостей сопряжены и изображаются с увеличением +1. Точки пересечения главных плоскостей с осью называются главными точками системы. Оптическую систему можно охарактеризовать линейным и угловым увеличением. Эти два параметра различны для разных точек оси. Чем больше линейное увеличение, тем меньше угловое, то есть, при увеличении размеров изображения лучи, которые его образуют, составляют меньший угол. Все это имеет важное значение при рассмотрении роли оптических инструментов.

**XVIII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW
FOLLOWING PHRASES:**

THAT'S RIGHT...; THAT'S WRONG...; TO MY MIND...; IN MY OPINION...; I
AGREEWITH YOU...; I THINK SO...

1. LOOKING GLASSES WERE DISCOVERED IN CHINA.
2. THE MOST COMPLICATED OPTICAL DESIGNS DON'T BOW TO THES
CAL PRINCIPLES AND INCORPORATE EITHER INDIVIDUALLY OR C
FUNDAMENTAL ELEMENTS OF OPTICS - MIRRORS, LENSES AND PR

3. PARAXIAL FORMULAS HAVE BEEN DEVISED TO EXPLAIN THE BEHA
LIGHT RAYS.
4. THE PROPERTY INHERENT IN MIRRORS, AS WELL AS LENSES AND
REFLECTANCE.
5. WHEN AN OBJECT REACHES A POINT HALFWAY BETWEEN THE MI
CENTER OF CURVATURE - THE FOCAL POINT OF THE MIRROR - TH
RAYS FROM EACH POINT BECOME PARALLEL AND NO IMAGE IS F
6. AN OBJECT BEYOND THE CENTER OF CURVATURE FORMS A REAL
TWEEN THE FOCAL POINT AND CENTER OF CURVATURE.
7. THE MIRROR CANNOT BE THE OLDEST OPTICAL ELEMENT.
8. AN IMAGE PRODUCED BY A CONCAVE SPHERICAL MIRROR ISN'T D
ON THE LOCATION OF THE OBJECT IN RELATION TO ITS FOCAL PO

**XIX. RETELL TEXT A3.1 ACCORDING TO THE SCHEME:**

BASIC OPTICAL PRINCIPLES

THE SCIENCE OF GEOMETRICAL OPTICS

THE MIRROR IS THE OLDEST OPTICAL ELEMENT

ABSORBTION AND REFLECTION OF THE COMPONENTS OF

THERATIO OF REFLECTING POWER

TWO LAWS OF REFLECTION

CONVEXAND CONCAVE MIRRORS

REAL AND VIRTUAL IMAGES

**XX. READ THE DIALOGUE AND ACT IT OUT. THEN MAKE UP T DIALOGUES OF YOUR OWN AND ROLE PLAY THEM.**

AT THE PLANT

*Mr. J.B. Crewe, the Chief of the shop:* HELLO, MR. JONES.

*Mr. R.D. Jones, the commercial Director:* HELLO, MR. CREWE. LET ME INTRODUCE YOU THE MANAGERS: MR. BLACK AND MR. STU WORK FOR SCIENTIFIC MEASUREMENT SYSTEMS INC.

*Mr. Crewe:* HELLO, MR. BLACK. HELLO, MR. STUART. HOW DO YOU DO

*Mr.Black:* HOW DO YOU DO?

*Mr. Stuart:* HOW DO YOU DO? OUR COMPANY IS INTERESTED IN YOUR PRODUCTS - MIRRORS, LENS, PRISMS.

*Mr. Crewe:* WE FABRICATE DIFFERENT KINDS OF THE FUNDAMENTAL OF OPTICS. THEY HAVE DIFFERENT SIZES, COVERINGS AND A FROM DIFFERENT MATERIALS. WE SHOULD BE PLEASED TO OF ILLUSTRATED CATALOGUE AND PRICE-LIST OF OUR PRODUCTS

*Mr.Black:* THANKS. BUT WE WOULD LIKE TO HAVE SOME INFORMATIO ABOUT PRISMS.

*Mr. Crewe:* OK. SOME MONTHS AGO WE BEGAN TO PRODUCE NEW KIN PRISMS. FOR EXAMPLE, MORE-SPECIALIZED PRISMS INCLUDE CUBE REFLECTORS, PENTA PRISMS, ROOF PRISMS AND PORRO P

*Mr. Stuart:* TELL US ABOUT THEM IN DETAIL.

*Mr. Crewe:* CORNER CUBES REFLECT ANY BEAM ENTERING THE FACE REGARDLESS OF ORIENTATION, MAKING THEM USEFUL FOR AP WHICH PRECISION ALIGNMENT IS DIFFICULT. PENTA PRISMS AR RANGE FINDERS AND MOVIE CAMERAS. THEY REFLECT LIGHT BY TWO REFLECTIONS WITHOUT INVERSION OR REVERSION OF

*Mr.Black:* AND WHAT ABOUT ROOF AND PORRO PRISMS?

*Mr. Crewe:* ROOF PRISMS ERECT AN IMAGE AND BEND THE LINE OF SI THROUGH $90^0$. IN REFRACTING ASTRONOMICAL TELESCOPES TH IMA-GES. PORRO PRISMS ARE PAIRS OF NARROW RIGHT-ANGLE ARE USED IN BINOCULARS AND TELESCOPES. THEY ERECT AN IMA-GE AS WELL AS SHORTEN THE LENGTH OF AN INSTRUMENT

*Mr.Black:* THANK YOU VERY MUCH. YOUR INFORMATION IS VERY US US. PLEASE LET US HAVE YOUR PRICES IN USD.

**XXI. CONTINUE AND WRITE THE DIALOGUE:**

*Edgar:* HI, MARK! HAVE YOU CHOSEN THE THEME OF YOUR REPORT?

*Mark:* OH, NO. COULD YOU HELP ME? I DID NOT WRITE THE LIST OF THEM.

*Edgar:* OK. TAKE YOUR PEN AND WRITE. THE FIRST ONE IS “THE HISTORY OF MIRRORS”, THE SECOND ONE IS “ THE BASIC OPTICAL PRINCIPLES”, THE THIRD ONE IS “ THE FUNDAMENTAL ELEMENTS OF OPTICS - MIRRORS, LENSES AND PRISMS”, THEN...

*Mark:* STOP, STOP THAT’S ENOUGH. I’VE CHOSEN

*Edgar:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Mark:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Edgar:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Mark:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**XXII. CHOOSE A PARTNER AND TALK ABOUT SOME PROBLEMS ARISE IN TEST A3.1.**

**XXIII. WRITE A SUMMARY OF THE TEXT. LIMIT IT TO 15 SENTENCES.**

## PART 2

**I. MIND THE PRONUNCIATION OF THE FOLLOWING WORDS:**

| | | |
|---|---|---|
| ABERRATION | [‘ÆBƏ'REɪʃ(ə)N] | аберрация; отклонение |
| ASTIGMATISM | [Ə'STIGMƏTIZ(ə)M] | астигматизм |
| BRAIN | [BREɪN] | мозг; голова |
| CHROMATIC | [KRƏU'MÆTIK] | цветной |
| COMA | ['KƏUMƏ] | кома |
| CORNEA | ['KƆ:NIƏ] | роговая оболочка глаза |
| DISTORTION | [DI'STƆ:ʃ(ə)N] | искажение; искривление |
| EQUATION | [ɪ'KWEɪʒ(ə)N] | выравнивание; уравнение |
| FEASIBLE | ['FI:ZƏBL] | выполнимый; осуществимый; возможный; вероятный |

| | | |
|---|---|---|
| FRUSTRATE | [ʌ'S FRE IT] | расстраивать; срывать; делать бесполезным |
| INDEX | ['INDEKS] | индекс; указатель; каталог; коэффициент |
| MICROSCOPE | ['MAIKRƏSKOUP] | микроскоп |
| QUANTITY | ['KWƆNTITI] | количество; величина |
| RETINA | ['RETINƏ] | сетчатка |
| SPECTACLES | ['SPEKTƏKLZ] | очки |
| TRANSPARENT | [TRÆNS'PE(Ə)RƏNT] | прозрачный; просвечивающийся |
| USABLE | ['JU:ZƏBL] | пригодный к использованию; удобный; практичный |

**II. READ TEXT B 3.1 AND FORMULATE ITS MAIN IDEA.**

## TEXT B 3.1

## LENSES: LIGHT BENDING

"LENSES HAVE HAD A RELATIVELY LONG EVOLUTION. ROGER A READING GLASS IN 13TH CENTURY. SPECTACLES WERE INTRODUC EUROPE IN 1287. BUT IT WASN'T UNTIL SOME 400 YEARS LATER MICROSCOPE WAS INVENTED, FOLLOWED BY THE TELESCOPE A D AFTER THAT.

THE GOVERNING LAW FOR THE OPERATION OF LENSES IS T REFRACTION, OR SNELL'S LAW. THIS CALCULATION DETERMINES HO IS BENT, OR REFRACTED, AS IT PASSES FROM ONE MEDIUM TO ANO SUNLIGHT PASSING FROM AIR INTO WATER OR FROM AIR INTO A REFRACTED WHEN THERE IS A CHANGE IN ITS SPEED. THE GREATE DENSITY OF THE MEDIUM THAT THE WAVELENGTH ENTERS, THE LO OF LIGHT THROUGH THE MEDIUM. THE WAVELENGTH ALSO BECO WHEN IT ENTERS THE MEDIUM, ALTHOUGH THE FREQUENCY IS THE

SNELL DISCOVERED TWO IMPORTANT POINTS FOR DETERM
MUCH THE RAY WILL BE BENT - THAT THE INCIDENT AND REFRAC
THE SAME PLANE AND THAT THE REFRACTED ANGLE CAN BE CALCU

$$N_1 \text{SIN}\,\theta_1 = N_2 \text{SIN}\,\theta_2$$

WHERE $N_1$ = INDEX OF REFRACTION OF THE FIRST MEDIUM, $\theta_1$ = ANGLE OF
INCIDENCE IN THE FIRST MEDIUM, $N_2$ = INDEX OF REFRACTION OF THE SECO
MEDIUM, $\theta_2$ = RESULTING ANGLE IN THE SECOND MEDIUM.

IN ITS MOST SIMPLE FORM, A LENS IS A SINGLE CURVED SUR
COLLECTS LIGHT FROM A SOURCE AND REFRACTS THAT LIGHT T
IMAGE OF THAT SOURCE. OUR EYES DO THIS. USUALLY, A LENS CO
OR MORE TRANSPARENT REFRACTING INTERFACES, AT LEAST O
CURVED. DEPENDING ON ITS CURVATURE, A LENS WILL CAUSE LI
CONVERGE OR DIVERGE. A CONVEX LENS, ALSO KNOWN AS A CON
POSITIVE LENS, WILL FOCUS LIGHT RAYS TO A POINT, AS DOES A
GLASS. IT WILL ALWAYS BE THICKER IN THE CENTER THAN AT
CONCAVE, DIVERGING, OR NEGATIVE LENS DISPERSES LIGHT AND
THE MIDDLE THAN AT THE EDGES.

A LENS, LIKE A MIRROR, WILL FORM EITHER A REAL IMAGE T
PROJECTED ONTO A SCREEN OR A CARD, OR A VIRTUAL ONE TH
PROJECTED. ALSO, AS WITH A MIRROR, AN IMAGE FROM A LENS
EITHER UPSIDE DOWN OR RIGHT SIDE UP. A CONVEXLENS INVERTS T
CONCAVE LENS DOES NOT. MOST ASTRONOMICAL TELESCOPES
LENSES. THIS INVERTED WAY OF VIEWING THE SKY FRUSTRATED
MUCH THAT HE INSERTED A CONCAVE LENS INTO HIS TELESCOPE
VIEW THE STARS RIGHT SIDE UP.

THE CORNEA OF THE HUMAN EYE IS CONVEX LENS THAT REF
COMING THROUGH IT, FOCUSING IT INTO INVERTED IMAGES ON TH
INVERTED IMAGES ARE CONVENIENTLY TURNED RIGHT SIDE UP BY

THE BEHAVIOR OF A CONVEX LENS IS SIMILAR TO THAT OF
MIRROR IN THAT THE PLACE WHERE THE IMAGE IS FORMED IS DE
WHERE THE OBJECT IS IN RELATION TO THE FOCAL POINT. THE EQU
CALCULATE THE FOCAL LENGTH OF A CONVEXLENS IS THE SAME A
MIRRORS.

A CONCAVE, NEGATIVE LENS BY ITSELF CANNOT FORM A REAL
POSITIVE LENS CAN. LIGHT PASSING THROUGH A NEGATIVE LENS P
OPTIC AXIS IS BENT AWAY FROM THE AXIS. THE FOCAL POINT OF TH

LENS IS LOCATED BY EXTENDING THESE DIVERGING RAYS BACKWA
CROSS THE AXIS. THE IMAGE FORMED BY A DIVERGING LENS IS ALW
UPRIGHT, SMALLER AND CLOSER TO THE LENS THAN THE OBJECT. N
ARE USED TO REDUCE IMAGES AND TO CONSTRUCT COMPOUND LEN

WHEN AN OPTICAL ENGINEER ASKS "WHICH LENS SHOULD I US
SHE BEGINS BY DEFINING THE PROBLEM - NOTHING CRITICAL QUAN
MAGNIFICATION, FOCAL LENGTH, CLEAR APERTURE (DIAMETER), A
IMAGE POSITION BY APPLYING THE PARAXIAL FORMULAS WITH
PARAMETERS AND SOLVING FOR REMAINING VALUES SUCH AS T *f*-NUMBER,
NUMERICAL APERTURE, AND ELEMENT DIAMETER OF THE SYSTE
PURELY GEOMETRICAL VALUES, DETERMINED BY PARAXIAL EQUA
NOTHING ABOUT THE QUALITY OF THE IMAGE PRODUCED. BUT THE
AN IDEA OF HOW FEASIBLE THE TASK IS. NEXT, THE OPTICAL EN
CHOOSE COMPONENTS BASED ON THESE VALUES, THEN EVALUAT
WORLD PERFORMANCE, PARTICULARLY THE EFFECTS OF ABERRATI

THE IMAGING CAPABILITY OF A REAL OPTICAL SYSTEM IS D
LIMITED, NEVER PERFECT. THIS INABILITY OF A LENS TO FORM A P
IS CALLED LENS ABERRATION. MIRRORS ARE ALSO SUSCEPT
PHENOMENON. COMMON LENS ABERRATIONS ARE SPHERICAL, C
CURVATURE, ASTIGMATISM, DISTORTION, AND CHROMATIC. A
ABERRATION OCCURS, FOR EXAMPLE, WHEN YOU HAVE A CONVER
MIRROR THAT CANNOT BRING PARALLEL RAYS INTO FOCUS. TH
BECAUSE THE FOCAL LENGTH FOR RAYS FOCUSED BY THE CENTRAL
DIFFERS FROM THAT FOR RAYS FOCUSED BY THE OUTER PARTS, AN
IS FORMED. COMPOUND LENSES ARE OFTEN USED TO M
ABERRATIONS."[3]

**III. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOLL
EXPRESSIONS:**

A RELATIVELY LONG EVOLUTION; THE GOVERNING LAW; TH
ANGLE; A SINGLE CURVED SURFACE; TWO OR MORE TRANSPARE
INTERFACES; A MAGNIFYING GLASS; TO INVERT THE IMAGE; TO INS
LENS INTO SOMETHING; ON THE RETINA; DIVERGING RAYS; TO
COMPOUND LENSES; CLEAR APERTURE; DIFFRACTION-LIMITED; NE
FUZZY IMA-GE.

**B) FIND IN THE TEXT THE EQUIVALENTS OF THE FO EXPRESSIONS:**

Рассеивающая линза; собирающая линза; оптическая плотность среды; в той же плоскости; по крайней мере; проектировать на экран; роговая оболочка глаза; параллельно оптической оси; инженер-оптик; качество изображения; астигматизм; дисторсия; хроматическая аберрация.

**IV. FIND A SENTENCE WHICH EXPRESSES THE MAIN IDEA O PARAGRAPH OF TEXT B3.1. ENTITLE EACH PARAGRAPH.**

**V. LOOK THROUGH TEXT B3.1 AND ANSWER THE FOL QUESTIONS:**

1. WHO USED A READING GLASS IN THE 13TH CENTURY?
2. WHEN WERE SPECTACLES INTRODUCED IN EUROPE?
3. WHAT HAPPENS WITH LIGHT WHEN THERE IS A CHANGE IN ITS SP
4. SNELL DISCOVERED TWO IMPORTANT POINTS. WHAT ARE THEY?
5. DEPENDING ON ITS CURVATURE, A LENS WILL CAUSE LIGHT EITH VERGE OR DIVERGE, WON'T IT?
6. WHAT LENS IS KNOWN AS A POSITIVE LENS?
7. CAN REAL IMAGE BE PROJECTED ONTO A SCREEN?
8. WHICH LENS SHOULD AN OPTICAL ENGINEER USE?
9. HOW INABILITY OF A LENS TO FORM A PERFECT IMAGE IS CALLE
10. WHAT COMMON LENS ABERRATIONS DO YOU KNOW?

**VI. FIND KEY WORDS (PHRASES) WHICH EXPRESS THE MAIN EACH PARAGRAPH OF TEXT B3.1. MAKE UP AND WRITE THE S TEXT B3.1 USING THE KEY WORDS.**

**VII. MAKE UP AND WRITE YOUR QUESTIONS TO TEXT B3.1 T BE USED AS A PLAN. ASK YOUR FRIENDS THESE QUESTIONS.**

**VIII. SAY WHAT INFORMATION WHICH YOU READ IN THE TE TO YOU. WHAT INFORMATION HAVE YOU EVER KNOWN?**

**IX. COMPLETE THE FOLLOWING SENTENCES USING THE TEXT.**

1. BUT IT WASN'T UNTIL SOME 400 YEARS LATER THAT ...
2. THE GOVERNING LAW FOR THE OPERATION OF LENSES IS ...
3. THE GREATER THE OPTICAL DENSITY OF THE MEDIUM THAT THI ENTERS, THE LOWER ...
4. THE REFRACTED ANGLE CAN BE CALCULATED BY ...
5. AN IMAGE FROM A LENS CAN APPEAR EITHER ... OR ...
6. NEGATIVE LENSES ARE USED ...
7. THE INVERTED IMAGES ARE ...
8. THE OPTICAL ENGINEER WILL CHOOSE COMPONENTS BASED ON .
9. THE IMAGING CAPABILITY OF A REAL OPTICAL SYSTEM IS ...
10. COMMON LENS ABERRATIONS ARE ...

**X. WRITE SOME SENTENCES ABOUT TEXT B3.1. USE THE FO CONVERSATION PHRASES: I THINK IT IS RIGHT BECAUSE ...; I T IMPORTANT...; IT IS INTERESTING TO KNOW ...**

**XI. USING THE MATERIAL OF THE TEXT ABOVE, WRITE MA ACCEDING TO THE QUESTIONS (VII).**

**XII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

YOU SEE ...; AS FOR ME...; IN MY OPINION...; I CAN SAY THAT...; I THIN

1. THE EQUATION USED TO CALCULATE THE FOCAL LENGTH OF A ISN'T THE SAME AS THAT USED FOR MIRRORS.
2. A NEGATIVE LENS BY ITSELF CAN FORM A REAL IMAGE AS A PO CAN.
3. THE FOCAL POINT OF THE NEGATIVE LENS IS LOCATED BY EXTENI DIVERGING RAYS BACKWARD UNTIL THEY CROSS THE AXIS.
4. THE WAVELENGTH DOESN'T BECOME SHORTER WHEN IT ENTERS ALTHOUGH THE FREQUENCY IS THE SAME.
5. A LENS, LIKE A MIRROR, WILL FORM EITHER A REAL IMAGE T PROJECTED ONTO A SCREEN OR A CARD, OR A VIRTUAL ONE TI PROJECTED.
6. THESE ARE NOT PURELY GEOMETRICAL VALUES, DETERMINED EQUATION.

7. A SPHERICAL ABERRATION OCCURS, FOR EXAMPLE, WHEN YO CONVERGING LENS OR MIRROR THAT CANNOT BRING PARALLEL
8. COMPOUND LENSES ARE OFTEN USED TO MINIMIZE ABERRATIONS
9. A LENS IS A SINGLE CURVED SURFACE THAT COLLECTS LIGHT FR AND REFRACTS THAT LIGHT TO FORM A USABLE IMAGE OF THAT SO

**XIII. CHOOSE A PARTNER AND TALK ABOUT SOME PROBLEM ARISE IN TEXT B3.1. USE CONVERSATION PHRASES.**

FOR EXAMPLE: *A:* WHAT IS THE MAIN IDEA OF ...?

*B:* IT IS KNOWN ...

*C:* WELL, YOU ARE RIGHT. BUT A LOT OF PROBLEMS ARISE ...

*D:* I'D RATHER ADD ...

*A:* I THINK IT IS ...

**XIV. PREPARE THE REPORT ON THE THEME CONNECTED WITH TI**

**XV. WRITE TRANSLATION OF THE PARAGRAPH WHICH BEGIN MOST SIMPLE FORM, A LENS IS..."**

**XVI. READ TEXT C 3.1**

**TEXT C 3.1**

## PRISMS: COLOUR COMPONENTS

"IN THE EARLY 1600S, MISSIONARY REPORTS FROM ASIA INDIC PRISMS WERE WELL KNOWN AND HIGHLY VALUED IN CHINA BECA ABILITY TO GENERATE COLOUR. BUT IT WAS LEFT TO SIR ISAA EXPLAIN THAT, DESPITE POPULAR BELIEF, THE PRISM DID NOT COLOURS BUT ONLY MADE VISIBLE THE COMPONENTS OF WHITE L THE PROCESS OF DISPERSION.

EACH COLOUR OF THE SPECTRUM HAS A DIFFERENT FREQUE OWN INDEX OF REFRACTION. AS INCIDENT WHITE LIGHT ENTERS A S ITS COMPONENT WAVELENGTHS IS BENT ACCORDING TO THE INDEX OF THE SOLID. BUT THIS REFRACTIVE INDEX IS ALSO WAVELENGT CAUSING THE SHORTER WAVELENGTHS (THOSE WITH A HIGHER RE SUCH AS BLUE) TO BEND MORE THAN THOSE WITH A LOWER REF

(SUCH AS RED). THE COLOURS EMERGING FROM THE PRISM TH
INDEPENDENT PATHS AND APPEAR IN THE ORDER OF INCREASING W

PRISMS ARE ALSO USED TO REDIRECT LIGHT BY REFRACTIO
REFLECTION. THE AMOUNT A RAY IS BENT DEPENDS ON THE APEX
PRISM, THE ANGLE OF INCIDENCE OF LIGHT, AND THE REFRACTIVE
PRISM MATERIAL. WHEN A RAY STRIKES THE ENTRANCE FACE OF T
REFRACTED TOWARDS THE NORMAL. AS THE RAY CONTINUES THR
AND STRIKES THE OUTSIDE WALL AND EMERGES INTO AIR, IT IS FU
FOLLOWING SNELL'S LAW. THE RAY IS BENT AWAY FROM THE NOR
AIR HAS A LOWER REFRACTIVE INDEX, ALLOWING THE WAVELENG
NORMAL SPEED. THE ANGULAR DIFFERENCE BETWEEN THE RAY'S
AND ITS NEW DIRECTION IS CALLED THE ANGULAR DEVIATION. T
REFRACTIVE INDEX, THE GREATER THE DEVIATION. THE DEVIATIO
WHEN THE RAY PASSES SYMMETRICALLY THROUGH THE PRISM.

BY THEMSELVES, PRISMS ARE INCAPABLE OF FORMING REAL
AN IMAGING OPTICS IS NOT PRESENT IN THE SYSTEM, THE EMER
WILL BE VIRTUAL. IT WILL HAVE THE SAME ORIENTATION AS THE
IT CAN BE SEEN ONLY LOOKING BACK THROUGH THE PRISM."[3]

**XVII. TRANSLATETEXTC3.1.USETHEFOLLOWINGPHRASES:**

Коэффициент преломления; дисперсия; с уменьщением длин волн; отражение света; угловое отклонение; реальное изображение; проходить через призму.

**XVIII. RETELL TEXT C3.1.USE THE FOLLOWING PHRASES:**

IT IS WELL-KNOWN THAT...; I'D LIKE TO SAY...; MAY BE CA
WOULD ADVISE TO CALL YOUR ATTENTION TO ...; IT IS INTEREST
SHOULD SAY THAT ...

# UNIT 4.1

## PART 1

### I. MIND THE PRONUNCIATION OF THE FOLLOWING WORDS:

| | | |
|---|---|---|
| ABSORPTION | əB'ZƆ'Pʃ(ə)N] | поглощение; впитывание; абсорбция |
| ACCOMPLISH | ə'KƆMPLIʃ] | совершать; выполнять, достигать; завершать |
| CYCLE | ['SAKL] | цикл |
| DETERMINE | [I'TƎ'MIN] | определять; устанавливать |
| DROP | [DRƆP] | падать; снижаться; понижаться |
| EXCESS | [IKSES] | избыток; излишек |
| EXCITE | [IKSAIT] | возбуждать |
| FLASHLAMP | [FLÆʃLÆMP] | импульсная лампа; лампа-вспышка |
| FURTHER | [Ƒ'ƷÐə] | далее; затем; более того, кроме того |
| GAIN | [GEIN] | усиление |
| GENERATE | ʤEN(ə)REIT] | генерировать; вырабатывать |
| HOLDOFF | əULDƆF] | удерживать; держать; задерживать |
| HOWEVER | HAUEV | однако; тем не менее; несмотря на (э)то |
| INVERSION | INVƷ'ʃ(ə)N] | инверсия; обратное преобразование |
| LATTICE | ['LÆTI | решетка |
| LEVEL | ['LEV(ə)L] | уровень; ступень |
| OCCUR | ə'KƷ'] | случаться; происходить; попадать |

| | | |
|---|---|---|
| POPULATION | [ˌpɔpju'leɪʃ(ə)n] | наполненность; степень заполнения; заселенность (энергетических уровней) |
| PRODUCE | ['prɔdju:s] | производить; вырабатывать создавать |
| PULSE | [pʌls] | импульс |
| PUMP | [pʌmp] | накачивать |
| QUALITY | ['kwɔlətɪ] | качество; добротность |
| QUANTITY | ['kwɔntətɪ] | количество; измеряемая величина |
| RELAX | [rɪ'læks] | релаксировать; ослаблять расслаблять; деформироваться |
| RELEASE | [rɪ'li:s] | освобождать; выпускать; сбрасывать |
| REQUIRE | [rɪ'kwaɪə | требовать |
| RESPONSIBLE | [rɪ'spɔn(t)səbl] | обусловливающий; ответственный |
| RETURN | [rɪ'tɜ:n] | возвращать; отдавать; повторяться |
| ROD | [rɔd] | стержень |
| RUBY | ['ru:bɪ] | рубин |
| SHUTTER | ['ʃʌtə] | затвор |
| SOLID | ['sɔlɪd] | твердый; твердотельный |
| STORE | [stɔ: | 1. запас; резерв<br>2. снабжать; наполнять; запасать; хранить |
| SURRENDER | [sə'rendə] | уступать; подчиняться, поддаваться |
| SURROUND | [sə'raund] | окружать |
| TERMINATE | ['tɜ:mɪneɪt] | ставить предел; положить конец; завершать(ся); ограничивать; прерывать |
| THEREFORE | ['ðɛəfɔ:] | поэтому; следовательно |

WEIGHT [WEɪT] вес; масса

WHOLE [HƏUL] целый; весь

**II. READANDTRANSLATETHEFOLLOWINGPHRASES:**

QUITESURE POTASSIUMANDCESIUMVAPOUR
SOLID CRYSTALS OF RARE-EARTH SALTS LASER FROM RUBY C
IN NEARLY EVERY STATE OF MATTER AN "EDIBLE" LASER OU
THE GAIN MEDIUM A SOLID AT ROOM TEMPERATU
FIRST EXCITED TO HIGHER ENERGY STATES EXCESS ENERGY
TO RELAXFROM THEIR EXCITED STATES THE SURROUNDING CR
FINALLY DROP BACK TO THE GROUND STATE TO ACHIEVE POPULA
THE LOWEST METASTABLE LEVEL STIMULATED EMISSION
TO START THE PROCESS ALL OVER AGAIN THE RIGHT OPTICAL C
TWO CLOSELY SPACED METASTABLE ENERGY LEVELS
WHOLE CYCLE OF EXCITATION AND RELAXATION

**III. READ AND GUESS THE MEANING OF THESE WORDS:**

ACTION ['ÆKʃ(ə)N] MOMENT ['MƏUMƏNT]

CONDITION [KƏN'DIʃ(ə)N] ORBITAL ['Ɔ:BIT(ə)L]

CYCLE ['SAIKL] POPULATION [ˌPƆPJU'LEIʃ(ə)N]

GELATIN ['dʒELƏTIN] PROCESS ['PRƏUSES]

GIANT ['dʒAIƏNT] PUBLISH ['PʌBLIʃ]

LASER ['LEIZƏ] RELAXATION [ˌRI:LÆK'SEIʃ(ə)N]

THEORETICAL [θIƏ'RETIK(ə)L]

LOOK, READ, REMEMBER !

**- AL**

**NOUN + AL = ADJ.**

MECHANIC + AL = MECHANICAL

CLASSIC + AL = CLASSICAL

NATION + AL = NATIONAL

THEORETICS + AL = THEORETICAL

OPTICS + AL = OPTICAL

**IV. A) MAKE UP AND WRITE ADJECTIVES FROM THE NOUN**

ORBIT - TYPE -
COMMERCE - ASYMMETRY -
THERMAE- VIBRATION -

**B) FILL IN THE BLANKS WITH SUITABLE WORDS AND W FOLLOWING SENTENCES:**

BY 2001, THE $50M MARKET FOR PLASTIC ... (*optics/optical*) FIBER (POF) WILL REACH $264M AS APPLICATIONS FOR ILLUMINATION MULTIPLY. POF HAS FOUND ACCEPTANCE IN APPLICATIONS I DISPLAYS, ... (*industry/industrial*) CONTROL AND MEDICAL SYSTEM. PO USED IN APPLICATIONS SUCH AS AUTOMOTIVE ... (*centre/central*) LIGHTING, AUTOMOTIVE DATE TRANSMISSION, MILITARY AND TELECOMMUNI

GRAMMAR REVIEW

**CONDITIONAL SENTENCES**

I IF THE DEVICE **IS** OK, WE **SHALL** CONTINUE OUR WORK.
***Если прибор будет в порядке, мы продолжим нашу работ***

II IF THE DEVICE **WAS** OK, WE **SHOULD CONTINUE** OUR WORK.
***Если бы прибор был в порядке, мы бы продолжили работу.***

III IF THE DEVICE **HAD BEEN** OK YESTERDAY, WE **SHOULD HAVE CONTINUED** OUR WORK. ***Если бы прибор был в порядке вчера, мы бы продолжили работу.***

**V. TRANSLATE AND WRITE THE FOLLOWING SENTENCES:**

1. Если бы он не следовал советам преподавателя, он не сделал бы эту работу так быстро. 2. Вы бы знали английский язык хорошо, если бы регулярно занимались. 3. Этот прибор работал бы лучше, если бы его правильно настроили. 4. Если нас не отправят на конференцию на следующей неделе, мы закончим работу вовремя. 5. Если бы мы знали, что вы были в нашем институте, мы бы обязательно встретились. 6. Если она позвонит утром, мы договоримся о встрече. 7. Если бы не было

презентации этой фирмы, мы бы не получили необходимую информацию.

**VI. LEARN TO READ THE WORDS:**

[N] KNOW, KNEE, KNIT, KNACK, KNOCK, KNOWLEDGE

[AU] OUT, ROUND, TOWER, SURROUND, HOWEVER

[EI] TABLE, LASER, METASTABLE, STATE, TERMINATE, PO GENERATE

**VII. READ AND TRANSLATE THE TEXT A 4.1.**

## TEXT A 4.1

## SOLID- STATE LASERS. RUBY LASERS.

"WHEN ARTHUR SCHAWLOW AND CHARLES TOWNES PUBLIS FAMOUS THEORETICAL PAPER "INFRARED AND OPTICAL MASER *The Physical Review* IN 1958, NO ONE WAS QUITE SURE WHAT FORM THE LASER WOULD TAKE. IN THEIR PAPER, SCHAWLOW AND TOWNES HA THAT POTASSIUM AND CESIUM VAPOUR, OR EVEN SOLID CRYSTAL SALTS, MIGHT EMIT LASER LIGHT IF THEY WERE FIRST IRRADIATE LIGHT OF JUST THE RIGHT WAVELENGTH, A SCHEME NOW KNOW PUMPING. BUT AS FATE WOULD HAVE IT, THEODORE MAIMAN CONS WORLD'S FIRST LASER FROM RUBY CRYSTAL - A MATERIAL THAT SAID WOULDN'T WORK.

SINCE THAT FIRST RUBY LASER, RESEARCHERS HAVE DISCO ACTION IN THOUSANDS OF SUBSTANCES AND IN NEARLY EVERY S IN FACT, SCHAWLOW AND OTHERS ONCE CREATED AN "EDIBLE" GELATIN.

IT IS COMMON KNOWLEDGE THAT SOLID-STATE LASERS IN OPTICALLY PUMPED LASERS IN WHICH THE GAIN MEDIUM IS A SO TEMPERATURE. IN SOLID-STATE LASER MATERIALS, THE ATOMS R GENE-RATING LASER LIGHT ARE FIRST EXCITED TO HIGHER ENERGY THE ABSORPTION OF PHOTONS, AND THE WAY IN WHICH THESE FROM THEIR EXCITED STATES DETERMINES THE QUALITY AND QU LIGHT PRODUCED.

FOR EXAMPLE, WHEN THE CHROMIUM (CR) ATOMS IN A RUBY ABSORB PHOTONS OF BLUE OR GREEN LIGHT FROM A XENON FLASH THE ORBITING ELECTRONS JUMP FROM THEIR GROUND-STA IMMEDIATELY SURRENDER SOME OF THEIR EXCESS ENERGY TO THE CRYSTAL LATTICE, DROPPING THEM INTO ONE OF TWO CLOS METASTABLE ENE-RGY LEVELS. IF THE ELECTRONS LINGER AT TH LEVELS LONG ENOUGH TO ACHIEVE POPULATION INVERSION, EMISSION WILL OCCUR WHEN THE ELECTRONS FINALLY DROP BACK STATE FROM THE LOWEST METASTABLE LEVEL.

THE FINAL RADIATIVE ELECTRON TRANSITION FROM THE LOW LEVEL TO THE GROUND STATE OF CHROMIUM REPRESENTS AN EN 1.79EV, GENERATING RUBY LIGHT WITH A WAVELENGTH OF 694.3 N THE ELECTRONS RETURN TO THEIR GROUND STATE, FURTHER AB AND GREEN PHOTONS CAN START THE PROCESS ALL OVER AGAIN.

BECAUSE THE WHOLE CYCLE OF EXCITATION AND RELAXAT CHROMIUM ATOM GENERALLY INVOLVES TRANSITIONS BETWEEN ENERGY LEVELS, RUBY IS DEFINED AS A THREE-LEVEL LASER M MATERIALS MAKE RELATIVELY INEFFICIENT LASERS BECAUSE THE TERMINATES IN THE GROUND STATE; THEREFORE, A LARGE NUMB MUST BE PUMPED OUT OF THE GROUND STATE TO ACHIEVE INVERSION. THE HIGH ENERGY REQUIRED FOR POPULATION INVER ALSO MAKES CONTINUOUS-WAVE (CW) LASER OPERATION VERY ACCOMPLISH.

ONCE POPULATION INVERSION IS REACHED, HOWEVER, A LAR OF ENERGY CAN BE STORED IN A RUBY CRYSTAL. FOR INSTANCE, A ROD DOPED WITH 0.05% CHROMIUM BY WEIGHT CAN STORE ABOU ENERGY WHEN THE ENTIRE POPULATION OF CHROMIUM ATOMS AND UNDER THE RIGHT OPTICAL CONDITIONS, SOME OF THE STORE BE RELEASED IN A SINGLE, HIGH-POWER LASER PULSE. ONE OF EFFECTIVE WAYS TO ACCOMPLISH THIS IS TO PLACE AN ELECTRO (USUALLY A POCKELS CELL) IN THE LASER CAVITY TO HOLD OFF LA THE POPULATION INVERSION HAS PEAKED. IF THE SHUTTER (CALLE IS OPENED AT JUST THE RIGHT MOMENT, THE LASER WILL EMIT A G LASER LIGHT."[4]

SAY WHY RUBY LASERS WERE NAMED SOLID-STATE LASER
SOLID-STATE LASERS GENERATE LIGHT?

**VIII. WORD STUDY.**

TO GAIN - TO OBTAIN, TO WIN (ESPECIALLY SMTH WANTED OR N
TO PUMP - CAUSE AIR, GAS, WATER, ETC. TO MOVE ( IN A SPECIFIE
TION) BY USING A PUMP
TO ABSORB - TO TAKE IN; TO INCLUDE (SMTH/SMB) AS PART OF ITS
ONESELF
FLASHLAMP - DEVICE THAT PRODUCES BRIEF BRIGHT LIGHT
ACCOMPLISH - SUCCEED IN DOING (SMTH); COMPLETE SUCCESSFUL

**IX. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOL EXPRESSIONS:**

IT IS COMMON KNOWLEDGE THAT; OPTICALLY PUMPED LAS TEMPERATURE; FROM THEIR EXCITED STATES; RUBY CRYSTALS A IMMEDIATELY; A METASTABLE ENERGY LEVEL; TO ACHIEVE INVERSION; STIMULATED EMISSION; TO RETURN TO THEIR GROUN LEVEL MATERIAL, A CONTINUOUS-WAVE LASER.

**B) FIND THE EQUIVALENTS OF THE FOLLOWING EXPRESSIONS IN**

твердотельные лазеры; активная среда; путь, по которому релаксируют атомы; переход атома из возбужденного состояния; достигнуть инверсии населенности; соседняя кристаллическая решетка; возвращаться в основное состояние; дальнейшая абсорбция зеленых фотонов; полный цикл возбуждения и релаксации; трехуровневые лазерные материалы.

**X. LOOK THROUGH THE TEXT "SOLID-STATE LASERS. RUBY AGAIN. READ THE FOLLOWING STATEMENTS AND IF YOU THIN WRONG CORRECT THEM.**

3. THEODORE MAIMAN CONSTRUCTED THE WORLD'S FIRST LASE CRYSTAL - A MATERIAL THAT SCHAWLOW HAD SAID WOULDN'T
4. SCHAWLOW AND TOWNES HAD NEVER SUGGESTED THAT POT CESIUM VAPOUR, OR EVEN SOLID CRYSTALS OF RARE-EARTH SA
5. LASER LIGHT.

6. IT IS COMMON KNOWLEDGE THAT SOLID-STATE LASERS IN
OPTICALLY PUMPED LASERS IN WHICH THE GAIN MEDIUM IS A
ROOM TEMPERATURE.
7. THE ATOMS RESPONSIBLE FOR GENERATING LASER LIGHT ARE T
HIGHER ENERGY STATES THROUGH THE ABSORPTION OF PHOTON
8. THE WAY IN WHICH THESE ATOMS RELAX FROM THEIR EXCIT
CANNOT DETERMINE THE QUALITY AND QUANTITY OF LASER LIG
7. ALL ORBITING ELECTRONS JUMP FROM THEIR GROUND-STATE OR
8. WHEN THE ELECTRONS RETURN TO THEIR GROUND STATE, FURT
OF BLUE AND GREEN PHOTONS CANNOT START THE PROCESS ALL
9. THE HIGH ENERGY REQUIRED FOR POPULATION INVERSION IN
MAKES CONTINUOUS-WAVE (CW) LASER OPERATION VERY DI
ACCOMPLISH.

**XI. COMPLETE THE FOLLOWING SENTENCES. YOUR ANSWER ACCORDING TO THE TEXT.**

1. SOLID-STATE LASERS INCLUDE ALL OPTICALLY PUMPED LASERS I
2. THE ATOMS RESPONSIBLE FOR GENERATING LASER LIGHT ARE ...
3. SOME OF THE ORBITING ELECTRONS JUMP FROM ...
4. IF THE ELECTRONS LINGER AT THESE METASTABLE LEVELS LONG ACHIEVE POPULATION INVERSION, STIMULATED EMISSION ...
5. WHEN THE ELECTRONS RETURN TO THEIR GROUND STATE, ...
6. THREE-LEVEL LASER MATERIALS MAKE RELATIVELY INEFFICIENT CAUSE ...

**XII. ANSWER THE FOLLOWING QUESTIONS:**

1. WHAT LASERS DO WE CALL SOLID-STATE LASERS?
2. WHY DO ELECTRONS JUMP FROM THEIR GROUND-STATE ORBITS?
3. WHAT ARE METASTABLE ENERGY LEVELS?
4. WHEN WILL STIMULATED EMISSION OCCUR?
5. WHAT WILL HAPPEN WHEN THE ELECTRONS RETURN TO THEIR GR DESCRIBE THE WHOLE CYCLE OF EXCITATION AND RELAXATION I MIUM ATOM.

**XIII. MATCH THE ENGLISH WORDS ON THE LEFT WITH THOSE O**

1. QUITE 1. затвор

| | |
|---|---|
| 2. SUGGEST | 2. поглощение |
| 3. RESEARCHER | 3. принадлежать |
| 4. CREATE | 4. релаксировать |
| 5. FLASHLAMP | 5. достигать |
| 6. BELONG | 6. создавать |
| 7. RESPONSIBLE | 7. исследователь |
| 8. ABSORPTION | 8. уровень |
| 9. RELAX | 9. вполне |
| 10. INVERSION | 10. метастабильный |
| 11. METASTABLE | 11. предполагать |
| 12. ACHIEVE | 12. инверсия |
| 13. LEVEL | 13. лампа вспышки |
| 14. ACCOMPLISH | 14. ответственный |
| 15. SHUTTER | 15. выполнить |

**XIV. CHOOSE THE BEST EQUIVALENTS OF THE WORDS ON FROM THE WORDS ON THE RIGHT AND WRITE THEM. (E ACCOMPLISH – ACHIEVE)**

1. ACCOMPLISH A) MAKE, B) ACHIEVE, C) DO, D) CREATE
2. PUMP A) ACCUMULATE, B) SAVE UP, C) GAIN, D) FILL
3. EMIT A) EXPIRE, B) EJECT, C) ERUPT, D) RADIATE
4. EXCITATION A) STIMULATION, B) EXCITEMENT, C) AGITATION,D
5. REQUIRE A) ASK, B) DEMAND, C) NEED, D) WANT
6. METASTABLE A) INTERMEDIATE, B) PROVISIONAL, C) TEMPORAL D) CHANGEABLE
7. SURRENDER A) OBEY, B) SUBMIT, C) GIVE, D) REFUSE
8. RELEASE A) EMIT, B) LIBERATE, C) ASSIGN, D) DROP
9. RETURN A) GIVE BACK, B) RECOVER, C)COME BACK, D) REST
10. DISCOVER A) TAKE OFF, B) OPEN, C) CREATE, D) DISCLOSE

**XV. DEFINE THE MEANING OF THE FOLLOWING WORDS (TH THE ADJECTIVES OR THE VERBS) IN THESE SENTENCES, TRANSLA**

WITH THE USE OF FIBER-BUNDLED LASER ***pumping*** DIODES, THE INTENSITY DISTRIBUTION CAN BE ***approximately*** UNIFORM OVER THE ***central*** PORTION OF THE ROD. THE ASSUMED ***pump*** MODE RADIUS OF 250 U-M IS ALMOST EQUIVALENT TO THE HALF-WIDTH AT HALF-MAXIMUM OF ***pump***

MODE (SPOT) RADIUS OF 365 U-M CORRESPONDING TO HALF-WIDT MAXIMUM, FROM WHICH WE *expect* A GOOD *approximation*. ***Efficient*** REDUCTION IN TEMPERATURE *rise* IN COMPOSITE RODS WAS CONFIRME ***quantitatively*** FROM THE ***experimental*** RESULTS.

**XVI. GUESS WHAT THESE WORDS MEAN:**

TERMINATE; ENERGY; CHROMIUM; CONDITION; CAVITY; PEAK;

**XVII. TRANSLATE AND WRITE THE SENTENCES, USING THE F WORDS AND PHRASES:**

LASER; GAIN MEDIUM; METASTABLE LEVEL; ATOMS RELAX EXCITED STATES; THE GROUND STATE; TO ACHIEVE POPULATIO STIMULATED EMISSION.

"В основе работы лазеров лежит способность возбужденных атомов под действием внешнего электромагнитного излучения соответствующей частоты совершать вынужденные квантовые переходы и усиливать это излучение. Активная среда может усиливать падающее излучение, если число атомов на возбужденном энергетическом уровне превышает число атомов на нижерасположенном уровне, то есть, находится в состоянии с так называемой инверсией населенностей.

Для создания и поддержания в активной среде инверсии населенностей применяются специальные методы, которые зависят от структуры активной среды. В лазере на кристалле рубина инверсия населенностей осуществляется посредством оптической накачки по трехуровневой схеме."

**XVIII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW FOLLOWING PHRASES:**

THAT'S RIGHT...; THAT'S WRONG...; TO MY MIND...; IN MY OPIN AGREE WITH YOU...; I THINK SO...

1. RUBY IS DEFINED AS A THREE-LEVEL LASER MATERIAL.
2. RUBY LASER MATERIALS MAKE RELATIVELY EFFICIENT LASERS.
3. A LARGE NUMBER OF ELECTRONS MUST BE PUMPED OUT OF THE G TO ACHIEVE POPULATION INVERSION.
4. THE HIGH ENERGY REQUIRED FOR POPULATION INVERSION IN RUB

MAKES CONTINUOUS-WAVE (CW) LASER OPERATION VERY DIFFIC
COMPLISH.

5. IF THE SHUTTER (CALLED A Q-SWITCH) IS CLOSED AT JUST THE RIG
THE LASER WILL EMIT A GIANT PULSE OF LASER LIGHT.

**XIX. RETELL TEXT A4.1 ACCORDING TO THE SCHEME:**

THE WORLD'S FIRST LASER FROM RUBY CRYSTAL

SOLID-STATE LASER MATERIALS

THE CHROMIUM (CR) ATOMS IN A RUBY CRYSTAL

HOW TO GENERATE RUBY LIGHT

POPULATION INVERSION IN RUBY

**XX. READ THE DIALOGUE AND ACT IT OUT. THEN MAKE U DIALOGUES OF YOUR OWN AND ROLE PLAY THEM.**

*Mrs. Robins:* HELLO, WHO'S SPEAKING, PLEASE?
*Helen:* THIS IS HELEN STUBBS. CAN I SPEAK TO KATE, PLEASE?
*Mrs. Robins:* JUST A MINUTE. HOLD ON! I'LL CALL HER TO THE PHONE.
*Helen:* THANK YOU SO MUCH.
*Kate:* HELLO, HELEN! HOW ARE YOU? WHY WERE YOU ABSENT FROM THE LECTURES YESTERDAY?
*Helen:* I FELT ILL YESTERDAY.
*Kate:* WHAT'S THE MATTER WITH YOU?
*Helen:* I HAD A SPLITTING HEADACHE. I WAS FEELING SORE ALL OVE NOW I AM MUCH BETTER. AND WHAT DID YOU STUDY LAST TIM
*Kate:* PROF. TAYLOR TOLD US ABOUT SOLID-STATE LASERS. HE EXPL

HOW THEY WORK. THERE ARE SOME KINDS OF SOLID-STA
BUT WE BEGAN TO STUDY RUBY LASERS.

*Helen:* WHY DID MR. TAYLOR CHOOSE RUBY LASERS?

*Kate:* BECAUSE THE WORLD'S FIRST LASER WAS CONSTRUCTED FROM
CRYSTAL.

*Helen:* I KNOW SCIENTISTS DEFINE THEM AS THREE-LEVEL LASERS. W

*Kate:* RUBY IS DEFINED AS A THREE-LEVEL MATERIAL BECAUSE THE
WHOLE CYCLE OF EXCITATION AND RELAXATION IN THE
ATOMGENERALLY INVOLVES TRANSITIONS BETWEEN TH
ENERGY LEVELS.

*Helen:* IT IS KNOWN SUCH MATERIALS MAKE RELATIVELY INEFFICIE
LASERS BECAUSE THE LASER TRANSITION TERMINATES IN
STATE; THEREFORE, A LARGE NUMBER OF ELECTRONS
PUMPED OUTOF THE GROUND STATE TO ACHIEVE PO
INVERSION.

*Kate:*YOU ARE RIGHT BUT UNDER THE RIGHT OPTICAL CONDITIONS,
OF THE STORED ENERGY CAN BE RELEASED IN A SINGLE, H
LASER PULSE. ONE OF THE MOST EFFECTIVE WAYS TO ACC
THIS IS TO PLACE AN ELECTRO-OPTIC SHUTTER (USUALLY
CELL) IN THE LASER CAVITY TO HOLD OFF LASER ACTION U
POPULATION INVERSION HAS PEAKED.

*Helen:* AND WHAT ABOUT OUR HOME TASK?

*Kate:* WE HAVE TO PREPARE A REPORTS ABOUT RUSSIAN PHYSICISTS
TOOK PART INTO THE USES OF SOLID-STATE LASERS OR
MOST MODERN DEVELOPMENTS IN RUBY LASER APPLICAT

*Helen:* OK. THANK YOU. BYE.

*Kate:* BYE.

**XXI. CONTINUE AND WRITE THE DIALOGUE:**

*Student A.:* WHAT'S WRONG? HAVE YOU GOT A "TWO" AGAIN?

*Student B:* YES, IN OPTOELECTRONICS. THAT'S MY WEAK POINT.
SEEMS TERRIBLY DIFFICULT TO ME. MY TONGUE FAI

*Student A:* WERE THE QUESTIONS RATHER TOUGH?

*Student B:* . . . . . . . . . . . . . . . . . . . . . . . . . .

*Student A:* I CAN HELP YOU. READ MY NOTES AND ANSWER WH
HAPPENS WHEN THE CHROMIUM ATOMS IN RUBY CR

ABSORB PHOTONS OF BLUE OR GREEN LIGHT FROM A FLASHLAMP?

*Student B:* . . . . . . . . . . . . . . . . . . . . . . . . . .

*Student A:* WELL, NOW, LET'S TACKLE THE NEXT QUESTION. . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Student B:* . . . . . . . . . . . . . . . . . . . . . . . . . .

*Student A:* . . . . . . . . . . . . . . . . . . . . . . . . . .

*Student B:* . . . . . . . . . . . . . . . . . . . . . . . . . .

**XXII. CHOOSE A PARTNER AND TALK ABOUT SOME PROBLEM ARISE IN THE TEST A4.1.**

**XXIII. WRITE A SUMMARY OF THE TEXT. LIMIT IT TO 15 SENT**

## PART 2

**I. MIND THE PRONUNCIATION OF THE FOLLOWING WORDS**

| | | |
|---|---|---|
| ACHROMATISM | [ə'KRƏUMƏTIZ(ə)M] | ахроматизм; бесцветность |
| BINARY | ['BAɪNƏRɪ] | двойной; сдвоенный; бинарный |
| BLAZE | [BLEɪZ] | пламя; яркий свет; гореть; сиять; отшлифовать |
| BLAZED | [BLEɪZD] | отшлифованный |
| DIAMOND | ['DAɪəMəND] | алмаз; ромбовидный; алмазный |
| DISTRIBUTE | [DɪS'TRɪBJU'T] | распределять; классифицировать |
| FINITE | ['FAɪNAɪT] | ограниченный |
| PRECISION | [PRɪ'SɪƷ(ə)N] | четкость; точность |
| PROPER | ['PRƆPƏ] | присущий; свойственный; точный; истинный |
| REPLICATION | [‘REPLɪ'KEɪʃ(ə)N] | ответ; возражение; копия; репродукция; копирование |

| | | |
|---|---|---|
| ROUGHNESS | [illegible] | грубость; резкость |
| STAIRCASE | [illegible] | лестница; ступенчатый |
| TOOL | [TU'L] | резец; орудие; станок |

**II. READ TEXT B 4.1 AND FORMULATE ITS MAIN IDEA.**

## TEXT B 4.1

## FABRICATION OF DIFFRACTIVE OPTICAL ELEMENTS

"DIFFRACTIVE OPTICS IS A TECHNOLOGY THAT PROVIDES EXCITING DEGREES OF FREEDOM IN THE DESIGN AND OPTIMIZATIO SYSTEMS. USING DIFFRACTIVE OPTICS, ONE CAN ACHROMATIZE OPT WITH A SINGLE, ECONOMICAL REFRACTIVE MATERIAL SUCH AS AC COMMON CROWN GLASS. IT HELPS TO CREATE ASPHERIC WAVEFR ASPHERIC SURFACES; ELIMINATE THE NEED FOR EXOTIC AND EXP TYPE MATERIALS; PRODUCE HIGH-PERFORMANCE, LARGE-APERTUR OPTICAL COMPONENTS; PRODUCE PRECISION MICRO-OPTICS. ONE THE WEIGHT, COMPLEXITY, AND COST OF A VARIETY OF OPTICAL SY

TO DATE, WIDESPREAD USE OF DIFFRACTIVE OPTICAL ELEME HAS BEEN LIMITED BY THE EFFECTS ASSOCIATED WITH SCAT SCATTERING ASSOCIATED WITH DOES IS CLASSIFIED AS EITHER S STATISTICAL. STRUCTURED SCATTERING OCCURS WHEN LIGHT IS UNWANTED DIFFRACTIVE ORDERS, WHILE STATISTICAL SCATTE RANDOM SCATTERING CAUSED BY SURFACE ROUGHNESS.

TO PRODUCE A SURFACE-RELIEF DOE, A PRECISION SURFA MASTER ELEMENT IS FABRICATED AND USED TO CREATE LARGE REPLICAS. TOOLING COSTS FOR SURFACE-RELIEF DOES ARE SIMI FOUND WITH PLASTIC-INJECTION-MOLDING PROCESSES; COST S ACHIEVED THROUGH REPLICATION OR MOLDING. WITH A SUITABL CAN MANUFACTURE TENS OF THOUSANDS OF ELEMENTS BASED MASTER.

HIGH-QUALITY DOES ARE PRODUCED BY SHAPING OR MICROM THE REQUIRED SURFACE PROFILE INTO SOME SUBSTRATE MATER HIGH DIFFRACTION EFFICIENCY, THE EDGE STEP AT EACH ZONE BOU

BE EXTREMELY SHARP AND THE SURFACE PROFILE WITHIN EACH Z
SMOOTHLY SHAPED, OR BLAZED, TO AVOID STATISTICAL SCATTEI
FOR SHARP EDGES AND SMOOTH BLAZED SURFACES PLACES ST
SOMEWHAT INCOMPATIBLE REQUIREMENTS ON THE FABRICATIO
USED TO MAKE THE SURFACE-RELIEF MASTER.

THE PRIMARY METHODS DEVELOPED TO PRODUCE THE SUR
DIFFRACTIVE MASTER ARE OPTICAL AND ELECTRON-BEAM (E-B
RAPHY, SINGLE-POINT LASER PATTERN GENERATION (LPG) AND
DIAMOND TURNING (SPDT). WITH OPTICAL AND E-BEAM LITHOGRA
OF LITHOGRAPHIC MASKS ARE USED TO CREATE A STAIRCASE APP
THE DESIRED SURFACE PROFILE. ELEMENTS PRODUCED VIA TH
FABRICATION PROCESS ARE REFERRED TO AS BINARY OPTICS BEC
IN THE PROCESS IS BINARY IN NATURE. LIMITING FACTORS IN TH
EFFICIENCY OF DOES PRODUCED BY THE BINARY OPTICS APPROA
NUMBER OF STEPS WITHIN EACH ZONE AND THE ACCURACY OF
ALIGNMENT IN EACH PHASE OF THE FABRICATION PROCESS.

SINGLE-POINT LASER PATTERN GENERATORS ARE CAPABLE C
BOTH BINARY AND CONTINUOUS BLAZE SURFACE-RELIEF DOES. W
LASER BEAM FOCUSED DOWN TO A SPOT DIAMETER OF μM APPROXIMA
IS USED TO EXPOSE A THIN LAYER OF PHOTORESIST. TO GENERATE
BLAZE STRUCTURE, THE INTENSITY OF THE LASER IS VARIED AS
TRANSLATED ACROSS THE SURFACE. THE SURFACE-RELIEF PATTER
THE PHOTORESIST IS DEVELOPED IS USED TO PRODUCE A POSITIVE
MASTER SUITABLE FOR THE REPLICATION PROCESS OF CHOICE.
FINISH OF PARTS GENERATED BY LPG IS EXCELLENT. THE MAIN LIM
DIFFRACTION EFFICIENCY OF THESE DOES IS THE ROUNDING OF E
ZONE BOUNDARIES CAUSED BY THE FINITE SIZE OF THE FOCUSEI
LASER BEAM. PEAK DIFFRACTION EFFICIENCIES FOR THESE DO
BETWEEN 93% AND 95%.

SINGLE-POINT DIAMOND TURNING SKIRTS THE ROUNDING ISSU
WHILE AVOIDING THE BINARY NATURE OF LITHOGRAPHIC TEC
ROCHESTER PHOTONICS CORP., WE HAVE BEEN ABLE TO USE SPDT
THE SHARP ZONE BOUNDARIES AND SMOOTH, CONTINUOUS BLA
NECESSARY TO ACHIEVE HIGH DIFFRACTION EFFICIENCY WITH
DESIGN AND PROCESS CONTROL. DOES PRODUCED BY THIS METH
DIFFRACTION EFFICIENCIES RANGING CONSISTENTLY BETWEEN 97%

THE DESIGN WAVELENGTH, WITH MEASURED BLAZE-SURFACE RMS OF APPROXIMATELY 40 Å. TO THE BEST OF OUR KNOWLEDGE, THE HIGHEST DIFFRACTION EFFICIENCIES ACHIEVED FOR VISIBLE-LIGHT

**III. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOLL EXPRESSIONS:**

DIFFRACTIVE OPTICS; EXCITING DEGREES OF FREEDOM; OPTIM OPTICAL SYSTEMS; ACRYLIC PLASTIC OR COMMON CROWN GLAS EXPENSIVE FLINT-TYPE MATERIALS; DISTRIBUTED INTO UNWANTE ORDERS; A PRECISION SURFACE-RELIEF MASTER ELEMENT; PLAS MOLDING PROCESSES; SINGLE-POINT LASER PATTERN GENERATION DIAMOND TURNING; WITH PROPER TOOL DESIGN AND PROCESS CON

**B) FIND THE EQUIVALENTS OF THE FOLLOWING EXPRESSI TEXT:**

Ахроматизм оптических систем; точная микрооптика; дифракционные оптические элементы; электронно-лучевая литография; двойное лучепреломление; процесс производства; коэффициент дифракции; граница раздела; диаметр пятна; приблизительно.

**IV. FIND A SENTENCE WHICH EXPRESSES THE MAIN IDEA O PARAGRAPH OF TEXT B4.1. ENTITLE EACH PARAGRAPH.**

**V. LOOK THROUGH TEXT B4.1 AND ANSWER THE FOL QUESTIONS:**

1. IS DIFFRACTIVE OPTICS A TECHNOLOGY THAT PROVIDES NEW DEGREES OF FREEDOM IN THE DESIGN AND OPTIMIZATION O SYSTEMS?
2. HOW CAN WE ACHROMATIZE OPTICAL SYSTEMS?
3. WHAT HELPS TO CREATE ASPHERIC WAVEFRONTS WITHOU SURFACES?
4. WHY CAN ONE REDUCE THE WEIGHT, COMPLEXITY, AND COST OF OF OPTICAL SYSTEMS?
5. TOOLING COSTS FOR SURFACE-RELIEF DOES ARE SIMILAR TO THO WITH PLASTIC-INJECTION-MOLDING PROCESSES, AREN'T THEY?
6. WHAT ARE THE PRIMARY METHODS DEVELOPED TO PRODUCE TH RELIEF DIFFRACTIVE MASTER?

7. WHAT IS THE MAIN LIMITING IN THE DIFFRACTION EFFICIENCY O
DOES?
8. ARE SINGLE-POINT LASER PATTERN GENERATORS CAPABLE O
BOTH BINARY AND CONTINUOUS BLASE SURFACE-RELIEF DOES?
9. ARE THESE THE HIGHEST DIFFRACTION EFFICIENCIES ACHIEVE
LIGHT DOES?

**VI. FIND KEY WORDS (PHRASES) WHICH EXPRESS THE MAIN EACH PARAGRAPH OF TEXT B4.1. MAKE UP AND WRITE THE S TEXT B4.1 USING THE KEY WORDS.**

**VII. MAKE UP AND WRITE YOUR QUESTIONS TO TEXT B4.1 T BE USED AS A PLAN. ASK YOUR FRIENDS THESE QUESTIONS.**

**VIII. SAY WHAT INFORMATION WHICH YOU READ IN THE TE TO YOU. WHAT INFORMATION HAVE YOU EVER KNOWN?**

**IX. COMPLETE THE FOLLOWING SENTENCES USING THE TEXT.**

1. DIFFRACTIVE OPTICS IS ...
2. USING DIFFRACTIVE OPTICS, ONE CAN ACHROMATIZE...
3. SCATTERING ASSOCIATED WITH DOES IS CLASSIFIED AS ...
4. STRUCTURED SCATTERING OCCURS WHEN LIGHT IS ...
5. HIGH-QUALITY DOES ARE PRODUCED BY ...
6. WITH OPTICAL AND E-BEAM LITHOGRAPHY, A SET OF LITHOGR ARE USED ...
7. ELEMENTS PRODUCED VIA THIS MULTISTEP FABRICATION P REFERRED TO AS ...
8. THE MAIN LIMITING IN THE DIFFRACTION EFFICIENCY OF THESE D
9. PEAK DIFFRACTION EFFICIENCIES FOR THESE DOES RANGE BETW

**X. WRITE SOME SENTENCES ABOUT TEXT B4.1. USE THE FO CONVERSATION PHRASES: I THINK IT IS RIGHT BECAUSE ...; I T IMPORTANT ...; IT IS INTERESTING TO KNOW ...**

**XI. USING THE MATERIAL OF THE TEXT ABOVE, WRITE MA ACCORDING TO THE QUESTIONS (VII).**

**XII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

YOU SEE ...; AS FOR ME...; IN MY OPINION...; I CAN SAY THAT...; I SO...

1. DIFFRACTIVE OPTICS IS A PART OF OPTICAL SYSTEMS.
2. STRUCTURED SCATTERING OCCURS WHEN LIGHT IS DISTRIBUTED DIFFRACTIVE ORDERS, WHILE STATISTICAL SCATTERING REF SCATTERING CAUSED BY SURFACE ROUGHNESS.
3. SCATTERING ASSOCIATED WITH DOES CANNOT BE CLASSIFIED AS STRUCTURED OR STATISTICAL.
4. COST SAVINGS AREN'T ACHIEVED THROUGH REPLICATION OR MO
5. TO ACHIEVE HIGH DIFFRACTION EFFICIENCY, THE EDGE STEP AT E BOUNDARY HASN'T TO BE EXTREMELY SHARP.
6. THE SURFACE PROFILE WITHIN EACH ZONE MUST BE SMOOTHLY S BLAZED, TO AVOID STATISTICAL SCATTERING.
7. SINGLE-POINT LASER PATTERN GENERATORS ARE CAPABLE OF P BINARY AND CONTINUOUS BLASE SURFACE-RELIEF DOES.
8. DOES PRODUCED BY THIS METHOD EXHIBIT DIFFRACTION EFFICIE RANGING CONSISTENTLY BETWEEN 87% AND 89% AT THE DESIGN W LENGTH.

**XIII. CHOOSE A PARTNER AND TALK ABOUT SOME PROBLEM ARISE IN TEXT B4.1. USE CONVERSATION PHRASES.**

FOR EXAMPLE: *A:* WHAT IS THE MAIN IDEA OF ...?
*B:* IT IS KNOWN ...
*C:* WELL, YOU ARE RIGHT. BUT A LOT OF PROBLEMS A

**XIV. PREPARE THE REPORT ON THE THEME CONNECTED WITH T**

**XV. WRITE TRANSLATION OF THE PARAGRAPH WHICH BEG PRIMARY METHODS DEVELOPED TO PRODUCE..."**

**XVI. READ TEXT C 4.1**

## TEXT C 4.1

## NONLINEAR OPTICAL MATERIALS

"NONLINEAR OPTICAL (NLO) MATERIALS CAN SIGNIF ENHANCE LASER PERFORMANCE BY ENABLING WAVELENGTH TUNABILITY OVER A BROAD SPECTRAL RANGE. TECHNICAL PROG MADE IN DEVELOPING SEVERAL CRYSTALS THAT TOGETHER COV RANGE FROM MID-ULTRAVIOLET TO THE FAR-INFRARED. SYSTEMS ZINC GERMANIUM PHOSPHIDE, FOR EXAMPLE, HAVE ALREADY DEM TUNABILITY OVER MUCH OF THE MID-INFRARED ATMOSPHERIC WIN AVERAGE POWER OF APPROXIMATELY 3.5 W. SIGNIFICANT IMPRO HAVE ALSO BEEN MADE IN EXTENDING THE TRANSPARENCY IMPROVING THE LASER-DAMAGE RESISTANCE OF THE POTASS PHOSPHATE (KTP) FAMILY OF COMPOUNDS.

SOME OF THE MULTITUDE OF APPLICATIONS REQUIRING US ELEMENTS IN LASER SYSTEMS INCLUDE MILITARY INFRARED COU ENVIRONMENTAL MONITORING BY DIFFERENTIAL ABSORPTION OPERATION IN THE 2- TO 14-MKM WAVELENGTH RANGE, WINDSHEA MEDICAL DIAGNOSIS AND TREATMENT, MATERIALS PROCESSIN INSTRUMENTS, OPTICAL COMMUNICATIONS, LOW-LIGHT IMAGING, ABERRATION COMPENSATION FOR ASTRONOMY AND SATELLITE PROJECTOR, OPTICAL SIGNAL PROCESSING, DATA STORAGE, COMMUNICATIONS AND IMAGING, AND REMOTE IDENTIFICATION O MATERIALS. HOWEVER, AVAILABLE NONLINEAR OPTICAL MATER UNSATISFACTORY FOR MANY APPLICATIONS DUE TO SMALL NONL OPTICAL CLARITY, SMALL THERMAL CONDUCTIVITIES, DIFFICULT INTO DEVICES, AND OTHER FACTORS."[8]

**XVII. TRANSLA TETEXT C 4.1. USE THE FOLLOWING PHRASES**

Нелинейные оптические элементы; лазеры, работающие в видимом диапазоне спектра; некоторые применения требуют ...; не удовлетворять некоторым требованиям; развитие некоторых кристаллов, малая теплопроводимость.

# РАЗДЕЛ II: ОПТОЭДЕКТРОНИКА. ЛАЗЕРЫ

## UNIT 1.2

### PART 1

**I. READ AND LEARN THE FOLLOWING WORDS, MIND PRONUNCIATION:**

| | | |
|---|---|---|
| SIMPLIFY | [′SIMPLIFAI] | упрощать |
| DIAGRAM | [′DAI∂GRÆM] | диаграмма |
| LOITER | [′LOIT∂] | медлить; отставать |
| TERMINAL | [′T∂:MINL] | 1. заключительный, конечный; 2. периодический |
| DETOUR | [′DI:TU∂] | обход; окольный путь |
| CRITERION | [KRI′TI∂RI∂N] | критерий |
| MODE | [M∂UD] | мода; тип колебания |
| AMORPHOUS | [∂′MO:F∂S] | бесформенный; аморфный; некристаллический |
| THRESHOLD | [′θREʃH∂ULD] | порог; начало |
| ATTAINABLE | [∂′TEIN∂BL] | достижимый |
| UNIQUELY | [′NIKLI] | уникально |
| FLUORESCENCE | [FLU∂′RESNS] | свечение; флуоресценция |
| GARNET | [Gα:NIT] | гранат |
| NEODYMIUM | [NI:OU′DIMI∂M] | неодим |
| EXCESS | [IK′SES] | избыток |
| APPROXIMATELY | [∂′PROKSIMITLI] | приблизительно; приближенно; почти |
| PROFOUND | [P∂′FAUND] | 1. глубокий; основательный; 2. полный; абсолютный |
| KRYPTON | [′KRIPTON] | криптон |

| | | |
|---|---|---|
| BEHAVE | [BI'HEIV] | 1. поступать, вести себя; 2. работать (о приборе) |
| INCORPORATE | [IN'KO:P∂RIT] | соединенный; объединенный; нераздельный |
| SHIFT | [∫IFT] | изменение; перемещение; сдвиг |
| BROADEN | ['BRO:DN] | расширять(ся) |
| FACILITATE | [F∂'SILITEIT] | упрощать;облегчать; содействовать; продвигать |
| BIREFRINGENCE | [BAIRE'FRIN3ENS] | двойное лучепреломление |
| BIREFRINGENT | [BAIRE'FRIN3ENT] | двоякопреломляющий |
| ORTHOGONAL | [O:'θOG∂NL] | ортоганальный; прямоугольный; перпендикулярный |
| CODOPE | [K∂'D∂UP] | вкрапление |
| SPECIES | ['SPI:∫I:Z] | вид; род; порода |
| TRANSFER | ['TRÆNSF∂:] | перемещение; передача |
| RARE-EARTH | [RE∂'∂:θ] | редкоземельный |
| ASSORTMENT | [∂'SO:TMENT] | ассортимент; сортировка |
| VIBRONIC | [VAI'BRONIK] | виброниковый |
| AFFECT | [∂'FEKT] | 1. притворяться; делать вид; 2. любить; предпочитать |
| VIBRATIONAL | [VAI'BREI∫∂NL] | вибрационный |
| KEY | [KI:] | ключ |
| EMPLOY | [IM'PLOI] | служба; работа |

**II. READ AND TRANSLATE THE FOLLOWING PHRASES:**

HIGHER PUMPING EFFICIENCIES — FOUR-LEVEL LASER MEDIA
ALL SOLID-STATE LASER MATERIALS — WITH THIS SCHEME
TO BE EXCITED TO HIGHER ENERGY STATES — ORTHOGONAL POLA
THE ABSORPTION OF NEAR-IR PHOTONS — AS WITH RUBY
THEIR EXCESS ENERGY TO THE CRYSTAL LATTICE — INSTEAD OF
A SHORT-LIVED INTERMEDIATE ENERGY LEVEL — KRYPTON ARC LAMP

THE STRONG ABSORPTION LINES OF ND:YAG HOST MATERIALS
AN AMORPHOUS SUBSTANCE LINE OF NEODYMIUM S
ORDER TO ACHIEVE POPULATION UNIQUELY BIREFRINGE
ONE ATOMIC SPECIES IS TRANSFERRED IN THE PAST TWO YEA
TO THE OTHER SIGNIFICANTLY
BOTH THE LASING THRESHOLD AND ENERGY-STORAGE CAPACITY
THE DEVELOPMENT OF MORE-ROBUST NONTOXIC OPTICAL FIBERS

**III. READ AND GUESS THE MEANING OF THESE WORDS:**

| | | | |
|---|---|---|---|
| BALANCE | ['BÆL∂NS] | MEDICINE | ['MEDSIN] |
| ELASTIC | [I'LÆSTIK] | SCHEME | [SKI:M] |
| MOLECULAR | [M∂U'LEKJUL∂] | POLARISATION | [,P∂UL∂RAI'ZEI∫N] |
| APPROXIMATE | [∂'PROKSIMIT] | MECHANICAL | [MI'KÆNIK∂L] |
| CUBE | [KJU:B] | IDEAL | [AI'DI∂L] |
| FILTER | ['FILT∂] | CONCENTRATION | [,KONSEN'TREI∫N] |
| SUBSTRATE | ['SΛBSTREIT] | FACTOR | ['FÆKT∂] |
| EXAMINE | [IG'ZÆMIN] | PHOTOCOPY | ['F∂UT∂UKOPI] |
| CONFIGURATION | [K∂N,FIGJU'REI∫N] | CAMERA | ['KÆM∂R∂] |
| PROPORTION | [P∂'PO:∫∂N] | DISK | [DISK] |
| HARMONIC | [HA:'MONIK] | SCANNING | ['SKÆNIŋ] |

**IV. READ THE WORDS:**

[Æ] GAS, FACTOR, MATCH, TRANSFER, DIAGRAM, EXAMINE
[θ] THREE, BOTH, THROUGH, THULIUM, THRESHOLD, OPHTHALM
[Ð] THE, THIS, THESE, THAT, THEY, THEM, THEN, WITH, FURT
THEREFORE

**V. WORD STUDY.**

TO RELEASE – TO SET FREE OR LIBERATE SB/STH; TO REMOVE (STH)
POSITION; TO CAUSE (STH) TO MOVE FREELY
TO LOITER - TO STAND ABOUT IDLY; TO GO SLOWLY, WITH FREQUEN
TERMINAL - OF THE LAST STAGE IN A FATAL DISEASE; FORMING OR S
END OR BOUNDARY OF STH

UNIQUE - BEING THE ONLY ONE OF ITS TYPE
TISSUE - MASS OF CELLS FORMING THE BODY OF AN ANIMAL OR A
PRECISE - STATED CLEARLY AND ACCURATELY
TO APPROPRIATE – TO TAKE (STH) FOR ONE'S OWN USE, ESPECIALLY WITHOUT PERMISSION OR ILLEGALLY
COLLATERAL - SIDE BY SIDE; PARALLEL; CONNECTED BUT LESS IMPORTANT
ROBUST - VIGOROUS; HEALTHY AND STRONG
RELIABLE - CONSISTENTLY GOOD IN QUALITY OR PERFORMANCE, AND SO DESERVING TRUST; DEPENDABLE

LOOK, READ, REMEMBER!

**IR-**
**DIS-** **NEGATIVE** MEANING OF THE NOUN
**MIS-**
**CO-** **+ NOUN = TOGETHER, JOINTLY** WITH SOMEBODY
**COUNTER-** **IN THE OPPOSITE DIRECTION, CONTRARY** TO SOMETHING
**SUB-** **UNDER, BELOW, LOWER IN RANK NOT QUITE**
**RE-** THINGS WHICH ARE MADE **AGAIN**

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**VI. USING PREFIXES MIS-, CO-, CONTER- SUB, RE-, DIS- MAK AND WRITE NEW WORDS (CHECK YORSELF USING A DICTIONAR THESE WORDS:**

CHARGE - ; COVER - ; LEVEL - ; STRATE - ; ORDINATION -;
GENERATION - ; POISE - ; POINT - ; PROOF - ; FLEX- ;
FLECTION - ; TRUST - ; HABITATION - ; INCIDENCE - ; ROUTIN

**UN-**
**IN-** **+ ADJ = NEGATIVE** MEANING OF THE ADJ
**DIS-**
**IM-**

**USING PREFIXES IN-, IM-, UN-, DIS- MAKE UP AND WR ADJECTIVES OF THE OPPOSITE MEANING (CHECK YOURSEL DICTIONARY) :**

POSSIBLE - ; MODEST - ; TEMPERATE - ; PLEASANT - ; MACULATE - HONEST -.

**VII. TRANSLATE THE FOLLOWING SENTENCES.DEFINE THE M THE WORDS WHICH ARE PUT IN ITALICS (THE NOUNS, THE ADJEC VERBS).**

AT ROOM TEMPERATURE THE DARK CURRENT IS DOMINATI LEAKAGE RATHER THAN SUCH MECHANISMS AS ***mismatch dislocation*** OR SURFACE LEAKAGE. THIS ***mismatch*** DOES NOT CONTRIBUTE ***significantly*** TO THE REVERSE DARK CURRENT. ***Unlike*** LEAD SULPHIDE AND LEAD SELENI PHOTOCONDUCTORS, THE ***heterojunction*** DETECTORS OPERATE IN THE ***photovoltaic*** MODE, PROVIDING ***improved*** NOISE PERFORMANCE WITH HIGH STABILITY AND FAST RESPONSE. IONS OF THE DESIRED ***impurity*** ARE GENERATED ***selectively*** BY IRRADIATING THE SAMPLE WITH ***finely tuneable*** LASER ***radiation*** OF NARROW BANDWIDTH. IN MEDICINE, IT CAN BE USED ***detection*** OF TRACE ELEMENTS AND ELEMENTS SUCH AS MAN MOLYBDENUM AND NICKEL THAT CAUSE ***metabolicdisorders***

**2) FIND AND WRITE THE WORDS WHICH HAVE DIFFERENT (FOR EXAMPLE, MIS-, DIS-, IM- AND ETC.). WRITE WORDS OF THE MEANING (CHECK YORSELF USING A DICTIONARY).**

## GRAMMAR REVIEW

### THE PERFECT FORMS

**THE PRESENT PERFECT TENSE**:

THEPRESENTPERFECT используется для выражения действия, происходившего до настоящего момента и уже завершенного к этому моменту. Связь действия с настоящей ситуацией выражается указанием на период времени в настоящем, который еще не закончен: **THIS**MORNING (EVENING, AFTERNOON, WEEK, M YEAR, CENTURY), TODAY.

| | | |
|---|---|---|
| I | | I **HAVE** JUST **DONE** MY WORK TODAY. |
| YOU | | WE **HAVEN'T WATCHED** THIS FILM YET. |
| THEY` | **HAVE + PARTICIPLE II** | **HAVE** THEY **BEEN** TO PARIS THIS MONTH? |
| WE | | WE **HAVE** ALREADY **KNOWN** HIM SINCE 1975. |
| HE | | HE **HAS LIVED** HERE FOR 5 YEARS. |
| SHE | **HAS + PARTICIPLE II** | SHE **HASN'T DRUNK** COFFEE THIS MORNING. |
| IT | | **HAS** THE TRAIN **ARRIVED** THIS EVENING? |

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**THEPASTPERFECTTENSE**:

THEPASTPERFECTTENSE употребляется для выражения действия, завершившегося до какого-либо момента или другого действия в прошлом.

I (SHE, IT, THEY, YOU, WE, HE) **HAD + PARTICIPLE II**

I **HAD DONE** MY WORK TODAY, WHEN HE CAME.

SHE **HADN'T DONE** HER WORK BY 4 O'CLOCK YESTERDAY.

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**THEFUTUREPERFECTTENSE**:

THEFUTUREPERFECTTENSE употребляется для выражения действия, которое будет происходить до определенного момента или другого действия в будущем и завершится или прекратится до него.

| | | |
|---|---|---|
| I (WE) | **SHALL HAVE + PARTICIPLE II** | I **SHALL HAVE READ** THE BOOK WHEN HE CALL ME. |
| HE (SHE,IT,THEY,YOU) | **WILL HAVE + PARTICIPLE II** | YOU **WILL HAVE FINISHED** YOUR WORK BY 7 O'CLOCK TOMORROW |

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**VIII. PUT THE VERBS IN BRACKETS INTO THE CORRECT TE[...] THE FUTURE, PRESENT, OR PAST PERFECT.**

1. WE (TAKE) OUR EXAM BY 12 O'CLOCK TOMORROW. 2. WHO ([...] THE PAPERS BY THE END OF THE LAST TERM? 3. HE (STUDY) ENGL[...] YEARS. 4. OUR PROFESSOR NEVER (BE) TO LONDON. 5. WHEN HE (CO[...] YESTERDAY THEY ALREADY (FINISH) TO REPAIR THE DEVICE. 6. MY [...] SOLVE) THE PROBLEM YET. 7. MR. GREEN (KNOW) THAT MAN B[...] (BEGIN) TO WORK AT THE UNIVERSITY.

**IX. READ AND TRANSLATE TEXT A 1.2.**

## TEXT A1.2

## SOLID-STATE LASERS. NEODYMIUM LASERS

"HIGHER PUMPING EFFICIENCIES CAN BE OBTAINED FROM FC LASER MEDIA. THIS CAN BE ILLUSTRATED BY EXAMINING A SIMPI LEVEL ENERGY DIAGRAM OF ND:YAG (NEODYMIUM-DOPED Y ALUMINIUM GARNET) - THE MOST SUCCESSFUL OF ALL SOLID MATERIALS.

IN ND:YAG, ELECTRONS OF THE ACTIVE ELEMENT NEODYM EXCITED TO HIGHER ENERGY STATES BY THE ABSORPTION OF NEA HAVING WAVELENGTHS AROUND 0.73 AND 0.8 MKM. AS WITH R ELECTRONS QUICKLY RELEASE SOME OF THEIR EXCESS ENERGY T LATTICE, PLACING THEM IN A LOWER-ENERGY METASTABLE LEVEL LOITER HERE FOR APPROXIMATELY 230 MKS, BUT INSTEAD OF DIRECTLY TO THE GROUND STATE FROM THE METASTABLE LEVEL T A SHORT-LIVED INTERMEDIATE ENERGY LEVEL (TERMINAL LEVEL) GROUND STATE.

THE DETOUR HAS A PROFOUND EFFECT ON THE PUMPING EFF THE MATERIAL BECAUSE LARGE NUMBERS OF ELECTRONS NO LON RAISED FROM THE GROUND STATE IN ORDER TO ACHIEVE POPULA CRITERION IS THAT MORE ELECTRONS POPULATE THE METASTA TERMINAL LEVEL.

RODS OF ND:YAG CANNOT STORE NEARLY AS MUCH ENERGY CAN, BUT THEY CAN OPERATE IN EITHER PULSED (Q-SWITCHE (CONTINUOUS WAVE) MODE. OPTICAL PUMPING IS USUALLY ACC WITH KRYPTON ARC LAMPS BECAUSE THE NEAR-IR EMISSION LINE GAS ARE A GOOD MATCH FOR THE STRONG ABSORPTION LINES OF N

NEODYMIUM BEHAVES VERY DIFFERENTLY IN HOST MATER THAN YAG. WHEN INCORPORATED INTO AN AMORPHOUS SUBSTAN PHOSPHATE GLASS, FOR EXAMPLE, THE 1.064-MKM LASER L NEODYMIUM SHIFTS TO 1.053 MKM AND BROADENS BY AS MUC TIMES THAT OF YAG. THE WIDER EMISSION LINE RAISES BOTH T THRESHOLD AND ENERGY-STORAGE CAPACITY OF ND:GLASS L

CORRESPONDINGLY WIDER ABSORPTION LINES FACILITATE FLASH
ALL OF THESE FACTORS, AS WELL AS THE HIGHER ATTAINABLE CO
NEODYMIUM IN GLASS HOSTS, MAKE ND:GLASS LASERS IDEAL FOR
PULSED OPERATION. HOWEVER, ND:GLASS LASERS CANNOT BE RUN

OTHER USEFUL HOST MATERIALS FOR NEODYMIUM INCL
(YTTRIUM LITHIUM FLUORIDE), GSGG (GADOLINIUM SCANDIUM
GARNET) AND YALO (YTTRIUM ALUMINATE). WHEN DOPED
NEODYMIUM, THESE CRYSTALS DISPLAY A VARIETY OF OPTICAL
THERMAL AND STIMULATED-EMISSION QUALITIES. FOR EXAMPLE,
BE RUN BOTH CW AND PULSED, LIKE ND:YAG, BUT THE OPTICAL Q
THE BEAM IS BETTER THAN ND:YAG. ND:YLF ALSO IS UNIQ
BIREFRINGENT, LEADING TO THE EMISSION OF TWO LASER BEAMS
WAVELENGTHS (1.047 AND 1.053 MKM) AND ORTHOGONAL POLARIZA

HOST MATERIALS CAN EVEN BE CODOPED WITH TWO ACTIVE
IMPROVE PUMPING EFFICIENCY. WITH THIS SCHEME, THE ENERGY
BY ONE ATOMIC SPECIES IS TRANSFERRED TO THE OTHER. IF, FO
GSGG IS CODOPED WITH CHROMIUM AND NEODYMIUM (CR, ND:G
AND PUMPED WITH A XENON FLASHLAMP, THE CHROMIUM ATOMS
THE BLUE AND GREEN LIGHT FROM THE LAMP (JUST AS IN RUBY)
THE ABSORBED ENERGY TO THE ND ATOMS THROUGH RED-SHIFTED
THIS PARTICULAR SYSTEM IS THREE TIMES MORE EFFICIENT THAN
PUMPED ND:YAG LASER.

MATERIALS DOPED WITH RARE-EARTH ELEMENTS OTHER THAN
SUCH AS ERBIUM, THULIUM, AND HOLMIUM, HAVE LED TO A
ASSORTMENT OF SOLID-STATE LASER LIKE ER:GLASS: ER:YAG:
TM:YLF; HO. SOME OF THESE LASERS HAVE FOUND APPLICAT
COMMUNICATIONS AND MEDICINE.

FOR EXAMPLE, IN THE PAST TWO YEARS, THE DEVELOPMENT
ROBUST, NONTOXIC OPTICAL FIBERS AND IMPROVEMENTS IN FIB
MECHANISMS HAVE CONTRIBUTED TO THE MEDICAL COMMUNITY
THE ERBIUM LASER. IMPROVEMENTS IN LASER DESIGN ALSO HAVE
ADVANCEMENT OF CERTAIN ERBIUM-LASER APPLICATIONS. CLIN
LASER PRODUCTS TYPICALLY HAD A MAXIMUM PULSE RATE OF 10
PRODUCTS CAN BE OPERATED AT PULSE RATES OF UP TO 30 HZ, S
IMPROVING THEIR UTILITY FOR CUTTING AND OTHER SMALL-T
APPLICATIONS." [4, 9]

**X. MATCH THE ENGLISH WORDS ON THE LEFT WITH THEI EQUIVALENTS:**

| | |
|---|---|
| 1. ABSORPTION | 1. флуоресценция |
| 2. RELEASE | 2. основной материал |
| 3. EXCESS | 3. сортировка |
| 4. INTERMEDIATE | 4. освобождать |
| 5. PROFOUND | 5. лекарство |
| 6. MORE-ROBUST | 6. поглощение |
| 7. NONTOXIC | 7. более сильный |
| 8. CONTRIBUTE | 8. двойное лучепреломление |
| 9. ASSORTMENT | 9. глубокий, основательный |
| 10. MEDICINE | 10. нетоксичный |
| 11. SPECIES | 11. содействовать |
| 12. VARIETY | 12. избыток, излишек |
| 13. HOST MATERIAL | 13. род, вид |
| 14. BIREFRINGENCE | 14. промежуточный |
| 15. FLUORESCENCE | 15. разнообразие |

**XI. CHOOSE AND WRITE THE BEST EQUIVALENTS FOR THE THE LEFT FROM THE WORDS ON THE RIGHT. EXAMPLE: OBTAIN -**

1. OBTAIN A) INCREASE, B) RECEIVE, C) DEVASTATE, D) GET
2. EXCITE A) ATTRACT, B) UPSET, C) STIMULATE, D) AROUSE
3. ACHIEVE A) LOSE, B) REACH, C) GET, D) STRIVE
4. DROP A) FALL, B) THREW, C) BRING, D) SETTLE
5. CONTRIBUTE A) TAKE, B) HOLD, C) PROMOTE, D) ASSIST
6. RELEASE A) APPROPRIATE, B) FREE, C) EXEMPT D) CLEAR
7. SOLVE A) DECIDE, B) COUNT, C) COME OUT, D) DO
8. SEARCH A) EXPLORE, B) TEST, C) SEEK, D) LOOK FOR
9. INVOLVE A) INCLUDE, B) COVER, C) DRAW (INTO), D) AFFECT
10. CLAIM A) DEMAND, B) EXPECT, C) WAIT, D) REQUIRE

**XII. TRANSLATE THE SENTENCES, USING THE FOLLOWING V PHRASES:**

SOLID-STATE LASER; FOUR-LEVEL; HOST MATERIAL; CAN I ACTIVE ELEMENTS AT LOWER-ENERGY METASTABLE LEVEL.

В твердотельных лазерах активной средой являются оптические монокристаллы и стекла, содержащие примеси ионов-активаторов CR, ND, ER. Такие активные среды работают по четырехуровневой схеме. В энергетических спектрах таких сред между метастабильным и основным уровнями имеется промежуточный рабочий уровень. Этот промежуточный уровень расположен настолько выше основного, что в условиях термодинамического равновесия его заселенность незначительна. Малая населенность такого уровня облегчает создание инверсии населенностей. Это является основным преимуществом активных сред, работающих по четырехуровневой схеме.

**XIII 1. GIVE THE RUSSIAN EQUIVALENTS OF THE FOLL EXPRESSIONS:**

THE ELECTRONS QUICKLY RELEASE SOME OF THEIR EXCESS ENERGY; A SHORT-LIVED INTERMEDIATE ENERGY LEVEL; A PROFOUND EFFEC ACHIEVE POPULATION; EITHER...OR; A GOOD MATCH FOR THE STRO LINES; THE WIDER EMISSION LINE; BOTH...AND; AS WELL AS; D NEODYMIUM; CAN BE CODOPED WITH TWO ACTIVE ELEMENTS; VIB A WIDER RANGE OF FREQUENCIES; AS A RESULT; BROADEN INTO E LIKE RUBY; ODDLY; A SINGLE RED LINE; THE DESIRED FREQUENC MECHANICAL AND THERMAL PROPERTIES; SEPARATE SETS OF CA FREQUENCY-DOUBLED LASER; NONLINEAR OPTICAL TECHNIQUES.

**2. FIND THE EQUIVALENTS OF THE FOLLOWING EXPRESSI TEXT:**

четырехуровневая лазерная среда; промежуточный рабочий уровень; переходить из основного состояния; основной материал; аморфное вещество; способность к накоплению энергии; вынужденное излучение; оптическое качество луча; двоякопреломляющий; увеличить эффективность накачки; передача энергии поглощения; редкоземельные элементы; дискретная длина волны; ключевой энергетический уровень; видимая полоса поглощения; накопить большое количество энергии накачки; трехуровневая мода; полный спектральный диапазон; электрооптический источник света.

**XIV. LOOK THROUGH THE TEXT AGAIN. READ THE FO STATEMENTS. COMPARE YOUR VERSION AND IF YOU THINK WRONG CORRECT THEM.**

1. HIGHER PUMPING EFFICIENCIES CAN BE OBTAINED FROM ONLY T LASER MEDIA.
2. RUBY IS THE MOST SUCCESSFUL OF ALL SOLID-STATE LASER MAT
3. IN ND:YAG, ELECTRONS OF THE ACTIVE ELEMENT NEODYMIUM A TO HIGHER ENERGY STATES BY THE ABSORPTION OF NEAR-IR PHO WAVELENGTHS AROUND 0.73 AND 0.8 MKM.
4. THE ELECTRONS QUICKLY RELEASE SOME OF THEIR EXCESS ENER CRYSTAL LATTICE, PLACING THEM IN A LOWER-ENERGY METAST
5. HOST MATERIALS CANNOT BE CODOPED WITH TWO ACTIVE ELE IMPROVE PUMPING EFFICIENCY.
6. ELECTRONS DROP FIRST TO A SHORT-LIVED INTERMEDIATE ENER (TERMINAL LEVEL) AND THEN TO THE GROUND STATE.
7. ND:YLF CAN BE RUN BOTH CW AND PULSED, LIKE ND:YAG, BUT T OPTICAL QUALITY OF THE BEAM IS BETTER THAN ND:YAG.
8. THE CHROMIUM ATOMS WILL NOT ABSORB THE BLUE AND GREEN THE LAMP (JUST AS IN RUBY) AND CANNOT TRANSFER THE ABSO TO THE ND ATOMS THROUGH RED-SHIFTED FLUORESCENCE.
9. THE ENERGY ABSORBED BY ONE ATOMIC SPECIES IS TRANSFERRED
10. THE DEVELOPMENT OF MORE-ROBUST, NONTOXIC OPTICAL FIB IMPROVEMENTS IN FIBER-DELIVERY MECHANISMS HAVE CONTR THE MEDICAL COMMUNITY'S INTEREST IN THE THULIUM LASER.

- **XV. COMPLETE THE FOLLOWING SENTENCES.**

1. HIGHER PUMPING EFFICIENCIES CAN BE OBTAINED ...
2. ELECTRONS OF THE ACTIVE ELEMENT NEODYMIUM ARE EXCITED
3. THE ELECTRONS QUICKLY RELEASE ...
4. THEY DROP FIRST TO A SHORT-LIVED INTERMEDIATE ENERGY LE
5. RODS OF ND:YAG CANNOT STORE ...
6. THE WIDER EMISSION LINE RAISES BOTH ...
7. HOST MATERIALS CAN EVEN BE CODOPED WITH ...
8. NEODYMIUM BEHAVES VERY DIFFERENTLY IN ...
9. OTHER USEFUL HOST MATERIALS FOR NEODYMIUM INCLUDE ...
10. THE DETOUR HAS A PROFOUND EFFECT ON ...

**XVI. ANSWER THE FOLLOWING QUESTIONS.**

1. HOW CAN HIGHER PUMPING EFFICIENCIES BE OBTAINED?
2. DO THE ELECTRONS QUICKLY RELEASE SOME OF THEIR ENERGY T LATTICE?
3. HOW DO THE ELECTRONS GET TO THE GROUND STATE?
4. WHY DOES THE DETOUR HAVE A PROFOUND EFFECT ON THE PUMI EFFICIENCY OF THE MATERIAL?
5. WHAT DOES THE WIDER EMISSION LINE RAISE? WHY?
6. CAN HOST MATERIALS BE CODOPED WITH TWO ACTIVE ELEMENT
7. HAVE MATERIALS DOPED WITH RARE-EARTH ELEMENTS LED TO A ASSORTMENT OF SOLID-STATE LASER?
8. THE ELECTRONS LOITER HERE FOR APPROXIMATELY 230 MKS, ARE
9. WHAT LASERS TYPICALLY HAD A MAXIMUM PULSE RATE OF 10 HZ
10. WHY CANNOT RODS OF ND:YAG STORE NEARLY AS MUCH ENERG CAN?

**XVII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

THAT'S RIGHT...; THAT'S WRONG...; TO MY MIND...; IN MY OPIN AGREE WITH YOU...; I THINK SO...

1. HIGHER PUMPING EFFICIENCIES CAN BE OBTAINED FROM FOUR-L MEDIA.
2. THE ELECTRONS QUICKLY ABSORPD SOME OF THEIR EXCESS ENER CRYSTAL LATTICE, PLACING THEM IN A LOWER-ENERGY METAST
3. THE ELECTRONS LOITER HERE FOR APPROXIMATELY 230 MKS.
4. THERE IS NO MATERIAL DOPED WITH RARE-EARTH ELEMENTS OT NEODYMIUM.
5. HOST MATERIALS CAN EVEN BE CODOPED WITH TWO ACTIVE ELE IMPROVE PUMPING EFFICIENCY.
6. THE ONLY CRITERION IS THAT MORE ELECTRONS POPULATE THE LEVEL THAN TERMINAL LEVEL.
7. RODS OF ND:YAG CAN STORE NEARLY AS MUCH ENERGY AS RUBY
8. RODS OF ND:YAG CAN OPERATE IN EITHER PULSED (Q-SWITCHED (CONTINUOUS WAVE) MODE.

9. SOME OF LASERS LIKE ER:GLASS: ER:YAG: TM:YAG; TM:YLF; H TM:YAG HAVE FOUND APPLICATIONS IN COMMUNICATION MEDICINE.
10. ND:GLASS LASERS CAN BE RUN CW.

**XVIII. RETELL TEXT A1.2 ACCORDING TO THE SCHEME:**

FOUR-LEVEL LASER MEDIA

ND:YAG IS THE MOST SUCCESSFUL SOLID-STATE LASER MATERIAL

A PROFOUND EFFECT ON THE PUMPING EFFICIENCY OF THE MATERIAL

RODS OF ND:YAGCAN OPERATE IN EITHER PULSED (Q-SWITCHED) OR CW MODE

NEODYMIUM BEHAVES VERY DIFFERENTLY IN HOST MATERIALS OTHER THAN YAG

OTHER USEFUL HOST MATERIALS FOR NEODYMIUM

TWO ACTIVE ELEMENTS TO IMPROVE PUMPING EFFICIENCY

MATERIALS DOPED WITH RARE-EARTH ELEMENTS

THEIR APPLICATIONS

**XIX. READ THE DIALOGUE AND ACT IT OUT.**

*Martin:* WE ARE GOING TO EXHIBIT A SAMPLE OF OUR NEW K ND:YAG AT THE TRADE FAIR NEXT MONTH IN GERMANY.

*Jack:* NEXT MONTH? A TRADE FAIR IN GERMANY? YOU MOVE F THAN I DO.

*Martin:* DON'T WORRY. OUR STANDS HAVE ALREADY BEEN BOO GOT EVERYTHING READY ON TIME. BUT IT IS NECESSARY ADVERTISEMENTS IN THE TRADE FAIR CATALOGUE. DO YOU THINK IT, JACK?

*Jack:* CERTAINLY, I'M SURE!

*Martin:* AND I'D LIKE YOU TO COME TO THE BOARD MEETIN TUESDAY.

*Jack:* OK. BYE.

*Martin:* BYE.

**XX. COMPLETE THE DIALOGUE:**

*Mr. Barner:* DEAR MR. BANNET, WHERE CAN WE FIND THE FULL OF GOODS OF YOUR COMPANY?

*Mr. Bennet:* RECENTLY WE HAVE PUBLISHED THE NEWEST COM CATALOGUE.

*Mr. Barner:* WE ARE INTERESTED IN IT.

*Mr. Bennet:* . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

*Mr. Barner:* WE SHOULD BE PLEASED TO RECEIVE YOUR ILLU CATALOGUE AND PRICE-LIST OF NEW KINDS OF LASERS.

*Mr. Bennet:* . . . . . . . . . . . . . . . . . . . . . . . . . . . .

**XXI. CHOOSE A PARTNER AND TALK ABOUT NEODYMIUM BE IN HOST MATERIALS OTHER THAN YAG.**

**XXII. WRITE A SUMMARY OF THE TEXT IN NO MORE TH SENTENCES.**

## PART 2

### I. READ TEXT B 1.2 AND FORMULATE ITS MAIN IDEA.

### TEXT B 1.2

### VIBRONIC LASERS

"ALL OF THE SOLID-STATE LASERS MENTIONED SO FAR EM RELATIVELY DISCRETE WAVELENGTHS, SUCH AS 694.3 NM FOR RU MKM FOR ND:YAG. BUT THERE IS ANOTHER IMPORTANT CLASS OF LASERS - VIBRONIC LASERS - THAT EMIT LIGHT WITH A WIDE FREQUENCIES.

IN THESE LASERS, THE ELECTRONIC ENERGY STATES OF THE A ARE STRONGLY AFFECTED BY THE VIBRATIONAL ENERGY S SURROUNDING ATOMS IN CRYSTAL LATTICE. AS A RESULT, KEY EN THE ACTIVE ATOM BROADEN INTO ENERGY BANDS.

THE FIRST COMMERCIALLY SUCCESSFUL VIBRONIC LASER, (CR:CHRYSOBERYL), HAS VISIBLE ABSORPTION BANDS IN THE BL SPECTRAL REGIONS. THEREFORE IT CAN BE PUMPED BY XENON FL RED DIODE LASERS. LIKE RUBY, ALEXANDRITE CAN STORE LARG PUMP ENERGY FOR HIGH-POWER, PULSED OPERATION; BUT UNLIK CAN RUN CW.

ODDLY, ALEXANDRITE CAN FUNCTION AS A THREE-LEVEL O LASER. IN THE THREE-LEVEL MODE, THE OUTPUT IS A SINGLE RED NM, BUT IN THE FOUR-LEVEL CONDITION ALEXANDRITE BECOME LASER WITH AN OUTPUT IN THE 700 - TO 830-NM RANGE AT ROOM T WAVELENGTH-SELECTIVE CAVITY OPTICS IS USUALLY EMPLOYED THE DESIRED FREQUENCIES.

THE MOST COMMERCIALLY SUCCESSFUL OF ALL VIBRON HOWEVER, IS TI:SAPPHIRE. ITS POPULARITY CAN BE ATTRIBUTED BROAD SPECTRAL OUTPUT (670-1070 NM) AND EXCELLENT MECHA THERMAL PROPERTIES. TI:SAPPHIRE ALSO HAS HIGH GAIN AND C EITHER CW OR PULSED. HOWEVER, SEPARATE SETS OF CAVITY OPT USED TO TUNE OVER THE ENTIRE SPECTRAL RANGE.

THE PRIMARY ABSORPTION BAND OF TI:SAPPHIRE IS CENTRE BLUE-GREEN PORTION OF THE SPECTRUM AROUND 490 NM, BUT TH METASTABLE STATE (3.2 MKS) MAKES FLASHLAMP PUMPING VERY FOR CW OPERATION, THEN, TI:SAPPHIRE IS USUALLY PUMPED WITH ION OR METAL-VAPOUR LASER. PULSED PUMPING IS TYPICALLY FREQUENCY-DOUBLED ND:YAG OR ND:YLF LASER.

NON-LINEAR OPTICAL TECHNIQUES SUCH AS FREQUENCY DO REGULARLY USED TO EXPAND THE SPECTRAL REACH OF ALL SO INCLUDING THE TUNEABLE VARIETY. THESE TECHNIQUES, AS W DEVELOPMENT OF MINIATURE, DIODE-LASER-PUMPED DESIGNS, H TO TRANSFORM SOLID-STATE LASERS INTO A VITALLY IMPORTANT OPTIC LIGHT SOURCES.”[9]

**II. LOOK THROUGH TEXT B 1.2 AND ANSWER THE FOL QUESTIONS:**

1. WHAT IS A VIBRONIC LASER?
2. ARE THE ELECTRONIC STATES OF THE ACTIVE ELEMENT STRONG THE VIBRATIONAL ENERGY STATES OF SURROUNDING ATOMS IN LATTICE?
3. WHAT FIRST COMMERCIALLY SUCCESSFUL LASERS DO YOU KNOW
4. WHICH DISTINCTIONS BETWEEN RUBY AND VIBRONIC LASERS CA INDICATE?
5. WHERE IS THE PRIMARY ABSORPTION BAND OF TI:SAPPHIRE CEN
6. WHERE ARE FREQUENCY DOUBLING REGULARLY USED?
7. IS THE PRIMARY ABSORPTION BAND OF TI:SAPPHIRE CENTRED I GREEN PORTION OF THE SPECTRUM AROUND 590 NM?
8. WHAT MAKES FLASHLAMP PUMPING VERY INEFFICIENT?
9. WHEN DOES ALEXANDRITE BECOME A VIBRONIC LASER WITH A THE 700 - TO 830-NM RANGE?
10. CANA VIBRONIC LASER BE PUMPED BY RED DIODE LASERS?

**III. COMPLETE THE FOLLOWING SENTENCES USING THE TEX**

1. THE ELECTRONIC ENERGY STATES OF THE ACTIVE ELEMENT ARE
2. THE FIRST COMMERCIALLY SUCCESSFUL VIBRONIC LASER HAS ...
3. IN THE THREE-LEVEL MODE, THE OUTPUT IS A SINGLE RED LINE A BUT IN THE FOUR-LEVEL CONDITION ALEXANDRITE BECOMES ...

4. THE MOST COMMERCIALLY SUCCESSFUL OF ALL VIBRONIC LASER
5. THE PRIMARY ABSORPTION BAND OF TI:SAPPHIRE IS ...
6. PULSED PUMPING IS ...
7. THESE TECHNIQUES HAVE HELPED ...
8. TI:SAPPHIRE IS USUALLY PUMPED WITH ...
9. TI:SAPPHIRE ALSO HAS HIGH GAIN AND CAN BE RUN EITHER ...
10. VIBRONIC LASERS EMIT LIGHT WITH ...

**IV. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

YOU SEE ...; AS FOR ME...; IN MY OPINION...; I CAN SAY THAT...; I SO...

1. VIBRONIC LASERS EMIT LIGHT WITH A WIDER RANGE OF FREQUEN
2. THE ELECTRONIC ENERGY STATES OF THE ACTIVE ELEMENT ARE AFFECTED BY THE VIBRATIONAL ENERGY STATES OF THE SURROUN CRYSTAL LATTICE.
3. KEY ENERGY LEVELS OF THE ACTIVE ATOM CANNOT BROADEN IN BANDS.
4.THERE IS NO FIRST COMMERCIALLY SUCCESSFUL VIBRONIC LASER
5. UNLIKE RUBY, ALEXANDRITE CAN STORE LARGE AMOUNTS OF PU FOR HIGH-POWER, PULSED OPERATION.
6. LIKE RUBY, IT ALSO CAN RUN CW.
7. ALEXANDRITE CAN FUNCTION AS A THREE-LEVEL OR FOUR-LEVE
8. IN THE FOUR-LEVEL CONDITION ALEXANDRITE BECOMES A VIBRO WITH AN OUTPUT IN THE 700 - TO 830-NM RANGE AT ROOM TEMPERA
9. TI:SAPPHIRE ISN'T USUALLY PUMPED WITH AN ARGON-ION OR ME LASER.
10. NON-LINEAR OPTICAL TECHNIQUES SUCH AS FREQUENCY DOUBL REGULARLY USED TO EXPAND THE SPECTRAL REACH OF ALL SOLID INCLUDING THE TUNEABLE VARIETY.

**V. FIND THE SENTENCE WHICH EXPRESSES THE MAIN IDEA PARAGRAPH OF TEXT B1.2. ENTITLE EACH PARAGRAPH.**

**VI. MAKE UP AND WRITE THE SCHEME OF TEXT B1.2 USING T EACH PARAGRAPH.**

**VII. MAKE UP YOUR QUESTIONS TO TEXT B1.2. ASK YOUR F THESE QUESTIONS.**

**VIII. USING THE MATERIAL OF THE TEXT ABOVE, WRITE T POINTS ACCORDING TO THE QUESTIONS (VII). USE THE FO CONVERSATION PHRASES:** I THINK IT IS RIGHT BECAUSE ...; I THINK IT IMPORTANT ...; IT IS INTERESTING TO KNOW ...

**IX. SAY WHAT INFORMATION ABOUT VIBRONIC LASERS Y KNOWN AND WHICH IS NEW.**

**X. WRITE A SUMMARY OF THE TEXT.**

**XI. MAKE UP A TOPIC ON THE THEME "Ti:SAPPHIRE LASERS. ITS MECHANICAL AND THERMAL PROPERTIES".**

**XII. WRITE THE FOLLOWING WORDS IN ALPHABETICAL ORDER:**

**A)** MIRROR; IMAGE; PHASE; HOLOGRAM; CODER; SWITCH; BEAM THRESHOLD; ABSORBER; STRIAC; VALUE; LASER; PULSE; V ZONE.

**B)** RESEARCH; RUBY; RESONANCE; RANGE; ROTATION; REFRA RELAXATION; RADAR.

**XIII. FIND WHAT WORDS FORM THE FOLLOWING COMPOUND WOR**

RUNWAY; BACKSCATTERING; MULTILEVEL; ANTIPHASE; ISOPLA HYPERFINE; LINEWIDTH; LINESHAPE; HYDROXYAPATITE.

**XIV. USE A DICTIONARY TO FIND SYNONYMOUS WORDS WITH THE FOLLOWING WORDS:**

SHARP; OPAQUE; WIDEBAND; FREE; TOTAL; CHROMATIC; ATTRACTIVE; NONTOXIC; FLEXIBLE.

**XV. CHOOSE ENGLISH WORDS WHICH HAVE THE SAME MEA RUSSIAN LANGUAGE:**

PROFILE; SUPERHARD; BINARY; PROPAGATION; PHOTOGRAPH MARK; TWIST; PIXEL; ORDER.

**XVI. USE A DICTIONARY AND FIND ANTONYMS OF THE FOLLO WORDS AND EXPRESSIONS:**

SLOW; ABSORPTION; CONTRAST; BRIGHTNESS; DIELECTRIC; LIQUID-CRYSTAL; FULL COLOUR.

**XVII. FIND RUSSIAN EQUIVALENTS OF THE FOLLOWING WOR**

MEDICAL RESEARCHERS AND CLINICIANS; THE HIGH WATER PEAK; SOFT TISSUE; COLLATERAL MECHANICAL AND THERMAL D ROBUST; FIBER-DELIVERY MECHANISMS; TO IMPROVE FIBER RELIAB

**XVIII. FINDINTEXTC1.2ENGLISHEQUIVALENTSOFTHEFOLLOWINGWORD**

некоторые процедуры в дерматологии, офтальмологии и лечении зубов; для многих клинических целей; минимальная опасность термического повреждения; интерес медицинской общественности; причинять минимальную боль пациенту.

**XIX. READ TEXT C 1.2.**

**SAY WHY ERBIUM LASERS ARE APPLIED BY MED RESEARCHERS AND CLINICIANS.**

# TEXT C 1.2

## SOME APPLICATIONS OF ERBIUM LASERS IN MEDICAL MAINSTREAM

"GROWING NUMBERS OF MEDICAL RESEARCHERS AND CLINICIANS ER:YAG LASER (EMITTING AT 2.94 MKM) COULD BECOME THE L CHOICE FOR CERTAIN PROCEDURES IN DERMATOLOGY, DEN OPHTHALMOLOGY. IN ADDITION, SEVERAL COMPANIES ARE FIBERLESS ERBIUM-LASER PRODUCTS AS ALTERNATIVES TO NEED FOR DRAWING BLOOD.

FOR MANY CLINICAL APPLICATIONS, THE HIGH WATER-ABSO FOUND AT 2.94 MKM IS PARTICULARLY ATTRACTIVE BECAUSE EXTREMELY PRECISE CUTTING AND ABLATING OF SOFT TISSUE. IN WATER SURROUNDING COLLAGEN STRONGLY ABSORBS 2.94-MKM DOES THE ORGANIC SUBSTANCE AND INORGANIC HYDROXYAPAT MORE-SOLID BIOLOGICAL MATERIAL, MAKING THE ERBIUM LASE FOR FINE PROCEDURES ON THE SKIN AND FOR CUTTING AND A TISSUES SUCH AS TOOTH ENAMEL AND BONE. OTHER ADVANTA MINIMAL COLLATERAL MECHANICAL AND THERMAL DAMAGE PATIENT PAIN.

IN THE PAST YEARS, THE DEVELOPMENT OF MORE-ROBUST, OPTICAL FIBERS AND IMPROVEMENTS IN FIBER-DELIVERY MECHA CONTRIBUTED GREATLY TO THE MEDICAL COMMUNITY'S INTEREST IN THE ERBIUM LASER. FIBER MANUFACTURERS CONTINUE TO IMPROVE FIBER INCREASING THE NUMBER OF TIMES A FIBER CAN BE USED AND TH PER-USE FIBER COSTS." [4]

**XX. RETELL TEXT C1.2USING THE FOLLOWING PHRASES:**

IT IS WELL-KNOWN THAT...; I'D LIKE TO SAY...; MAY BE CA WOULD ADVISE TO CALL YOUR ATTENTION TO ...; IT IS INTEREST SHOULD SAY THAT ...

# UNIT 2.2

## PART 1

**I. READ AND LEARN THE FOLLOWING WORDS, MIND PRONUNCIATION:**

| | | |
|---|---|---|
| NARROW | ['NÆREU] | 1. узкий; 2. узкая часть |
| MIXTURE | ['MIKSʃE] | смесь; примесь |
| MIRROR | ['MIRE] | 1. зеркало; 2. зеркальная поверхность; 3. отображение |
| BORE | [BO:] | 1. диаметр отверстия; калибр; 2. сверлить; растачивать |
| FURNISH | ['FE:NIʃ] | снабжать; предоставлять; доставлять |
| DISCHARGE | [IS'TʃA:DƷ] | разряд |
| COLLIDE | [KE'LAID] | 1. Сталкиваться; 2. вступать в противоречие |
| VIA | ['VAIE] | через |
| NOTORIOUS | [NEU'TO:RIES] | 1. пользующийся дурной славой; печально известный; отъявленный; пресловутый; 2. известный |
| NOTORIOUSLY | [NEU'TO:RIESLI] | пресловуто |
| RELEGATE | ['RELIGEIT] | отсылать; направлять; относить; классифицировать |
| INTERFEROMETRY | [ˌINTEFE'ROMITRI] | интерферометрия |
| ION | ['AIEN] | ион |
| INTERACTION | [ˌINTER'ÆKʃEN] | взаимодействие |
| PLETHORA | ['PLEθERE] | 1. полнокровие; 2. изобилие; большой избыток |
| APPEAR | [E'PIE] | показываться; появляться; проявляться |
| VIOLET | ['VAIELIT] | фиолетовый |
| MOLECULAR | [MEU'LEKJULE] | молекулярный |

EXPERIENCE [ɪKS'PɪERɪENS] 1. опыт; эксперимент;
2.испытывать; знать по опыту
SYMMETRICAL [ɪ'METRɪKEL] симметричный
BEND [BEND] 1. изгиб
2. гнуть; изгибать; связывать; направлять
ACCOMPANY [ʌ'KʌMPENɪ] сопровождать; сопутствовать
EVENTUALLY [ɪ'VENʃTʃLɪ] в конечном счете; в конце концов; со временем
LONGITUDINAL [LONʒɪ'TJU:DɪNL] продольный
TRANSVERSE ['TRÆNZVE:S] поперечный
COMBINE [KEM'BAɪN] объединять; комбинировать; смешивать; сочетать(ся)
SURGICAL ['SE:DʒɪKEL] хирургический

**II. READ AND TRANSLATE THE FOLLOWING PHRASES:**

GAS LASERS THE OVERWHELMING MAJORITY
THE VAST MAJORITY NOTORIOUSLY LOW GAIN AND EF
AN ELECTRIC DISCHARGE CW RADIANT POWER
DISCHARGE-PUMPED LASER PRODUCT-CODE SCANNING
RF EXCITATION TO BE DIRECTED DOWN THE BORE
RARE-GAS ION LASERS A MIXTURE OF HELIUM AND NEON GA
THE OPTICAL FEED-BACK A GAS-FILLED TUBE
RESONANT COLLISIONS TO BE HIGH ENOUGH TO IONIZE THE G
VIA SEVERAL PATHS A PLETHORA OF LASER EMISSION
MOLECULAR BANDS BETWEEN VIBRATION AND ROTATION
VIBRATIONAL MODES GENERATING DIFFERENT OUTPUT FRE
VIBRATIONAL ENERGY BANDS LOW-ENERGY ROTATIONAL MODES

**III. READ AND GUESS THE MEANING OF THESE WORDS:**

GAS [GÆS] IDENTICAL [Aɪ'DENTɪKL]
DESIGN [Dɪ'ZAɪN] PRODUCT-CODE ['PRODʌKT KOUD]
PLASMA ['PLÆZMə] DISCRETE [DɪS'KRɪ:T]
ANODE ['ÆNOUD] METROLOGY [Mɪ'TROLəDʒɪ]

TUBE [TJU:B] IONIZE [ˈAɪ∂NAɪZ]
CATHODE [ˈKÆθ∂UD] RADAR [ˈREɪD∂]
RESONANT [ˈREZ∂N∂NT] ATMOSPHERIC-PRESSURE [ˌÆTM∂SˈFERɪK PREʃ∂]
TENSOR [ˈTENZ∂] VALENCY
[ˈVEɪL∂NSɪ]фывап
DISLOCATION [ˌDɪSL∂UˈKEɪʃ∂N] SITUATION [ˌSɪTJUˈEɪʃ∂N]
ACCOMMODATE [∂ˈKOM∂DEɪT] SCHEMATIC [SKɪˈMÆTɪK]

**IV. READ THE WORDS:**

[ʃ] SHE, SHORT, SHAPE, FURNISH, INTERACTION, PHOTOABLATION S
PROPORTIONAL, PRESSURE
[Tʃ]MIXTURE, FIXTURE, FEATURE, DISCHARGE, EVENTUALLY
[∂U] NARROW, CODE, MODE, ANODE, CATHODE, MOLECULAR, NOTO
EXPOSUREPHOTO, PHOTOLITHOGRAPHY
[Aɪ∂] VIA, VIOLET, ION, IONIZE, DESIRABLE

**V. WORD STUDY.**

BORE - DEEP HOLE MADE IN THE GROUND; (DIAMETER OF THE) HO
SIDE A GUN BARREL
COLLIDE - (OF MOVING OBJECTS OR PEOPLE) STRIKE VIOLENTLY AG
EACH OTHER
RELEGATE - DISMISS TO A LOWER POSITION OR CONDITION
HENCE - FROM THIS TIME; (A WEEK HENCE, IN A WEEK FROM NOW)
TO INTERACT – TO ACT OR TO HAVE AN EFFECT ON EACH OTHER;
TO ACT TOGETHER OR COOPERATIVELY, ESPECIALLY SO AS
COMMUNICATE WITH EACH OTHER
SINGLE - ONLY ONE; NOT IN A PAIR, GROUP, ETC.
PLETHORA - QUANTITY GREATER THAN WHAT IS NEEDED
TO STRETCH - TO MAKE (STH) LONGER, WIDER OR TIGHTER BY PULLI
TO SPLIT - (TO CAUSE STH TO) BREAK OR TO BE BROKEN (INTO TW
PARTS), ESPECIALLY FROM END TO END
WITHIN - INSIDE THE RANGE OR LIMITS OF (SB/STH)
TRANSVERSE - LYING OR ACTING IN A CROSSWISE DIRECTION

**LOOK, READ, REMEMBER !**

**-NESS**

**ADJ + -TY = NOUN**

**-DOM**

BRIGHT + NESS = BRIGHTNESS    PROPER + TY = PROPERTY
ROUGH + NESS = ROUGHNESS    SAFE + TY = SAFETY
SMALL + NESS = SMALLNESS    FINAL + TY = FINALITY

FREE + DOM = FREEDOM
WISE + DOM = WISDOM

**VI. A) MAKE UP NOUNS FROM THE ADJECTIVES:**

BUSY -    CAUSAL -    FINE -
THICK -    DEAF -    FIXED -
BARRIEN -    EXTERNAL -    FLAT -
EXACT -    EXTREME -    RESPONSIVE -

**B) FILL IN THE BLANKS WITH SUITABLE WORDS:**

THIS LATTICE MISMATCH IS ACCOMODATED BY ELASTIC ST THAN *(dislocate/dislocation)*, PROVIDED THAT THE LAYER *(thick/thicknesses)* ARE LESS THAT SOME *(critic/critical)* VALUE. THE LOWER'S THE *(electric/electrical)* FIELD ACROSS THE DETECTOR AND LOWER *(responsive/responsivity)*. THE LIGHT OUTPUT IS SUBSTANTIALLY COHERENT AND HAS A WAVELENGTH THAT CAN BE *(fine/fineness)*-TUNED BY ADJUSTING THE *(active/activity)*-LAYER *(thick/thickness)*.

**VII. TRANSLATE THE FOLLOWING SENTENCES. DEFINE THE MEAN THE WORDS WHICH ARE PUT IN ITALICS (THE NOUNS, THE ADJECTIVES O VERBS).**

THE RESEARCHERS FROM MOSCOWSTATEUNIVERSITY HAV ***theoretically*** THE ***feasibility*** OF GENERATING A SINGLE ALTOSECOND PULSE. THIS CAN BE ACHIEVED BY GENERATING HIGH-ORDER HA LIGHT PULSE IN THE GAS WITH A ***variable ellipticity*** AND A ***relative spectral*** WIDTH $\Delta\omega = 0.04$. THEY SHOWED THAT ***photonic*** CRYSTALS WITH A

***cubicopticalnonlinearity*** CAN BE USED TO REDUCE THE ***duration*** OF LASER PULSES.

ONE COULD HAVE A TWO-CRYSTAL ***arrangement*** WITH A COMPENSATING HALF-WAVE PLATE IN BETWEEN, AND ***greater*** WIDTH THAN ITS ***thickness*** IF REQUIRED.

## GRAMMAR REVIEW

### PASSIVE VOICE

**TO BE + PARTICIPLE II**

| | PRESENT | PAST | FUTURE |
|---|---|---|---|
| INDEFINITE | (IS,ARE,AM)+ DONE | (WAS,WERE)+ DONE | (SHALL,WILL)+BE + DONE |
| CONTINUOUS | (IS,ARE,AM)+ BEING + DONE | (WAS,WERE) + BEING + DONE | - |
| PERFECT | (HAVE,HAS) + BEEN + DONE | HAD + BEEN + DONE | (SHALL,WILL) + HAVE + BEEN + DONE |

**EXAMPLES:**

1. INDEFINITE

THE STUDENT IS ASKED TO LEARN A NEW RULE.
I WAS TOLD WHAT I HAD TO DO.
THEY WILL BE MET AT THE AIRPORT TOMORROW.

2. CONTINUOUS

SHE IS BEING ANSWERED NOW.
MY FRIENDS WERE BEING ASKED THE WHOLE EVENING.

3. PERFECT

MY BOOK HAS BEEN TAKEN THIS WEEK.
THAT BUILDING HAD BEEN DESTROYED BY 1965.
WE SHALL HAVE BEEN TESTED BY 7 O'CLOCK TOMORROW.

**VIII. REWRITE THE FOLLOWING SENTENCES IN PASSIVE TRANSLATE THEM.**

1. THEY HAVE NEVER READ THAT ARTICLE. 2. THE STUDENTS TEST-PAPER WITHOUT MISTAKES AT THE LAST LESSON. 3. WE SHAI PROBLEM NEXT TIME. 4. I HAVE JUST BOUGHT A NEW BOOK. 5. THE WERE TESTING A NEW DEVICE SINCE FOUR TILL SEVEN. 6. BY SIX PROFESSOR HAD FINISHED HIS REPORT. 7. SHE WILL HAVE EXPLAIN BEFORE THE EXAMINATIONS. 8. THE SCIENTIST WILL SHOW HIS D WEEK. 9. THE STUDENTS GREETED THEIR TEACHER.

**IX. READ TEXT A 2.2.**
**SAY WHAT KINDS OF GAS LASERS YOU KNOW. WHY ARE TH CALLED "GAS LASERS"?**

## TEXT A 2.2

## GAS LASERS

"**HELIUM-NEON LASER.** "IN GAS LASERS, OF COURSE, THE GA MEDIUM IS A GAS. THE VAST MAJORITY OF THESE LASERS ARE PU ELECTRIC DISCHARGE, BUT SOME DESIGNS USE RF WAVES, PHOTO E-BEAMS.

LIKE MOST GAS LASERS, THE HENE (HELIUM-NEON) LASER IS D PUMPED, ALTHOUGH RF EXCITATION ALSO IS POSSIBLE. THE GAIN CONSISTS OF A NARROW GLASS TUBE FILLED WITH A MIXTURE O NEON GASES. AN ANODE NEAR ONE END OF THE TUBE AND A CATH OTHER DELIVER THE DC DISCHARGE CURRENT DOWN THE BORE, W THE TUBE ENDS FURNISH THE OPTICAL FEED-BACK REQUIRED F EMISSION. ELECTRONS FROM THE DISCHARGE COLLIDE WITH NUMEROUS HELIUM ATOMS (WHICH USUALLY OUTNUMBER THE NE 10 TO1), EXCITING THESE ATOMS TO A HIGHER METASTABLE ST THROUGH RESONANT COLLISIONS, THE EXCITED HELIUM ATOMS ENERGY TO THE NEON ATOMS, RAISING THEM TO A METASTABLE IDENTICAL IN ENERGY TO THE EXCITED HELIUM ATOMS.

FROM THE METASTABLE STATE OF NEON, ELECTRONS CAN E GROUND STATE VIA SEVERAL PATHS, THUS GENERATING DIFF FREQUENCIES OF LASER LIGHT ONCE POPULATION INVERSION HOWEVER, THE OVERWHELMING MAJORITY OF HENE LASERS ARE FAVOR 632.8-NM EMISSION. BECAUSE THEIR NOTORIOUSLY LOW EFFICIENCY (0.01% - 0.1%), FEW HENE LASERS CAN EXCEED 100 MW CW RADIANT POWER AT THIS WAVELENGTH, WHICH RELEGATES T POWER APPLICATIONS SUCH AS PRODUCT-CODE SCANNING, INTERFEROMETRY AND METROLOGY.

**RARE-GAS ION LASERS.** HIGHER CW POWER IN THE VISIBLE AND UV REGIONS IS POSSIBLE WITH RARE-GAS ION LASERS SUCH A AND KRYPTON-ION. LIKE THE HENE LASER, THESE GAS LASERS A PUMPED BY A HIGH VOLTAGE DC ELECTRIC DISCHARGE DIRECTED I OF A GAS-FILLED TUBE. HOWEVER, THE DISCHARGE CURRENT OF A HIGH ENOUGH TO IONIZE THE GAS, HENCE THE NAME. THROUGH A C SET OF ELECTRON-ION INTERACTIONS, THE RARE-GAS IONS ARE EXC GROUND STATE TO HIGHER METASTABLE STATE FROM WHIC EMISSION CAN OCCUR.

MANY STIMULATED TRANSITIONS EXIST IN SINGLY AND DOU RARE GASES, RESULTING IN A PLETHORA OF LASER EMISSION LI IONIZED ARGON (AR+), THE MOST IMPORTANT VISIBLE EMISSION LI IN THE BLUE (488 NM) AND GREEN (514.5 NM) AREAS OF THE SPECTR FOR KRYPTON-ION LASERS (KR+), SOME OF THE MOST USEFUL EM FALL IN THE RED (647.1 NM), YELLOW, GREEN AND VIOLET SPECTRA

**MOLECULAR GAS LASERS**. AT IR WAVELENGTHS, EXTREMELY HIGH POWERS ARE AVAILABLE FROM MOLECULAR GAS LASERS S DIOXIDE ($CO_2$). THESE LASERS GENERATE STIMULATED EMISSION F LOW-ENERGY TRANSITIONS BETWEEN VIBRATION AND ROTATI MOLECULAR BONDS. THE TRIATOMIC MOLECULE $CO_2$, FOR EXAMPLE, EXPERIENCES THREE MODES OF VIBRATION: SYMMETRICAL ASYMMETRICAL STRETCHING AND BENDING. THE ENERGIES OF VIBRATIONAL MODES CORRESPOND TO THE IR WAVELENGTH REGI MKM. BUT ALSO ACCOMPANYING THESE VIBRATIONAL MODES ARE ROTATIONAL MODES THAT MATERIALIZE AS ENERGY SUBLEVELS WITHIN THE 10-MKM VIBRATIONAL ENERGY BANDS.

MOST $CO_2$ LASERS ARE DISCHARGE-PUMPED, BUT RF EXCITAT USED TOO. IF THE $CO_2$ GAS - WHICH IS USUALLY ACCOMPANIED BY NIT AND HELIUM - IS PLACED IN A SEALED TUBE, IT MUST BE CON REGENERATED BECAUSE THE MOLECULES EVENTUALLY BREAK AI OUTPUT POWER, THE GAS ALSO CAN BE MADE TO FLOW ALONG (LO ACROSS (TRANSVERSE) THE OPTICAL CAVITY. TRANSVERSE DI POSSIBLE AS WELL. SOME OF THE HIGHEST-POWER PULSED $CO_2$ LASERS, CALLED TEA (TRANSVERSELY EXCITED ATMOSPHERIC-PRESSURE) LASERS, MEGAWATTS OF PEAK POWER BY TRANSVERSELY EXCITING THE $CO_2$ GAS AT ATMOSPHERIC PRESSURES.

THE 10.6-MKM AVERAGE EMISSION WAVELENGTH OF $CO_2$ IS IDEAL FOR DRILLING, CUTTING AND WELDING A VARIETY OF MATERIALS, COMBINED WITH THE LASER'S GOOD GAIN AND VERY HIGH EFFICIENCY ( U 30%), HAS TURNED THIS LASER INTO AN INDUSTRIAL WORKHOUSI THE ABILITY OF $CO_2$ LASERS TO CUT AND CAUTERIZE LIVING TISSUE H THEM VALUABLE IN SURGICAL MEDICINE."[4]

**X. MATCH THE ENGLISH WORDS ON THE LEFT WITH THE EQUIVALENTS:**

| | |
|---|---|
| 1. NOTORIOUSLY | 1. сталкиваться |
| 2. RELEGATE | 2. через |
| 3. COLLIDE | 3. снабжать, предоставлять |
| 4.VIA | 4. отсылать, направлять |
| 5. FURNISH | 5. изобилие |
| 6.ION | 6. пресловуто |
| 7. MOLECULAR | 7. сверлить |
| 8. MIRROR | 8. взаимодействие |
| 9. BORE | 9. зеркало |
| 10. INTERACTION | 10. хирургический |
| 11. BEND | 11. молекулярный |
| 12. PUMP | 12. изгиб |
| 13. MAJORITY | 13. накачивать |
| 14. SURGICAL | 14. большинство |
| 15. PLETHORA | 15. ионы |

**XI. CHOOSE AND WRITE THE BEST EQUIVALENTS FOR THE THE LEFT FROM THE WORDS ON THE RIGHT. EXAMPLE: POSSIBL**

1. VAST A) WIDE, B) NARROW, C) SPREAD, D) LITTLE
2. MAJORITY A) POWER, B) LARGE, C) MILITARY, D) AUTHOR
3. DISCHARGE A) EXCHANGE, B) RELAXATION, C) SORT, D) TY
4. POSSIBLE A) DIFFERENT, B) PROBABLE, C) INCARNATE, D)
5. IDENTICAL A) MAIN, B) CONSIDERABLE, C) STRAN SIMILAR
6. STIMULATE A) EXIST, B) ENCOURAGE, C) MEND, D) STRIKE
7. RELEGATE A) LEAD, B) SENT, C) DIRECT, D) COME
8. AVERAGE A) TALL, B) LOW, C) HIGH, D) MEDIUM
9. SPROUT A) DISCOVER, B) COMPETE, C) GROW, D) FALL D
10. ARGUE A) THINK, B) DISAGREE, C) AGREE, D) DISPUTE

**XII. TRANSLATE THE SENTENCES , USING THE FOLLOWING PHRASES:** GAS LASERS; THE GAIN MEDIUM; A NARROW GLASS TUBE FI MIXTURE OF GASES; THROUGH RESONANT COLLISIONS; POPULATIO

В газовом лазере активной средой является газ или смесь газов. Трубку или камеру с активной газовой средой помещают в оптический резонатор. Простейший оптический резонатор содержит два плоских зеркала, одно из которых делается полупрозрачным. Зеркала располагаются перпендикулярно продольной оси трубки. При наличии в газе инверсии населенностей световая волна усиливается из-за процессов вынужденного испускания. Газовые лазеры обладают высокой оптической однородностью активной среды и узкими спектральными линиями излучения. Эти свойства определяют высокую монохроматичность, острую направленность излучения, высокую когерентность и стабильность частоты. Диапазон рабочих длин волн составляет 100 нм - 1000 мкм. Мощность излучения - 100 мкВт - 1 МВт в непрерывном режиме.

**XIII. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOLLOWING EX**

THE GAIN MEDIUM; AN ELECTRIC DISCHARGE; E-BEAM; TO FU OPTICAL FEED-BACK; OUTNUMBER THE NEON ATOMS; THROUG COLLISIONS; HOWEVER; OVERWHELMING MAJORITY OF HENE LAS

POWER; PRODUCT-CODE SCANNING, LIKE THE HENE LASER; A GAS-
HIGH ENOUGH TO IONIZE THE GAS; THROUGH A COMPLICATED S
IONIZED RARE GASES; PLETHORA OF LASER EMISSION LINES; THE
EMISSION LINES; MOLECULAR GAS LASER; FROM THE LOW-ENERG
ASYMMETRICAL STRETCHING AND BENDING; LOW-ENERGY ROTA
THE MOLECULES EVENTUALLY BREAK APART; TO BE IDEAL FOR D
AND WELDING; MOREOVER.

- **B) FIND IN THE TEXT THE EQUIVALENTS OF THE FO EXPRESSIONS:**

преобладающее большинство этих лазеров; электрический разряд; возбуждение газовым разрядом; узкая стеклянная трубка; смесь гелиевого и неонового газов; почти идентична по энергии; возвращаться в основное состояние по определенному пути; низкий коэффициент усиления и эффективность; регулировка (выравнивание); ионный лазер; возбуждение электрическим разрядом высокого напряжения; разрядный ток; наиболее важные видимые линии излучения; области спектра; спектральные диапазоны; чрезвычайно высокая мощность; вращательные уровни; межмолекулярные связи; симметричное вытягивание; передача в инфракрасную область спектра; энергетические подуровни; помещать в запаянную трубку; высокая выходная мощность; атмосферное давление; хирургия.

**XIV. LOOK THROUGH THE TEXT AGAIN. READ THE FO STATEMENTS. COMPARE YOUR VERSION AND IF YOU THINK WRONG CORRECT THEM.**

1. AN ANODE NEAR ONE END OF THE TUBE AND A CATHODE NEA DELIVER THE DC DISCHARGE CURRENT DOWN THE BORE.
2. THE EXCITED HELIUM ATOMS TRANSFER THEIR ENERGY TO ATOMS.
3. ELECTRONS FROM THE DISCHARGE CANNOT COLLIDE WIT NUMEROUS HELIUM ATOMS, EXCITING THESE ATOMS TO METASTABLE STATE.

4. FROM THE METASTABLE STATE OF NEON, ELECTRONS CANNOT GROUND STATE VIA SEVERAL PATHS.
5. BECAUSE OF THEIR NOTORIOUSLY LOW GAIN AND EFFICIENC 0.1%), FEW HENE LASERS CAN EXCEED 100 MW OF CW RADI POWER AT THIS WAVELENGTH.
6. THE 10.6-MKM AVERAGE EMISSION WAVELENGTH OF $CO_2$ IS IDEAL FOR DRILLING, CUTTING, AND WELDING A VARIETY OF MATERIALS.
7. THE ABILITY OF $CO_2$ LASERS TO CUT AND CAUTERIZE LIVING TISS MADE THEM VALUABLE IN SURGICAL MEDICINE.
8. RARE-GAS ION LASERS ARE TYPICALLY PUMPED BY A HIGH- V ELECTRIC DISCHARGE DIRECTED DOWN THE BORE OF A GAS-FI
9. THE 10.6-MKM AVERAGE EMISSION WAVELENGTH OF $CO_2$ IS IDEAL FOR DRILLING, CUTTING AND WELDING A VARIETY OF MATERIALS, COMBINED WITH THIS LASER'S GOOD GAIN AND VERY HIGH EFFICIENCY TO 30%), HAS TURNED THIS LASER INTO AN INDUSTRIAL WORK
10. SOME OF THE HIGHEST-POWER, PULSED $CO_2$ LASERS, CALLED TEA (TRANSVERSELY EXCITED ATMOSPHERIC-PRESSURE) LASERS, MEGAWATTS OF PEAK POWER BY TRANSVERSELY EXCITING THE $CO_2$ GAS AT ATMOSPHERIC PRESSURES.

**XV. COMPLETE THE FOLLOWING SENTENCES:**

1. THE VAST MAJORITY OF GAS LASERS ARE ...
2. THE GAIN MEDIUM CONSISTS OF ...
3. FROM THE METASTABLE STATE OF NEON, ELECTRONS CAN RETU
4. THE OVERWHELMING MAJORITY OF HENE LASERS ARE ...
5. HIGHER CW POWER IN THE VISIBLE AND UV IS POSSIBLE WITH ...
6. RARE-GAS ION LASERS ARE TYPICALLY PUMPED BY ...
7. THROUGH A COMPLICATED SET OF ELECTRON-ION INTERACTION IONS ARE EXCITED FROM ...
8. MANY STIMULATED TRANSITIONS EXIST IN ...
9. SOME OF THE MOST USEFUL EMISSION LINES FALL IN ...
10. EXTREMELY HIGH POWER IS AVAILABLE FROM MOLECULAR GAS AS...
11. THESE LASERS GENERATE STIMULATED EMISSION FROM ...
12. THE ENERGIES OF THESE THREE VIBRATIONAL MODES CORRESPO

13. THE GAS ALSO CAN BE MADE ...
14. IT MUST BE CONTINUOUSLY REGENERATED BECAUSE ...

**XVI. ANSWER THE FOLLOWING QUESTIONS:**

1. WHAT IS THE GAIN MEDIUM IN GAS LASERS?
2. IS THE HENE LASER DISCHARGE-PUMPED?
3. WHERE DO THE EXCITED HELIUM ATOMS TRANSFER THEIR ENER
4. CAN ELECTRONS RETURN TO THE GROUND STATE?
5. WHICH PATHS DO THEY RETURN?
6. HOW IS POPULATION INVERSION REACHED?
7. WHAT IS THE RARE-GAS LASER?
8. WHY DO WE CALL IT RARE-GAS ION LASER?
9. WHAT IS THE GAIN MEDIUM IN THESE LASERS?
10. IS THE DISCHARGE CURRENT OF AN ION LASER HIGH ENOUGH GAS?
11. WHERE DO THE MOST IMPORTANT VISIBLE EMISSION LINES APPE
12. WHY DO WE SAY THAT CARBON DIOXIDE LASERS ARE MOLECUL
13. HOW DO THESE LASERS STIMULATE EMISSION?
14. ARE ACCOMPANYING VIBRATIONAL MODES THE LOW-ENERGY MODES?
15. WHAT KINDS OF PUMPS AREUSED IN THE MOST MOLECULAR LAS
16. WHERE DO PEOPLE USUALLY USE MOLECULAR LASERS?

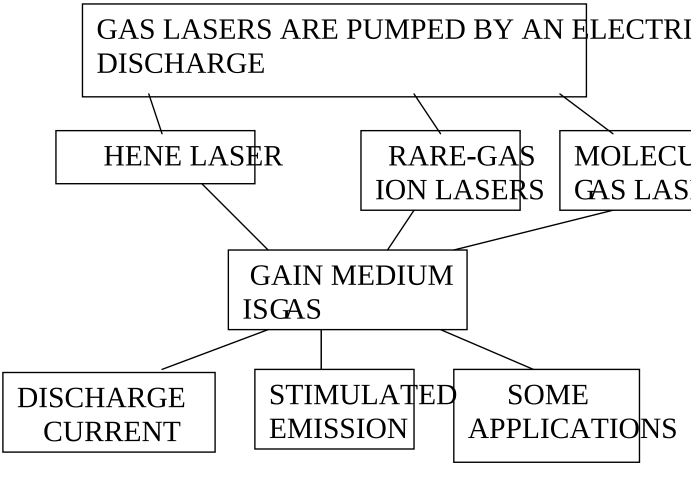
**XVII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW FOLLOWING PHRASES:**

THAT'S RIGHT...; THAT'S WRONG...; TO MY MIND...; IN MY OPIN AGREE WITH YOU...; I THINK SO...

1. SOME DESIGNS USE RF WAVES, PHOTONS, OR EVEN E-BEAMS.
2. THE GAIN MEDIUM CONSISTS OF A WIDE GLASS TUBE FILLED WIT OF HELIUM AND NEON GASES.
3. HIGHER CW POWER IN THE VISIBLE AND UV REGIONS ISN'T POSSI RARE-GAS ION LASERS SUCH AS ARGON-ION AND KRYPTON-ION.
4. GAS LASERS ARE TYPICALLY PUMPED BY A HIGH VOLTAGE DISCHARGE DIRECTED DOWN THE BORE OF A GAS-FILLED TUBE.

5. THE RARE-GAS IONS ARE EXCITED FROM THEIR GROUND STAT
METASTABLE STATE FROM WHICH STIMULATED EMISSION CAN O
6. AT IR WAVELENGTHS, EXTREMELY LOW POWERS ARE AVAIL
MOLECULAR GAS LASERS SUCH AS CARBON DIOXIDE ($CO_2$).
7. FOR HIGHER OUTPUT POWER, THE GAS ALSO CANNOT BE MADE T
(LONGITUDINAL) OR ACROSS (TRANSVERSE) THE OPTICAL CAVITY
8. IN SINGLY IONIZED ARGON (AR+), THE MOST IMPORTANT VISIBLE
LINES APPEAR IN THE BLUE (488 NM) AND GREEN (514.5 NM) AREA
SPECTRUM.
9. FOR KRYPTON-ION LASERS (KR+), SOME OF THE MOST USEFUL
LINES FALL IN THE RED (647.1 NM), YELLOW, GREEN AND VIOLE
REGIONS.
10. THE ENERGIES OF THESE THREE VIBRATIONAL MODES CORRES
IR WAVELENGTH REGION AROUND 30 MKM.
11. THROUGH RESONANT COLLISIONS, THE EXCITED HELIUM ATO
THEIR ENERGY TO THE NEON ATOMS, RAISING THEM TO A META
NEARLY IDENTICAL IN ENERGY TO THE EXCITED HELIUM ATOMS.

**XVIII. RETELL TEXT A2.2 ACCORDING TO THE SCHEME:**



**XIX. READ THE DIALOGUE AND ACT IT OUT.**

*Mr. Nicolson:* I SAW YOUR ADVERTISEMENT FOR OPTOELECTRONIC IN THE CAREER FORUM RECENTLY AND I AM INTERESTED IN APPLY WITH YOU.

*Mrs. Grey:* OK. WHAT QUALIFICATION HAVE YOU GOT?

*Mr. Nicolson:* I HAVE A SCHOOL LEAVING CERTIFICATE AND A DIP OPTOELECTRONIC DEVICES MAINTENANCE AND OPERATION. SINCE WORKED AT ELECTRONIC ENGINEERING COMPANY IN MOSCOW.

*Mrs. Grey:* WHO CAN RECOMMEND YOU?

*Mr. Nicolson:* HERE ARE THE NAMES AND ADDRESSES OF THE PEOP CAN WRITE LETTERS OF REFERENCE FOR ME:

MR. D. GOLD, ELECTRONIC HIGH SCHOOL, MOSCOW.

DR. N. TUROV, MOSCOWSTATEUNIVERSITY, MOSCOW.

*Mrs. Grey:* PLEASE WRITE YOUR CURRICULUM VITAE AND COME WEEKS. BYE.

*Mr. Nicolson:* BYE.

**XX. CONTINUE THE DIALOGUE:**

*Mrs. Grey:* WE HAVE ACQUAINTED WITH YOUR DOCUMENTS A LIKE TO ASK YOU SOME QUESTIONS.

*Mr. Nicolson:* YOU ARE WELCOME.

*Mrs. Grey:* . . . . . . . . . . . . . . . . . . . . . . . . .

*Mr. Nicolson:* . . . . . . . . . . . . . . . . . . . . . . . . .

*Mrs. Grey:* . . . . . . . . . . . . . . . . . . . . . . . . .

**XXI. CHOOSE A PARTNER AND TALK ABOUT DIFFERENT KIN LASERS.**

**XXII. WRITE A SUMMARY OF THE TEXT. LIMIT IT TO 10 SENT**

## PART 2

**I. READ TEXT B 2.2 AND FORMULATE ITS MAIN IDEA.**

## TEXT B 2.2

## SOME APPLICATIONS OF GAS LASERS

"THE WORLD AS WE KNOW IS SHRINKING. WE ARE STARTING TO
TELEPHONES IN OUR POCKETS AND OUR COMPUTERS UNDER
AUTOMOBILES ARE SPROUTING TINY SENSORS AND ACTUATORS.
AND HEARTS ARE BEING REPAIRED WITH MINIATURE TOOLS AND
MINIATURIZATION REVOLUTION IS FUELLINGAN EXPANDING DEM
EQUIPMENT FOR MICROMANUFACTURING.

FABRICATION OF MICROCOMPONENTS AND MINIATURE SYSTE
TOOLS CAPABLE OF SHAPING, MEASURING, AND MARKING MATERI
ON VERY SMALL SCALES. CONVENTIONAL MECHANICAL OPERATIO
BY MILLING MACHINES, LATHES, CALLIPERS, ENGRAVERS, A
EQUIPMENT CAN ADDRESS MOST REQUIREMENTS WHEN FEATU
LARGER THAN A FEW HUNDRED MICROMETERS.

HOWEVER, WHEN HOLE DIAMETER, SLOT WIDTH, CHARACTER HEIG
FEATURE SIZES FALL BELOW THIS RANGE, OPTICAL TOOLS ARE O
VIABLE OPTIONS.

THE SPATIAL RESOLUTION ASSOCIATED WITH LASERS, HIG
IMAGING SYSTEMS, AND PRECISION MOTION-CONTROL DEVIC
RELATIVELY EASY ACCESS TO FEATURE SIZES IN THE 1 - 100 MKM R
OPTICALLY CONTROLLED MATERIAL PROCESSING USES EITHER OPT
PHOTORESIST OR LASER ABLATION AS PRIMARY PROCESS MECHA
WOULD ARGUE THAT ANY SINGLE LIGHT SOURCE IS OPTIMU
APPLICATIONS, BUT ULTRAVIOLET-EMITTING EXCIMER LASERS P
ROLES IN BOTH OF THESE PROCESSES.

EXCIMER LASER ABLATION HAS SEVERAL FEATURES THAT A
FOREFFECTIVE MICROMANUFACTURING. THE DEEP-UV WAVELENG
EXCIMER LASERS OPERATE ARE STRONGLY ABSORBED BY A W
MATERIALS AND ALSO CAN PRODUCE VERY SMALL SPOT SIZES. A
BECAUSE SHORT-WAVELENGTH UV PHOTONS CAN DIRECTLY BRE
BONDS, MATERIAL CAN BE LITERALLY VAPORIZED WITH MINIMAL
TO THE SURROUNDING SUBSTRATE.

IN GENERAL, VERY LITTLE LASER ENERGY IS NEEDED TO ABLA
ON ABSORBING SUBSTRATES. TYPICALLY, ONLY A FEW HUNDRED M

OPTICAL ENERGY ARE REQUIRED FOR ABLATION IN A 100 MKM FOC
MATERIAL-REMOVAL RATE IS PROPORTIONAL TO THE AVERAGE
DELIVERED TO THE SUBSTRATE , AND THE LASER ENERGY SHOULD
SHORT PULSES TO MINIMIZE HEAT CONDUCTION TO UNILLUMINATE

CYLINDRICAL COMPONENTS SUCH AS TUBE, WIRES, AND RODS
DRILLED AND MARKED WITH APPROPRIATE FIXTURING. HOLE PAT
MADE IN TUBING BY CONFIGURING THE LASER AND BEAM-DELIVE
PRODUCE A FOCAL SPOT OF SUITABLE SIZE AND SHAPE AND MO
LOCATION TO LOCATION ALONG THE TUBE WITH TRANSLATIO
OPERATIONS.

A WAVEGUIDE EXCIMER LASER PRODUCING 50 MKJ OF ENERGY A
REPETITION RATE OF 500 HZ ALLOWS THE HOLE PATTERN TO BE C
SECONDS. OVERALL PROCESS TIME OF 60 S INFLUENCED BY THE
HANDLING TIME, PROVIDING A GOOD EXAMPLE OF THE IMPACT
HANDLING AND FIXTURING ON MACHINE THROUGHOUT."[10]

**II. LOOK THROUGH TEXT B 2.2 AND ANSWER THE FOL QUESTIONS:**

1. IN WHICH BRANCHES DO PEOPLE USUALLY USE GAS LASERS?
2. IS MINIATURIZATION REVOLUTION FUELLINGAN EXPANDING NEW
3. EQUIPMENT FOR MICROMANUFACTURING?
4. SHOULD THE LASER ENERGY BE DELIVERED IN SHORT PULSES T
5. HEAT CONDUCTION TO UNILLUMINATED AREAS?
6. IS ANY SINGLE LIGHT SOURCE OPTIMUM FOR ALL APPLICATION
7. CAN MATERIAL BE LITERALLY VAPORIZED WITH MINIMAL HEA THE
8. SURROUNDING SUBSTRATE?
9. WHAT CYLINDRICAL COMPONENTS CAN BE CUT, DRILLED A WITH APPROPRIATE FIXTURING?
10. WHYCAN PHOTONS DIRECTLY BREAK CHEMICAL BONDS?
11. WHAT SEVERAL FEATURES THAT ARE DESIRABLE FO MICROMANUFACTURING DOES EXCIMER LASER ABLATION HA

12. DOES A WAVEGUIDE EXCIMER LASER PRODUCING 50 M
ENERGY AT A PULSE-REPETITION RATE OF 500 HZ ALLOW THE H
TO BE CUT IN A FEW SECONDS?
13. WHO WOULD ARGUE THAT ANY SINGLE LIGHT SOURCE IS
FOR ALL APPLICATIONS?

**III. COMPLETE THE FOLLOWING SENTENCES USING TEXT B2.**

1. THIS MINIATURIZATION IS ...
2. FABRICATION OF MICROCOMPONENTS AND MINIATURE SYSTEMS
3. CONVENTIONAL MECHANICAL OPERATIONS CARRIED OUT BY ...
4. THE SPATIAL RESOLUTION ASSOCIATED WITH LASERS, HIGH-RESO IMAGINGSYSTEMS, AND PRECISION MOTION-CONTROL DEVICES A
5. NO ONE WOULD ARGUE THAT ...
6. EXCIMER LASER ABLATION HAS SEVERAL FEATURE THAT ...
7. THE DEEP-UV WAVELENGTHS AT WHICH EXCIMER LASERS OPERA
8. ONLY A FEW HUNDRED MICROJOULES OF OPTICAL ENERGY ARE R ...
9. HOLE PATTERNS CAN BE MADE IN ...
10. THE LASER ENERGY SHOULD BE DELIVERED IN ...

**IV. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

YOU SEE ...; AS FOR ME...; IN MY OPINION...; I CAN SAY THAT...; I SO...

1. THE WORLD AS WE KNOW IT IS SHRINKING.
2. THIS MINIATURIZATION REVOLUTION IS FUELLINGAN EXPANDING NEW EQUIPMENT FOR MICROMANUFACTURING.
3. CONVENTIONAL MECHANICAL OPERATIONS CANNOT BE CAR MILLING MACHINES, LATHES, CALLIPERS, ENGRAVERS AND SIMILAR
4. FEATURE SIZES OF HOLE DIAMETERS ARE LARGER THAN A F MICROMETERS.
5. PRECISION MOTION-CONTROL DEVICES DON'T ALLOW RELATIVE TO FEATURE SIZES IN THE 1 - 100 MKM RANGE.
6. MATERIAL CANNOT BE LITERALLY VAPORIZED WITH MINIMAL HE THE SURROUNDING SUBSTRATE.

7. VERY LITTLE LASER ENERGY IS NEEDED TO ABLATE SMALL AREA
SUBSTRATES.
8. THE LASER ENERGY SHOULD NOT BE DELIVERED IN SHORT
MINIMIZE HEAT CONDUCTION TO UNILLUMINATED AREAS.
9. ONLY A FEW HUNDRED MICROJOULES OF OPTICAL ENERGY ARE
ABLATION IN A 100 MKM FOCAL SPOT.
10. OVERALL PROCESS TIME OF 30 S INFLUENCED BY THE 80 S PART
TIME, PROVIDING A GOOD EXAMPLE OF THE IMPACT OF PARTS- HA
FIXTURING ON MACHINE THROUGHPUT.

**V. FIND THE SENTENCE WHICH EXPRESSES THE MAIN IDEA PARAGRAPH OF TEXT B2.2. ENTITLE EACH PARAGRAPH.**

**VI. MAKE UP AND WRITE THE SCHEME OF TEXT B2.2 USING T EACH PARAGRAPH.**

**VII. MAKE UP YOUR QUESTIONS TO TEXT B2.2. ASK YOUR F THESE QUESTIONS.**

**VIII. USING THE MATERIAL OF THE TEXT ABOVE, WRITE T POINTS ACCORDING TO THE QUESTIONS (VII). USE THE FO CONVERSATION PHRASES:** I THINK IT IS RIGHT BECAUSE ...; I THINK IT IMPORTANT ...; IT IS INTERESTING TO KNOW ...

**IX. SAY WHAT INFORMATION ABOUT APPLICATION OF GAS L HAVE KNOWN AND WHICH IS NEW.**

**X. WRITE A SUMMARY OF THE TEXT.**

**XI. MAKE UP A TOPIC ON THE “GAS LASERS. ITS MECHANICAL AND THERMAL PROPERTIES”.**

**XII. WRITE THE FOLLOWING WORDS IN ALPHABETICAL ORDER:**

**A)** DOUBLE; GAMMA; MONITOR; RADIATION; LENS; SPIN; CO
SURFACE; INDERECT; ELECTRON; VISION; FOCAL; INCIDENCE

**B)** ASYMMETRY; ANGLE; ARRAY; ABILITY; APERTURE; A
AMPLIFICATION; ARM.

**XIII. FIND WHAT WORDS FORM THE FOLLOWING COMPOUND**

MONOPULSE; AFTERPULSING; THERMOMAGNETIC; AUTOI
PHOTODETECTOR; OPTOELECTRONICS; ULTRATRANSPARENT.

**XIV. USE A DICTIONARY TO FIND SYNONYMOUS WORDS WIT FOLLOVING WORDS:**

SCREEN; TO PUMP; PULSE; FLAT; HANDLING; EMBOSSED; MO
RANDOM; MOUNT; PEL; ROUGHNESS.

**XV. CHOOSE ENGLISH WORDS WHICH HAVE THE SAME MEAN RUSSIAN LANGUAGE:**

BARRIER; ALGORITHM; TRANSPARENT; MATRIX; VALENCE; VA
FIGURE; PEAK; MODE.

**XVI. USE A DICTIONARY AND FIND ANTONYMS OF THE FOLLOWING WORDS AND EXPRESSIONS:**

NATURAL; DARK; REFLECTING; HEAVY; DEPOPULATION; RECEI
INPUT; LOSSLESS WAVEGUIDE; NONLINEAR; TO HEAT; EMISSION.

**XVII. USE A DICTIONARY AND FIND RUSSIAN EQUIVALENT THE FOLLOWING WORDS:**

TO CARRY OUT TELEPHONES IN OUR POCKETS; MINIATURE
IMPLANTS; MARKING MATERIALS; MICROMANUFACTURING;
EXPANDING DEMAND; CARRIED OUT BY MILLING MACHINES; LARG
HUNDRED MICROMETERS; CHARACTER HEIGHT; FALL BELOW THIS
THE FEW VIABLE OPTIONS; HIGH-RESOLUTION IMAGING SYSTEM
MOTION-CONTROL DEVICES; LASER ABLATION AS PRIMARY PROCE
NO ONE WOULD ARGUE THAT; THE DEEP-UV WAVELENGTHS; PR
SMALL SPOT SIZES; DIRECTLY BREAK CHEMICAL BONDS; LITERA
WITH MINIMAL HEAT; IN GENERAL; SHOULD BE DELIVERED IN S

BEAM-DELIVERY SYSTEM; MOVING FROM LOCATION TO LOCATION A
PROCESS TIME.

**XVIII. USE A DICTIONARY AND FIND ENGLISH EQUIVALENT FOLLOWING WORDS:**

крошечные датчики и возбудители; миниатюрные инструменты и приспособления; маркировочные материалы; токарный станок; гравировочный резец; кронциркуль; характерные размеры; диаметр отверстия; ширина щели; оптическое воздействие фоторезистора; играть важную роль; сильно поглощающий; в дополнение; прилегающая подложка; неосвещенная область; подходящий размер и форма.

**XIX. FIND IN TEXT C2.2 ENGLISH EQUIVALENTS OF THE FO WORDS:**

молекулярные газовые лазеры; дальняя ультрафиолетовая область спектра; мощный электрический импульс; независимые атомы; за несколько наносекунд; от фотолитографии в фотоудаления.

**XX. READ TEXT C 2.2**
**SAY WHERE EXCIMER LASERS ARE USED.**

## TEXT C 2.2

## EXCIMER LASERS

"FOR APPLICATIONS AT THE UV END OF THE SPECTRUM, THERE A
LASERS. THESE MOLECULAR GAS LASERS CAN CREATE HIGH-INTE
UV LIGHT THROUGH AN UNUSUAL INTERACTION BETWEEN HALOG
RARE-GAS ATOMS. WHEN A HIGH-ENERGY ELECTRIC PULSE PASSE
GAS MIXTURE CONTAINING THESE ELEMENTS, THE ELEMENTS BEC
AND BIND TOGETHER INTO A MOLECULE CALLED AN EXCIPLEX IT
EXCIMER WHEN THE TWO ATOMS ARE OF THE SAME SPECIES.

AFTER A FEW NANOSECONDS, THE EXCIPLEX DISINTEGRATE
PREFERRED “GROUND STATE” OF INDEPENDENT ATOMS, EMITTING

UV LASER LIGHT. CREATION OF THE EXCIPLEX ALSO CAN BE DONE OR RF EXCITATION.

EXCIMER LASERS RESEMBLE TEA LASERS IN DESIGN; HOWEV MUST ALSO WITHSTAND THE CORROSIVE EFFECTS OF HALOGENS HAVE EXTREMELY HIGH GAIN, AND THEIR UV RADIATION HAS BE APPLICATIONS FROM PHOTOLITHOGRAPHY TO PHOTOABLATION."[10]

**XXI. RETELL TEXT C 2.2USING THE FOLLOWING PHRASES:**

IT IS WELL-KNOWN THAT...; I'D LIKE TO SAY...; MAY BE CAL WOULD ADVISE TO CALL YOUR ATTENTION TO ...; IT IS INTEREST SHOULD SAY THAT ...

# UNIT 3.2

## PART 1

**I. READ AND LEARN THE FOLLOWING WORDS, MIND PRONUNCIATION:**

| | | |
|---|---|---|
| EXISTENCE | ɪG'ZIST∂NS] | существование |
| VIRTUALLY | ∂:TJU∂L [JU] | фактически; в сущности, поистине |
| MATURE | [M∂'TJU∂] | 1. зрелый; тщательно обдуманный; продуманный; 2. созреть; вполне развиться; подробно разработать |
| SCANNER | ['SKÆN∂ | 1. многоточечный измерительный прибор; сканер |
| WORLDWIDE | ∂:LD'WAID] | всемирно известный; мировой |
| ROUGHLY | ^FLI [R | бурно; резко; грубо; неровно |
| GAP | [GÆP] | промежуток; интервал |
| OUTMODED | ['AUT'M∂UDID] | устаревший |
| SUCCUMB | ∂'K^M] [S | поддаться; уступить |
| BIASED | ['BAI∂ST] | смещенный |
| REVERSE-BIASED | ɪ'V∂:S 'BAI∂ST] | обратный смещенный |
| FORWARD-BIASED | ∂D 'BAI∂ST] [FO:W | прямой смещенный |
| TRAFFIC | ['TRÆFIK] | движение |
| JAM | [DƷÆM] | 1. скопление; 2. Сжатие;сжимание; 3. защемление |
| DISPARITY | ɪS'PÆRITI] [D | неравенство, несоответствие |

**II. READANDTRANSLATETHEFOLLOWINGPHRASES:**

TO MEET THE DEMANDS OF REAL-WORLDAPPLICATIONS

| | |
|---|---|
| TO TAKE PLACE IN | SEMICONDUCTOR LASERS |
| AT VIRTUALLY THE SAME TIME | HANDHELD BARCODE SCANNI |
| LONG-DISTANCE | INFORMATION SUPERHIGHWAY |
| TO DEPEND ON | OUTMODED LASER TECHNOLOGIES |

THE LIGHT-EMITTING DIODE A FORWARD BIASED *pn* JUNCTION
THE FORWARD-BIASED CONDITION AN ELECTRIC CURRENT
INDIRECTBAND GAPS A TRAFFIC JAM OF ELECTRONS AN

**III. READ AND GUESS THE MEANING OF THESE WORDS:**

LABORATORY [L∂'BOR∂T(∂)RI] PHOTODIODE [FƏUTƏU'DAI∂UD]

RESOLUTION [REZ∂'LU:∫∂N] MILLION ['MILJ∂N]

RECOMBINE [RI:K∂M'BAIN] STRUCTURE ['STRΛKʧ∂]

MATERIAL [M∂'TI∂RI∂L] FACT [FÆKT]

SEPARATE ['SEP∂RIT] DYNAMICS [DAI'NÆMIKS]

VALENCE ['VEIL∂N(T)S] CAVITY ['KÆVITI]

DETECTOR [DI'TEKT∂] SPECTROMETER [SPEK'TROMIT∂]

REGION ['RI:ʤ(ə)N] MASK [Mα:SK]

OPTOMECHANICAL [OPT∂UMI'KÆNIK∂L]

**IV. READ THE WORDS:**

[JU] TUBE, VIRTUALLY, MATURE, ACTUATOR, LONGITUDINAL

[Dʒ] JAM, REGION, HALOGEN, METROLOGY, SURGICAL, DAMAGE, C
ORIGINATE

**V. WORD STUDY .**

FLASH - GIVE OR SEND OUT A BRIEF BRIGHT LIGHT
VIRTUALLY - IN EVERY IMPORTANT RESPECT, ALMOST
SUCCUMB - (TO STH) STOP RESISTING (TEMPTATION, ILLNESS,ATTAC
YIELD
AMID - IN THE MIDDLE OF (STH); AMONG
FACETS - 1. ANY OF THE MANY SIDES OF A CUT STONE OR JEWEL
2. ASPECT OF A SITUATION OR A PROBLEM

**LOOK, READ, REMEMBER!**

**-ER,-OR,-MENT**

**-ER**
**V + -OR = N**
**-MENT**

WORK + ER = WORKER
TEACH + ER = TEACHER
RESEARCH + ER = RESEARCHER
PLAY + ER = PLAYER
CONDUCT + OR = CONDUCTOR
DEVELOP + MENT = DEVELOPMENT

**VI. A) MAKE UP NOUNS FROM THE VERBS:**

| | | |
|---|---|---|
| DETECT - | TRANSLATE - | EQUIP - |
| CARRY - | DRIVE - | ENVIRON - |
| LAY - | EXPLORE - | READ - |
| CONFUNE - | TRANSFORM - | WRITE - |

**B) FILL IN THE BLANKS WITH SUITABLE WORDS:**

THE GRATING LIES BEYOND THE ACTIVE ... (*lay/layer*) AND ... (*require/requirement*) AN INDEX-GUIDING ... (*lay/layer*) TO OPTICALLY LINK IT TO THE GAIN REGION OF THE CAVITY. BOTH CAV... (*arrange/arrangement*) ARE COMMERCIALLY USED FOR FIBERO... COMMUNICATIONS IN THE 1.3-MKM AND 1.55-MKM SPECTRAL REGI... MOST RECENT ... (*research/researcher*) INTO QUANTUM-WELL STRUCTUR... NOW INCLUDES QUANTUM WIRES - TWO-DIMENSIONAL ... (*carry/carrier*) ... (*confine/confinement*).

**VII. TRANSLATE THE FOLLOWING SENTENCES. DEFINE THE MEAN... THE WORDS WHICH ARE PUT IN ITALICS (THE NOUNS, THE ADJECTIVES O... VERBS).**

RECENT PROGRESS IN SO-CALLED STRAINED-*layer* ARCHITECTURES HAS RELAXED THE LATTICE-MATCHING ***requirement*** TO ABOVE 1%. ONE OF THE FIRST ***encroachments*** A LASER DIODE INTO FORBIDDEN ***spectral*** REGION AROUND 1 MKM CAME FROM A STRAINED-LAYER DESIGN CONSISTING OF ULT... ACTIVE ***layers*** AND GAALAS ***confinement layers*** ALL GROWN ON A GAAS

SUBSTRATE. THE LASER WAS USED FOR PUMPING ERBIUM-DOPED ***optical amplifiers*** AT 980 NM. APPLICATIONS ***require*** A HIGHLY COHERENT BEAM OF LIGHT WITH A NARROW BAND OF FREQUENCIES.

## GRAMMAR REVIEW
## SEQUENCE OF TENSES. REPORTED SPEECH

| | |
|---|---|
| INDEFINITE | |
| PRESENT *(I **write** a letter)* | PAST INDEFINITE *(He **said** he **wrote** a letter)* |
| **(CAN, MUST, MAY)** | **(COULD, HAD TO, MIGHT)** |
| PAST *(I **wrote** it two days ago)* | PAST PERFECT *(He **said** he **had written** it two days before)* |
| FUTURE *(I **shall write** it tomorrow)* | FUTURE-IN-THE PAST *(He **said** he **would write** it the next day)* |
| CONTINUOUS | |
| PRESENT *(I **am writing** it now)* | PAST CONTINUOUS *(He **said** he **was writing** it at that moment)* |
| PAST *(I **was writing** from 5 till 6 yesterday)* | PAST PERFECT CONTINUOUS *(He **said** he **had been written** from 5 till 6 the previous day)* |
| FUTURE *(I **shall be writing** at 6 next Monday)* | FUTURE-IN-THE PAST *(He **said** he **would be writing** at 6 the following Monday)* |
| PERFECT | |
| PRESENT *(I **have** just **written**)* | PAST PERFECT *(He **said** he **had written**)* |
| PAST *(I **had written** the novel for 5 years)* | PAST PERFECT *(He **said** he **had written** the novel for 5 years)* |
| FUTURE *(I **shall have written** It by 7 o'clock tomorrow)* | FUTURE-IN-THE PAST *(He **said** he **would have written** it by 7o'clock the next day)* |

### TIME AND PLACE CHANGES:

| | |
|---|---|
| HERE - THERE | TODAY– THAT DAY |
| THIS - THAT | YESTERDAY–THE DAY BEFORE/THE PREVIOUS DAY |
| THESE - THOSE | |

NOW - AT THAT MOMENT/THEN A MONTH AGO - A MONTH B
LAST MONDAY - THE PREVIOUS MONDAY TONIGHT - THAT NIGHT
NEXT WEEK - THE FOLLOWING WEEK TOMORROW - THE NEXT D

**VIII. CHANGE THE FOLLOWING SENTENCES INTO INDERECT**

1. “I AM TALKING ON THE TELEPHONE,” SAID OUR TEACHER ENGINEER ASKED US, “WHO TOOK MY TOOLS?” 3. MY FRIEND SAI “PASS ME THAT MAGAZINE, PLEASE.” 4. THE PROFESSOR ASKED, “W THIS LAW DISCOVERED?” 5. “DO YOU THINK IT IS RIGHT?” – AN ASKED ME. 6. SHE ASKED HIM, “WHERE HAVE YOU PUT MY TEXT-BO

**IX. READ AND TRANSLATE TEXT A 3.2.**

**TEXT A 3.2**

**SEMICONDUCTOR LASERS**

"IN 1962, JUST TWO YEARS AFTER THEODORE H. MAIMAN BUILT LASER AT HUGHES RESEARCH LABS IN MALIBU, SEMICONDUCT QUIETLY FLASHED INTO EXISTENCE. THE BIRTH TOOK PLACE IN T LABORATORIES AT VIRTUALLY THE SAME TIME - GENERAL ELECT AND DEVELOPMENT CENTER, IBM'S T.J. WATSON RESEARCH CENT MIT'S LINCOLN LABORATORY - BUT ALMOST 18 YEARS SLIPPED BY TECHNOLOGY MATURED ENOUGH TO MEET THE DEMANDS OF APPLICATIONS.

TODAY, NOT ONLY HAVE SEMICONDUCTOR LASERS MATURED EVERYBODY USES THEM. EVERY CD PLAYER AND CD-ROM HAS ONE DOES EVERY HANDHELD BARCODE SCANNER. IT'S NEARLY IMPOSSI LONG-DISTANCE CALL WITHOUT THEM. AND HIGH-SPEED DATA LIN THEM, TOO. IN 1994 ALONE, ALMOST 80 MILLION SEMICONDUCTOR L SOLD WORLDWIDE - ROUGHLY 230 TIMES THE COMBINED TOTAL LASERS. AND THE GAP CONTINUES TO WIDEN AS THE INF SUPERHIGHWAY EXPANDS AND OUTMODED LASER TECHNOLOGI SUCCUMB TO THE SMALLER, CHEAPER, FASTER WORLD OF SEMICO SOURCES.

SEMICONDUCTOR LASERS EVOLVED FROM THE SIMPL SEMICONDUCTOR LIGHT SOURCES, THE LIGHT-EMITTING DIODE (LE CONSISTS OF A BIASED *p*-*n* JUNCTION, JUST LIKE THE PHOTODIODE DETECT CONTRARY TO THE PHOTODIODE, THE JUNCTION OF AN LED IS FO RATHER THAN REVERSE-BIASED. IN FACT, LEDS ARE ESSENTIALLY IN REVERSE.

IN THE FORWARD-BIASED CONDITION, THE EXTERNALLY APP FIELD POINTSTOWARD THE *n*-REGION, WHICH FORCES HOLES FROM THE *p*-REGION TOWARD THE *n*-REGION AND CONDUCTION ELECTRONS FROM THE *n*-REGION THE TOWARD THE *p*-REGION. THIS CREATES AN ELECTRIC CURRENT THR DEVICE AND A TRAFFIC JAM OF ELECTRONS AND HOLES AT THE JU THE CONGESTION, ELECTRONS AND HOLES RECOMBINE, AND T ENERGY FROM THE JUNCTION. BUT THE KIND OF ENERGY RELEASE THE BAND-GAP STRUCTURE OF THE SEMICONDUCTOR MATERIAL.

IF, FOR EXAMPLE, THE VOLTAGE CONNECTIONS OF A SILICON WERE SIMPLY REVERSED SO AS TO FORWARD-BIAS THE *p*-*n* JUNCTION, THE ENERGY RELEASED WOULD BE MOSTLY HEAT. THIS IS BECAUSE SI INDIRECT BAND GAP. TO GENERATE MOSTLY LIGHT ENERGY AT TH SEMICONDUCTOR MATERIAL MUST HAVE A DIRECT BAND GAP.

THE DISPARITY BETWEEN THE TWO TYPES OF SEMICON ORIGINATES FROM THE FACT THAT CONDUCTION ELECTRONS AND SEPARATE DYNAMICS IN VARIOUS MATERIALS. NOT ONLY DO TH MOMENTUM OF THESE CHARGE VARY FROM ONE SUBSTANCE TO A TWO PROPERTIES ALSO DEPEND ON THE DIRECTION OF MOTION W MATERIAL.

IN DIRECT-BAND-GAP SEMICONDUCTORS , WHEN AN ELECT FROM THE BOTTOM OF THE CONDUCTION BAND TO THE TOP OF THE ITS MOMENTUM CHANGES VERY LITTLE AND THE ENERGY IS REL WITH A WAVELENGTH INVERSELY PROPORTIONAL TO THE BAN (WHERE $\lambda = hc/E_g$). BUT IN SEMICONDUCTORS WITH INDIRECTBAND GA SAME ELECTRON TRANSITION IS ACCOMPANIED BY SHIFT IN M THEREFORE, MUCH OF ENERGY IS RELEASED AS HEAT. THIS EXPLAI LIGHT-EMITTING SEMICONDUCTORS CONSIST OF DIRECT-BAND-G SUCH AS GAAS. THE FIRST PRACTICAL LEDS WERE MADE FROM G *p*-*n* JUNCTIONS. SO WERE THE FIRST SEMICONDUCTOR LASERS.

IN PRINCIPLE, THE LEAP FROM LEDS TO SEMICONDUCTOR LA SIMPLE ONE. IT REQUIRES A POPULATION INVERTION AND SOME KI FEED-BACK.POPULATION INVERTION CAN BE ACHIEVED IN AN LED DOPING THE *p*- AND *n*-REGIONS AND APPLYING A STRONG FORWARD BIA THE DEVICE SO AS TO INJECT A HIGH DENSITY OF ELECTRONS AND JUNCTION. FOR OPTICAL FEED-BACK, A FABRY-PEROT CAVITY CAN FROM TWO OPPOSING FACETS CLEAVED PERPENDICULAR TO THE J THIS WAS THE APPROACH TAKEN BY ROBERT N. HALL'S RESEAR GENERAL ELECTRIC'S R&DCENTER IN 1962."[11]

**X. MATCH THE ENGLISH WORDS ON THE LEFT WITH THE EQUIVALENTS:**

| | |
|---|---|
| 1. SEMICONDUCTOR | 1. переход |
| 2. WORLDWIDE | 2. продуманный |
| 3. GRADUALLY | 3. движение |
| 4. SUCCUMB | 4. управляемый |
| 5. MATURE | 5. инжектировать |
| 6. HANDHELD | 6. полупроводник |
| 7. TRAFFIC | 7. сжатие, скопление |
| 8. CONGESTION | 8. ширина запрещенной зоны |
| 9. JUNCTION | 9. напряжение |
| 10. FEED-BACK | 10. передвижение |
| 11. MOTION | 11. широкоизвестный |
| 12. VOLTAGE | 12. постепенно |
| 13. JAM | 13. обратная связь |
| 14. BAND-GAP | 14. поддаться, уступить |
| 15. INJECT | 15. перенаселенность |

**XI. CHOOSE THE BEST EQUIVALENTS FOR THE WORDS ON FROM THE WORDS ON THE RIGHT. EXAMPLE: ENOUGH - SUFFICI**

| | |
|---|---|
| 1. ENOUGH | A) TOO, B) RATHER, C) GENTLY, D) SUFFICIENTL |
| 2. SEPARATE | A) DECOMPOSE, B) TEAR UP, C) SPLIT UP, D) DI |
| 3. ORIGINATE | A) CREATE, B) BUILD, C) PRODUCE, D) MAKE |
| 4. FASHION | A) RAISE, B) SIMULATE, C) DESIGN, D) FORM |
| 5. CLEAVE | A) CUT, B) OPEN, C) PAVE, D) BREAKTHROUGH |

6. EVOLVE A) DEVELOP, B) DISPERSE, C) PICK UP, D) UNWIN
7. INDIRECT A) SIMPLE, B) CONTRARY, C) OPPOSITE, D) THE
8. SLIP A) COMBINE, B) DISAPPEAR, C) SLIDE, D) GLIDE
9. CONNECTION A) RELATION, B) ADDING, C) INNATE, D) COND
10. FLASH A) SWITCH ON, B) SPARKLE, C)SHINE, D) BLAZE

**XII. TRANSLATE THE SENTENCES , USING THE FOLLOWING WORDS AND PHRASES:** SEMICONDUCTOR LASERS; A *p-n* BIASED JUNCTION; AN ELECTRIC CURRENT; A TRAFFIC JAM OF ELECTRONS AND HOLES AT THE JU MATERIAS;TO CONSIST OF DIRECT-BAND-GAP MATERIALS SUCH AS

Полупроводниковые лазеры относятся к твердотельным лазерам. Активная среда в таких лазерах создается в объеме электронно-дырочного перехода в полупроводниках при возбуждении током, который течет в прямом направлении, за счет инжекции в область перехода электронов проводимости и дырок. Для создания полупроводниковых лазеров применяются GAALAS, INP, PBSE, PBS и другие полупроводниковые материалы. Из-за малых объемов *p-n* перехода полупроводниковые лазеры имеют малую мощность возбуждения и небольшую выходную мощность (Единицы и десятки мВт). Они являются самыми миниатюрными лазерами. Используя полупроводники различного состава, можно получать излучение на длинах волн в диапазоне 0.7 - 1.6 мкм.

**XIII. A) GIVE THE RUSSIAN EQUIVALENTS OF THE FOLLOWING EXPRESSIONS:**

JUST TWO YEARS AFTER; QUIETLY FLASHED INTO EXISTENC IMPOSSIBLE; HIGH-SPEED DATA LINKS; SOLD WORLDWIDE; GRADUA TO THE SMALLER, CHEAPER, FASTER WORLD OF SEMICONDUCTOR AMID THE CONGESTION; FORWARD-BIASED *p-n* JUNCTION; MUST HAVE A DIRECT BAND GAP; VARY FROM ONE SUBSTANCE TO ANOTHER; SOME KIN FEED-BACK; A FABRY-PEROT CAVITY; CRYOGENIC COOLING; EFF SINKING; TWO THICKER SEMICONDUCTOR LAYERS; FORWARD-BIA TO INJECT HOLES AND ELECTRONS; SO-CALLED CARRIER CONTI PACKED INTO A SMALL VOLUME; STRIPE-GEOMETRY LASER DIODES AND INDEX-GUIDED; THIN RIBBON OF METAL; THE GAIN REGION O NARROW WAVEGUIDE; OPTICAL STORAGE.

**B) FIND IN THE TEXT THE EQUIVALENTS OF THE FO EXPRESSIONS:**

В отличие от фотодиода; точно так, как фотодиодный детектор; рекомбинация электронов и дырок; прямой и обратный *p-n* переход; различные материалы; высокая плотность электронов и дырок; сжатие; прямой смещенный; обратная связь; развитие двойных гетероструктур; состоять из очень тонких слоев; *p-n* переход; потенциально-энергетический барьер; большое число электронов и дырок; больше света меньше тепла; протекать через активный слой; положительно заряженный металлический контакт; одна из наиболее эффективных конструкций; коэффициент преломления.

**XIV. LOOK THROUGH THE TEXT AGAIN. READ THE FO STATEMENTS. COMPARE YOUR VERSION AND IF YOU THINK WRONG CORRECT THEM.**

1. THE VOLTAGE CONNECTIONS OF A SILICON PHOTODIODE WE REVERSED SO AS TO FORWARD-BIAS THE *p-n* JUNCTION.
2. THE CONDUCTION ELECTRONS AND HOLES EXPERIENCE SEPARA IN VARIOUS MATERIAS.
3. IT'S POSSIBLE TO MAKE A LONG-DISTANCE CALL WITHOUT SE LASERS.
4. IN 1894 ALONE, ALMOST 80 MILLION SEMICONDUCTOR LASERS WORLDWIDE - ROUGHLY 230 TIMES THE COMBINED TOTAL O LASERS.
5. LEDS AREN’T ESSENTIALLY PHOTODIODES IN REVERSE.
6. ELECTRONS AND HOLES RECOMBINE, AND THIS RELEASES ENE JUNCTION.
7. A HOLE DROPS FROM THE BOTTOM OF THE CONDUCTION BAND THE VALENCE BAND.
8. SEMICONDUCTOR LASERS EVOLVED FROM THE SIMPLEST OF SE LIGHT SOURCES, THE LIGHT-EMITTING DIODE.
9. THERE ARE THREE PROPERTIES WHICH ALSO DEPEND ON THE MOTION WITHIN A GIVEN MATERIAL.
10. THE LEAP FROM LEDS TO SEMICONDUCTOR LASERS IS A SIMPLE

**XV. COMPLETE THE FOLLOWING SENTENCES. YOUR ANSWER MU IN THE TEXT.**

1. ALMOST 18 YEARS SLIPPED BY BEFORE ...
2. EVERY CD PLAYER AND CD-ROM HAS ...
3. IN 1994 ALONE, ALMOST 80 MILLION SEMICONDUCTOR LASERS WE
4. OUTMODED LASER TECHNOLOGIES GRADUALLY SUCCUMB TO ...
5. THE LED CONSISTS OF ...
6. BUT CONTRARY TO THE PHOTODIODE, THE JUNCTION OF AN LED
7. IN FACT, LEDS ARE ...
8. BUT THE KIND OF ENERGY RELEASED DEPENDS ON ...
9. THE VOLTAGE CONNECTIONS OF A SILICON PHOTODIODE WERE ..
10. THE DISPARITY BETWEEN THE TWO TYPES OF SEMICONDUCTOR FROM THE FACT THAT ...
11. THE FIRST PRACTICAL LEDS WERE MADE FROM ...
12. POPULATION INVERSION CAN BE ACHIEVED IN ...

**XVI. ANSWER THE FOLLOWING QUESTIONS:**

1. WHERE DID THE BIRTH OF SEMICONDUCTOR LASERS TAKE PLACE?
2. WHERE ARE SEMICONDUCTOR LASERS USED TODAY?
3. IS IT POSSIBLE TO MAKE A LONG-DISTANCE CALL WITHOUT SEMI LASERS?
4. DID SEMICONDUCTOR LASERS EVOLVE FROM THE SIMPLEST OF SEMICONDUCTOR LIGHT SOURCES, THE LIGHT-EMITTING DIODE?
5. THE JUNCTION OF A LED IS FORWARD-BIASED RATHER THAN REV ISN'T IT?
6. WHAT TWO PROPERTIES DEPEND ON THE DIRECTION OF MOTION GIVEN MATERIAL?
7. WHAT HAPPENS WHEN AN ELECTRON DROPS FROM THE BOTTOM CONDUCTION BAND TO THE TOP OF THE VALENCE BAND?
8. IS MUCH OF ENERGY RELEASED AS HEAT?
9. WHAT EXPLAINS WHY MOST LIGHT-EMITTING SEMICONDUCTOR DIRECT-BAND-GAP MATERIALS SUCH AS GAAS?
10. THE FIRST PRACTICAL LEDS WERE MADE FROM GAAS *pn* JUNCTIONS, WEREN'T THEY?

**XVII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

THAT'S RIGHT...; THAT'S WRONG...; TO MY MIND...; IN MY OPIN
AGREE WITH YOU...; I THINK SO...

1. EVERY CD PLAYER AND CD-ROM HAS SEMICONDUCTOR DIODES.
2. AND HIGH-SPEED DATA LINKS DON'T DEPEND ON SEMICONDUCTO
3. THE LED CONSISTS OF A BIASED *p-n* JUNCTION, JUST LIKE THE PHOTODIO
DETECTOR.
4. IN THE FORWARD-BIASED CONDITION, THE EXTERNALLY APPLIED
DOESN'T POINT TOWARD THE *n*-REGION.
5. THE *n*-REGION CANNOT FORCE HOLES FROM THE *p*-REGION TOWARD THE *n*-REGION AND CONDUCTION ELECTRONS FROM THE *n*-REGION TOWARD THE *p*-REGION.
6. THE KIND OF ENERGY RELEASED DEPENDS ON THE BAND-GAP S
THE SEMICONDUCTOR MATERIAL.
7. TO GENERATE MOSTLY LIGHT ENERGY AT THE JUNCTION, THE SE
MATERIAL MUST HAVE A DIRECT BAND GAP.
8. SEMICONDUCTOR LASERS WERE BUILT IN 1982.
9. THE LEAP FROM LEDS TO SEMICONDUCTOR LASERS IS A SIMPLE O
10. POPULATION INVERTION CAN BE ACHIEVED IN AN LED BY HEAVI
THE *p*- AND *n*-REGIONS AND APPLYING A STRONG FORWARD BIAS A
DEVICE SO AS TO INJECT A HIGH DENSITY OF ELECTRONS AND HO
JUNCTION.

**XVIII. RETELL TEXT A3.2 ACCODING TO THE SCHEME:**

THE FIRST SEMICONDUCTOR LASERS

MODERN APPLICATION OF SEMICONDUCTOR LASERS

LIGHT-EMITTING DIODE

THE FORWARD-BIASED CONDITION

THE DISPARITY BETWEEN THE TWO TYPES OF SEMICONDUCTORS

DIRECT-BAND-GAP AND INDIRECT-BAND-GAP SEMICONDUCTORS

A POPULATION INVERTION AND SOME KIND OF OPTICAL FEED-BACK

**XIX. READ THE DIALOGUE AND ACT IT OUT. THEN MAKE U DIALOGUES OF YOUR OWN AND ROLE PLAY THEM.**

*Mr. Tompson:* THE OPPORTUNITY TO MEET YOURSELF, YOUR DI AND YOUR PLANT IS SOMETHING I HAD LONG LOOKED FORWA ACQUAINTED WITH YOUR PRODUCTS AND I'D LIKE TO ASK YOU SOM

*Mr. Roberts:* WE'LL BE GLAD TO ANSWER THEM.

*Mr. Tompson:* HAVE YOU MADE SEMICONDUCTOR LASERS FOR A DISTANCE CALL?

*Mr. Roberts:* YES, WE HAVE, IT'S ONE OF THE WAYS OF OUR WOR

*Mr. Tompson:* WHAT PROPERTIES DEPEND ON THE DIRECTIO MOTION WITHIN A GIVEN MATERIAL?

*Mr. Roberts:* THE DISPARITY BETWEEN THE TWO TYPES SEMICONDUCTORS ORIGINATES FROM THE FACT THAT CONDUCTIO HOLES EXPERIENCE SEPARATE DYNAMICS IN VARIOUS MATERIALS THE ENERGY AND MOMENTUM OF THESE CHARGE VARY FROM ONE ANOTHER.

*Mr. Tompson:* WHAT EXPLAINS WHY MOST LIGHT-EMITT SEMICONDUCTORS CONSIST OF DIRECT-BAND-GAP MATERIALS SUC

*Mr. Roberts:* IN DIRECT-BAND-GAP SEMICONDUCTORS, WHE ELECTRON DROPS FROM THE BOTTOM OF THE CONDUCTION BAND THE VALENCE BAND, ITS MOMENTUM CHANGES VERY LITTLE AND RELEASED AS LIGHT WITH A WAVELENGTH INVERSELY PROPORTIO GAP ENERGY (WHERE $\lambda = hc/E_g$). BUT IN SEMICONDUCTORS WITH INDIRECT GAPS, THE SAME ELECTRON TRANSITION IS ACCOMPANIED B MOMENTUM. THEREFORE, MUCH OF ENERGY IS RELEASED AS EXPLAINS WHY MOST LIGHT-EMITTING SEMICONDUCTORS CONSI BAND-GAP MATERIALS SUCH AS GAAS.

*Mr. Tompson:* I VERY MUCH APPRECIATE YOUR KINDNESS AND T
MR. FORST IN SHOWING ME ROUND THE NEW PLANT. I THANK YOU O

*Mr. Roberts:* YOU ARE ALWAYS WELCOME.

**XX. CONTINUE THE DIALOGUE:**

*Mr. Roberts:* PLEASE, PREPARE THE QUESTIONNAIRE FOR QUALI
TEST FOR NEW WORKERS.

*Mrs. Crown:* . . . . . . . . . . . . . . . . . . . .

*Mr. Roberts:* . . . . . . . . . . . . . . . . . . . .

*Mrs. Crown:* . . . . . . . . . . . . . . . . . . . .

**XXI. CHOOSE A PARTNER AND TALK ABOUT SEMICONDUCT
AND THEIR APPLICATION.**

**XXII. WRITE A SUMMARY OF THE TEXT.LIMIT IT TO 10 SENTE**

## PART 2

**I. READ TEXT B 3.2. SAY WHATTECHNIQUES RESTRICT THE LA
AREA OF CURRENT FLOW THROUGH THE ACTIVE LAYER IN GAIN
DIODES.**

### TEXT B 3.2

### DOUBLE HETEROSTRUCTURES. STRIPE GEOMETRY

"THE EARLIEST SEMICONDUCTOR LASERS (ALSO KNOWN AS LA
JUNCTION LASERS, OR INJECTION LASERS) REQUIRED FANTASTICA
DENSITIES TO REACH LASER THRESHOLD. THEREFORE THEY HAD
PULSED MODE TO AVOID THE CATASTROPHIC FAILURE CAUSED BY
CRYOGENIC COOLING AND EFFICIENT HEAT-SINKING WERE COM
FACT, IT WASN'T UNTIL 1970 THAT CONTINUOUS ROOM-TEMPERAT
BECAME THROUGH THE DEVELOPMENT OF DOUBLE HETEROSTRUCT

UNLIKE THE SIMPLE *p-n* HOMOJUNCTIONS DESCRIBED ABOVE, A DOU
HETEROSTRUCTURE JUNCTION CONSISTS OF A VERY THIN (APPR
MKM) DIRECT-BAND-GAP SEMICONDUCTOR LAYER SANDWICHED B
THICKER SEMICONDUCTOR LAYERS. THE KEY TO THIS DESIGN IS TH *p-*
TYPE LAYER - KNOWN AS THE ACTIVE LAYER - IS MADE FROM A MA

SMALLER BAND GAP THAN THE THICKER *p*- AND *n*-TYPE LAYERS ON EITHER SIDE WHEN THIS STRUCTURE IS FORWARD-BIASED, THE VOLTAGE INJE ELECTRONS FROM THE OUTER *p*- AND *n*- REGIONS INTO THE CENTRAL ACTIVE L WHERE THEY BECOME TRAPPED BETWEEN THE POTENTIAL-ENE CREATED BY THE WIDER-BAND-GAP MATERIALS.

IN A FORWARD-BIASED DOUBLE HETEROSTRUCTURE, THEN, B HOLES CAN ENTER THE ACTIVE REGION. BUT THEY CANNOT ESCA THEY CAN FROM A *p*-*n* HOMOJUNCTION. THIS SO-CALLED CARRIER CONF ENABLES A LARGE NUMBER OF ELECTRONS AND HOLES TO BE P SMALL VOLUME, WHICH, FOR A LASER DIODE, TRANSLATES INT LOWER THRESHOLD CURRENT, AND HIGHER EFFICIENCY. OF CO EFFICIENCY MEANS MORE LIGHT AND LESS HEAT.

TO ACHIEVE EVEN GREATER EFFICIENCY, THE ACTIVE LAYER HETEROSTRUCTURE LASER DIODE CAN BE NARROWED IN TWO DIM OF JUST ONE. THIS DEFINES THE FUNDAMENTAL APPROACH OF STR LASER DIODES, WHICH MAKE UP THE GREAT MAJORITY OF COMM DIODES IN USE TODAY. STRIPE-GEOMETRY DIODES COME IN T VARIETIES: GAIN-GUIDED AND INDEX-GUIDED.

A NUMBER OF TECHNIQUES RESTRICT THE LATERAL AREA OF THROUGH THE ACTIVE LAYER IN GAIN-GUIDED LASER DIODES. METHOD IS TO LAY DOWN A GROOVED LAYER OF AN INSULATOR S DIOXIDE ($SiO_2$) BETWEEN THE POSITIVELY CHARGED METAL CONTAC TEST OF THE STRUCTURE. THIS EXPOSES A THIN RIBBON OF META CURRENT CAN FLOW THROUGH THE SEMICONDUCTOR LAYERS. CURRENT FLOWING THROUGH THE ACTIVE LAYER ESTABLISHES TH THE LASER, WHICH ACTS LIKE A NARROW WAVEGUIDE FOR THE LIG

INDEX-GUIDED LASER DIODES USE A TRUE WAVEGUIDE ST OPTICALLY CONFINE THE LASER LIGHT TO A NARROW REGION OF ONE OF THE MOST EFFECTIVE DESIGNS, THE BURIED-HETEROST DIODE, TAKES ADVANTAGE OF THE NATURALLY LOWER REFRACTIV BAND- GAP MATERIALS TO CONTAIN THE LASER LIGHT THROUGH REFLECTION. IN THIS DEVICE, A NARROW ACTIVE REGION IS SURRO SIDES BY LOW-INDEX, WIDE-BAND-GAP MATERIAL, WHICH SERVES BOTH THE LIGHT AND THE CHARGE CARRIERS. GAIN GUIDING ALS WITH THIS STRUCTURE TO CONCENTRATE CURRENT FLOW THRO STRIPE.

DOZENS OF GAIN-GUIDED AND INDEX-GUIDED LASER-DIODE S HAVE BEEN DEVELOPED FOR VARIOUS APPLICATIONS. FOR EX ELECTRIC CURRENT IN GAIN-GUIDED DIODES CAN BE CONFINED B LAYERS, PROTON-IMPLANTED REGIONS, OR EVEN REVERSE-BIASED INDEX-GUIDED, THE MOST IMPORTANT STRUCTURES INCLU HETEROSTRUCTURE, BURIED CRESCENT, DUAL-CHANNEL PL HETEROSTRUCTURE, RIDGE WAVEGUIDE, AND CHANNELED-SUBSTR

BECAUSE OF THE NARROW CONFINEMENT OF CHARGE CARRIE MADE POSSIBLE BY INDEX-GUIDED STRUCTURES (ACTIVE STRIPES ARE NOT UNHEARD OF), LASER DIODES BASED ON THIS ARCHITEC EFFICIENT. A NARROW ACTIVE REGION ALSO GENERATES A LIGHT, OF LIGHT, WHICH IS WHY INDEX-GUIDED DIODES ARE MOST OFTE OPTICAL COMMUNICATIONS, OPTICAL STORAGE, AND LASER PR GUIDEDDIODES GENERATE A BROADER, LESS-COHERENT LIGHT B ALLOWS THEM TO REACH HIGHER POWER THAN INDEX-GUIDED DIODES."[11] **RS EFFECTIVE:**

**II. LOOK THROUGH TEXT B3.2 AND ANSWER THE FOLLOWI QUESTIONS:**

1. WHAT DID THE EARLIEST SEMICONDUCTOR LASERS REQUIRE T THRESHOLD?
2. ARE SEMICONDUCTOR LASERS ALSO KNOWN AS LASER DIODE LASERS, OR INJECTION LASERS?
3. WERE CRYOGENIC COOLING AND EFFICIENT HEAT-SINKING COMP
4. WHAT HAPPENS WITH THE VOLTAGE WHEN THE STRUCTURE BIASED?
5. WHAT BECOMES TRAPPED BETWEEN THE POTENTIAL-ENERG CREATED BY THE WIDER-BAND-GAP MATERIALS?
6. CAN ELECTRONS AND HOLES ENTER THE ACTIVE REGION?
7. ELECTRONS AND HOLES CANNOT ESCAPE AS EASILY AS THEY CA *p-n* HOMOJUNCTION, CAN THEY?
8. WHAT DEFINES THE FUNDAMENTAL APPROACH OF STRIPE-GEO DIODES?
9. WHAT TWO BASIC VARIETIES STRIPE-GEOMETRY DIODES COME IN
10. WHAT DOES INDEX-GUIDED LASER DIODES USE?

**III. COMPLETE THE FOLLOWING SENTENCES USING THE TE**

1. IN FACT, IT WASN'T UNTIL 1970 THAT ...
2. UNLIKE THE SIMPLE *p-n* HOMOJUNCTIONS DESCRIBED ABOVE, A DOUB HETEROSTRUCTURE JUNCTION CONSISTS OF ...
3. THE KEY TO THIS DESIGN IS THAT ...
3. HIGHER EFFICIENCY MEANS ...
4. TO ACHIEVE EVEN GREATER EFFICIENCY, THE ACTIVE LAYER OF HETEROSTRUCTURE LASER DIODE CAN BE ...
5. ONE SIMPLE METHOD IS ...
6. INDEX-GUIDED LASER DIODES USE ...
7. ONE OF THE MOST EFFECTIVE DESIGNS, THE BURIED-HETEROSTRU DIODE, TAKES ADVANTAGE OF ...
8. GAIN GUIDING ALSO CAN BE USED WITH ...
9. A NARROW ACTIVE REGION ALSO GENERATES ...
10. GAIN GUIDING ALSO CAN BE USED WITH THIS STRUCTURE TO CO

**IV. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. USE THE FOLLOWING PHRASES:**

YOU SEE ...; AS FOR ME...; IN MY OPINION...; I CAN SAY THAT...; I SO...

1. SEMICONDUCTOR LASERS HAD TO OPERATE IN A PULSED MODE TO AVOID THE CATASTROPHIC FAILURE CAUSED BY HEAT BUILD-UP.
2. LIKE THE SIMPLE *p-n* HOMOJUNCTIONS DESCRIBED ABOVE, A DOUBLE HETEROSTRUCTURE JUNCTION CONSISTS OF A VERY THIN (APPRO MKM) DIRECT-BAND-GAP SEMICONDUCTOR LAYER.
3. IN A FORWARD-BIASED DOUBLE HETEROSTRUCTURE ELECTRONS CANNOT ENTER THE ACTIVE REGION.
4. THIS SO-CALLED CARRIER CONTINEMENT ENABLES A LARGE NUM ELECTRONS AND HOLES TO BE PACKED INTO A SMALL VOLUME.
5. HIGHER EFFICIENCY MEANS LESS LIGHT AND MORE HEAT.
6. STRIPE-GEOMETRY LASER DIODES MAKE UP THE GREAT MAJORIT MERCIAL LASER DIODES IN USE TODAY.
7. IN THIS DEVICE, A NARROW ACTIVE REGION ISN'T SURROUNDED BY LOW INDEX.
8. GAIN GUIDING ALSO CANNOT BE USED WITH THIS STRUCTURE TO CURRENT FLOW THROUGH THE ACTIVE STRIPE.

9. DOZENS OF GAIN-GUIDED AND INDEX-GUIDED LASER-DIODE STR
HAVE NOT BEEN DEVELOED FOR VARIOUS APPLICATIONS.
10. THE MOST IMPORTANT STRUCTURES INCLUDE BURIED HETERO
BURIED CRESCENT, DUAL-CHANNEL PLANAR BURIED HETEROST
WAVEGUIDE, AND CHANNELED-SUBSTRATE PLANAR.

**V. FIND THE SENTENCE WHICH EXPRESSES THE MAIN IDEA OF EACH PARAGRAPH OF TEXT B3.2. ENTITLE EACH PARAGRAPH.**

**VI. MAKE UP AND WRITE THE SCHEME OF TEXT B3.2 USING T EACH PARAGRAPH.**

**VII. MAKE UP YOUR QUESTIONS TO TEXT B3.2. ASK YOUR FRIENDS THESE QUESTIONS.**

**VIII. USING THE MATERIAL OF THE TEXT ABOVE, WRITE THE MAIN POINTS ACCORDING TO THE QUESTIONS (VII). USE THE FO CONVERSATION PHRASES:** I THINK IT IS RIGHT BECAUSE ...; I THINK IT IMPORTANT ...; IT IS INTERESTING TO KNOW ...

**IX. SAY WHAT INFORMATION ABOUT SEMICONDUCTOR LA YOU HAVE KNOWN AND WHICH IS NEW.**

**X. WRITE A SUMMARY OF THE TEXT.**

**XI. MAKE UP A TOPIC ON THE THEME "SEMICONDUCTOR LASERS AND THEIR APPLICATION IN DIFFERENT BRANCHES OF INDUSTRY".**

**XII. WRITE THE FOLLOWING WORDS IN ALPHABETICAL ORDER:**

**A)** INJECTION; BUNDLE; FIBER; ATTENUATION; JUNCTION; APPR
CRYSTAL; SPEED; PROJECTOR; SPECTRUM; FILTER; EMISSION;
**B)** DYE; DENSITY; DUMPER; DECODER; DURATION; DAMPING; DE
DISPERSION; DISCHARGE; DECAY.

**XIII. FIND WHAT WORDS FORM THE FOLLOWING COMPOUND WOR**

THERMONUCLEAR; MINILASER; WAVEPLATE; ACTIVATION; AUTOCORRELAT MICROSPECTROPHOTOMETER; HETEROSTRUCTURE; MU MONOCHROMATISM.

**XIV. USE A DICTIONARY TO FIND SYNONYMOUS WORDS WITH FOLLOVING WORDS:**

UNBOUNDED; OUTSIDE; INDEFINITE; RETARDATION; SMOOTH; UNIFORM; OVERALL; INCURVITY; ROUGH.

**XV. CHOOSE ENGLISH WORDS WHICH HAVE THE SAME MEA IN RUSSIAN LANGUAGE:**

RELY; CHECK; RELAY; LINEARLY; INDEX; ACTIVE; CONTROL; CUBIC; ACTUAL; CAMERA; BOB.

**XVI. USE A DICTIONARY AND FIND ANTONYMS ING THE FOLLO WORDS AND EXPRESSIONS:**

INCONDENSABLE; INCOMPLETE; NEGATIVE; TOTAL; SOLID; LOW SPECIFIC; ADVANCED.

**XVII. USE A DICTIONARY AND FIND RUSSIAN EQUIVALENT THE FOLLOWING WORDS AND EXPRESSIONS:**

SEMICONDUCTOR FABRICATION TECHNIQUES; METAL-ORGANIC CHE VAPOR DEPOSITION; THE MOTION OF ELECTRONS AND HOLES; T DISCRETE SUBBANDS; A CONDUCTION SUBBAND AND A VALENCE SINGLE DOUBLE-HETEROSTRUCTURE JUNCTION; CAN BE FINE-TUNE THE ACTIVE-LAYER THICKNESS.

**XVIII. FIND IN TEXT C3.2 ENGLISH EQUIVALENTS OF THE FOLLOWING WORDS AND EXPRESSIONS:**

с развитием полупроводниковой техники; молекулярно-лучевая эпитаксия; чрезвычайно тонкие структуры; толщина активного слоя; валентные связи; двойной гетеропереход; пороговый ток.

**XIX. READ TEXT C 3.2.**

**SAY WHAT EFFECT IMPLIES THAT THE WAVELENGTH OF EM CAN BE ADJUSTED BY VARYING THE THICKNESS OF THE ACTIVE**

**TEXT C 3.2**

**QUANTUM-WELL STRUCTURES**

"WITH THE DEVELOPMENT OF ADVANCED SEMICONDUCTOR F TECHNIQUES SUCH AS MOLECULAR-BEAM EPITAXY AND MET

CHEMICAL VAPOR DEPOSITION (MOCVD), IT HAS BECOME POSSIBLE
EXTREMELY THIN STRUCTURES. USING MOCVD, FOR EXAMPLE, IT
TO GROW LAYERS JUST A FEW ATOMS THICK.

NOW IF THE THICKNESS OF THE ACTIVE LAYER IN A
HETEROSTRUCTURE FALLS BELOW ABOUT 50 NM, THE MOTION OF
HOLES IS SEVERELY LIMITED IN THAT ONE DIMENSION. THIS CH
OVERALL ENERGY AND MOMENTUM OF THESE CHARGE CARRIE
MATERIAL, WHICH MODIFIES THE OPTICAL PROPERTIES IN SIGNIFIC

ONE IMPORTANT EFFECT IS THAT THE CONDUCTION BAND A
BAND EACH SPLIT INTO DISCRETE SUBBANDS WITH ENERGY DIST
DEPEND ON THE THICKNESS OF THE MATERIAL. ANOTHER CONSEQ
THE PROBABILITY OF A TRANSITION BETWEEN A CONDUCTION S
VALENCE SUBBAND CHANGES. THE FIRST EFFECT IMPLIES THAT TH
OF EMITTED LIGHT CAN BE ADJUSTED BY VARYING THE THICKNES
LAYER, AND THE SECOND EFFECT ENDS UP MAKING A POPULATI
EASIER TO ATTAIN.

A LASER DIODE FABRICATED FROM A SINGLE DOUBLE-HETE
JUNCTION WITH AN ACTIVE LAYER LESS THAN 50 NM THICK IS CA
QUANTUM-WELL (SQW) LASER. SQW LASERS HAVE HIGHER GAIN
LOWER THRESHOLD CURRENTS THAN CONVENTIONAL DOUBLE-
DEVICES. ALSO, THE LIGHT OUTPUT IS SUBSTANTIALLY MORE COHE
WAVELENGTH THAT CAN BE FINE-TUNED BY ADJUSTING THE
THICKNESS."[11]

**XX. RETELL TEXT C3.2USING THE FOLLOWING PHRASES:**

IT IS WELL-KNOWN THAT...; I'D LIKE TO SAY...; MAY BE CAL
WOULD ADVISE TO CALL YOUR ATTENTION TO ...; IT IS INTEREST
SHOULD SAY THAT ...

# UNIT 4.2

## PART 1

**I. READ AND LEARN THE FOLLOWING WORDS, MIND PRONUNCIATION:**

| | | |
|---|---|---|
| LIQUID | [′LɪKWɪD] | 1.жидкий; 2. жидкость |
| DYE | [DAɪ] | 1. краситель; 2. окрашивать |
| SOLVENT | [′SOLV∂NT] | 1. растворитель; 2. растворяющий |
| SPAN | [SPÆN] | 1. период времени; диапазон; 2. измерять; охватывать |
| CHAMBER | [ʧEɪMB∂] | камера |
| ORIGINATE | [əʹRɪʤ(ə)NEɪT] | давать начало; порождать; создавать |
| DESIRE | [ɪʹZAɪ∂] | 1. желание; просьба; 2. желать; хотеть |
| COHERENCE | [K∂UʹHɪ∂R∂NS] | когерентность |
| PLASTIC | [′PLÆSTɪK] | 1. пластический; 2. пластмасса; пластичность |
| CONGENITAL | [K∂N'ʤENɪT(∂)L] | прирожденный; врожденный |
| WART | [WO:T] | нарост |
| VEIN | [VEɪN] | прожилка; кровеносный сосуд |
| SCAR | [SKα:] | 1. рубец; 2. оставлять шрам; рубцеваться |
| ACCEPTANCE | [∂KʹSEPT∂NS] | 1. принятое значение слова; 2. принятие; прием |
| PROMPT | [PROMPT] | быстрый; точный |
| AWARE | [∂′Wε∂] | знающий; сознающий |
| DAMAGE | ['DÆMɪʤ] | 1. повреждение; ущерб; 2. повреждать; наносить ущерб |
| AMAZE | [∂′MEɪZ] | удивлять; поражать |
| WORTH | [W∂:θ] | цена; достоинство |
| PROPEL | [PR∂ʹPEL] | 1. продвигать вперед; толкать; приводить в движение; |

2. двигать; стимулировать;
3. побуждать

TREATMENT ['TRI:TM∂NT] обработка; лечение; уход

**II. READ AND TRANSLATE THE FOLLOWING PHRASES:**

LIQUID LASERS TO GENERATE BROADBAND LASER LIGH
DYE LASERS THE VIBRATIONAL AND ELECTRONIC STA
TO SPAN THE SPECTRUM TO SPLIT THE ELECTRONIC ENERGY L
THE DYE SOLUTION SKIN RESURFACING AND HAIR REMOV
A FLOW CELL TO BE CONTAINED BY A TRANSPARENT C
DIFFRACTION GRATING THE FOREFRONT OF CLINICAL APPLIC
DYE-LASER TREATMENT BURN-DEPTH DIAGNOSIS AND DEBRI
PERMANENT DAMAGE STUDY OF LASER-TISSUE INTERACTION

**III. READ AND GUESS THE MEANING OF THESE WORDS:**

ELLIPTICAL [ɪ'LɪPTɪK(ə)L] MONOLITHIC [ˌMONƏ'LɪθɪK]
MASSIVE ['MÆSɪS] ELEGANT ['ELɪGƏNT]
MOMENTUM [M∂'MENT∂M] PROPORTIONAL [P∂'PO:ʃ∂NL]
INDEX ['ɪNDEKS] METAL ['METL]
CONCENTRATE ['KONS∂NTREɪT] PHASE [FEɪZ]
ORGANIC [O:'GÆNɪK] QUANTUM ['KWONT∂M]
CONFIGURATION [K∂NˌFɪGU'REɪʃ(ə)N] DIFFRACTION [Dɪ'FRÆKʃ∂N]

**IV. LEARN TO READ THE WORDS:**

[ɪ:] HE, SEE, BEEN, REGION, TREATMENT, BETWEEN, SPECIES
[∂] WORKER, CHAMBER, PROPEL, CONGENITAL, AWARE, AMAZE
[U:] TOO, LOOK, TISSUE, GROOVE, DOOMS
[K] CLOCK, CHECK, LUCKILY, CRACK

**V. WORD STUDY .**

TO DISSOLVE – TO BECOME LIQUID
TO DYE - TO COLOUR (STH), ESPECIALLY BY DIPPING IN A LIQUID
CHAMBER - ROOM; ENCLOSED SPACE OR CAVITY IN THE BODY OF ANIMAL, P

PLANT OR IN SOME KINDS OF MACHINERY
TREAT - THING THAT GIVES GREAT PLEASURE
TREATMENT - PROCESS OR MANNER OF TREATING SB OR STH
SCAR - MARK LEFT ON THE SKIN BY A WOUND, SORE, ETC
ATTAIN - SUCCEED IN GETTING (STH); ACHIEVE
PROMPT - DONE WITHOUT DELAY; PUNCTUAL
AWARE - HAVING KNOWLEDGE OR REALIZATION OF SB/STH
WORTH - HAVING A CERTAIN VALUE
DRUG - SUBSTANCE USED AS A MEDICINE OR IN IT

**LOOK, READ, REMEMBER!**

**-OUS**
**NOUN + -LESS = ADJ**
**-FUL**

BEAUTY + -FUL = BEAUTIFUL
DANGER + -OUS = DANGEROUS
AIM + -LESS = AIMLESS

**VI. A) MAKE UP ADJECTIVES FROM THE NOUNS:**

| | | |
|---|---|---|
| PAPER - | EVENT - | ONER - |
| MOTHER - | NERVE - | POWER - |
| SPOT - | NET - | PRECOCITY - |
| REGARD - | ODOUR - | REMORSE - |

**B) FILL IN THE BLANKS WITH SUITABLE WORDS:**

A MAJOR LIMITATION OF THAT APPROACH REMAINS THE *(need/needless)* FOR GOOD OPTICAL AMPLIFIERS. OUTPUT *(power/powerful)* IS LIMITED BY FILAMENTATION DAMAGE. IT IS HOPED TO INCORPORATE SUCH DIS A PLASTIC SUBSTRATE INTO CREDIT CARDS AND *(variety/various)* TYPES OF SMART CARD. THEY WILL PROVIDE ADAPT AND OPTIMISE LIQU TECHNOLOGIES FOR *(use/useful)* IN REFLECTIVE *(colour/colourful),* SUPERTWIST PASSIVE AND ACTIVE MATRIX LCD DEVICES.

**VII. TRANSLATE THE FOLLOWING SENTENCES. DEFINE THE MEAN OF THE WORDS WHICH ARE PUT IN ITALICS (THE NOUNS, THE ADJECTIV THE VERBS).**

1. IF THE TRANSMISSION MEDIUM IS LOGIC, *infinitely* ONE COULD EXPECT THAT THIS ENERGY PROPAGATE OUTWARD FOREVER IF T… ***lossless*** OR ***slowly*** DEGRADE INTO HEAT IF THERE ***losses*** ARE FINITE. 2. IT BEGINS AND ENDS A TRIFLE MORE ***gradually*** SINCE IT IS A ***continuous*** FUNCTION. 3. IT IS USUALLY ***advantageous*** TO SEND THE READINGS FROM A NUMBER… INSTRUMENTS OVER THE SAME FIBER. THE RELATIVE ***advantages*** OF FDM STEM FROM THE FACT THAT EACH INPUT SIGNAL ***available*** IS ALWAYS

GRAMMAR REVIEW

## THE INFINITIVE

| | | | |
|---|---|---|---|
| A C T I V E | INDEFINITE | 1. После модальных глаголов ***can, may***, ***must, should*** и после глаголов ***let, make*** без частицы TO. 2. Действие, выраженное инфинитивом, одновременно с действием глагола сказуемого. | I CAN ***repair*** THIS DEVICE. *(Я могу починить этот прибор)* LET ME ***help*** YOU. *(Позволь я помогу тебе)* IT WAS NECESSARY ***to help*** HIM. *(Было необходимо помочь ему)* I NEED ***to buy*** THAT BOOK. *(Необходимо купить ту книгу* |
| | CONTINUOUS | Выражает действие которое длится в то время, когда происходит действие глагола-сказуемого. | IT WAS PLEASANT ***to be speaking*** WITH YOU AGAIN. *(Было приятно снова с тобой разговаривать)* |
| | PERFECT | Выражает действие, которое предшествует действию, выраженному глаголом-сказуемым, или происходит ранее какой-либо ситуации | I AM GLAD ***to have done*** MY WORK. *(Я рад, что уже сделал свою работу)* |
| | | Показывает, что выраженное им дейст- | I AM GLAD ***to have been listening*** TO YOU. *(Я рад,* |

| | | | |
|---|---|---|---|
| | PERFECT CONTINUOUS | ние началось до действия глагола-сказуемого и все еще продолжается. | *что уже давно (все это время) слушаю тебя)* |
| P A S S I V E | INDEFINITE | Пассивный инфинитив выражает действие, которое испытывает лицо или предмет, обозначенный подлежащим. | I <u>AM</u> (ALWAYS) GLAD ***to be invited*** BY HIM. (*Мне всегда приятно, когда он меня приглашает*) |
| | PERFECT | Выражает действие, которое испытывало лицо или предмет, обозначенный подлежащим, ранее какой-либо ситуации или действия, выраженного глаголом-сказуемым. | I <u>AM</u> GLAD ***to have been invited***. (*Я рад, что меня пригласили*) |

**VIII. REPLACE THE GROUP OF WORDS IN ITALICS BY AN INFINITIVE OR AN INFINITIVE CONSTRUCTION. FOR EXAMPLE,**

IT IS IMPORTANT *that you should write* THIS REPORT.

IT IS IMPORTANT FOR YOU TO WRITE THIS REPORT.

1. IT IS NECESSARY *that the material modifies* THE OPTICAL PROPERTIES IN SIGNIFICANT WAYS. 2. *We heard* THAT THE PROFESSOR HAS READ HIS LE THIS WEEK. 3. SHE WOULD BE DELIGHTED *if you could visit us*. 4. DON'T PROMISE *that you will do it*, IF YOU ARE NOT SURE. 5. THE ENGINEER W VERY PROUD *that he had repaired* THAT DEVICE. 6. THE STUDENT SEEMS *that he is taught a lot*. 7. IS *it* LIKELY *that he will arrive* IN TWO DAYS?

**IX. READ AND TRANSLATE TEXT A 4.2**

## TEXT A 4.2

## LIQUID LASERS. SOME APPLICATIONS OF PULSED-LASERS

"LIQUID LASERS ARE OPTICALY PUMPED LASERS IN WHICH
MEDIUM IS A LIQUID AT ROOM TEMPERATURE. AND THE MOST SU
ALL LIQUID LASERS ARE DYE LASERS. THESE LASERS GENERATE E
LIGHT FROM THE EXCITED ENERGY STATES OF ORGANIC DYES DISSO
SOLVENTS. OUTPUT CAN BE EITHER PULSED OR CW AND SPANS TH
FROM THE NEAR-UV TO THE NEAR-IR, DEPENDING ON THE DYE USED

THE LARGE ORGANIC MOLECULES OF THE DYE ARE EXCITED
ENERGY STATES BY ARC LAMPS, FLASHLAMPS, OR OTHER LAS
FREQUENCY-DOUBLED ND:YAG, COPPER-VAPOUR, ARGON-ION, NIT
EVEN EXCIMER. THE DYE SOLUTION IS USUALLY PUMPED TRA
THROUGH THE LASER CAVITY AND CONTAINED BY A TRANSPARENT
A FLOW CELL.

BROADBAND LASER EMISSION ORIGINATES FROM INTERACTI
THE VIBRATIONAL AND ELECTRONIC STATES OF DYE MOLECULES.
SPLIT THE ELECTRONIC ENERGY LEVELS INTO BROAD ENERGY BAN
AS A PRISM OR DIFFRACTION GRATING CAN BE USED TO TUNE
FREQUENCY.

THE EFFICIENCY, TUNABILITY, AND HIGH COHERENCE OF D
MAKE THEM IDEAL FOR SCIENTIFIC, MEDICAL AND SPECTROSCOPIC
ADDITION, THEIR BROADBAND EMISSION MAKES THEM PARTICU
SUITED FOR GENERATING ULTRASHORT LASER PULSES.

ADVANCES IN PULSED-LASER AND SCANNING TECHNOLOGY
NEW COSMETIC PROCEDURES - IN PARTICULAR, SKIN RESURFACI
REMOVAL - THAT ARE PROPELLING LASER TECHNOLOGY INTO THE
AND TURNING THE DERMATOLOGY AND PLASTIC-SURGERY MA
POTENTIAL GOLD MINE. IN ADDITION, Q-SWITCHED LASER TR
CONGENITAL NEVI AND DYE-LASER TREATMENT OF LEG VEINS, A
WARTS ARE AMONG SEVERAL LASER PROCEDURES AT THE FORE
APPLICATION.

OTHER APPLICATIONS - INCLUDING PHOTODYNAMIC THER
PSORIASIS, BURN-DEPTH DIAGNOSIS AND DEBRIDEMENT, AND HAIR
ARE THE FOCUS OF ONGOING RESEARCH THAT SHOULD RESULT IN
THE NEAR FUTURE.

TOGETHER, THESE PROCEDURES ARE HELPING LASERS ATTAIN A
ACCEPTANCE WITHIN THE MEDICAL COMMUNITY AND EVEN T
PUBLIC. THEY ARE ALSO PROMPTING CLOSER STUDY OF LASER-TISS

AND ITS IMPLICATIONS IN THE CLINICAL SETTING. "PRACTICING DE
AND CLINICIANS HAVE BECOME MORE AWARE OF THE PHYSICAL E
HEATING, THERMAL DAMAGE, AND PARTICLE FRAGMENTATION -
INTERACTIONS BETWEEN PULSED LASERS AND TISSUE," - SAY
ANDERSON, ASSOCIATE PROFESSOR OF DERMATOLOGY FROM HAR
SCHOOL, - " BUT IT IS STILL AMAZING THAT WE USE THESE TOOLS, A
THEY WORK, BUT WE DON'T ALWAYS UNDERSTAND WHY."

QUESTIONS SUCH AS THESE HAVE PROMPTED ADDITIONAL STU
RELATIONSHIP BETWEEN LASERS AND THE PHYSICAL PROPERTIES
INSTANCE, RESEARCHERS AT WELLMAN LABORATORIES ARE ST
INDUCED STRESS WAVES TO DETERMINE THEIR EFFECTS ON C
SUBCELLULAR TISSUE PROPERTIES. OTHER STUDIES ARE LOOKING
RESPONDS TO THERMAL DAMAGE.

IN THE PAST YEARS, NUMEROUS LASER-TISSUE INTERACTI
INVOLVING COLLAGEN HAVE BEEN CONDUCTED. RESEARCHERS U
OPTICAL-PROPERTY CHANGES THAT TAKE PLACE IN COLLAGEN DU
PROVIDE INFORMATION ABOUT TISSUE RESPONSE AND HELP TO
OPTIMAL DOSIMETRIES FOR SPECIFIC APPLICATIONS. OTHER RESEA
THAT LASER ENERGY STIMULATES COLLAGEN REGROWTH DURING
IF RESEARCHERS CAN CONTROL THE DEPTH OF PENETRATION MORE
CAN TAKE ADVANTAGE OF THIS PROCESS.

ADDITIONALLY, BIOPSY STUDIES CONDUCTED BY FITZPAT
COLLEAGUES HAVE SHOWN THAT EVEN IF THE LASER ENERGY G
THERE IS NO PERMANENT DAMAGE FROM THE RESULTING WOUND.

TO LIST ALL THE LASERS AND APPLICATIONS USED IN DERMAT
WOULD FILL SEVERAL PAGES; STILL, A FEW MORE ARE WORTH M
LEVELS OF LASER ENERGY COULD BE AN EFFECTIVE ALTERNATIV
DRUG THERAPIES CURRENTLY USED TO TREAT CHRONIC DIABETIC
FURTHER RESEARCH IS UNDER WAY."[12]

**X. MATCH THE ENGLISH WORDS ON THE LEFT WITH THE
EQUIVALENTS:**

| | |
|---|---|
| 1. PROMPT | 1. решетка |
| 2. INDEX | 2. раствор |
| 3. GRATING | 3. краситель |

4. SOLUTION — 4. знающий
5. DYE — 5. точный
6. AWARE — 6. органический
7. AMAZE — 7. когерентность
8. ORGANIC — 8. коэффициент
9. TREATMENT — 9. проникновение
10. COHERENCE — 10. желать
11. LIQUID — 11. поражать, изумлять
12. PENETRATION — 12. двухчастотный
13. DESIRE — 13. камера
14. FREQUENCY-DOUBLED — 14. жидкость
15. CHAMBER — 15. лечение

**XI. CHOOSE THE BEST EQUIVALENTS OF THE WORDS ON TH THE WORDS ON THE RIGHT. EXAMPLE:** DAMAGE – LOSS.

1. SOLVENT A) STATE, B) ACCESORY, C) DISSOLVING, D) STRAIN
2. SPAN A) CONDITION, B) PERIOD, C) TIME, D) LEVEL
3. EFFECT A) ORDER, B) COMMAND, C) ADVICE, D) RESULT
4. TRANSVERSE A) INTERMEDIATE, B) PARALLEL, C) CROSS, D
5. CELL A) CAMERA, B) CHAMBER, C) ROOM, D) FLAT
6. TUNE A) SUPPORT, B) OFFER, C) AGREE, D) BE ACCORD
7. ADVANCE A) SUCCESS, B) TREATMENT, C) GRATING, D) LIN
8. ATTAIN A) REACH, B) ACHIEVE, C) COLLECT, D) DRAW
9. DAMAGE A) SEND, B) CORRECT, C) CROSS, D) LOSS
10. PROMPT A) FAST, B) EFFICIENT, C) CLEVER, D) EXPIR

**XII. TRANSLATE THE SENTENCES, USING THE FOLLOWING WORDS AND PHRASES:** LIQUID LASERS, OPTICALLY PUMPED LASERS, THE GAIN MED LASERS, THE DYE SOLUTION, BROADBAND LASER EMISSION.

В жидкостных лазерах активной средой служат растворы или неорганические соединения. Широкое распространение получили жидкостные лазеры на растворах органических красителей. Они дают возможность осуществить плавную перестройку частоты излучения в пределах широкой (до 100 нм) полосы люминесценции красителя. Перестройка осуществляется с помощью дисперсионных элементов (призм, дифракционных решеток), расположенных внутри резонатора лазера. Накачка осуществляется лампами-вспышками или другими лазерами. В процессе накачки раствор красителя непрерывно прокачивается через область возбуждения.

**XIII. 1. GIVE THE RUSSIAN EQUIVALENTS OF THE FOLL EXPRESSIONS:**

DYE LASERS; GENERATE BROADBAND LASER LIGHT; SPANS T FROM THE NEAR-UV TO THE NEAR -IR; FREQUENCY-DOUBLED; DY DIFFRACTION GRATING; HIGH COHERENCE; ULTRASHORT LASE RESURFACING AND HAIR REMOVAL; POTENTIAL GOLD MINE; DYE-L OF LEG VEINS; THE FOREFRONT OF CLINICAL APPLICATION; BURN-D AND DEBRIDEMENT; FOCUS OF ONGOING RESEARCH; IN THE CLIN RAPID HEATING; THERMAL DAMAGE; PARTICLE FRAGMENTATION; LASERS; THE COSTLY DRUG THERAPIES; TO TREAT CHRONIC CONDITIONS; UNDER WAY.

EQUIPMENT DESIGN; THE OVERALL SIZE; THE ELECTRONIC H MINIATURIZED DISPLAY AND COMPONENTS; VIRTUAL-REALITY HE HELD PAPERLESS FAX MACHINE; HEAD-UP DISPLAY; A VIDEO-RAT SAFETY RAILING;AN ELECTRONIC TRANSPARENCY; A BUILT-IN FLO

**2. FIND IN THE TEXT THE EQUIVALENTS OF THE FO EXPRESSIONS:**

жидкостные лазеры; наиболее удачные из всех; диапазон спектра от ближней ультрафиолетовой области до ближней инфракрасной; двухчастотный; раствор красителя; дифракционная решетка; высокая когерентность; сверхкороткие лазерные импульсы; технология сканирования; пластическая хирургия; воспаленные шрамы; фотодинамичная терапия; в недалеком будущем; пройти ускоренное дополнительное изучение; воздействие лазеров на физические свойства ткани; заполнило бы несколько страниц.

Размер каждой составляющей; оптический путь; сотни и тысячи микрозеркал; индивидуально направленный; проекционная панель; источник информации; результаты не всегда предсказуемы.

**XIV. LOOK THROUGH THE TEXT AGAIN. READ THE FO STATEMENTS. COMPARE YOUR VERSION AND IF YOU THINK WRONG CORRECT THEM.**

1. OUTPUT CAN BE PULSED AND SPANS THE SPECTRUM FROM THE NEAR-UV TO THE NEAR-IR, DEPENDING ON THE DYE USED.
2. THE DYE SOLUTION IS USUALLY PUMPED TRANSVERSELY THRO CAVITY.
3. DYE MOLECULES CANNOT BE USED TO TUNE TO A DESIRED FREQU
4. ADVANCES IN PULSED-LASER AND SCANNING TECHNOLOGY HAV BRANCHES OF INDUSTRY.
5. Q-SWITCHED LASER TREATMENT OF CONGENITAL NEVI ANI TREATMENT OF LEG VEINS, ACNE SCARS, AND WARTS ARE AM LASER PROCEDURES AT THE FOREFRONT OF CLINICAL APPLICATI
6. OTHER STUDIES AREN'T LOOKING AT HOW TISSUE RESPONDS DAMAGE.
7. IF RESEARCHERS CANNOT CONTROL THE DEPTH OF PENET PRECISELY, THEY CANNOT TAKE ADVANTAGE OF THIS PROCESS.
8. BIOPSY STUDIES HAVEN'T SHOWN THAT EVEN IF THE LASER ENE DEEP.
9. THERE IS SOME PERMANENT DAMAGE FROM THE RESULTING WO
10. LOW LEVELS OF LASER ENERGY COULD BE AN EFFECTIVE AL THE COSTLY DRUG THERAPIES CURRENTLY USED TO TREAT C SKIN CONDITIONS.
11. THE MOST SUCCESSFUL OF ALL LIQUID LASERS ARE DYE LASER
12. OUTPUT CAN BE ONLY CW AND SPANS THE SPECTRUM FROM T TO THE NEAR-IR, DEPENDING ON THE DYE USED.
13. THE DYE SOLUTION IS USUALLY PUMPED TRANSVERSELY T LASER CAVITY AND CONTAINED BY A TRANSPARENT CHAMBER CELL.
14. DYE MOLECULES DON'T SPLIT THE ELECTRONIC ENERGY LEVE ENERGY BANDS OPTICS.
15. THEIR BROADBAND EMISSION CANNOT MAKE THEM PARTICU SUITED FOR GENERATING ULTRASHORT LASER PULSES.
16. ADVANCES IN PULSED-LASER AND SCANNING TECHNOLOGY NEW COSMETIC PROCEDURES.

17. RESEARCHERS HAVE NEVER STUDED LASER-INDUCED STRES
DETERMINE THEIR EFFECTS ON CELLULAR AND SUBCELLULAR TI
18. SOME RESEARCH HAS FOUND THAT LASER ENERGY STIMULA
REGROWTH DURING WOUND HEALING.

**XV. COMPLETE THE FOLLOWING SENTENCES. YOUR ANSWE GIVEN IN THE TEXT.**

1. LIQUID LASERS ARE ...
2. THESE LASERS GENERATE BROADBAND LASER LIGHT FROM ...
3. THE LARGE ORGANIC MOLECULES OF DYE ARE ...
4. BROADBAND LASER EMISSION ORIGINATES FROM ...
5. ADVANCES IN PULSED-LASER AND SCANNING TECHNOLOGY HAV
6. OTHER APPLICATIONS ARE THE FOCUS OF ONGOING RESEARCH TH
7. THEY ARE ALSO PROMPTING CLOSER STUDY OF ...
8. PRACTISING DERMATOLOGISTS AND CLINICIANTS HAVE BECOME
9. TO LIST ALL THE LASERS AND APPLICATIONS USED IN DERMATOL WOULD ....

**XVI. ANSWER THE FOLLOWING QUESTIONS:**

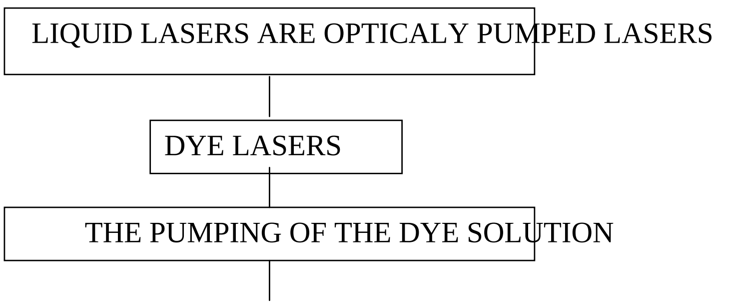
1. WHAT IS LIQUID LASER?
2. HOW DOES IT GENERATE?
3. CAN OUTPUT BE PULSED OR CW?
4. WHAT IS THE DYE SOLUTION? HOW IS IT OBTAINED?
5. WHAT MAKES DYE LASERS IDEAL FOR SCIENTIFIC, MEDI SPECTROSCOPIC RESEARCH?
6. WHERE DO PEOPLE USUALLY USE Q-SWITCHED LASERS?
7. WHERE HAVE ADVANCES IN PULSED-LASER AND SCANNING TECH
8. ARE SEVERAL PROCEDURES HELPING LASERS ATTAIN A NE ACCEPTANCE WITHIN THE MEDICAL COMMUNITY?
9. WHY DOES PROFESSOR R. ROX ANDERSON SAY THAT CLINICIANS AND SCANNING TECHNOLOGY AND THEY WORK BUT CLINICIANS UNDERSTAND WHY?
10. WHAT QUESTIONS HAVE PROMPTED ADDITIONAL STUDIES?
11. IS FURTHER RESEARCH UNDER WAY?

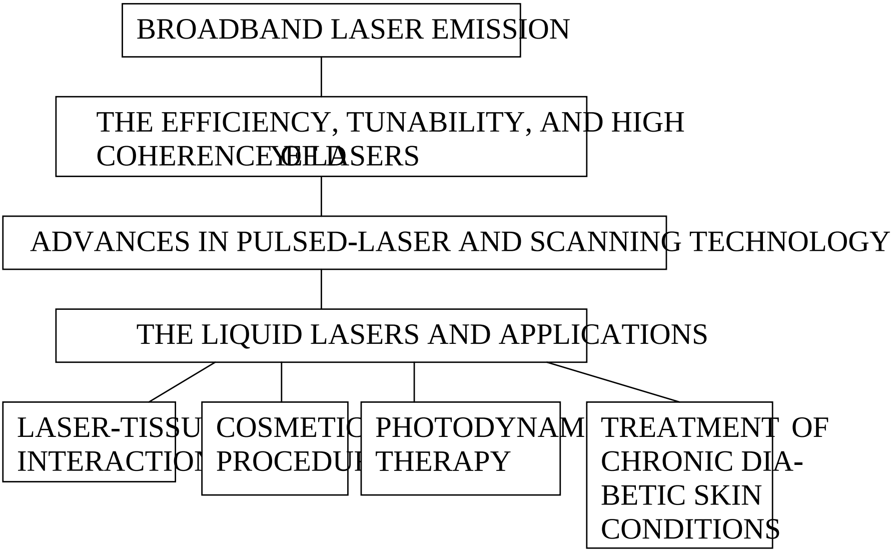
**XVII. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. FOLLOWING PHRASES:**

THAT'S RIGHT...; THAT'S WRONG...; TO MY MIND...; IN MY OPIN AGREE WITH YOU...; I THINK SO...

1. LQUID LASERS ARE OPTICALLY PUMPED LASERS.
2. THEIR GAIN MEDIUM IS A LIQUID AT ROOM TEMPERATURE.
3. NUMEROUS LASER-TISSUE INTERACTION STUDIES INVOLVING CO NOT BEEN CONDUCTED.
4. RESEARCHERS UNDERSTAND THE OPTICAL-PROPERTY CHANG PLACE IN COLLAGEN DURING LASING CANNOT PROVIDE INFORI TISSUE RESPONSE AND HELP TO DETERMINE OPTIMAL DOSIMETRIE APPLICATIONS.
5. AND THE MOST SUCCESSFUL OF ALL LIQUID LASERS ARE DYE LAS
6. OUTPUT CANNOT BE EITHER PULSED OR CW AND SPANS THE SPEC THE NEAR-UV TO THE NEAR-IR.
7. THE DYE SOLUTION IS USUALLY PUMPED TRANSVERSELY THRO CAVITY AND CONTAINED BY A TRANSPARENT CHAMBER CALLED A
8. LOW LEVELS OF LASER ENERGY COULD BE AN EFFECTIVE ALTE COSTLY DRUG THERAPIES CURRENTLY USED TO TREAT CHRONI CONDITIONS.
9. BROADBAND LASER EMISSION ORIGINATES FROM INTERACTIONS VIBRATIONAL AND ELECTRONIC STATES OF DYE MOLECULES.
10. ADVANCES IN PULSED-LASER AND SCANNING TECHNOLOGY HAV COSMETIC PROCEDURES.

**XVIII. RETELL TEXT A4.2 ACCORDING TO THE SCHEME:**






**XIX. CHOOSE A PARTNER AND TALK ABOUT APPLICATION O LASERS.**

**XX. WRITE A SUMMARY OF THE TEXT IN NO MORE TH SENTENCES.**

## PART 2

**I. READ TEXT B4.2. SAY WHYTHE LCD PROJECTOR IS A SELF-CONTAINED PROJECTION SYSTEM.**

### TEXT B4.2

### DISPLAY TECHNOLOGY. SELECTION BY SIZE

“REAL ESTATE IS ONE OF THE MOST IMPORTANT CONCERNS IN DESIGN. MINIMIZING SPACE REQUIREMENTS CAN DRIVE MANY DEC THIS EFFORT, THE ENGINEER MUST BE AWARE OF NOT ONLY THE C THE EQUIPMENT BUT ALSO THE SIZES OF EACH OF THE COMPONE

SIZING IS UNDER THE SAME CONSTRAINTS, BUT DESIGN SOLUTIONS
SPACE HAVE TAKEN A VARIETY OF APPROACHES.

THE DRIVE TO SMALLNESS IS LIMITED BY THE ABILITY OF THE
TO RESOLVE THE IMAGES. THE DISPLAY CANNOT BE MADE TOO S
INFORMATION BECOMES UNREADABLE. THE RESULT HAS BEEN THA
THE DISPLAY SIZE REMAINS CONSTANT. IT TAKES UP PROPORTION
THE EQUIPMENT SPACE THAN THE ELECTRONIC HARDWARE ASSOC
DISPLAY, AND THE REST OF THE COMPONENTS SHRINK. THE DISP
DOMINATES THE DEVICE.

AN ALTERNATIVE SOLUTION ADDRESSES THE PROBLEM OF
INABILITY TO RESOLVE A SMALL IMAGE, WHICH HAS LIMITED THE
OF TRULY PORTABLE ELECTRONICS PRODUCTS. WITH THESE SO
PRODUCTS CONTAIN A MINIATURIZED DISPLAY AND CO
SUBSEQUENTLY IN THE OPTICAL TRAIN, THE IMAGE IS MAGNIFIED
SO THAT IT CAN BE SEEN. SEVERAL COMPANIES USING THESE TECH
SHOWN PRODUCTS FOR GAMING (VIRTUAL-REALITY HEADSETS), B
HELD PAPERLESS FAX MACHINE) AND MILITARY SIMULATION (HEA
APPLICATIONS.

ONE OF THE PRODUCTS FREQUENTLY DISCUSSED UTILIZED D
PROCESSING TECHNOLOGY. THIS IS PROJECTION ARRANGEMENT
HUNDREDS OF THOUSANDS OF MICROMIRRORS, CREATED ON A MIC
MIRROR IS INDIVIDUALLY ADDRESSABLE, CREATING A VIVID, BE
IMAGE ON SCREEN, CAPABLE OF SUPPORTING VIDEO-RATE TRANSFE

IF THE DESIGNER WILL NOT BE USING MINIATURIZATION TECH
THE DISPLAY MUST BE LARGE ENOUGH FOR THE IMAGE TO BE
DISTANCE AT WHICH IT WILL BE OBSERVED. THIS DISPLAY CAN BE
FOR ONLY ONE OBSERVER, FOR EXAMPLE, EXAMINING WATCH FA
IF THERE IS AN AUDIENCE OF 20 TRYING TO SEE COMPUTER OR A
MUST READ A GAUGE FROM BEHIND A SAFETY RAILING, THEN T
IMAGE MUST BE SCALED TO A SIZE THAT CAN BE SEEN. A PROJECTIO
ONE SOLUTION THAT WORKS FOR A GROUP SITUATION.

PROJECTION DISPLAYS COME IN SEVERAL VARIETIES. THE
PANEL CAN BE THOUGHT OF AS AN ELECTRONIC TRANSPARENCY
FRAMED LCD PANEL THAT IS PLACED ONTO AN OVERHEAD PRO
INFORMATION SOURCE IS A SLIDE SHOW FROM AN ATTACHED CO
BUILT-IN FLOPPY DISK DRIVER. THE OVERHEAD PROJECTOR PR

ILLUMINATION SOURCE AND MAGNIFYING OPTICS. THE RESULTS A
PREDICTABLE BECAUSE THE QUALITY OF THE IMAGE IS DEPENDE
OVERHEAD PROJECTOR.

THE LCD PROJECTOR IS A SELF-CONTAINED PROJECTION SYSTE
TO THE OLD-FASHIONED SLIDE PROJECTOR. THE "SLIDES" ARE TI
DATA VIDEO IMAGE THAT CAN BE UP TO 200 INCHES ON THE DIAG
OUTPUT IS OF A PREDICTABLY HIGH QUALITY. SO THE SYSTEM
ESPECIALLY WHEN COMPARED TO PROJECTION CRT MONITORS
SOURCE PROJECTORS, ALTHOUGH SOMEWHAT BULKY AND HEAVY."

**II. LOOK THROUGH TEXT B4.2 AND ANSWER THE FOL QUESTIONS:**

1. CAN MINIMIZING SPACE REQUIREMENTS DRIVE MANY DECISIONS?
2. WHAT IS LIMITED BY THE ABILITY OF THE HUMAN EYE TO R IMAGES?
3. THE DISPLAY VISUALLY DOMINATES THE DEVICE, DOESN'T IT?
4. WHAT HAS LIMITED THE DEVELOPMENT OF TRULY PORTABLE PRODUCTS?
5. HAVE SEVERAL COMPANIES USING THESE TECHNIQUES SHOWN P GAMING, BUSINESS AND MILITARY SIMULATION APPLICATIONS?
6. WHAT PROJECTION ARRANGEMENT USES HUNDREDS OF THOUSA MICROMIRRORS?
7. CAN DISPLAY BE TINY IF IT IS FOR ONLY ONE OBSERVER? GIVE TI EXAMPLE.
8. IS THE LCD PROJECTOR A SELF-CONTAINED PROJECTION SYSTEM THE OLD-FASHIONED SLIDE PROJECTOR?
9. THE "SLIDES" AREN'T THE ELECTRONIC DATA VIDEO IMAGE, ARE THEY?
10. THE "SLIDES" CANNOT BE UP TO 200 INCHES ON THE DIAGONAL, CAN THEY?

**III. COMPLETE THE FOLLOWING SENTENCES USING THE TEX**

1. THE RESULT HAS BEEN THAT ...
2. SUBSEQUENTLY IN THE OPTICAL TRAIN, THE IMAGE IS ...
3. IT TAKES UP PROPORTIONATELY MORE OF THE EQUIPMENT SPACE THAN...
4. ONE OF THE PRODUCTS FREQUENTLY DISCUSSED...
5. THIS IS PROJECTION ARRANGEMENT THAT ...
6. IF THE DESINER WILL NOT BE USING MINIATURIZATION TECHNIQUES, THEN...

7. THIS DISPLAY CAN BE TINY IF ...
8. A PROJECTION DISPLAY IS ONE SOLUTION THAT
9. THE INFORMATION SOURCE IS ...
10. SO THE SYSTEM IS PORTABLE, ESPECIALLY WHEN ...

**IV. AGREE OR DISAGREE WITH THE IDEAS GIVEN BELOW. THE FOLLOWING PHRASES:**

YOU SEE ...; AS FOR ME...; IN MY OPINION...; I CAN SAY THA THINK SO...

1. REAL ESTATE IS ONE OF THE MOST IMPORTANT CONCERNS IN DESIGN.
2. DISPLAY SIZING ISN'T UNDER THE SAME CONSTRAINTS.
3. THE DISPLAY CAN BE MADE TOO SMALL OR THE INFORMATIO UNREADABLE.
4. AN ALTERNATIVE SOLUTION ADDRESSES THE PROBLEM OF THE U TO RESOLVE A SMALL IMAGE, WHICH HAS NEVER LIMITED THE DE TRULY PORTABLE ELECTRONICS PRODUCTS.
5. EACH MIRROR IS INDIVIDUALLY ADDRESSABLE, CREATING A VI COLOUR IMAGE ON SCREEN, CAPABLE OF SUPPORTING VIDEO-RATE
6. IF THERE IS AN AUDIENCE OF 20 TRYING TO SEE COMPUTER, AN MUSTN'T READ A GAUGE FROM BEHIND A SAFETY RAILING.
7. THE PROJECTION PANEL CAN BE THOUGHT OF AS AN E TRANSPARENCY IN THAT IT IS A FRAMED LCD PANEL THAT IS PLA OVERHEAD PROJECTOR.
8. THE INFORMATION SOURCE IS A SLIDE SHOW FROM AN ATTACH OR A BUILT-IN FLOPPY DISK DRIVER.
9. THE "SLIDES" ARE THE ELECTRONIC DATA VIDEO IMAGE THAT C TO 200 INCHES ON THE DIAGONAL.

**V. FIND THE SENTENCE WHICH EXPRESSES THE MAIN IDEA PARAGRAPH OF TEXT B4.2. ENTITLE EACH PARAGRAPH.**

**VI. MAKE UP AND WRITE THE SCHEME OF TEXT B4.2 USING TITLES OF EACH PARAGRAPH.**

**VII. MAKE UP YOUR QUESTIONS TO TEXT B4.2. ASK YOUR F THESE QUESTIONS.**

**VIII. USING THE MATERIAL OF THE TEXT ABOVE, WRITE T POINTS ACCORDING TO THE QUESTIONS (VII). USE THE FO CONVERSATION PHRASES:** I THINK IT IS RIGHT BECAUSE ...; I THINK IT IMPORTANT ...; IT IS INTERESTING TO KNOW ...

**IX. SAY WHAT INFORMATION ABOUT DISPLAY TECHNOLOGY KNOWN AND WHICH IS NEW.**

**X. WRITE A SUMMARY OF THE TEXT.**

**XI. MAKE UP A TOPIC ON THE THEME "THE LCD PROJECTORS".**

**XII. WRITE THE FOLLOWING WORDS IN ALPHABETICAL ORDER:**

**A)** X-RAYS; EMIT; RESONATOR; YIELD; FREQUENCY; CIRCUIT; BAND; PARALLEL; AXIS; SCANNING; VARIABLE; MASK; A NEMATIC.

**B)** PATTERN; PRISM; POWER; PANEL; PAIR; PUMP; PULSING; PROB PHOTON; PROFILE.

**XIII. FIND WHAT WORDS FORM THE FOLLOWING COMPOUND WOR**

PHOTODYNAMIC; PHOTOSENSITIVE; FLASHLAMP; MULTICHANN BROADBAAND; WAVELENGTH; GASDYNAMIC; VIEWFINDER; W LIGHTWEIGHT.

**XIV. USE A DICTIONARY TO FIND SYNONYMOUS WORDS WITH THE FOLLOWING WORDS:**

KNOB; MUTABLE; SLOPE; FIBROUS; MOLD; ORTHOGONAL; FIN COMPLICATED; DESTROY.

**XV. CHOOSE ENGLISH WORDS WHICH HAVE THE SAME MEANING IN RUSSIAN LANGUAGE:**

KIT; LABORATORY; MATERIAL; PROCESSING; LACK; LOGIC; MOLE ZIGSAG.

**XVI. USE A DICTIONARY AND FIND ANTONYMS OF THE FOLLOWING WORDS AND EXPRESSIONS:**

SINGLE; SHADOW; QUENCH; DEAD; ZERO-LOSS; REPAIR; THE SAME HUGE; WEAKNESS.

**XVII. USE A DICTIONARY AND FIND RUSSIAN EQUIVALENTS O FOLLOWING WORDS:**
LOW-ENERGY-LASER TISSUE EFFECTS; SUPERFICIAL SKIN; DIODE-PU TECHNOLOGY; A RENAISSANCE OF SORTS; TO DETERMINE LIG DOSIMETRIES; A STANDARD TREATMENT MODALITY FOR PSORIASIS

**XVIII. FINDINTEXTC4.2ENGLISHEQUIVALENTSOFTHEFOLLOWINGWORI**
С технологической стороны; клиническое использование; дерматология; привлекать внимание; фоточувствительные лекарства; лазеры на красителях; существенное улучшение.

**XIX. READ TEXT C 4.2. SAY ABOUT LASER SYSTEM FOR CLINI**

**TEXT C 4.2**

**OTHER LASERS AND APPLICATIONS**

"ON THE APPLICATION SIDE, BIOSTIMULATION MAY GET A BO STUDIES ATTEMPTING TO QUANTIFY LOW-ENERGY-LASER TISSUI EXAMPLE, EXPERIMENTS AT ROCHESTER GENERAL HOSPITAL LAS HAVE SHOWN THAT SUPERFICIAL SKIN WOUNDS IN DIABETIC MICI QUICKLY FOLLOWING EXPOSURE TO LOW FLUENCES (5J/CM$^2$) OF ARGON-LASER-PUMPED DYE-LASER ENERGY THAN WOUNDS LEFT TO THEMSELVES.

ON THE TECHNOLOGY SIDE, LIHTAN TECHNOLOGIES (SAN A CA) RECENTLY INTRODUCED THE FIRST DIODE-PUMPED SOLID- SYSTEM FOR CLINICAL USE , DISPELLING THE NOTION THAT DIOI PROHIBIT THE DEVELOPMENT OF EFFECTIVE DIODE-PUMPED TECI DERMATOLOGY. THE ERBIUM LASER IS ALSO ATTRACTING ATTEN BECAUSE OF ITS POTENTIAL TO BE A LOWERCOST ALTERNATIVE T $_2$ LASER FOR SKIN RESURFACING.

EVEN THE DYE LASER IS EXPERIENCING A RENAISSANCE OF S LASER IS NO LONGER JUST FOR TREATING PORT-WINE STAINS. A THINGS, IT IS BEING USED ON TELANGIECTASIA, WARTS STRETCH AND PSORIASIS. IN PHOTODYNAMIC THERAPY (PDT) ARE STUDII BECKMAN INSTITUTE, FOR EXAMPLE, RESEARCHERS TEAMED AN

LASER-PUMPED DYE LASER WITH A SECOND-GENERATION PDT D
DETERMINE LIGHT-AND-DRUG DOSIMETRIES AND IDENTIFY THE M
PHOTOSENSITIVE DRUG FOR TREATING PSORIASIS. FINDING A DE
PENETRATE THE THICKLAYERS OF "FISH SCALES" SYMPTOMATIC OF
BEEN THE PRIMARY OBSTACLE TO CLINICAL IMPLEMENTATION OF T
ONCE THIS PROBLEM IS SOLVED, PDT IS EXPECTED TO BECOME A
TREATMENT MODALITY FOR PSORIASIS.

DYE LASERS ARE ALSO PROVING USEFUL IN CLEARING ACNE
RECENT STUDY AT THE WASHINGTON INSTITUTE OF DERMATO
SURGERY (WASHINGTON, DC), SIGNIFICANT IMPROVEMENT IN TE
APPEARANCE WAS OBSERVED AFTER ONLY ONE OR TWO TREAT
FLASHLAMP-PUMPED DYE LASER. AT SIX MONTHS, THE EFFECTS
EVIDENT, SUGGESTING THEY MAY BE PERMANENT." [3]

**XX. RETELL TEXT C4.2USING THE FOLLOWING PHRASES:**

IT IS WELL-KNOWN THAT...; I'D LIKE TO SAY...; MAY BE CAL
WOULD ADVISE TO CALL YOUR ATTENTION TO ...; IT IS INTEREST
SHOULD SAY THAT ...

# РАЗДЕЛ III:

## ДОПОЛНИТЕЛЬНЫЙ МАТЕРИАЛ ДЛЯ ПЕРЕВОДА, РЕФЕРИРОВАНИЯ И АННОТИРОВАНИЯ

## UNIT 1.3

### PART 1

**READ THE TEXT.**

### TEXT A1.3

### HISTORY OF OPTOELECTRONICS

“MANY SEMICONDUCTOR MATERIALS OTHER THAN SIL GERMANIUM EXIST, AND THEY HAVE DIFFERENT USEFUL I COMPOUNDS FORMED BY THE ELEMENTS FROM COLUMN III OF TH TABLE – SUCH AS ALUMINUM, GALLIUM, AND INDIUM – WITH THOSE FRO COLUMN V – SUCH AS PHOSPHORUS, ARSENIC, AND ANTIMONY – ARE O PARTICULAR INTEREST. THESE SO-CALLED III-V COMPOUNDS ARE USED TO M SEMICONDUCTOR DEVICES THAT EMIT LIGHT EFFICIENTLY OR THAT OP EXCEPTIONALLY HIGH FREQUENCIES.

A REMARKABLE CHARACTERISTIC OF THESE COMPOUNDS IS THAT TH IN EFFECT, BE MIXED TOGETHER. ONE CAN PRODUCE GALLIUM ARSENIDE SUBSTITUTE ALUMINUM FOR SOME OF THE GALLIUM, OR ALSO SUBSTI PHOSPHORUS FOR SOME OF THE ARSENIC. WHEN THIS IS DONE, THE ELE AND OPTICAL PROPERTIES OF THE MATERIAL ARE SUBTLY CHANGED CONTINUOUS FASHION TO THE AMOUNT OF ALUMINUM OR PHOSPHORUS ALL THESE COMPOUNDS HAVE THE SAME CRYSTAL STRUCTURE. THIS M POSSIBLE THE GRADATION OF COMPOSITION, AND THUS THE PROPERTIES SEMICONDUCTOR MATERIAL WITHIN ONE CONTINUOUS CRYSTALLINE B MODERN MATERIAL-PROCESSING TECHNIQUES ALLOW THESE COMPOSIT CHANGES TO BE CONTROLLED ACCURATELY ON AN ATOMIC SCALE.

THESE CHARACTERISTICS ARE EXPLOITED IN MAKING SEMICONDUC LASERS THAT PRODUCE LIGHT OF ANY GIVEN WAVELENGTH WITH

CONSIDERABLE RANGE. SUCH LASERS ARE USED, FOR EXAMPLE, DIGITAL AUDIO DISC PLAYERS AND AS LIGHT SOURCES FOR COMMUNICATION. A NEW DIRECTION IN ELECTRONICS EMPLOY (PACKETS OF LIGHT) INSTEAD OF ELECTRONS. BY COMMON CONSE APPROACHES ARE INCLUDED IN ELECTRONICS, BECAUSE THE FUNC PERFORMED ARE, AT LEAST FOR THE PRESENT, THE SAME AS THOSE ELECTRONIC SYSTEMS AND BECAUSE THESE FUNCTIONS USUALLY IN A LARGELY ELECTRONIC ENVIRONMENT. THIS NEW DIRECTIO OPTICAL ELECTRONICS, OR OPTOELECTRONICS.

IN 1966 IT WAS PROPOSED ON THEORETICAL GROUNDS THAT C COULD BE MADE WITH SUCH HIGH PURITY THAT LIGHT COULD T THEM FOR GREAT DISTANCES. SUCH FIBERS WERE PRODUCED DUR 1970S. THEY CONTAIN A CENTRAL CORE IN WHICH THE LIGHT TRAVE CLADDING IS MADE OF GLASS OF A DIFFERENT CHEMICAL FORMUL A LOWER OPTICAL INDEX OF REFRACTION. THIS DIFFERENCE IN RE INDICATES THAT LIGHT TRAVELS FASTER IN THE CLADDING THAN THUS, IF THE LIGHT BEAM BEGINS TO MOVE FROM THE CORE INTO T ITS PATH IS BENT SO AS TO MOVE IT BACK INTO THE CORE.

DURING THE LATE 1970S, FIBERS WERE MADE WITH SMALL DIAMETERS IN WHICH THE LIGHT WAS CONSTRAINED TO FOLLOW THIS OCCURS IF THE CORE HAS A DIAMETER ABOUT THE SA WAVELENGTH OF THE LIGHT TRAVELLING IN IT – ABOUT 1 TO 2 MICROMETERS (0.001 TO 0.002 MILLIMETER, OR 0.000039 TO 0.000078 INCH). THESE SINGLE-MODE FIBERS AVOID THE DIFFICULTY DESCRIBED ABOVE. BY 1993 OPTICAL FIBERS CAPABLE OF CARRYING LIGHT SIGNALS MORE THAN 215 KILOMETERS (135 MILES) BECAME AVAILABLE. SPECIALIZED FIBERS THAT INCORPORATE INTEGRAL AMPLIFYING FEATURES SHOW PROMISE OF BEING ABLE TO CARRY LIGHT SIGNALS OVER TRANSOCEANIC DISTANCES WITHOUT THE NEED FO CONVENTIONAL PULSE REGENERATION MEASURES. OPTICAL FIBERS HAVE SEVERAL ADVANTAGES OVER THE COPPER WIRES OR COAXIAL CABLES SO WIDELY USED IN THE PAST. THEY CAN CARRY INFORMATION AT A MUCH HIGHER RATE, THEY OCCUPY LESS SPACE (AN IMPORTANT FEATURE IN LARGE CITIES AND IN BUILDINGS), AND THEY ARE QUITE INSENSITIVE TO ELECTRICAL NOISE. MOREOVER, IT IS VIRTUALLY IMPOSSIBLE TO MAKE UNAUTHORIZED CONNECTIONS TO THE COSTS, INITIALLY HIGH, HAD DROPPED BY 1985 TO THE POINT WHERE MOST

NEW INSTALLATIONS OF TELEPHONE CIRCUITS BETWEEN CENTI
OFFICES AND LONGER DISTANCES CONSISTED OF OPTICAL FIBERS.

MOST CURRENT INSTALLATIONS USE A SINGLE LIGHT SIGNAL ONE DIRECTION WITHIN AN OPTICAL FIBER. THE LIGHT IS PROVIDE STATE LASER AND DETECTED AT THE RECEIVING END BY A SEMICO THERE IS NO REASON THAT MORE THAN ONE LIGHT SIGNAL CANNO ONE TIME IN A FIBER; MANY SUCH SIGNALS HAVE BEEN SENT DOV FIBER IN LABORATORY TESTS. EACH SIGNAL IS OF A SLIGHT WAVELENGTH AND CAN BE SEPARATED FROM THE OTHERS AT THE SIGNALS ALSO HAVE BEEN SENT IN BOTH DIRECTIONS SIMULT LABORATORY. NEW TERMINAL EQUIPMENT CAN BE RETROFITTED NOW IN SERVICE TO CARRY MUCH MORE INFORMATION THAN ORIGINALLY INTENDED TO DO, AND THIS IS IN FACT BEGINNING TO

A SECOND PHASE OF OPTOELECTRONICS WAS BEING DEVELO THE LATE 1980S, BUT THE IMPROVED SYSTEM WAS NOT EXPECTE SERVICE FOR SEVERAL YEARS. GIVEN THE FACT THAT COMMUNIC ARRIVE AT A CENTRAL SWITCHING OFFICE IN OPTICAL FORM, IT I CONSIDER SWITCHING THEM FROM ONE ROUTE TO ANOTHER BY C RATHER THAN ELECTRICALLY, AS IS DONE TODAY. THE DISTA CENTRAL OFFICES IN MOST CASES ARE SUBSTANTIALLY LESS TH LIGHT CAN TRAVEL WITHIN A FIBER. OPTICAL SWITCHING W UNNECESSARY THE DETECTION AND REGENERATION OF THE LIGH THAT ARE CURRENTLY REQUIRED. THE PRINCIPLES OF AN OPTICA SWITCH ARE ALREADY UNDERSTOOD, THOUGH MUCH RESEARCH IS PROVIDE THE NEW OPTICAL COMPONENTS AND NEW MANU TECHNOLOGY REQUIRED TO PRODUCE SUCH A SWITCH.

A THIRD DIRECTION IN OPTOELECTRONICS IS TO BUILD FASTE AND FASTER INTEGRATED CIRCUITS. A KEY PROBLEM IN DEVEL COMPUTERS AND FASTER INTEGRATED CIRCUITS TO USE IN THEM I TIME REQUIRED FOR ELECTRICAL SIGNALS TO TRAVEL INTERCONNECTIONS. THIS IS A DIFFICULTY BOTH FOR THE INTEG THEMSELVES AS WELL AS FOR THE CONNECTIONS BETWEEN THE BEST CIRCUMSTANCES, ELECTRICAL SIGNALS CAN TRAVEL IN A W PERCENT OF THE SPEED OF LIGHT. A MORE USUAL RATE IS 50 PER TRAVELS ABOUT 30 CENTIMETERS IN A BILLIONTH OF A SECO SUPERCOMPUTERS OPERATE AT SPEEDS OF MORE THAN 1 BILLION C

SECOND. THUS, IF TWO SIGNALS THAT START SIMULTANEOUSLY F
SITES ARE TO ARRIVE AT THEIR DESTINATION SIMULTANEOUSLY,
TRAVEL MUST NOT DIFFER IN LENGTH BY MORE THAN A FEW CENTI

ULTIMATELY, AS COMPUTERS OPERATE EVEN FASTER, A RA
TECHNIQUE MUST BE USED. OPTICAL COMMUNICATION BETWEEN
CIRCUITS IS ONE POSSIBLE ANSWER. LIGHT BEAMS DO NOT TAKE
INTERFERE WITH COOLING AIR. IF THE COMMUNICATION IS OPTIC
COMPUTATION MIGHT BE DONE OPTICALLY AS WELL. OPTICAL COM
REQUIRE A RADICALLY DIFFERENT FROM OF INTEGRATED CIRCUIT
CIRCUITS CAN IN PRINCIPLE BE MADE OF GALLIUM ARSENIDE AND
COMPOUNDS. THESE PROBLEMS ARE CURRENTLY UNDER SERIOU
RESEARCH LABORATORIES." [1]

## ? *Comprehension Check*

**1. MAKE THE RIGHT CHOICE:**

1) SEMICONDUCTOR MATERIALS ARE A) OXYGEN
B) SILICON AND GERMANIUM
C) COPPER

2) ALL THESE COMPOUNDS HAVE A) THE SAME CRYSTAL STRUCTU
B) VARIOUS CRYSTAL STRUCTURES
C) SINGLE CRYSTAL STRUCTURE

3) THE OUTER CLADDING HAS A) A LOWER OPTICAL INDEX OF
B) A HIGHER OPTICAL INDEX OF REFRACT
C) A LOWER OPTICAL INDEX OF REFRACT

4) ELECTRICAL SIGNALS CAN TRAVEL IN A WIRE A) AT ABOUT 90 % OF THE S
B) AT ABOUT 40 % OF THE SPEED OF LI
C) AT ABOUT 60 % OF THE SPEED OF LIGH

5) THESE CHARACTERISTICS ARE A) IN MAKING GAS LASERS EX
B) IN MAKING SOLID STATE LASERS
C) IN MAKING SEMICONDUCTOR LASERS

**2. READ THE FOLLOWING STATEMENTS AND AGREE OR DISAGR DON'T KNOW».**

1) COMPOUNDS FORMED BY THE ELEMENTS FROM COLUMN III PERIODIC TABLE ARE OF PARTICULAR INTEREST.

2) A REMARKABLE CHARACTERISTIC OF THESE COMPOUNDS IS THA
BE MIXED TOGETHER.
3) ALL THESE COMPOUNDS HAVE THE SAME CRYSTAL STRUCTURE.
4) THE DISTANCES BETWEEN CENTRAL OFFICES IN MOST C
SUBSTANTIALLY LESS THAN THE DISTANCE LIGHT CAN TRAVEL W
5) LIGHT BEAMS TAKE UP SPACE OR INTERFERE WITH COOLING AIR.

**3. ANSWER THE FOLLOWING QUESTIONS:**

1) WHAT ALLOWS TO CONTROL THE COMPOSITIONAL CHANGES ACCURATELY ON AN ATOMIC SCALE?
2) WHAT DIFFERENCE IN REFRACTIVE INDEX INDICATES THAT LIGH
IN THE CLADDING THAN IT DOES IN CORE?
3) CAN THE LIGHT BE PROVIDED BY A SOLID-STATE LASER AND DET
RECEIVING END BY A SEMICONDUCTOR DIODE?
4) WHY ARE THE SO-CALLED III-V COMPOUNDS USED TO
SEMICONDUCTOR
DEVICES?
5) WHERE ARE SEMICONDUCTOR LASERS USED?

4. **WRITE TEXT ANNOTATIONS (ABOUT 250 WORDS).**

## 🕮 *Working with Vocabulary and Grammar*

**4. PUT THE WORDS BELOW IN THE RIGHT COLUMN ACCORDI
PARTS OF SPEECH:**
DIFFERENT, EFFICIENTLY, DIRECTION, CENTRAL, COMPUTATION,
COMMUNICATION, RADICALLY, DESTINATION, ELECTRICAL, SEVERA

| NOUN | ADJECTIVE | ADVERB |
|---|---|---|
| | | |

**5. TRANSLATE THE SENTENCES PAYING SPECIAL ATTENTION TO THE WORDS IN ITALICS.**
1) *Each* WAVE DISPLAYS *the same* RELATIONSHIPS OF WAVELENGT
FREQUENCY, PERIOD, VELOCITY OF PROPAGATION, AMPLITUDE,
*Each* WAVE IS SUBJECT TO *the same* CONDITION OF REFLECTION AN
REFRACTION.

2) ALL THESE COMPOUNDS HAVE *the same* CRYSTAL STRUCTURE.
3) THEY CAN CARRY INFORMATION *at a much higher rate.*
4) A NEW DIRECTION IN ELECTRONICS EMPLOYS PHOTONS (PACKETS
*instead of* ELECTRONS.
5) IF THE COMMUNICATION IS OPTICAL, THEN THE COMPUTATION
DONE OPTICALLY *as well.*

**6. OPEN THE BRACKETS TO MAKE THE SENTENCES COMPLETE.**

1) IT *(make)* POSSIBLE THE GRADATION OF COMPOSITION.
2) THEY *(contain)* A CENTRAL CORE IN WHICH THE LIGHT *(travel)*.
3) IT *(be)* ATTRACTIVE TO CONSIDER SWITCHING THEM FROM ONE
ANOTHER BY OPTICAL MEANS RATHER THAN ELECTRICALLY.
4) LIGHT *(travel)* ABOUT 30 CENTIMETERS IN A BILLIONTH OF A SECO
5) LIGHT BEAMS *(not, take up)* SPACE OR INTERFERE WITH COOLING AIR

**7. MATCH A STATEMENT WITH A SUITABLE ENDING AND TRANSL**

| | |
|---|---|
| 1) MANY SEMICONDUCTOR MATERIALS OTHER THAN SILICON AND GERMANIUM EXIST, | ITS PATH IS BENT SO AS T BACK INTO THE CORE. |
| 2) THIS MAKES POSSIBLE THE GRADATION OF COMPOSITION, | AND CAN BE SEPARATED OTHERS AT THE RECEIVING E |
| 3) IF THE LIGHT BEAM BEGINS TO MOVE NOT FROM THE CORE INTO THE CLADDING, | THE PATHS THEY TR DIFFER IN LENGTH BY M FEW CENTIMETERS. |
| 4) EACH SIGNAL IS OF A SLIGHTLY DIFFERENT WAVELENGTH | AND THEY HAVE DIFFER PROPERTIES. |
| 5) THUS, IF TWO SIGNALS THAT START SIMULTANEOUSLY FROM DIFFERENT SITES ARE TO ARRIVE AT THEIR DESTI- BODY, | AND THUS THE PROPERT SEMICONDUCTOR MATE ONE CONTINUOUS CRY NATION SIMULTANEOUSLY, |

## ***Discussing the text***

**8. DISCUSS THE FOLLOWING:**

1) SEMICONDUCTOR LASERS ARE USED IN COMPACT DIGITAL AUD

PLAYERS AND AS LIGHT SOURCES FOR OPTICAL FIBER COMMUN

2) A NEW DIRECTION IN ELECTRONICS EMPLOYS PHOTONS (PACKE INSTEAD OF ELECTRONS;
3) NEW TERMINAL EQUIPMENT CAN BE RETROFITTED TO ALLOW E SERVICE TO CARRY MUCH MORE INFORMATION THAN T ORIGINALLY INTENDED TO DO;
4) THIS NEW DIRECTION IS CALLED OPTICAL ELECTRONICS, OR OI NICS;
5) OPTICAL SWITCHING WOULD MAKE UNNECESSARY THE DETECT REGENERATION OF THE LIGHT SIGNALS.

**9. PROVE THE FOLLOWING CHOOSING THE FACTS FROM THE T**

1) ALL SEMICONDUCTOR COMPOUNDS HAVE THE SAME CRYSTAL ST
2) THERE IS NO REASON THAT MORE THAN ONE LIGHT SIGNAL CAN AT ONE TIME IN A FIBER;
3) MUCH RESEARCH IS STILL NEEDED TO PROVIDE THE NEV COMPONENTS AND NEW MANUFACTURING TECHNOLOGY;
4) COMMUNICATION SIGNALS ARRIVE AT A CENTRAL SWITCHING OI FORM;
5) A RADICALLY NEW TECHNIQUE MUST BE USED.

**10. GIVE SOME MORE INFORMATION TO THE FOLLOWING:**

1) SEMICONDUCTOR MATERIALS OTHER THAN SILICON AND GERMA
2) A REMARKABLE CHARACTERISTIC OF THESE COMPOUNDS;
3) A NEW DIRECTION WHICH IS CALLED OPTOELECTRONICS;
4) A KEY PROBLEM IN DEVELOPING FASTER COMPUTERS AND FAST CIRCUITS TO USE IN THEM;
5) MODERN SUPERCOMPUTERS.

## PART 2

**READ THE TEXT.**

## TEXT B1.3

# LIQUID-CRYSTAL DISPLAYS

"LIQUID CRYSTALS WERE DISCOVERED IN 1889 WHEN THE A BOTANIST FRIEDRICH REINITZER OBSERVED A CURIOUS, CLOU BEHAVIOUR IN CERTAIN PURE ORGANIC COMPOUNDS, WHICH H GERMAN PHYSICIST OTTO LEHMAN ASCRIBED TO A TRANSITION LIQUID-CRYSTALLINE STATE OF MATTER. SOME ORGANIC COM PARTICULAR ROD-SHAPED ONES, PARTIALLY MELT TO A LIQUID-CR AT A PRECISE TRANSITION TEMPERATURE. IN THIS PHASE, THE THRE CRYSTAL LATTICE STRUCTURE DISAPPEARS, AND THE MATERIAL LIQUID, YET A LONG-RANGE ORIENTATIONAL ORDER OF THE RETAINED, GIVING THE MATERIAL SOME CRYSTAL LIKE PROPERTIE HIGHER TEMPERATURE THIS LIQUID-CRYSTALLINE STATE UNDE TRANSITION TO AN ORDINARY LIQUID.

MANY KINDS OF LIQUID-CRYSTAL PHASES ARE KNOWN BUT ONLY THE NEMATIC PHASE IS USED IN LIQUID-CRYSTAL DISPLA AVERAGED OVER TIME, THE ELONGATED MOLECULES IN ANY LO NEMATIC PHASE ALL POINT IN THE SAME DIRECTION, WHICH IS KN LOCAL OPTIC AXIS OR DIRECTOR. THIS DIRECTION CAN BE INFLU WALLS OF THE CONTAINER OR BY AN ELECTRIC OR MAGNETIC FIE DIRECTION CAUSES CERTAIN PHYSICAL PROPERTIES TO HAVE MEASURED PARALLEL TO THE DIRECTOR AND ANOTHER MEASURE TO IT. PARTICULARLY IMPORTANT FOR LCDS ARE THE DIFF ANISOTROPIES, IN DIELECTRIC CONSTANT AND REFRACTIVE INDE THE TWO DIRECTIONS. FOR MOST DISPLAY APPLICATIONS, THESE SHOULD BE LARGE AND POSITIVE. IN THIS CASE, A POTENTIAL DIFF A FEW VOLTS APPLIED ACROSS THE LIQUID CRYSTAL IS SUFFICIENT DIRECTOR PARALLEL TO THE ELECTRIC FIELD AND AWAY FROM WALLS. THE REFRACTIVE INDEX ANISOTROPY ENSURES THAT A R THE LIQUID CRYSTAL WILL BE ACCOMPANIED BY A CHANGE IN T LIGHT TRANSMITTED BY THE DISPLAY.

THE FIRST LCD, DEMONSTRATED AT RADIO CORPORATION OF (NOW RCA CORPORATION) LABORATORIES IN 1963, USED AN EFFECT THE DYNAMIC SCATTERING MODE (DSM), WHICH CAUSED THE LIQ TO TURN CLOUDY AND SCATTER LIGHT UNDER AN APPLIED VOL POWER CONSUMPTION OF THIS DEVICE, WHICH IS THE RESULT OF MODIFY AMBIENT LIGHT RATHER THAN GENERATE LIGHT OF ITS VOLTAGE COMPATIBILITY WITH THE NEWLY DEVELOPED INTEG

GAVE THIS DISPLAY MANY ADVANTAGES OVER OTHER FLAT-PAN THE TIME. ALTHOUGH NO LONGER USED BECAUSE OF POOR VIEW LIFETIME, DSM DISPLAYS PROVED THE FEASIBILITY AS WELL AS TH POTENTIAL OF LCDS.

THE NEXT GENERATION OF LCDS USED THE TWISTED NEMAT EFFECT, DEVELOPED AT HOFFMAN-LA ROCHE, INC., IN 1971 AND STI WATCHES AND CALCULATORS TODAY. THE UPPER AND LOWER SUB A TN DISPLAY ARE SEPARATED BY A NARROW GAP OF ABOUT 8 M PATTERNED, TRANSPARENT CONDUCTIVE COATINGS OF INDIUM TIN INNER SURFACES. THE TRANSPARENT ELECTRODES HAVE THIN PO SEVERAL HUNDRED ANGSTROMS THICK THAT ARE UNIDIRECTION ALIGN THE DIRECTOR OF THE LIQUID CRYSTAL AT THE SURFACES P DIRECTIONS. THE UPPER SUBSTRATE IS RUBBED AT RIGHT ANGL DIRECTION OF THE LOWER SUBSTRATE, SO THAT, WHEN NO VOLT THE DIRECTOR OF THE LIQUID CRYSTAL UNDERGOES A $^{0}$ TWIST CONTINUO THE REGION BETWEEN THE SUBSTRATES. POLARIZER SHEETS AR BOTH SIDES OF THE DISPLAY IN SUCH A WAY THAT THE DIRECTIO OF THE LINEAR POLARIZED LIGHT IS PARALLEL TO THE RUB DI ADJACENT ALIGNMENT LAYER AT EACH SUBSTRATE. LINEAR POLA THE UPPER POLARIZER PROPAGATES THROUGH THE LIQUID-CRYS ROTATES ITS PLANE OF POLARIZATION IN STEP WITH THE TWISTED LIGHT THEN EMERGES AT THE BOTTOM OF THE LIQUID-CRYSTAL PARALLEL TO THE TRANSMISSION AXIS OF THE LOWER POLARIZER, THROUGH.

APPLICATION OF 3-5 VOLTS ACROSS THE UPPER AND LOWER ORIENTS THE OPTIC AXIS IN THE CENTRAL PORTION OF THE LIQUI PREDOMINANTLY TO THE ELECTRIC FIELD AND PERPENDICULAR WHICH UNTWISTS THE STRUCTURE AND DESTROYS ITS POLARIZ CAPACITY. THE POLARIZED LIGHT PASSING THROUGH THE CELL N THE SECOND POLARIZER IN THE “CROSSED” POSITION, WHERE IT CAUSING THE ACTIVATED PORTION OF THE DISPLAY TO APPEA DISPLAY ALSO CAN BE OPERATED IN A REFLECTIVE MODE BY PUTT REFLECTOR BEHIND THE DISPLAY; AMBIENT LIGHT PASSING THROU IS REFLECTED AND SIMPLY RETRACES ITS PATH BACK TO THE VIEW

THE FIRST TN DISPLAYS WERE USED IN LOW-INFORMATION WATCH AND CALCULATOR APPLICATIONS, IN WHICH THE DIGITS 0

FORMED BY APPLYING VOLTAGES BETWEEN APPROPRIATE COMB
SEGMENTED ELECTRODES AND A COMMON BACKPLANE. TO A
DISPLAY INFORMATION IN THE FORM OF TEXT, GRAPHICS, AND PICT
INFORMATION-CONTENT DOT MATRIX COMPOSED OF MANY TH
INDEPENDENTLY ADDRESSABLE PICTURE ELEMENTS, OR PIXELS, I
VIDEO GRAPHICS ARRAY COMPUTER SCREEN, FOR EXAMPLE, CON
ARRAY OF 640 BY 480 DOTS RESULTING IN 307,200 INDIVIDUAL PIXE
PASSIVE-MATRIX DRIVE METHOD, THE PIXELS ARE DEFINED BY TH
TRANSPARENT HORIZONTAL ROW ELECTRODES AND VERTICAL COL
POTENTIAL DIFFERENCE ACROSS ANY GIVEN PIXEL IS PRODUCED
VOLTAGES TO THE APPROPRIATE ROW AND COLUMN ELECTROD
PIXELS INDEPENDENTLY IN THIS SIMPLE MATRIX, THE DISPLAY IS
BY SEQUENTIALLY PULSING, OR SELECTING, THE ROW ELEC
SIMULTANEOUSLY APPLYING A VOLTAGE TO EACH COLUMN
DETERMINED BY THE DESIRED OPTICAL STATE OF THE PIXEL ON
ROW. AS THE NUMBER OF MATRIX ROWS INCREASES, HOWEVER,
INCREASINGLY DIFFICULT TO SIGNIFICANTLY AFFECT THE OPTIC
INDIVIDUAL PIXEL WITHOUT AFFECTING THE STATES OF THE OTHE
SHARED ROW OR COLUMN ELECTRODE. WITH THE TN EFFECT, NO
ABOUT 20 ROWS CAN BE MULTIPLEXED WITH GOOD PERFORMANC
HIGH-INFORMATION-CONTENT DISPLAYS EITHER THE DRIVE ME
CHANGED OR A DIFFERENT LIQUID-CRYSTAL ELECTRO-OPTICAL E
USED.” [3]

## ? *Comprehension Check*

**1. MAKE THE RIGHT CHOICE:**

1) LIQUID CRYSTALS WERE DISCOVERED A) IN 1889.
B) IN 1948.
C) IN 1798.

2) THE ANISOTROPIES SHOULD BE A) NEGATIVE.
B) LARGE AND POSITIVE.
C) LARGE AND NEGATIVE.

3) THE FIRST LCD WAS DEMONSTRATED A) IN 1890.
B) IN 1980.
C) IN 1963.

4) THE FIRST TN DISPLAYS WERE USED A) IN WATCH AND CALCU

B) IN COMPUTERS.
C) IN OPTICAL DEVICES.

5) THE UPPER AND LOWER SUBSTRATE PLATES OF A TN DISPLAY ARE SEPARATED
A) BY A WIDE GAP.
B) BY A NARROW GAP.
C) NOTHING.

**2. READ THE FOLLOWING STATEMENTS AND AGREE OR DISAGR DON'T KNOW».**

1) IN A LIQUID-CRYSTALLINE PHASE, THE THREE-DIMENSIONAL C STRUCTURE DISAPPEARS, AND THE MATERIAL MAY FLOW LIKE A
2) SCIENTISTS DON'T KNOW ANY KINDS OF LIQUID-CRYSTAL PHASES
3) THE BUILT-IN DIRECTION CAUSES CERTAIN PHYSICAL PROPERTIE VALUE MEASURED PARALLEL TO THE DIRECTOR AND ANOT PERPENDICULAR TO IT.
4) THE REFRACTIVE INDEX ANISOTROPY ENSURES THAT A REORIE LIQUID CRYSTAL WON'T BE ACCOMPANIED BY A CHANGE IN THE LIGHT TRANSMITTED BY THE DISPLAY.
5) A POTENTIAL DIFFERENCE ACROSS ANY GIVEN PIXEL IS PRO APPLYING VOLTAGES TO THE APPROPRIATE ROW AND COLUMN E

**3. ANSWER THE FOLLOWING QUESTIONS:**

1) DO SOME ORGANIC COMPOUNDS PARTIALLY MELT TO A LIQUID PHASE AT A PRECISE TRANSITION TEMPERATURE?
2) WHAT PHASE IS USED IN LIQUID-CRYSTAL DISPLAYS (LCDS)?
3) THE TRANSPARENT ELECTRODES HAVE THIN POLYMER COAT HUNDRED ANGSTROMS THICK, DON'T THEY?
4) IS AMBIENT LIGHT PASSING THROUGH THE DISPLAY REFLECTED
5) HOW MANY ROWS CAN BE MULTIPLEXED WITH GOOD PERFORM THE TN EFFECT?

**4. WRITE A TEXT ANALYSIS.**

**5. MAKE UP A TOPIC ON THE THEME "LIQUID-CRYSTAL DISPLAYS".**

## 🕮 *Working with Vocabulary and Grammar*

**4. FILL EACH GAP WITH THE RIGHT PREPOSITION.**

1) LIQUID CRYSTALS WERE DISCOVERED ___ 1889.
2) ___ A SECOND, HIGHER TEMPERATURE THIS LIQUID-CRYSTALLINE UNDERGOES ANOTHER TRANSITION ___ AN ORDINARY LIQUID.
3) THE UPPER AND LOWER SUBSTRATE PLATES ___ A TN DISPLAY AR SEPARATED ___ A NARROW GAP ___ ABOUT 8 M.
4) THE POLARIZED LIGHT PASSING ___ THE CELL NOW INTERSECTS T POLARIZER ___ THE “CROSSED” POSITION.
5) THE PIXELS ARE DEFINED ___ THE OVERLAP ___ TRANSPARENT ROW ELECTRODES AND VERTICAL COLUMN ELECTRODES.

**5. TRANSLATE THE SENTENCES PAYING SPECIAL ATTENTION TO ITALICS.**

1) THE MATERIAL MAY FLOW *like* A LIQUID.
2) AVERAGED *over time*, THE ELONGATED MOLECULES IN *any* LOCALITY OF THE NEMATIC PHASE ALL POINT IN *the same* DIRECTION, WHICH IS KNOWN *as* THE LOCAL OPTIC AXIS OR DIRECTOR.
3) DSM DISPLAYS PROVED THE FEASIBILITY *as well as* THE ENORMOUS POTENTIAL OF LCDS.
4) THE ATOMS OF THE SOURCE ARE EXCITED TO PRODUCE *as well as* GLOWIN DEPENDING UPON THE NATURE OF THE SOURCE.
5) *As* THE NUMBER OF MATRIX ROWS INCREASES, IT BECOMES *increasingly* DIFFICULT TO SIGNIFICANTLY AFFECT THE OPTICAL STATE OF PIXEL WITHOUT AFFECTING THE STATES OF THE OTHER PIXELS ROW OR COLUMN ELECTRODE.
6) FURTHER RESEARCH AND DEVELOPMENT UNDOUBTEDLY W REVOLUTIONARY IMPROVEMENTS IN THEIR ACCURACY *as well* AND REL *as* IN THEIR ADAPTATION TO INDUSTRIAL AND COMMERCIAL USA

**6. OPEN THE BRACKETS TO MAKE THE SENTENCES COMPLETE.**

1) PARTICULARLY IMPORTANT FOR LCDS *(be)* THE DIFFERENCES, OR ANISOTROPIES, IN DIELECTRIC CONSTANT AND REFRACTIVE INDE THE TWO DIRECTIONS.
2) THE LOW POWER CONSUMPTION OF THIS DEVICE *(give)* THE DISPLAY MANY ADVANTAGES OVER OTHER FLAT-PANEL DISPLAYS OF THE TIME.
3) THE TRANSPARENT ELECTRODES *(have)* THIN POLYMER COATINGS SEVER HUNDRED ANGSTROMS THICK.

4) A VIDEO GRAPHICS ARRAY COMPUTER SCREEN, FOR EXAMPLE, *(consist)* OF AN ARRAY OF 640 BY 480 DOTS RESULTING IN 307,200 INDIVIDUAL
5) THE LIGHT THEN *(emerge)* AT THE BOTTOM OF THE LIQUID-CRYSTAL POLARIZED PARALLEL TO THE TRANSMISSION AXIS OF THE LO WHERE IT *(pass)* THROUGH.

**7. MATCH A STATEMENT WITH A SUITABLE ENDING AND TRANSL**

| | |
|---|---|
| 1) LIQUID CRYSTALS WERE DISCOVERED IN 1889 | THE DIRECTION OF VIBR LINEAR POLARIZED LIGHT IS PARAL TO THE RUB DIRECTION OF TH ADJACENT ALIGNMENT LAYER EACH SUBSTRATE. |
| 2) THE DISPLAY ALSO CAN BE OPERATED IN | RIGHT ANGLES TO THE I OF THE LOWER SUBSTRATE. |
| 3) POLARIZER SHEETS ARE ORIENTED ON BOTH SIDES OF THE DISPLAY IN SUCH A WAY THAT | OF POOR VIEW ABILITY LIFETIME. |
| 4) THE UPPER SUBSTRATE IS RUBBED AT | A REFLECTIVE MODE BY DISPLAY. |
| 5) ALTHOUGH NO LONGER USED BECAUSE | WHEN THE AUSTRIAN FRIEDRICH REINITZER OBSERVED CURIOUS, CLOUDY MELTING BEHAVIOUR IN CERTAIN PURE ORGANIC COMPOUNDS. |

## *Discussing the text*

**8. DISCUSS THE FOLLOWING:**

1) LIQUID CRYSTALS WERE CALLED “LIQUID”;
2) GENERALLY ONLY THE NEMATIC PHASE IS USED IN LIQUID-CRY (LCDS);
3) PARTICULARLY IMPORTANT FOR LCDS ARE THE DIFFERENCES, OF IN DIELECTRIC CONSTANT AND REFRACTIVE INDEX MEASURE DIRECTIONS;

4) WHEN NO VOLTAGE IS APPLIED, THE DIRECTOR OF THE LIQ
UNDERGOES A CONTINUOUS TWIST 90$^0$ IN THE REGION BETWEEN TI
SUBSTRATES;
5) THE FIRST TN DISPLAYS WERE USED IN LOW-INFORMATION-CON
AND CALCULATOR APPLICATIONS.

**9. PROVE THE FOLLOWING CHOOSING THE FACTS FROM THE T**

1) SOME ORGANIC COMPOUNDS, IN PARTICULAR ROD-SHAPED ONE
MELT TO A LIQUID-CRYSTALLINE PHASE AT A PRECISE TRANSITIO
2) FOR MOST DISPLAY APPLICATIONS, THESE ANISOTROPIES SHOU
AND POSITIVE;
3) THE DIRECTION OF VIBRATION OF THE LINEAR POLARIZED LIGH
THE RUB DIRECTION OF THE ADJACENT ALIGNMENT LAYER AT E
4) THE DISPLAY ALSO CAN BE OPERATED IN A REFLECTIVE MODE;
5) WITH THE TN EFFECT, NO MORE THAN ABOUT 20 ROWS CAN BE M
WITH GOOD PERFORMANCE.

**10. GIVE SOME MORE INFORMATION TO THE FOLLOWING:**

1) THE DIRECTION WHICH CAN BE INFLUENCED BY THE WALLS OF T
OR BY AN ELECTRIC OR MAGNETIC FIELD;
2) THE MOST DISPLAY APPLICATIONS;
3) THE FIRST LCD, DEMONSTRATED AT RADIO CORPORATION O
(NOW RCA CORPORATION) LABORATORIES IN 1963;
4) THE NEXT GENERATION OF LCDS USED THE TWISTED NEMATIC (T
5) THE FIRST TN DISPLAYS;

# UNIT 2.3

## PART 1

**READ THE TEXT.**

## TEXT A2.3

## OPTOELECTORONICS RESEARCH IN FRANCE

“AT THE INSTITUTE D’OPTIQUE AT PARIS SUD RESEARCHERS ARE TR
DEVELOP AN ARTIFICIAL RETINA. THEY USE SMART-PIXEL TECHN
SIMPLIFY AN IMAGE BEFORE PASSING IT TO A COMPUTER FOR PROCESS
FIRST PROCESSING STEP IN COMPUTATIONAL VISION – REFERRED TO AS
MIDDLE VISION – INVOLVES INTERPRETATION OF TWO-DIMENSION
IMAGES AS PROJECTIONS FROM THREE-DIMENSIONAL (3-D) SCEN
ENHANCING THE IMAGE, REDUCING NOISE AND OPTIMIZING ASPECTS
EDGE SHARPNESS THE COMPUTING WORK NECESSARY TO COMPLET
PROCESSING IS GREATLY REDUCED, LEADING TO ORDERS-OR-MAG
IMPROVEMENT IN SPEED. ONE OF THE GROUP’S MORE SUCCESSFUL TEC
IS THAT OF SIMULATED ANNEALING USING LASER-GENERATED SPECKL
THE COMBINATION OF SPECKLE AND DEDICATED INTEGRATED CI
CALLED A STOCHASTIC ARTIFICIAL RETINA. THIS OPENS THE WAY F
IMAGE PROCESSING IN THE PIXEL ARRAY.

THE FRANCE TELECOM CENTER NATIONAL D’ETUDES
TELECOMMUNICATIONS (CNET) LABORATORIES INVESTIGATE D
SYSTEMS, AND THEIR IMPLEMENTATIONS. THE CNET OPTOELE
MATERIALS AND COMPONENTS GROUP IS LOCATED IN BAGNEUX. O
DEVELOPMENT BEING PURSUED THERE IS THE POSSIBILITY OF FA
HYBRID POLYMER/SEMICONDUCTOR OPTICAL INTEGRATED DEVICES. T
FABRICATION OF A DEVICE WITH PERFORMANCE CHARACTERISTICS
THOSE OF INDIVIDUAL SEMICONDUCTOR STRUCTURES THAN IS O
OBTAINABLE WITH MONOLITHICALLY INTEGRATED DEVICES. AT TH
PRODUCTION COSTS MUST BE SUCH THAT THE HYBRID DEVICES CAN
REAL SYSTEMS.

AMONG OTHER DEVICES UNDER DEVELOPMENT AT BAGNEUX HIGH-PERFORMANCE STRAINED-LAYER INTEGRATED LASER-MOD GBIT/S TRANSMISSION. IN THIS DEVICE, THE SAME ACTIVE LAYER BOTH A DISTRIBUTED-FEEDBACK (DFB) LASER AND MODULATOR ON INGAASP MULTIPLE QUANTUM WELLS (MQWS). THE LASER E 1.553 MKM AND PERFORMANCE TESTS DEMONSTRATED 20 TRANSMISSION OVER 108 KM OF DISPERSION-SHIFTED FIBE MONOLITHICALLY INTEGRATED LASER-MODULATORS ARE EXPECT FOR LONG-HAUL TRANSMISSION BECAUSE OF THEIR COMPAC INTRINSICALLY LOW CHIRP.

THE RESEARCHERS AT BAGNEUX ARE ALSO DEVELOPING SY MILLIMETER-WAVE UPCONVERSION AS PART OF A SCHEME F DEVELOPMENT OF DISTRIBUTION NETWORKS BASED ON HIG MICROWAVE-RADIO SYSTEMS OVER FIBER. THESE SYSTEMS A DEVELOPED RAPIDLY WORLDWIDE FOR APPLICATIONS IN AREA INTELLIGENT VEHICLES AND INFORMATION HIGHWAYS. USE OF WAVES IN RADIO COMMUNICATION SYSTEMS WILL RELIEVE OVERCROWDING WHILE ALSO SUPPORTING HIGH DATE RATES (622 OPTOELECTRONIC UPCONVERTER DEVELOPED AT BAGNEUX INTEG DEB LASER WITH A DISTRIBUTED TRANSIMPEDANCE MICROWAV (DTA) ON A SINGLE MOUNT.

AT CNET LANNION, RESEARCHERS ARE INVESTIGATING HIG TRANSMISSION OVER FIBERS AND NETWORKS AND ALSO T ARCHITECTURES TO OPTIMIZE USE OF OPTICAL ELEMENTS IN NETW WITH THE OVERALL GOAL OF INTRODUCING WDM IN A SYNCHRO HIERARCHY (SDH) TELECOMMUNICATIONS SYSTEM ACROSS FRAN PAN-EUROPEAN SYSTEM, THE GROUP IS DEVELOPING TIME- AND W MULTIPLEXING SYSTEMS (T/WDM), SDH SELF-HEALING RINGS USING ADD/DROP MULTIPLEXERS (OADM), AND ALL-OPTICAL CROSS-CON ON WAVELENGTH CONVERSION IS REALIZED THROUGH A SEMICON AMPLIFIER (SOA), IN WHICH A COUNTER-PROPAGATING LOW-POW BEAM AT THE NEW WAVELENGTH USES THE GAIN TO TAKE CHARACTERISTICS FROM THE ORIGINAL WAVELENGTH.” [2]

## ? *Comprehension Check*

**1. MAKE THE RIGHT CHOICE:**

1) AT THE INSTITUTE D'OPTIQUE AT PARIS SUD RESEARCHERS
A) LCD TECHNOLOGY
B) USE SMART-PIXEL TECHNOL
C) ISOTOPE TECHNIQUES
D) VACUUM TECHNOLOGY

2)THIS OPENS THE WAY FOR
A) FAULT IMAGE PROCESSING IN ARRAY
B) ENLARGED IMAGE PROCESSING IN TH PIXEL ARRAY
C) BLURRED IMAGE PROCESSING IN THE PIXEL ARRAY
D) VIDEO-RATE IMAGE PROCESSING IN THE PIXEL ARRAY

3) ONE NEW DEVELOPMENT BEING PURSUED THERE IS THE POSSIBILITY OF FABRICATING
A) HYBRID POLYMER/SEMICOND OPTICAL INTEGRATED DEV
B) LASER RADARS
C) SEMICONDUCTOR DEVICES
D) MAGNETIC STORAGE DEVICES

4) SUCH MONOLITHICALLY INTEGRATED LASER-MODULATORS ARE EXPECTED TO BE USEFUL FOR
A) REGULAR TRANSMIS
B) SINGLE-BAND TRAN
C) LONG-HAUL TRANSMISSION
D) ONE-WAY TRANSMISSION

5)ACTIVE LAYER IS BASED ON
A) $IN_{0.2}GA_{0.8}AS$ MULTIPLE QUANTUM WELLS
B) $AL_{0.7}GA_{0.3}AS$ MULTIPLE QUANTUM WELLS
C) GAAS MULTIPLE QUANTUM WELLS
D) INGAASP MULTIPLE QUANTUM WELLS

**2. READ THE FOLLOWING STATEMENTS AND AGREE OR DISAGR DON'T KNOW».**

1) THEY USE SMART-PIXEL TECHNOLOGY TO SIMPLIFY AN IMAG
PASSING IT TO A COMPUTER FOR PROCESSING.
2) THE CNET OPTOELECTRONICS MATERIALS AND COMPONENTS
LOCATED IN PARIS.
3) THE LASER EMITS AT 1.63 MKM AND PERFORMANCE TESTS DEM
20-GBIT/S TRANSMISSION OVER 108 KM OF DISPERSION-SHIFTED F
4) USE OF MILLIMETRE WAVES IN RADIO COMMUNICATION SYST
RELIEVE SPECTRAL OVERCROWDING WHILE ALSO SUPPORTING H
(622 MBIT/S).
5) RESEARCHERS ARE INVESTIGATING HIGH-SPEED TRANSMISSION
AND NETWORKS AND ALSO THE OVERALL ARCHITECTURES TO
OPTICAL ELEMENTS IN NETWORKS.

**3. ANSWER THE FOLLOWING QUESTIONS.**

1) WHAT WAS THE FIRST PROCESSING STEP IN COMPUTATIONAL VIS
2) WHAT CHARACTERISTICS DOES A NEW HIGH-PERFORMANCE ST
INTEGRATED LASER-MODULATOR HAVE?
3) DOES A COUNTER-PROPAGATING LOW-POWER PROBE BEAM A
WAVELENGTH USE THE GAIN TO TAKE THE SIGNAL CHARACTER
ORIGINAL WAVELENGTH?
4) WHAT DOES THE OPTOELECTRONIC UPCONVERTER DEVELOPED
INTEGRATE?
5) WHERE ARE MONOLITHICALLY INTEGRATED LASER-MODULATO
BE USEFUL?

4. **WRITE TEXT ANNOTATIONS (ABOUT 250 WORDS).**

## 🕮 *Working with Vocabulary and Grammar*

**5. WRITE THE OPPOSITES TO THE ADJECTIVES IN COMPARATIVE**

*Examples:* MORE EXPENSIVE – CHEAPER
WARMER – COLDER

| | | | |
|---|---|---|---|
| LOWER | __________ | MORE SYNCHRONOUS | __________ |
| NEWER | __________ | RICHER | __________ |
| WORSE | __________ | MORE SUCCESSFUL | __________ |
| EARLIER | __________ | BROADER | __________ |

| | | | |
|---|---|---|---|
| NOISIER | ___________ | LONGER | ___________ |
| LESS | ___________ | MORE SERIOUS | ___________ |
| FURTHER | ___________ | HARDER | ___________ |

**5. TRANSLATE THE SENTENCES PAYING SPECIAL ATTENTION TO ITALICS.**

1) IT WAS *among* THESE PEOPLE *that* THE IDEA OF CONTINUOUS MATTER W FOSTERED.
2) THE RAPID EXPANSION OF RADIO BROADCASTING AND COMM CREATED THE SERIOUS PROBLEM OF INTERFERENCE *between* STATIONS.
3) *Though* THE MIXTURE CAN ACQUIRE AN APPEARANCE *that* DIFFERS FROM *any* OF *its* PARTS, *each* INGREDIENT *that* BLENDS INTO FORMING THE MIXTU WILL RETAIN *its* IDENTITY.
4) HOMOGENEOUS MIXTURE ARE THOSE *that* HAVE A UNIFORM COMPOSITION *such as* HOMOGENIZED MILK OR SUGAR DISSOLVED IN WATER.
5) SPONTANEOUS TRANSITIONS ARE NOT *the only means by* WHICH A PARTICULAR ATOM RETURNS TO ITS GROUND STATE.

**6. OPEN THE BRACKETS TO MAKE THE SENTENCES COMPLETE.**

1) NOW RESEARCHERS *(try)* TO DEVELOP AN ARTIFICIAL RETINA.
2) UNTIL THE 1950S, LASERS WERE STRICTLY THEORY, BUT MAN *(work)* FOR REALITY.
3) THE RESEARCHERS AT BAGNEUX ALSO *(develop)* SYSTEMS FOR MILLIMETER-WAVE UPCONVERSION AS PART OF A SCHEME F DEVELOPMENT OF DISTRIBUTION NETWORKS.
4) NOW RESEARCHERS (INVESTIGATE) HIGH-SPEED TRANSMIS FIBERS AND NETWORKS.
5) LASER HISTORY ACTUALLY *(begin)* WITH THE MASER.

**7. MATCH A STATEMENT WITH A SUITABLE ENDING AND TRANSL**

| | |
|---|---|
| 1) THE SAME ACTIVE LAYER SEMICONDUCTORPROVIDES | REALISED THROUGH OPTICAL AMPLIFIER. |
| 2) USE OF MILLIMETRE WAVES RADIO COMMUNICATION SYSTEMS WILL RELIEVE | INTERPRETATION OF TWO-DIME (2- D) IMAGES AS PROJECTIONS THREE-DIMENSIONAL (3-D) SCEN |

| | |
|---|---|
| 6) ALL-OPTICAL CROSS-CONNECTS BASED ON WAVELENGTH CON- VERSION IS | AT 1.553 MKM AND PERFORM DEMONSTRATED 20-GBIT/S TR OVER 108 KM OF DISPERSION-SHIFTE FIBER. |
| 4) THE FIRST PROCESSING STEP COMPUTATIONAL VISION INVOLVES | SPECTRAL OVERCROWDING WH SUPPORTING HIGH DATE RATES MBIT/S). |
| 5) THE LASER EMITS | FOR BOTH A DISTRIBUTED-FEEDBA (DFB) LASER AND MODULATOR. |

***Discussing the text***

**8. DISCUSS THE FOLLOWING:**

1) THEY USE SMART-PIXEL TECHNOLOGY;
2) THE SAME ACTIVE LAYER PROVIDES FOR BOTH A DISTRIBUT (DFB) LASER AND MODULATOR;
3) MONOLITHICALLY INTEGRATED LASER-MODULATORS ARE EXPEC FOR LONG-HAUL TRANSMISSION;
7) THESE SYSTEMS ARE BEING DEVELOPED RAPIDLY WORLD APPLICATIONS IN AREAS INCLUDING INTELLIGENT VEHICLES AN HIGHWAYS;
8) RESEARCHERS ARE INVESTIGATING HIGH-SPEED TRANSMISSION AND NETWORKS AND ALSO THE OVERALL ARCHITECTURES.

**9. PROVE THE FOLLOWING CHOOSING THE FACTS FROM THE TEX**

1) IT IS NECESSARY TO COMPLETE IMAGE PROCESSING;
2) PRODUCTION COSTS MUST BE CHEAP;
3) THERE IS THE POSSIBILITY OF FABRICATING HYBRID POLYMER/SI OPTICAL INTEGRATED DEVICES;
4) USE OF MILLIMETER WAVES IN RADIO COMMUNICATION SYS RELIEVE SPECTRAL OVERCROWDING;
5) THE RESEARCHERS ARE DEVELOPING SYSTEMS FOR MILLI UPCONVERSION.

**10. GIVE SOME MORE INFORMATION TO THE FOLLOWING:**

1) THE FIRST PROCESSING STEP IN COMPUTATIONAL VISION;
2) THE COMBINATION OF SPECKLE AND DEDICATED INTEGRATED CI
CALLED A STOCHASTIC ARTIFICIAL RETINA;
3) SYSTEMS FOR MILLIMETRE-WAVE UPCONVERSION;
4) THE POSSIBILITY OF FABRICATING HYBRID POLYMER/SEMICONDU
INTEGRATED DEVICES;
5) ALL-OPTICAL CROSS-CONNECTS BASED ON WAVELENGTH CONVE

## PART 2

**READ THE TEXT.**

## TEXT B2.3

### COMPUTING WITH PHOTONS AT THE SPEED OF LIGHT

"IT IS HARD TO BELIEVE THAT DIGITAL ELECTRONIC COMPUTE AROUND FOR HALF A CENTURY NOW, YET IT IS HARDER TO BELIEV COMPUTERS HAVE EVOLVED IN THAT TIME. WHEN ENIAC FIRST GLO UNIVERSITY OF PENNSYLVANIA IN 1946, IT CONTAINED 18000 VACUU TOOK UP AN ENTIRE ROOM, AND COULD GRIND OUT 4500 ADDITIO POCKET CALCULATORS HAVE FAR MORE COMPUTING POWER THA DID, AND SUPERCOMPUTERS CAN ZIP THROUGH BILLIONS OF CAL SECOND.

MUCH OF THE CREDIT FOR THIS SPECTACULAR GROWTH TO T OF TRANSISTORS AND INTEGRATED CIRCUITS, WHICH ENABLE EFFICIENCY AND MINIATURIZATION OF ELECTRONICS. BUT AS HARDWARE NEARS THE PRACTICAL LIMIT OF SIZE AND EFFICIEN GROWTH RATE OF COMPUTING POWER WILL RELY INCREA UNCONVENTIONAL TECHNOLOGIES NOW UNDER DEVELOPMENT. ON PROMISING OF THESE NEW TECHNOLOGIES IS OPTICAL COMPUTING.

OPTICAL METHODS OFFER A RADICALLY NEW APPROACH TO BECAUSE THE INFORMATION CARRIES ARE PHOTONS, WHICH B DIFFERENTLY FROM ELECTRONS. FOR EXAMPLE, PHOTONS CAN EACH OTHER LIKE GHOSTS; ELECTRONS CANNOT. PHOTONS CA

READILY THROUGH OPEN SPACE, WHEREAS ELECTRONS GENERA
ROUTED THROUGH CONDUITS. UNLIKE ELECTRONS, PHOTONS A
CHARGE AND ARE THEREFORE IMMUNE TO INTERFERENCE FRO
ELECTROMAGNETIC FIELDS.

THESE PROPERTIES PROVIDE OPTICAL COMPUTERS WITH CERTA
ADVANTAGES OVER THE CONVENTIONAL ELECTRONIC VARIETY,
RESEARCH ON OPTICAL LOGIC CIRCUITS AND COMPUTER ARCH
ACCELERATED IN RECENT YEARS. THIS ARTICLE REVIEWS THE
DESIGN AND FUNCTION OF SEVERAL DEVICES USED FOR OPTICAL C

DIGITAL ELECTRONIC COMPUTERS BASICALLY CONSIST O
COLLECTION OF INTERCONNECTED SWITCHES, GATES AND MEMO
CALLED “FLIP-FLOPS”. LOGIC OPERATIONS ARE PERFORMED BY CO
FLOW OF ELECTRONS BETWEEN THESE VARIOUS COMPONEN
COMPUTERS ALSO USE SWITCHES, GATES, AND FLIP-FLOPS IN
OPERATIONS, BUT THE DESIGNS OF THESE DEVICES ARE VERY DIFFE

THE PURPOSE OF A SWITCH IS TO MAKE OR BREAK A CON
BETWEEN ONE OR MORE TRANSMISSION PATHS. IF A SWITCH C
CONNECTION FROM JUST ONE PATH TO ANOTHER PATH, IT IS C
SWITCH. OTHER POSSIBILITIES INCLUDE *n, nXm*, 2X2, AND 1X*m* SWITCHERS,
WHERE *n* AND *m* CAN BE ANY INTEGER.

IN OPTICAL COMPUTERS, SWITCHES CAN BE BUILT FROM M
USING OPTO-MECHANICAL, ELECTRO-OPTIC, ACOUSTO-OPTIC, MA
AND OTHER TECHNIQUES. BY MODULATING THE RELATIVE PHASE O
WAVEFRONTS AS THEY PASS THROUGH THE INTERFEROMETER,
CONSTRUCTIVELY OR DESTRUCTIVELY RECOMBINED AT THE OUTP
AN ON OR OFF CONDUCTION.

ANOTHER USEFUL OPTICAL SWITCHING DESIGN IS THE D
COUPLER, WHICH MAKES AN IDEAL 2X2 SWITCH. ELECTRO-OPTIC CO
REFRACTIVE INDEX OF THESE DEVICES SHIFTS THEM BETWEEN TWO
AND BAR. IN THE BAR STATE, INPUTS 1 AND 2 ARE DIRECTED TO OU
, RESPECTIVELY; IN THE CROSS STATE, INPUTS 1 AND 2 CROSS OVER
AND 1, RESPECTIVELY. THIS TYPE OF SWITCH IS REFERRED TO AS
SWITCH AND CAN BE EXPANDED TO ACCOMMODATE *nXn* CONFIGURATIONS.

CROSSBAR SWITCHES ARE AN IMPORTANT ELEMENT OF MA
LOGIC CIRCUITS AND CAN BE FABRICATED IN A VARIETY OF WAYS
A 4X4 CROSSBAR SWITCH CAN BE CONSTRUCTED USING AN ARRAY

OPTIC MODULATORS. IN THIS PARTICULAR DEVICE, LIGHT FROM EA
IN A VERTICAL ARRAY IS SPREAD BY A CYLINDRICAL LENS IN A FA
ACROSS EACH ROW OF THE 4X4 SPATIAL LIGHT MODULATOR. AN
CYLINDRICAL LENSES (ORIENTED ORTHOGONALLY TO THE FIRST S
THE LIGHT PASSING THROUGH EACH COLUMN OF THE SLM
CORRESPONDING DETECTOR OF A HORIZONTAL DETECTOR ARRAY.

THIS OPTICAL CONFIGURATION CAN CONNECT ANY INPUT L
LASER) WITH ANY OUTPUT LINE (DETECTOR) WITHOUT CONFLICT
MODULATORS OF THE SLM WERE OPEN, FOR INSTANCE, THEN EAC
WOULD BE INDIVIDUALLY CONNECTED TO ALL OF THE OUTPUT LI
CONNECTING INPUT LINE ONLY WITH OUTPUT LINE MEANS C
MODULATORS OF THE SLM EXCEPT THE ONE IN THE SECOND ROW.
COMBINATIONS ARE POSSIBLE OF COURSE.

IN PRINCIPLE, THE MAGNETO-OPTIC SLM OF A CROSSBAR SWIT
REPLACED BY A LIQUID-CRYSTAL SLM OR EVEN AN ACOUSTO-O
THESE AND OTHER OPTICAL MODULATOR TECHNOLOGIES HAVE BE
INTO LARGER *nXn* SWITCHES FOR MORE COMPUTING POWER. ACOUSTO
MODULATORS ALSO ARE WELL SUITED FOR *n* AND *nXm* OPTICAL SWITCHING.
HOWEVER, ALL OF THE OPTICAL SWITCHES DESCRIBED SO FAR ARE
MAGNETICALLY CONTROLLED. WITH THE HELP OF CERTAIN NON
EFFECTS, THOUGH, ALL-OPTICAL SWITCHES CAN BE CONSTRUCTED

USING THE OPTICAL KERR EFFECT, FOR EXAMPLE, IT IS PO
TRANSFORM BOTH THE MACH-ZEHNDER INTERFEROMETER AND
COUPLER INTO ALL OPTICAL SWITCHES. IN EACH CASE, A STRONG
(NOT AN ELECTRIC FIELD) AFFECTS THE SWITCH BEHAVIOR.

IF A BRIGHT CONTROL BEAM PASSES PERPENDICULARLY THRO
OF THE MACH-ZEHNDER INTERFEROMETER, THE REFRACTIVE-IN
CAUSED BY THE OPTICAL KERR EFFECT CREATES THE RELATIV
NEEDED TO OPERATE THE SWITCH. BUT SINGLE BEAM COUPLED INT
THE WAVEGUIDES OF A DIRECTIONAL COUPLER CAN CONVERT THE
SELF-CONTROLLED SWITCH. WHEN THE BEAM IS BRIGHT ENOUGH
REFLECTIVE INDEX OF THE INPUT WAVEGUIDE OF THE COUPLE
REMAINS CONFINED TO THE SAME WAVEGUIDE. IF, HOWEVER,
INTENSITY IS LOW, THE COUPLER OPERATES NORMALLY BY CHANN
INTO THE ADJOINING WAVEGUIDE. THIS SWITCH CAN BE USED T
STRONG AND WEAK SIGNALS FROM A DATE STREAM.

ANOTHER IMPORTANT ALL-OPTICAL SWITCH IS HUGHES LIG VALVE. THE DESIGN OF THIS DEVICE ENABLES LIGHT ABSORBED BY CONTROL THE INTENSITY OF POLARIZED LIGHT REFLECTED FROM THIS EFFECT IS ACCOMPLISHED BY COMBINING A PHOTOCO ABSORBING LAYER WITH A REFLECTIVE LIQUID-CRYSTAL MODULA ABSORBED BY THE PHOTOCONDUCTIVE LAYER HAS AN INTENSITY THAT PATTERN WILL BE “WRITTEN” IN THE LAYER AND WILL THER SPATIAL DISTRIBUTION OF THE ELECTRIC FIELD THROUGH THE LI THIS WAY, THE INTENSITY PATTERN IS BINARY COMPLEMENT EXAMPLE, IS 0 AND VICE VERSA. ON THE LAYER ARRAY, EACH COMPLEMENT APPEAR AS A PATTERN OF HIGH AND LOW INTEN REPRESENTS THE DATE VECTOR.

AFTER COLLIMATION AND MAGNIFICATION, A SERIES OF C LENSES THEN SPREADS THE LIGHT FROM EACH LASER ELEMENT AC OF AN ACOUSTO-OPTIC SLM CONSISTING OF 64 ROWS AND 128 COLU SLM ACTS AS A TWO-DIMENSIONAL CONTROL MASK BY SELECTIV (DIFFRACTING) OR BLOCKING (ZERO-ORDER DIFFRACTION) THE LAS EACH ELEMENT OF THE MODULATOR ARRAY. THIS STEP IS THE M EQUIVALENT OF MULTIPLICATION, WHICH IN BOOLEAN LOGIC IS RE THE AND FUNCTION. THUS THE SLM MULTIPLIES THE DATE BITS LINEAR LASER ARRAY BY CONTROL BITS, WHICH ARE FED IN ELECTRONICALLY.

A SECOND SET OF CYLINDRICAL LENSES THEN TAKES THE L PASSING THROUGH EACH COLUMN OF THE SLM AND FOCUSES CORRESPONDING DETECTOR IN A 1 X 128 HORIZONTAL APD ARRAY. MATHEMATICALLY EQUIVALENT TO ADDITION, WHICH IS REPRESEN FUNCTION IN BOOLEAN LOGIC. BECAUSE EACH DETECTOR OF T REVERSED-BIASED, THE ELECTRONIC SIGNAL IT GENERATES IS INV POSITIVE LIGHT SIGNAL, WHICH IS EQUIVALENT TO THE NOT FUNC BOOLEAN SYSTEM.

BY COMBINING AND, OR, NOT FUNCTIONS, ANY LOGICAL OPER CAN BE PERFORMED IN THE BOOLEAN SYSTEM. THUS, DOC II IS PROGRAMMABLE, GENERAL-PURPOSE COMPUTER IN WHICH PROG DONE THROUGH THE SLM. MORE IMPORTANT, PROCESSING ALSO PARALLEL THROUGH THE OPTICAL INTERCONNECTIONS AND THE SL

OPTICAL COMPUTERS NEED NOT BE DIGITAL, EITHER. THERE AND MULTIVALUED-LOGIC ARCHITECTURES, AS WELL AS OPT AUTOMATA, OPTICAL DATAFLOW MACHINES, AND LINEAR AND NO NEURAL NETWORKS.

ALL OF THESE DEVELOPMENTS UNDERSCORE THE EXTR VERSATILITY OF ELECTRO-OPTICS. FROM THE SIMPLEST LENS T INTRICATE OPTICAL COMPUTER, ELECTRO-OPTIC TECHNOLOGY ENRICHED OUR LIVES BEYOND MEASURE, AND MANY EXCITING DE ARE EXPECTED IN THE DECADES AHEAD." [4]

## ? *Comprehension Check*

**1. MAKE THE RIGHT CHOICE.**

1) ENIAC COULD GRIND OUT A) 4500 SUBTRACTIONS.
B) 4500 ADDITIONS.
C) 4500 OPERATIONS.

2) OPTICAL COMPUTERS ALSO USE A) SWITCHES IN THEIR LOGIC O
B) GATES IN THEIR LOGIC OPERATIONS.
C) SWITCHES, GATES AND FLIP-FLOPS IN THEIR LOGIC OPERATIONS.

3) SWITCHES CAN BE BUILT A) FROM MODULATORS USING ON MECHANICAL TECHNIQUES.
B) FROM MODULATORS USING ONLY ELECTRO-OPTIC AND ACOUSTO-OPTIC TECHNIQUES.
C) FROM MODULATORS USING OPTO-MECHANICAL, ELECTRO-OPTIC, ACOUSTO-OPTIC, MAGNETO-OPTIC, AND OTHER TECHNIQUES.

4) ACOUSTO-OPTIC MODULATORS ALSO ARE WELL SUITED FOR A) 1X$n$ AND $n$X$m$ OPTICAL SWITCHING.
B) 1X2 OPTICAL SWITCHING.
C) 4X4 OPTICAL SWITCHING.

3) OPTICAL COMPUTERS NEED NOT BE A) DIGITAL.
B) ANALOG.
C) MULTIVALUED-LOGIC.

**2. READ THE FOLLOWING STATEMENTS AND AGREE OR DISAGR DON'T KNOW».**

1) SUPERCOMPUTERS CAN ZIP THROUGH BILLIONS OF CALCULATION
2) ALL OPTICAL COMPUTERS HAVE THE SAME DESIGNS.
3) A 4X4 CROSSBAR SWITCH CAN BE CONSTRUCTED USING AN ACOUSTO-OPTIC MODULATORS.
4) THE MAGNETO-OPTIC SLM OF A CROSSBAR SWITCH CAN BE REPL LIQUID-CRYSTAL SLM OR EVEN AN ACOUSTO-OPTIC SLM.
5) A WEAK BEAM OF LIGHT AFFECTS THE SWITCH BEHAVIOR.

3. **ANSWER THE FOLLOWING QUESTIONS.**
1) HOW MANY VACUUM TUBES DID ENIAC CONTAIN?
2) WHAT IS THE MOST PROMISING OF THE NEW TECHNOLOGIES?
3) CAN ELECTRONS PASS THROUGH EACH OTHER LIKE GHOSTS?
4) WHAT IS CALLED A 1X1 SWITCH?
5) WHAT USEFUL OPTICAL SWITCHING DESIGN DO YOU KNOW?

**4. WRITE A TEXT ANALYSIS.**

5. **MAKE UP A TOPIC ON THE THEME "LASER PRINTERS".**

## *Working with Vocabulary and Grammar*

6. **PUT THE WORDS BELOW IN THE RIGHT COLUMN ACCORDING TO PARTS OF SPEECH:**

DIGITAL, USEFUL, CALCULATION, THE LIMIT, TO LIMIT, IN TECHNOLOGIES, DIFFERENTLY, POTENTIAL, LOGIC, BASICALLY REFRACTIVE, TO SWITCH, TO LIKE, LIKE, LAYER, PHOTOCONDUCTIV

| NOUN | ADJECTIVE | VERB | ADVERB |
|---|---|---|---|
| | | | |

7. **TRANSLATE THE SENTENCES PAYING SPECIAL ATTENTION TO THE W ITALICS.**
1) *The greater* THE DIFFERENCE BETWEEN THE SIGNAL FREQUENCY RESONANT FREQUENCY OF THE STUB, *the smaller* THE TOTAL IMPEDANCE OFFERED BY THE STUB.
2) *The smaller* THE VOLUME OF THE CAVITY, *the higher* THE RESONANT FREQUENCY.

3) *Thedeeper* THE PLUG EXTENDS INTO THE CAVITY, *the higher* THE FREQUENCY.
4) *Thehigher* THE TEMPERATURE, *the more* ACTIVITY WITHIN THE ATOMIC SYSTEM.
5) *The fewer* INCLUSIONS THERE ARE, *the better* THE SURFACE FINISH SHOULD BE.

**8. COMPLETE THE SENTENCES BELOW WITH MODAL VERBS.**

1) *Must* OPTICAL COMPUTERS BE DIGITAL? NO, THEY _____.
2) THE CRYSTAL _______ BE MACHINED TO AN OPTICAL TOLERANCE ENDS OF THE RESULTING ROD SILVERED TO ENHANCE REFLECTION.
3) IN 1959 MASERS _______ AMPLIFY LIGHT AS WELL AS MICROWAVES
4) *Need* WE CHANGE THAT MATERIAL FROM THE SOLID TO THE GA WITHOUT GOING THROUGH THE LIQUID STATE? YES, YOU ________.
5) MUST IT BE MADE TO EXIST AS A LIQUID? NO, IT _________.

**9. MATCH A STATEMENT WITH A SUITABLE ENDING AND TRANSL**

| | |
|---|---|
| 1) DIGITAL ELECTRONIC COMPUTERS BASICALLY CONSIST OF | BY CONTROLLING THE FLOW BETWEEN THESE VARIOUS COMP |
| 2) THE SLM ACTS AS | TO MAKE OR BREAK A CONNECTION BETWEEN ONE OR MORE TRANSMISSION PATHS. |
| 3) THE PURPOSE OF A SWITCH IS | A PATTERN OF HIGH AND LOW IN |
| 4) ON THE LAYER ARRAY, EACH BIT AND ITS COMPLEMENT APPEAR AS | A LARGE COLLECTION OF INT SWITCHES, GATES AND MEMOR ELEMENTS CALLED “FLIP-FLOPS”. |
| 5) LOGIC OPERATIONS ARE PERFORMED | A TWO-DIMENSIONAL CONTROL SELECTIVELY PASSING OR BLOCKING LASER LIGHT THROUGH EACH ELEMEN THE MODULATOR ARRAY. |

***Discussing the text***

**10. DISCUSS THE FOLLOWING:**

1) IT IS HARD TO BELIEVE THAT DIGITAL ELECTRONIC COMPUTE AROUND FOR HALF A CENTURY NOW;
2) OPTICAL METHODS OFFER A RADICALLY NEW APPROACH TO COM
3) RESEARCH ON OPTICAL LOGIC CIRCUITS AND COMPUTER ARCH ACCELERATED IN RECENT YEARS;
4) OPTICAL COMPUTERS CAN BE CONSTRUCTIVELY OR DE RECOMBINED AT THE OUTPUT;
5) THE LIGHT REMAINS CONFINED TO THE SAME WAVEGUIDE.

**11. PROVE THE FOLLOWING CHOOSING THE FACTS FROM THE T**

1) THE OPTICAL CONFIGURATION CAN CONNECT ANY INPUT LINE (D WITH ANY OUTPUT LINE (DETECTOR) WITHOUT CONFLICT;
2) OPTICAL MODULATOR TECHNOLOGIES HAVE BEEN DE*nxn*VELOPED IN SWITCHES FOR MORE COMPUTING POWER;
3) IT IS POSSIBLE TO TRANSFORM BOTH THE MACH-ZEHNDER INTER AND DIRECTIONAL COUPLER INTO ALL OPTICAL SWITCHES;
4) THE ELECTRONIC SIGNAL IS INVERTED FROM THE POSITIVE LIGHT
5) OPTICAL COMPUTERS NEED NOT BE DIGITAL.

**12. GIVE SOME MORE INFORMATION TO THE FOLLOWING:**

1) THE FUTURE GROWTH RATE OF COMPUTING POWER;
2) ELECTRO-OPTIC CONTROL OF THE REFRACTIVE INDEX;
3) CROSSBAR SWITCHES;
4) HUGHES LIQUID-CRYSTAL VALVE;
5) THE STEP WHICH IS MATHEMATICALLY EQUIVALENT TO ADDITIO

# UNIT 3.3

## PART 1

**READ THE TEXT.**

## TEXT A3.3

## MIRROR MATERIAL MATTER

“METAL MIRRORS HAVE A GOOD HISTORY IN INFRARED AS INSTRUMENTS. THERE IS UNIFORMITY OF THERMAL PROPERTIES STRUCTURE AND MIRROR SUBSTRATE ARE OF THE SAME MATERIA THERMAL CONDUCTIVITY OF A METAL MIRROR HELPS DECREASE C CRYOGENIC APPLICATIONS. THE PROBLEM IS THAT NONPLATED M ALSO HAVE A HISTORY OF SCATTERING, WHICH LOWERS THE SIGNA AND THROUGHPUT. THE TYPICAL DIAMOND-TURNED SURFACE ALUMINUM ALLOY IS ABOUT 100 A RMS. WHILE HIGH-PURITY A ALLOYS, SUCH AS THE 1100 AND 5000 SERIES, OFTEN PRODUCE BETT WHEN DIAMOND-TURNED, THEY ARE NOT AS STABLE AS THE 6000 RESPECT TO SURFACE FINISH WHEN THERMALLY CYCLED-OPTICAL STABILITY OF CRYOGENIC MIRRORS AFTER CYCLING IS CRITICAL.

PLATING DIAMOND-TURNED MIRRORS WITH ELECTROLESS NIC BY POLISHING, CAN IMPROVE SURFACE FINISH AND REDUCE SCAT ADDS OTHER PROBLEMS.

MANUFACTURING COSTS GROW BECAUSE NICKEL POLISHES M THAN CONVENTIONAL OPTICAL MATERIALS AND POLISHING MA ALREADY DIAMOND-TURNED SURFACE FINISH. NICKEL ALSO MUST THE SUBSTRATE FAIRLY THICKLY-TYPICAL THICKNESS IS 75-125 MK

THE NICKEL PLATE ALSO HAS A DIFFERENT COEFFICIENT EXPANSION THAN THE ALUMINUM SUBSTRATE. AT 300 K, FOR EX THERMAL COEFFICIENT OF EXPANSION FOR NICKEL IS NEAR 15 10 COMPARED TO 23 10-6 M/M-K FOR 6061-T ALUMINUM. A COLD MIRRC ACT LIKE A THERMOSTAT STRIP AND BEND.

SCIENTISTS HAVE BEEN FIGHTING THE BIMETALLIC DEFORMAT SINCE THE 1960S. SEVERAL SOLUTIONS HAVE BEEN SUGGESTED, RA MAKING THICKER MIRRORS TO SHAPING OR CONTOURING THE

MIRROR-OR EVEN PLATING BOTH SIDES OF THE MIRROR WITH ELEC AND USING A SUBSTRATE WITH A SIMILAR COEFFICIENT OF EXPANS WORKED WELL. IN MANY CASES, EVEN IF SOMEONE MANAGES BIMETALLIC DEFORMATION OF THE OPTIC, STRESS IS STILL BEING SUBSTRATE. IF THAT FORCE EXCEEDS THE MICROYIELD IN THE RESULT CAN BE HYSTERESIS.

DESIGNERS OF THE GEMINI SPECTROGRAPH OPTICS RE-E SEVERAL CLASSICAL SOLUTIONS AND FOUND THAT NONE WORK THEY ARE ALL BASED ON AN UNRESTRAINED OPTICS, WHEREAS A ALWAYS MOUNTED. IN ONE CASE, THEY CAME UP WITH A FACT IMPROVEMENT IN DEALING WITH THE BIMETALLIC PROBLEM, BUT NOT MEET GEMINI OPTICS SPECIFICATIONS.

UNTIL LAST YEAR, THE CHOICES IN FABRICATING CRYOGENIC GEMINI SPECTROGRAPH WERE TO LIVE WITH THE SCATTERING C METAL DEFORMATION, WITH THE FIRST CHOICE BEING PERHA TROUBLESOME. DURING THIS PERIOD, A NEW PLATING PROCESS REVIEW BY SPECTROGRAPH OPTIC DESIGNERS THAT OFFERED A RE DILEMMA.

THE PROCESS DEVELOPED BY ALUMIPLATE INC. (MINNEAPOL PLATES AN ALUMINUM SUBSTRATE WITH AN AMORPHOUS LAYER ALUMINUM-REPORTEDLY 99.9% PURE. PROPERTIES OF THE MATER CLOSE TO THAT OF SUBSTRATE. THE THERMAL EXPANSION COEF ALUMIPLATE PROCESS IS 24.4* 10-6 M/M-K AT 300 K, WHILE 6061-T AVERAGES 23* 10-6 M/M-K. THERMAL CONDUCTIVITY IS 218 W/ VERSUS 171 W/M-K. ALTHOUGH CRYOGENIC MIRRORS PLATED THIS THEORETICALLY STILL BE BIMETALLIC, THEY SHOULD NOT E BIMETALLIC DEFORMATION FOUND WITH NICKEL PLATING.

ANOTHER ADVANTAGE OF THE NEW PLATING PROCESS IS TH IMPROVEMENT IN SURFACE FIGURE OF THE DIAMOND-TURNED MATERIAL INCLUSIONS CONTRIBUTE TO SURFACE ROUGHNESS IN D COMPONENTS. THE FEWER INCLUSIONS THERE ARE, THE BETTER FINISH SHOULD BE. ONE POSSIBLE DRAWBACK OF THE PLATIN THOUGH, IS THAT IT IS IMPOSSIBLE TO POLISH MACHINED MIRR COATING SOFTNESS.

TO TEST THE OPTICAL STABILITY OF A DIAMOND-TURNED 6061 MIRROR PLATED WITH THE ALUMIPLATE PROCESS, THE GEMINI N

SPECTROMETER PROJECT TEAM CYCLED THE MIRROR THROUGH
CHANGE FROM 300 K TO 65 K. THE TEST MIRROR, THE PRIMARY MIR
SPECTROGRAPH OFFNER RELAY, IS 175 MM IN DIAMETER WITH A
RADIUS OF CURVATURE. THE MIRROR HAS A BICONCAVE SYMMET
REDUCE BIMETALLIC BENDING. AS PART OF THE MIRROR FABRICA
AN UPHILL-QUENCH TREATMENT FOLLOWS MACHINING TO RED
STRESS. THE MIRROR IS THEN PLATED WITH 125 MKM OF ALU
ALUMINUM OVER A FLASH COATING OF 2 MKM OF NICKEL TO
ADHESION.

THE RESULTS OF FIVE TEMPERATURE CYCLES FROM 300 K
INDICATE THAT THE OPTICAL SURFACE FIGURE OF THE MIRROR CH
0.05 WAVE RMS AFTER CYCLING. THIS IS EXCELLENT PERFORMA
CRYOGENIC OPTICS AND IS AMONG THE BEST OF THE TEST RESULTS
OPTICS THAT HAVE BEEN REPORTED." [14]

## ? *Comprehension Check*

**1. MAKE THE RIGHT CHOICE.**

1) SCIENTISTS HAVE BEEN FIGHTING THE BIMETALLIC DEFORMATION PROBLEM
   A) SINCE THE 1990S.
   B) SINCE THE 1970S.
   C) SINCE THE 1960S.

2) THE MIRROR HAS
   A) A CONCAVE SYMMETRIC SHAPE T REDUCE BIMETALLIC BENDING.
   B) A BICONCAVE SYMMETRIC SHAPE TO REDUCE BIMETALLIC BENDING.
   C) A CONVEX SYMMETRIC SHAPE TO REDUCE BIMETALLIC BENDING.

3) THE NICKEL PLATE ALSO HAS
   A) A DIFFERENT COEFFICIENT O EXPANSION THAN THE ALUMINUM SUBSTRATE.
   B) THE SAME COEFFICIENT OF THERMAL EXPANSION LIKE THE ALUMINUM SUBSTRATE.
   C) NOT GOT COEFFICIENT OF THERMAL EXPANSION.

4) THE TYPICAL DIAMOND-TURNED SURFACE FOR 6061-T ALUMINUM ALLOY
A) IS ABOUT 200 A RMS.
B) IS ABOUT 100 A RMS.
C) IS ABOUT 50 A RMS.

5) THE FEWER INCLUSIONS THERE ARE,
A) THE BETTER THE SURFACE F BE.
B) THE WORSE THE SURFACE FINISH SHO BE.
C) THE LONGER THE SURFACE FINISH SHO BE.

**2. READ THE FOLLOWING STATEMENTS AND AGREE OR DISAGR DON'T KNOW».**

1) THE HIGH THERMAL CONDUCTIVITY OF A METAL MIRROR C DECREASE COOLING TIME IN CRYOGENIC APPLICATIONS.
2) NICKEL ALSO MUST BE LAYERED ON THE SUBSTRATE FAIRLY T THICKNESS IS 75-125 MKM.
3) IF SOMEONE MANAGES TO REDUCE BIMETALLIC DEFORMATION STRESS IS STILL BEING ADDED TO THE SUBSTRATE.
4) A REAL OPTICS ISN'T ALWAYS MOUNTED.
5) IT IS POSSIBLE TO POLISH MACHINED MIRRORS DUE TO COATING S

3. **ANSWER THE FOLLOWING QUESTIONS.**

1) CAN PLATING DIAMOND-TURNED MIRRORS WITH ELECTROL FOLLOWED BY POLISHING, IMPROVE SURFACE FINISH AND SCATTERING?
2) WHAT PROBLEMS DO PLATING DIAMOND-TURNED MIRRORS WIT NICKEL ADD?
3) HOW CAN A COLD MIRROR ACT?
4) WHEN DID A NEW PLATING PROCESS COME UNDER REVI SPECTROGRAPH OPTIC DESIGNERS?
5) WHAT ADVANTAGES OF THE NEW PLATING PROCESS DO YOU KNO

4. **WRITE TEXT ANNOTATIONS (ABOUT 250 WORDS).**

## 🕮 *Working with Vocabulary and Grammar*

**5. FILL EACH GAP WITH THE RIGHT PREPOSITION.**

1) SINCE THE PROPERTIES ____ MANY SUBSTANCES ARE DEPEND
BOTH TEMPERATURE AND PRESSURE.
2) WATER IS CONVERTED ___ A SOLID, ICE, OR ___ A GAS, STEAM.
3) THE DEVELOPMENT ___ ANY NEW PRODUCT MUST BE BASE
KNOWLEDGE ___ THESE SUBSTANCES.
4) IT IS NECESSARY ONLY TO DIVIDE THE VELOCITY ____ THE FREQ
THE WAVE.
5) MASER OUTPUTS ARE REFERRED ___ ___ TERMS ___ THEIR FREQ
THEIR WAVELENGTH.

**5. TRANSLATE THE SENTENCES PAYING SPECIAL ATTENTION TO ITALICS.**

1) BEFORE THESE SPECIAL PROPERTIES OF LASER AND MASER EN
PROPERLY UNDERSTOOD, *one must* UNDERSTAND THE PROPERTIES O
ORDINARY LIGHT AND RADIANT ENERGY.
2) *One can* PRODUCE GALLIUM ARSENIDE.
3) THE CHOICES IN FABRICATING CRYOGENIC MIRROR FOR TH
SPECTROGRAPH *were to live* WITH THE SCATTERING OR ACCEPT THE I
DEFORMATION.
4) THE REMAINING PROBLEM *is to obtain* THE HIGHER CONCENTRATION O
ATOMS IN THE UPPER ENERGY LEVEL NECESSARY FOR AMPLIFICA
5) IF ENERGY PROPAGATION *is to be sustained* WITHIN THE WAVEGUIDE, TWO
MAJOR BOUNDARY CONDITIONS *must be fulfilled.*

**6. CHANGE THE FOLLOWING SENTENCES INTO THE PAST AND TH**

1) SUBLIMATION *can* EVEN *occur* IN METALS AND OTHER HARD SUBSTA
EXPOSED TO LASERS.
2) SOME EXTERNAL INFLUENCE *must be involved* IN PRODUCING A CHANGE OF
STATE.

3) YOU *can conclude* FROM THIS EXPLANATION THAT A RAY WILL TOWARD THE NORMAL WHEN ITS VELOCITY *is decreased.*
4) THE FREQUENCY OF THE SCINTILLATION *must be used* TO IDENTIFY THE PATH OR LOCATE THE SOURCE OF THE RADIATION.
5) THE DESIRED DEVIATION OF THE LIGHT BEAM *can be produced* EVEN TO THE EXTENT OF PRODUCING TOTAL REFLECTION.

**7. MATCH A STATEMENT WITH A SUITABLE ENDING AND TRANSL**

1) THE WAVELENGTH IS THE DISTANCE
2) A WAVEFRONT IS
6) THE MOST IMPORTANT PHENOMENA OF LIGHT ARE
4) THE POINT SOURCE IS
5) BRIGHTNESS OF LIGHT REPRESENTS

A) A SURFACE ON WHICH ARE MEASURED ALONG THE AXIS OF PROPAGATION IN PHASE.
THE POINT OF INTERSECTION OF LINES EXTENDED ALONG THE PATH OF RAYS.
B) THE DEGREE TO WHICH LIGHT IS PRESENT IN THE RADI ENERGY EMITTED BY THE SOURCE.
C) BETWEEN TWO POINTS OF E INTENSITY THAT ARE IN PHASE OF ADJACENT WAVES.
D) REFLECTION, REFRAC DISPERSION, INTERFERENCE, AND POLARIZATION.

***Discussing the text***

**8. DISCUSS THE FOLLOWING:**

1) NOT DEAL WORKS WELL;
2) HIGH-PURITY ALUMINUM ALLOYS OFTEN PRODUCE BETTER FI DIAMOND-TURNED;

3) SEVERAL SOLUTIONS HAVE BEEN SUGGESTED, RANGING FROM M
MIRRORS;
4) A NEW PLATING PROCESS CAME UNDER REVIEW BY SPECTROC
DESIGNERS;
5) THE MIRROR HAS A BICONCAVE SYMMETRIC SHAPE.

**9. PROVE THE FOLLOWING CHOOSING THE FACTS FROM THE TEX**

1) THE NICKEL PLATE HAS A DIFFERENT COEFFICIENT OF THERM
THAN THE ALUMINUM SUBSTRATE;
2) MANUFACTURING COSTS GROW;
3) THE POTENTIAL IMPROVEMENT IN SURFACE FIGURE OF THE DIA
COMPONENTS IS ANOTHER ADVANTAGE OF THE NEW PLATING PR
4) IT IS IMPOSSIBLE TO POLISH MACHINED MIRRORS DUE TO COATIN
5) THE OPTICAL SURFACE FIGURE OF THE MIRROR CHANGES LESS T
RMS AFTER CYCLING.

**10. GIVE SOME MORE INFORMATION TO THE FOLLOWING:**

1) A HISTORY IN INFRARED ASTRONOMICAL INSTRUMENTS.
2) THE TYPICAL DIAMOND-TURNED SURFACE FOR 6061-T ALUMINUM
3) THE PROCESS DEVELOPED BY ALUMIPLATE INC.;
4) THE RESULTS OF FIVE TEMPERATURE CYCLES;
5) A SUBSTRATE WITH A SIMILAR COEFFICIENT OF EXPANSION.

## PART 2

**READ THE TEXT.**

## TEXT B3.3

## DIFFRACTIVE OPTICS BEND, SHAPE, AND FILTER X-RAY LIGHT

“DESIGNERS OF INSTRUMENTS BASED ON INFRARED, VISIBLE, AN
LIGHT USE CLASSICAL OPTICS SUCH AS LENSES, FILTERS, AND GRA
LIGHT BEAMS. OPTICAL COMPONENTS TO MONOCHROMATIZE AND

OR COLLIMATE A LIGHT BEAM ARE READILY AVAILABLE, BUT MAN
BEAM HAS PROVEN MORE DIFFICULT.

X-RAY INSTRUMENTATION DESIGNERS HAVE LIMITED OPTION GRATINGS, OR MULTILAYER-COATED OPTICS CAN BE USED TO DIFF RAY ENERGY BAND REQUIRED FOR THE APPLICATION. THIN FOILS IN TRANSMISSION ARE AVAILABLE TO FILTER LOWER-ENERGY X-R X-RAY BEAM REQUIRES APERTURES TO BLOCK PORTIONS OF THE B THAT WORK ON THE PRINCIPLE OF TOTAL EXTERNAL REFLECTION OPTICAL COMPONENTS INTRODUCES A SIGNIFICANT INTENSITY DESIRED X-RAY ENERGY. CREATING A FOCUSED OR COLLIMATED M BEAM BY COMBINING X-RAY OPTICAL COMPONENTS RESULTS IN INTENSITY THAT THE INSTRUMENT IS OFTEN RENDERED USELESS.

OSMIC (TROY, MI), A SUPPLIER OF MULTILAYER-COATED X-RA ASSEMBLIES, HAS DEVELOPED DIFFRACTIVE OPTICS FOR COLL FOCUSING X-RAY BEAMS TO ADDRESS THE NEEDS OF X-RAY DESIGNERS AND USERS. THESE OPTICS - MAX-FLUX OPTICS AND MAX-FLUX OPTICS – COMBINE ADVANCED MULTILAYER TECHNOL CLASSICAL OPTIC DESIGN AND ARE CURRENTLY IN USE IN POWDERD PROTEIN CRYSTALLOGRAPHY, HIGH-RESOLUTION DIFFRACTION, SM SCATTERING, TOTAL-REFLECTION X-RAY FLUORESCENCE SPECTRO SEVERAL OTHER X-RAY APPLICATIONS. X-RAY OPTICS ARE ALSO DEVELOPMENT FORSELECT MEDICAL APPLICATIONS.

CLASSICAL REFLECTIVE OPTICS DESIGNED TO COLLIMATE OR HAVE EXISTED FOR DECADES. FOR A DIVERGENT BEAM OF LIGHT, R COLLIMATING OPTICS ARE PARABOLIC WHILE FOCUSING OPTICS ARE FIGURE. IN EITHER DESIGN THE ANGLE Q OF A RAY OF LIGHT INCIDEN SURFACE VARIES ACROSS THE LENGTH OF THE OPTIC. FOR VISIBLE LIGHT AN IMPORTANT CONSIDERATION. HOWEVER, IT IS A CRITICAL CON WHEN ONE IS DESIGNING OR USING X-RAY DIFFRACTIVE OPTICS THAT W DESIRED WAVELENGTH Q ACCORDING TO BRAGG'S LAW

NL =2D SINQ

WHERE L IS THE X-RAY WAVELENGTH, D IS THE D-SPACING OF A C MULTILAYER-COATED OPTICS, AND Q IS THE INCIDENT ANGLE.

X-RAY DIFFRACTIVE OPTICS SUCH AS CRYSTALS OR SOAP FILMS W D-SPACINGS CANNOT BE MADE TO FUNCTION WHEN CURVED TO EITHE OR ELLIPTICAL OPTICAL FIGURES.

HISTORICALLY, THE RAY ANALOG OF CLASSICAL REFLECTIVE O TOTAL-REFLECTION MIRRORS, NOT DIFFRACTIVE OPTICS. BUT REFLECTION MIRRORS SUFFER FROM THE PHYSICAL LIMITATION ACCEPTANCE ANGLE AND A VERY BROAD ENERGY BANDPASS. ACHIEVING A HIGH-INTENSITY MONOCHROMATIC BEAM HAS BEEN IMPOSSIBLE.

MULTILAYER-COATED X-RAY OPTICS, COMMONLY CALLED M CONSISTS OF ALTERNATING LAYERS OF A REFLECTIVE MATERIAL MATERIAL. THEY FUNCTION ON THE PRINCIPLE OF DIFFRACTION. TH REGIONS OF HIGH ELECTRON DENSITY AND LOW ELECTRON DENSIT STRUCTURE OF A NATURAL CRYSTAL.

X-RAY MULTILAYER OPTICS ARE CREATED USING THIN-FILM S TECHNIQUE USED IN PRODUCTION OF SEMICONDUCTOR DEVIC LUBRICANT COATINGS, WEAR-RESISTANT COATINGS, AND OTH COATINGS. OSMIC HAS WORKED WITH PLD ADVANCED AUTO SYSTEMS (PLDAAS; ORLANDO, FL) TO DESIGN AND BUILD A MUL THIN-FILM SPUTTERING SYSTEM WITH CAPACITY TO COAT MA MULTILAYER OPTICS. THE FULLY AUTOMATED "TURNKEY" H PRODUCTION EQUIPMENT DESIGNED, ENGINEERED, AND FABR PLDAAS IS USED IN OSMIC'' MANUFACTURING PROCESS, WHICH IN COATING OPTICS UNDER VACUUM WITH SPECIAL PROPRIETAR MATERIALS.

A VARIANT ON THE UNIFORM MULTILAYER IS THE LATERA MULTILAYER COATING. BECAUSE THE INCIDENT ANGLE OF A DIVE X-RAYS ONTO A PARABOLIC OR ELLIPTICAL SURFACE CHANGES POINT ALONG THE LENGTH OF THE MIRROR, A UNIFORM MULTI WOULD NOT REFLECT THE SAME WAVELENGTH FOR THE ENTIR GRADING THE MULTILAYER'S D-SPACING IN ACCORDANCE WITH A CURVE ALONG THE MIRROR'S LENGTH, THE OPTICS CAN COLLECT ANGLE FROM AN X-RAY SOURCE WHILE SIMULTANEOUSLY RENDE MONOCHROMATIC. IN MOST APPLICATIONS, THE SOLID ANGLE CAP OPTICS RANGES FROM 2 TO 50 TIMES THAT OF TRADITIONAL X-RAY THE SOLID ANGLE CAPTURED CAN BE SEVERAL ORDERS OF MAGNIT THAT OF SPECIFIC X-RAY OPTICS, THE CAPTURE ANGLE REMAINS THAN THAT OF VISIBLE-LIGHT OPTICS.

A GRADED MULTILAYER IS NOT THE ONLY REQUIREMENT TO
DESIGN GOALS OF MOST X-RAY APPLICATIONS. ALSO IMPORTA
MANUFACTURE OF USEFUL OPTICS FOR A REASONABLE PRICE
TECHNOLOGY FOR BENDING, GLUEING, AND ALIGNING HIGH-PREC
OSMIC'S PROPRIETARY TECHNOLOGY ALLOWS MULTILAYER MIRR
AND GLUED TO ANY PRACTICAL FIGURED SURFACE TO CREATE A
WITH VERY PRECISE OPTICAL FIGURE. EVEN THE ENDS OF THE MIRRO
FLATTENING, A CONDITION THAT SEEMED TO BE UNAVOIDABLE WI
EXISTING TECHNOLOGIES.

APPLICATIONS FOR MULTILAYER COLLIMATING AND FOCUSIN
OPTICS INCLUDE BIOTECHNOLOGY, THIN-FILM ANALYSIS, AND MIC
SOURCES AND SYNCHROTRONS. IN THE CASE OF THE COLLIMATIN
COULD APPLY THESE IN INVERSE DIRECTION TO FOCUS A PARALLE
THE COLLIMATING AND FOCUSING OPTICS PROVIDE INCREASED IN
CONVENTIONAL X-RAY OPTICS. IN CASE OF THE FOCUSING OPTIC
DENSITY AT THE LOCAL POINT IS ALSO SIGNIFICANTLY INCREASED.

FOR EXAMPLE, EXPERIMENTAL RESULTS OBTAINED A
BIOMACROMOLECULAR CRYSTALLOGRAPHY FACILITY AT MIC
UNIVERSITY (LANSING, MI) INDICATE A FLUX GAIN FACTOR OF FIVE
CONVENTIONAL TOTAL-REFLECTION OPTICS USED IN MAC
CRYSTALLOGRAPHY. THIS TRANSLATES INTO A HUGE SAVINGS
REQUIRED FOR DATA COLLECTION, WHICH PREVIOUSLY COULD REQ
DAYS. MACROMOLECULE CRYSTALLOGRAPHY IS THE STUDY O
STRUCTURE OF PROTEINS, NUCLEIC ACIDS, AND OTHER BIOLOGIC
STRUCTURAL BIOLOGISTS AND BIOMEDICAL RESEARCHERS EMP
DIFFRACTION TECHNIQUE TO BETTER UNDERSTAND HOW VIRUSES
PHARMACEUTICALS INTERACT WITHIN THE HUMAN BODY." [15]

## ? *Comprehension Check*

### 1. MAKE THE RIGHT CHOICE.

1) HISTORICALLY, THE RAY ANALOG OF CLASSICAL REFLECTIVE OPTICS HAS BEEN
   A) DIFFRACTIVE OPTICS.
   B) TOTAL-REFLECTION MIRR
   C) TOTAL-REFLECTION MIRRORS AND DIFFRACTIVE OPTICS.

2) THE SOLID ANGLE CAPTURED OPTICS RANGES
A) FROM 2 TO 50 TIMES THAT TRADITIONAL X-RAY OPTICS.
B) FROM 2 TO 5 TIMES THAT OF TRADITIONAL X-RAY OPTICS.
C) FROM 10 TO 500 TIMES THAT OF TRADITIONAL X-RAY OPTICS.

3) MACROMOLECULE CRYSTALLOGRAPHY IS THE STUDY OF
A) DIFFERENT BIOLOGICAL
B) THE ATOMIC STRUCTURE OF PR NUCLEIC ACIDS, AND OTHER BIOLOGICA SUBSTANCES.
C) THE ATOMIC STRUCTURE OF NUCLEIC ACIDS.

4) WHILE THE SOLID ANGLE CAPTURED CAN BE SEVERAL ORDERS OF MAGNITUDE LARGER THAN THAT OF SPECIFIC X-RAY OPTICS,
A) THE CAPTURE ANGLE REMA LOWER THAN THAT OF VIS OPTICS.
B) THE CAPTURE ANGLE REMAINS VISIBLE-LIGHT OPTICS.
C) THE CAPTURE ANGLE REMAINS MUCH LARGER THAN THAT OF VISIBLE-LIGHT OPTICS.

5) EXPERIMENTAL RESULTS INDICATE A FLUX GAIN FACTOR
A) OF SEVEN TIMES OVER CO TOTAL-REFLECTION OPTICS US MACROMOLECULE CRYSTALLOGRAPHY.
B) OF FIVE TIMES OVER CONVENTIONAL TOTAL-REFLECTION OPTICS USED IN MACROMOLECULE CRYSTALLOGRAPHY
C) OF TWO TIMES OVER CONVENTIONAL TOTAL-REFLECTION OPTICS USED IN MACROMOLECULE CRYSTALLOGRAPHY.

**2. READ THE FOLLOWING STATEMENTS AND AGREE OR DISAGR DON'T KNOW».**

1) X-RAY OPTICS ARE ALSO UNDER DEVELOPMENT FOR SELEC APPLICATIONS.

2) REFLECTIVE COLLIMATING OPTICS ARE ELLIPTICAL WHILE FOCU
PARABOLIC IN FIGURE.
3) X-RAY DIFFRACTIVE OPTICS SUCH AS CRYSTALS OR SOAP FILMS
SPACINGS CAN BE MADE TO FUNCTION WHEN CURVED TO EITH
OR ELLIPTICAL OPTICAL FIGURES.
4) THE ALTERNATING REGIONS OF HIGH ELECTRON DENSITY AND
DENSITY SIMULATE THE STRUCTURE OF A NATURAL CRYSTAL.
5) A GRADED MULTILAYER IS THE ONLY REQUIREMENT TO ACHIEV
GOALS OF MOST X-RAY APPLICATIONS.

3. **ANSWER THE FOLLOWING QUESTIONS.**

1) WHAT CLASSICAL OPTICS DO DESIGNERS OF INSTRUMENTS BASE
VISIBLE, AND ULTRAVIOLET LIGHT USE?
2) DOES MULTILAYER-COATED X-RAY OPTICS CONSIST OF ALTERNA
OF A REFLECTIVE MATERIAL AND A “SPACER” MATERIAL?
3) CAN THE OPTICS COLLECT A LARGE SOLID ANGLE FROM AN X-RA
4) THE CAPTURE ANGLE REMAINS MUCH LOWER THAN THAT OF
OPTICS, DOESN’T IT?
5) WHAT DOES OSMIC’S PROPRIETARY TECHNOLOGY ALLOW
MIRRORS?

**4. WRITE A TEXT ANALYSIS.**

5. **MAKE UP A TOPIC ON "THE DIFFRACTIVE OPTICS".**

## *Working with Vocabulary and Grammar*

**6. PUT THE WORDS BELOW IN THE RIGHT COLUMN ACCORDING TO THEIR PARTS OF SPEECH:**

EXPERIMENTAL, DIFFRACTIVE, PREVIOUSLY, MUL
SIMULTANEOUSLY,MONOCHROMATIC, INTENSITY, INVISIBLE,
ARGUMENT.

| NOUN | ADJECTIVE | ADVERB |
|---|---|---|
| | | |

**7. TRANSLATE THE SENTENCES PAYING SPECIAL ATTENTION TO ITALICS.**

1) MODERN THEORY CONSIDERS LIGHT, *both* VISIBLE *and* INVISIBLE, *as* CONSISTING OF QUANTA OF ENERGY *that* MOVE *as* IF GUIDED BY WAVES.
2) THE RADAR BEAM IS NARROWED *so that both* THE INCIDENT *and* REFLECTED BEAMS TRAVEL THROUGH A NARROW ZONE.
3) POLARIZER SHEETS ARE ORIENTED ON *both* SIDES OF THE DISPLAY.
4) *Both* THEORY *and* EXPERIMENT HAVE SHOWN THAT LONGITUDINAL CANNOT BE POLARIZED.
5) *Both* OF THESE ARGUMENTS WERE EQUALLY VALID AT *that* TIME.
6) SINCE THE ELECTRON IN THE HYDROGEN ATOM HAS *both* MASS *and* MOTION, IT CONTAINS TWO TYPES OF ENERGY.

**6. MATCH A STATEMENT WITH A SUITABLE ENDING AND TRANSL**

| | |
|---|---|
| 1) THE CRITICAL ANGLE OF INCIDENCE IS | EMISSION, ABSORPTION, SPECTRA. |
| 2) THE SPECTRUM IS COMPOSED OF | BASICALLY SYSTEMS OF LE |
| 3) SPECTRA ARE OFTEN CLASSIFIED INTO THREE GENERAL TYPES: | THE VARIOUS COLOURS THE INCIDENT LIGHT CONV INDIVIDUAL POINTS ALONG THE PRINCIPAL AXIS OF THE LENS. |
| 4) SUCH OPTICAL INSTRUMENTS AS EYE-GLASSES, CAMERAS, MICROSCOPES, AND TELESCOPES ARE | HUNDREDS OF HUES WH GROUPED BROADLY INTO PRINCIPAL COLOURS. |
| 5) CHROMATIC ABERRATION OCCURS WHEN | THE MAXIMUM ANGLE A THE RAY OF LIGHT STRIKING THE SURFACE OF A MEDIUM PASSES THROUGH IT. |

***Discussing the text***

**7. DISCUSS THE FOLLOWING:**

1) MANAGING AN X-RAY BEAM HAS PROVEN MORE DIFFICULT;
2) THE INSTRUMENT IS OFTEN RENDERED USELESS;
3) ACHIEVING A HIGH-INTENSITY MONOCHROMATIC BEAM H PRACTICALLY IMPOSSIBLE;
4) A VARIANT ON THE UNIFORM MULTILAYER IS THE LATER MULTILAYER COATING;
5) A GRADED MULTILAYER IS NOT THE ONLY REQUIREMENT TO DESIGN GOALS OF MOST X-RAY APPLICATIONS.

**8. PROVE THE FOLLOWING CHOOSING THE FACTS FROM THE TEX**

1) X-RAY INSTRUMENTATION DESIGNERS HAVE LIMITED OPTIONS;
2) A VARIANT ON THE UNIFORM MULTILAYER IS THE LATER MULTILAYER COATING;
3) X-RAY MULTILAYER OPTICS ARE CREATED USING THIN-FILM SPU

**9. GIVE SOME MORE INFORMATION TO THE FOLLOWING:**

1) MULTILAYER-COATED X-RAY OPTICS;
2) CLASSICAL REFLECTIVE OPTICS;
3) THE RAY ANALOG OF CLASSICAL REFLECTIVE OPTICS;
4) THE PRINCIPLE OF DIFFRACTION;
5) X-RAY INSTRUMENTATION DESIGNERS.

# UNIT 4.3

## PART 1

**READ THE TEXT.**

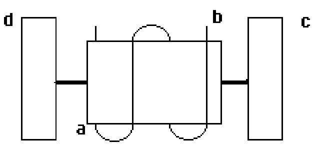
## TEXT A4.3

## THE RUBY LASER

IN HIS OWN BOOK CLAYTON L. HALLMARK SAYS: "IN ITS SIMPLEST RUBY LASER IS SHOWN IN FIG. 1. THE RUBY (ALUMINUM OXIDE) PL CHROMIUM ATOMS (0.05%) SPARSELY LOCATED THROUGHOUT THE OXIDE IS THE MATERIAL MOST COMMONLY USED. THE HEART OF T THE CYLINDRICAL RUBY CRYSTAL (A), AROUND WHICH IS THE HEL (B). MIRRORS AT EACH AND (C AND D) REFLECT THE LIGHT BAC THROUGH THE CRYSTAL, AND THE LASER BEAM EMERGES THROU MIRRORS WHICH IS ONLY PARTLY SILVERED.

THE HELICAL FLASH TUBE IS DEVICE FOR PRODUCING VERY IN THE RUBY ABSORBS ENERGY FROM THE FLASH TUBE, AND IN A VE (THOUSANDTHS OF A SECOND) EMITS IT, SOME ENERGY IN THE FO AND THE REST AS HEAT.

A SMALL PART OF THE LIGHT ENERGY PRODUCED BY THE RUBY C RED BEAMS TRAVELLING PARALLEL TO ITS AXIS. THIS ENERGY IS R




A RUBY CRYSTAL
B HELICAL FLASH TUBE
C MIRROR
D MIRROR

**FIG. 1.SIMPLE RUBY LASER.**

THERE IS FOURTH BY THE MIRRORS SO THAT IT PASSES THROUG MANY TIMES. AS IT PASSES, IT IS AMPLIFIED; THAT IS, IT PICKS ENERGY FROM THE RUBY. THIS ENERGY TRAVELS IN THE FORM ALONG THE BEAM AS THE INTENSITY CONTINUES TO BUILD.

LIGHT WAVES CONSIST OF ALL ELECTROMAGNETIC WAVES BE AND 7000 ANGSTROM UNITS IN WAVELENGTH. AN ANGSTROM UNIT, THE SYMBOL Å, IS $10^{8}$ CM. THE SHORTER 4000 Å WAVES PRODUCE THE VIOLET COLOUR, THE 7000 Å WAVES ARE THOSE OF RED LIGHT, AND THE WAVE CORRESPOND TO OTHER COLOURS OF THE VISUAL SPECTRUM. THE PRESENTED HERE OPERATES IN THE RANGE 6943 Å, WHICH ACCOUNTS FOR T CHARACTERISTIC RED FLUORESCENCE.

SINCE THE ESSENTIAL PROPERTY OF A GAS IS THAT THE CON NOT INTERACT WITH ONE ANOTHER, A LIGHTLY DOPED (MUCH L CRYSTAL IS ESSENTIALLY A GAS OF DOPANT ATOMS IN A RA CONTAINER. THEIR ENERGY LEVELS ARE MODIFIED BY THE PRESEN MATERIAL. A SIMPLIFIED ENERGY LEVEL DIAGRAM OF THE CHROM RUBY CRYSTAL IS SHOWN IN FIG. 2. THE INTERMEDIATE LEV METASTABLE WITH A LIFETIME OF APPROXIMATELY $10^{3}$ SECOND.

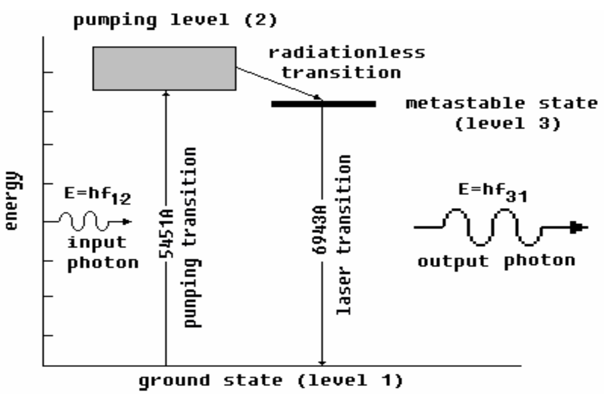



**FIG. 2. THREE LEVELS OF CHROMIUM ION IN RUBY ROD (ASSOCI PUMPING AND LASER ACTION).**

BY EXAMINATION OF FIG. 2, YOU CAN SEE THAT A PUMPING I
FREQUENCY $f_{12}$ CAUSES A TRANSITION BETWEEN LEVELS 1 AND 2. THE A
THE EXCITED (2) STATE CAN RETURN TO THE GROUND STATE SI
EITHER DIRECTLY OR BY FIRST STOPPING AT THE METASTABLE STA
LIFETIME OF THE METASTABLE STATE IS 100000 TIMES LONGER T
STATE 2, THE ATOMS WHICH FALL THERE CAN BE CONSIDERED ALM
THE RATE AT WHICH ATOMS FIND THEMSELVES IN STATE 3 IS PRO
THE RATE AT WHICH THEY ARRIVE IN STATE 2, WHICH, IN TURN, IS
TO THE PUMPING POWER AND INDEPENDENT OF THE POPULATION.
PUMPING POWER IS SUPPLIED, THE POPULATION OF STATE 3 GRO
EXPENSE OF STATE 1 AND POPULATION INVERSION IS OBTAINED.

AS LONG AS THE POPULATION IS INVERTED, THE RUBY CA
AMPLIFIER FOR RADIATION OF FREQUENCY $f_{31}$. AND, WITH ANY AMPLIFIER,
ADDING A POSITIVE FEEDBACK LOOP CAN CAUSE SUSTAINED OSCIL
CASE, THE POSITIVE FEEDBACK IS THE RETURN OF SOME OF THE OU $f_{31}$
RADIATION) INTO THE RUBY. THIS CAN EASILY BE ACCOMPLISHED W
BY MAKING USE OF THE GEOMETRY OF THE MIRRORS SO THE F
DIRECTIONAL, A RESONANT CAVITY IS FORMED. THE AMPLIFIE
REFERRED TO AS PHOTON AMPLIFICATION, BUILDS UP IN A STA
PATTERN THAT IS FAMILIAR TO YOU FROM YOUR STUDY OF MICROW

THE RESONANT CAVITY FORMED IN THE CRYSTAL ITSELF IS M
BY CAREFULLY GRINDING AND POLISHING THE RUBY, THEN SILVE
BECAUSE OF THE SHORTNESS OF OPTICAL WAVELENGTHS, A
DIFFERENCE EXISTS BETWEEN THE CRYSTAL CAVITY AND THE I
MICROWAVE CAVITY. CALCULATING THE WAVELENGTH FROM TH
DIAGRAM, THE WAVELENGTH CORRESPONDING TO $f_{31}$ RADIATION IS FOUND TO BE
6943 ANGSTROMS IN VACUUM. A RUBY GROUND TO FORM A CA
CENTIMETERS LONG (A TYPICAL SIZE) HAS 100000 NODES IN THE
WAVE, AND IS RESONANT FOR EVERY FREQUENCY THAT SATISFIE
WAVE CONDITION $f_0 = n\lambda/2$, WHERE $\lambda$ IS THE WAVELENGTH AND $n$ IS AN
INTEGER. FOR EXAMPLE, TAKING $n = 10^5$, THE DIFFERENCE BETWEEN RESONA
WAVELENGTH, $\Delta\lambda$, IS GIVEN BY $(\Delta\lambda/\lambda) = (\Delta f/f) = 1/n = 10^{5}$. THE CAVITY IS
RESONANT FOR LARGE NUMBER OF FREQUENCIES IMMEDIATELY $f_{31}$,
INSTEAD OF BEING RESONANT FOR ONLY ONE PARTICULAR FREQU
MICROWAVE CASE.

THE PUMPING POWER REQUIRED TO OBTAIN POPULATION INVE REASONABLY SIZED CRYSTAL IS CONSIDERABLE. THIS POPULATION BE ACCOMPLISHED ONLY IN BRIEF BURSTS OF LIGHT FROM A FLAS THE OPERATING TIME OF THE RUBY LASER IS LIMITED TO A MILLISECONDS. SECOND, WHILE THE RUBY IS OPERATING AS A METASTABLE STAGE IS BEING DEPOPULATED BY STIMULATED E VERY QUICKLY (IN $10^{5}$ SECOND) OUTRUNS THE PUMP. THIS CAUSES L ACTION TO STOP UNTIL THE PUMP CAN AGAIN CREATE A POPULAT THE OUTPUT OF A RUBY LASER IS COMPOSED OF A SERIES OF SPACED ABOUT $10^{6}$ SECOND IN DURATION, IN AN ENVELOPE DEFINED PUMP LAMP DURATION.

FINALLY, CONSIDER THE OVERALL EFFICIENCY OF THE RU FORMING A PERCENTAGE FROM THE RATIO OF TOTAL OUTPUT ENERGY TO THE ELECTRICAL ENERGY SUPPLIED TO THE PUMP. THIS LESS THAN 1% WITH MOST OF THE LOST ENERGY DISSIPATED IN RUBY CRYSTAL. THIS MAKES COOLING THE CRYSTAL AN IMPOR CONSIDERATION.” [16]

## ? *Comprehension Check*

### 1. MAKE THE RIGHT CHOICE.

1) THE LASER BEAM EMERGES THROUGH
A) ONE OF THE MIRRORS WHICH ONLY PARTLY SILVERED.
B) THE CYLINDRICAL RUBY CRYSTAL.
C) THE HELICAL FLASH TUBE.

2) THE HELICAL FLASH TUBE IS DEVICE FOR
A) PRODUCING A FEW CH ATOMS.
B) PRODUCING A SMALL PART OF TH ENERGY.
C) PRODUCING VERY INTENSE LIGHT.

3) THE HEART OF THE DEVICE IS
A) THE HELICAL FLASH TUBE (B
B) MIRRORS AT EACH AND (C AND D)
C) THE CYLINDRICAL RUBY CRYSTAL (A)

4) THE WAVELENGTH CORRESPONDING TO $f_{31}$ RADIATION IS FOUND TO BE
A) 6943 ANGSTROMS IN VACUU
B) 3543 ANGSTROMS IN VACUUM.
C) 1050 ANGSTROMS IN VACUUM.

6) THE INTERMEDIATE LEVEL (3) IS METASTABLE WITH A LIFETIME OF APPROXIMATELY
A) $10^{-6}$ SECOND.
B) $10^{-3}$ SECOND.
C) $10^{-8}$ SECOND

**2. READ THE FOLLOWING STATEMENTS AND AGREE OR DISAG**
**«I DON'T KNOW».**

1) IF SUFFICIENT PUMPING POWER IS SUPPLIED, POPULATION INVERSION ISN
OBTAINED.
2) THE RATE AT WHICH ATOMS FIND THEMSELVES IN STATE 3 IS PRO
THE RATE AT WHICH THEY ARRIVE IN STATE 2.
3) THE SHORTER 4000 Å WAVES PRODUCE THE RED COLOUR.
4) THE CAVITY IS RESONANT FOR LARGE NUMBER OF FREQUENCIES
AROUND $f_{31}$.
5) CONSIDER THE OVERALL EFFICIENCY OF THE RUBY LASER BY
PERCENTAGE FROM THE RATIO OF TOTAL OUTPUT OF LASER LIG
ELECTRICAL ENERGY SUPPLIED TO THE PUMP.

3. **ANSWER THE FOLLOWING QUESTIONS.**

1) WHAT IS THE HEART OF THE DEVICE (RUBY LASER)?
2) HOW DO MIRRORS REFLECT THE LIGHT?
5) WHAT DEVICE IS THE HELICAL FLASH TUBE?
6) WHAT COLOUR DO WAVES PRODUCE?
7) IS THE POSITIVE FEEDBACK THE RETURN OF SOME OF THE OUTPU ($f_{31}$
RADIATION) INTO THE RUBY?

4. **WRITE TEXT ANNOTATIONS (ABOUT 150 WORDS).**

**5. ADD TEXT ANNOTATIONS TO FIGURES 1 AND 2.**

📖 ***Working with Vocabulary and Grammar***

6. **PUT THE WORDS BELOW IN THE RIGHT COLUMN ACCORDING PARTS OF SPEECH:**

POPULATION, ESSENTIAL, EXAMINATION, POSITIVE, CAREFULL IMMEDIATELY, INDEPENDENT, APPROXIMATELY.

| NOUN | ADJECTIVE | ADVERB |
|---|---|---|
| | | |

7. **TRANSLATE THE SENTENCES PAYING SPECIAL ATTENTION T IN ITALICS.**

1) THE COLOURS APPEAR *in the order of* INCREASING DEVIATION FROM RED VIOLET.
2) *In order to* RESONATE, THE CAVITY MAKES USE OF THE DIST INDUCTANCE AND CAPACITANCE OF THE ENCLOSING BOX.
3) TYPICAL PRF RATES HAVE BEEN *on the order of* SEVERAL PULSES PER MINUTE.
4) THE EFFECTIVE HEIGHT OF THE IONOSPHERE IS *of the order of* 90 KM.
5) AT FREQUENCIES ABOVE THE OPERATING RANGES, HIGH *order* TRANSMISSION LINE MODES ARE PRESENT AND OTHER WAVE IMP PRESENT.

**8. OPEN THE BRACKETS TO MAKE THE SENTENCES COMPLETE**

1) THE CONTINUOUSLY OPERATING GAS LASER *(to develop)* IN 1961.
2) THE ELEMENTS IN THE FAR-RIGHT GROUP *(to call)* THE INERT GASES.
3) RADIO WAVES USUALLY *(refer)* TO IN TERMS OF THEIR FREQUENCY.
4) THE SCREEN *(to move)* ALONG THE FLUX PART BETWEEN THE TWO SOU UNTIL THE SAME DEGREE OF ILLUMINATION *(to observe)* ON BOTH SIDES.
5) THE DISTANCES FROM THE LAMPS TO THEIR RESPECTIVE SIDES O THEN *(to measure)*.

**7. MATCH A STATEMENT WITH A SUITABLE ENDING AND TRANSL**

| | |
|---|---|
| 1) THE RUBY PLUS A FEW CHROMIUM ATOMS (0.05%) SPARSELY LOCATED THROUGHOUT THE ALUMINUM OXIDE IS | BY THE PRESENCE OF THE MATERIAL. |

| | |
|---|---|
| 2) A SMALL PART OF THE LIGHT ENERGY PRODUCED BY THE RUBY CONSISTS OF | THE POPULATION OF ST AT THE EXPENSE OF STA POPULATION INVERSION IS OBTAINED. |
| 3) THEIR ENERGY LEVELS ARE MODIFIED | THE RED BEAMS TRAVEI PARALLEL TO ITS AXIS. |
| 4) IF SUFFICIENT PUMPING POWER IS SUPPLIED, | IN BRIEF BURSTS OF LIGHT FLASH LAMP. |
| 5) THIS POPULATION INVERSION CAN BE ACCOMPLISHED ONLY | THE MATERIAL MOST COM USED. |

## *Discussing the text*

**8. DISCUSS THE FOLLOWING:**

1) AN ESSENTIAL DIFFERENCE EXISTS BETWEEN THE CRYSTAL CA MORE FAMILIAR MICROWAVE CAVITY;
2) THE ATOMS WHICH FALL TO THE METASTABLE STATE CAN B ALMOST STATIONARY;
3) POPULATION INVERSION CAN BE ACCOMPLISHED ONLY IN BRIE LIGHT FROM A FLASH LAMP;
4) WHILE THE RUBY IS OPERATING AS A LASER, THE METASTABLE S DEPOPULATED BY STIMULATED EMISSION, AND VERY $^{5}$ QUICKL SECOND) OUTRUNS THE PUMP;
5) THE HEART OF THE DEVICE IS THE CYLINDRICAL RUBY CRYSTAL.

**9. PROVE THE FOLLOWING CHOOSING THE FACTS FROM THE TEX**

1) THE WAVELENGTHS CORRESPOND TO OTHER COLOURS OF THE VI
2) THE OPERATING TIME OF THE RUBY LASER IS LIMITED TO A MILLISECONDS;
3) A POSITIVE FEEDBACK LOOP CAN CAUSE SUSTAINED OSCILLATIO
4) THE INTERMEDIATE LEVEL (3) IS METASTABLE;
5) LIGHT WAVES CONSIST OF ALL ELECTROMAGNETIC WAVES BETW 7000 ANGSTROM UNITS IN WAVELENGTH.

**10. GIVE SOME MORE INFORMATION TO THE FOLLOWING:**

1) THE SIMPLEST FORM OF THE RUBY LASER;
2) THE ATOMS IN THE EXCITED STATE;
3) THE AMPLIFIER RADIATION;
4) THE HOST MATERIAL;
5) THE OUTPUT OF A RUBY LASER.

## PART 2

**READ THE TEXT.**

## TEXT B4.3

# EXCITATION OF WAVEGUIDES

CLAYTON L. HALLMARK WROTE: “AS WITH ANY TRANSMISSION WAVEGUIDE MUST BE PROPERLY EXCITED OR FED IN ORDER TO CA FROM ONE POINT TO ANOTHER. WAVEGUIDES, HOWEVER, DO NOT H CONVENIENT CONNECTION POINTS POSSESSED BY THE CONVENTIO IN WAVEGUIDES, THE ENERGY IS IN THE FORM OF AN ELECTROMA THEREFORE, THE EXCITATION DEVICE MUST CAUSE THESE FIELDS WITHIN THE GUIDE. IN MASERS, THE EXCITATION DEVICE IS ACTUA GUIDE. IN CONVENTIONAL MICROWAVE SYSTEMS, OTHER TECHNIQUES ARE USED. THESE SAME TECHNIQUES ARE ALSO U EXTRACTION OF ENERGY FROM THE WAVEGUIDE – IN BOTH MASERS AND CONVENTIONAL MICROWAVES. THE TECHNIQUES USE ELECTRIC FIELDS, MAG FIELDS, OR ELECTROMAGNETIC FIELDS.

INSERTING A SMALL PROBE OR ANTENNA INTO A WAVEGUIDE APPLYING AN RF SIGNAL CAUSES CURRENT TO FLOW IN THE PROBE. THIS CUR SETS UP AN ELECTROSTATIC FIELD; E-LINES DETACH THEMSELVES FROM TH AND PROPAGATE IN THE WAVEGUIDE. THE PROPAGATING E-LINES ESTA CORRESPONDING H-LINES AND RESULT IN THE FORMATION OF A COMP ELECTROMAGNETIC FIELD WITHIN THE WAVEGUIDE. IF THE PROBE IS POS IN THE PROPER LOCATION AND SUPPLIED THE PROPER SIGNAL WAVEGUIDE

A FIELD HAVING CONSIDERABLE INTENSITY CAN BE ESTABL MAINTAINED.

THE BEST PLACE TO LOCATE THE PROBE IS IN THE CENTER O DIMENSION, PARALLEL TO THE NARROW DIMENSION, AND O WAVELENGTH AWAY FROM THE SHORTED END OF THE GUIDE. THIS OF MAXIMUM COUPLING BETWEEN THE PROBE AND THE FIELD.

THE PROBE WILL WORK EQUALLY WELL AT ANY POINT WHE EXIST WITH MAXIMUM INTENSITY (FOR EXAMPLE, A THRE WAVELENGTH DISTANCE FROM THE SHORTED END).

USUALLY THE PROBE IS FED WITH A COAXIAL CABLE. THIS CA SHORT TO DERIVE THE GREATEST BENEFIT FROM THE WAVEGUID MATCHING BETWEEN THE CABLE AND THE WAVEGUIDE IS ACCO VARYING THE DISTANCE OF THE PROBE FROM THE END OF THE W MOVING THE SHORTED END) OR BY VARYING THE LENGTH OF TH MISMATCH WILL CAUSE UNWANTED REFLECTIONS WITHIN THE WA

THE DEGREE OF EXCITATION CAN BE REDUCED BY REDUCING OF THE PROBE, MOVING IT OUT FROM THE CENTER OF THE E-FIELD, IT. WHERE IT WILL BE NECESSARY TO VARY THE DEGREE OF FREQUENTLY, THE PROBE IS MADE RETRACTABLE, AND THE WAVEGUIDE IS FITTED WITH A MOVABLE PLUNGER. SOMETIMES IT TO EXCITE A WAVEGUIDE WITH A WIDE BAND OF FREQUENCIES. IN A WIDEBAND PROBE IS USED. THIS KIND OF PROBE IS LARGE IN DIA IS CONICAL OR DOORKNOB SHAPED. A CONICAL PROBE IS CAPABLE MODERATE AMOUNTS OF POWER, BUT FOR HIGH-POWER SITUATIO PROBES ARE USED.

THE SAME TYPES OF PROBES ARE USED TO TAKE ENERGY WAVEGUIDE AND DELIVER IT TO COAXIAL CABLES.

ANOTHER WAY TO EXCITING A WAVEGUIDE IS BY SETTING UP H-FIELD IN THE WAVEGUIDE. THIS CAN BE ACCOMPLISHED BY SMALL LOOP THAT CARRIES A HIGH CURRENT IN THE WAVEGUID FIELD BUILDS UP AND EXPANDS UNTIL IT FILLS THE SPACE WAVEGUIDE. IF THE FREQUENCY OF THE CURRENT IS CORRECT, E TRANSFERRED FROM THE LOOP TO THE WAVEGUIDE. NOTICE THAT BY COAXIAL CABLE. THE LOCATION OF THE LOOP FOR OPTIMUM CO GUIDE IS AT THE PLACE WHERE THE MAGNETIC FIELD THAT IS TO BE OF GREATEST STRENGTH.

WHEN LESS COUPLING IS DESIRED, THE LOOP CAN BE RO
REPOSITIONED UNTIL IT ENCIRCLES A SMALLER NUMBER OF LINES

WHEN AN EXCITATION LOOP IS USED IN SOME EQUIPMENT (R
PROPER LOCATION IS OFTEN PREDETERMINED AND FIXED EI
CONSTRUCTION OR FINAL TUNING AT THE FACTORY. IN TEST
EQUIPMENT, THE LOOP IS OFTEN MADE ADJUSTABLE.

WHEN A LOOP IS INTRODUCED IN A GUIDE AT A POINT WHERE
IS PRESENT, A CURRENT WILL BE INDUCED IN THE LOOP ITSELF. T
CAN TAKE ENERGY OUT OF THE WAVEGUIDE AS WELL AS PUT ENER

IT MIGHT SEEM THAT A GOOD WAY TO EXCITE THE WAVEG
COUPLE ENERGY OUT OF IT IS SIMPLY TO LEAVE THE END OPEN. H
IS NOT THE CASE. WHEN ENERGY LEAVES A WAVEGUIDE, FIELDS
THE END THAT WOULD RESULT IN A MISMATCH. IN OTHER WORD
AND STANDING WAVES WOULD RESULT IF THE END WERE LEFT
SIMPLY LEAVING THE END OPEN IS NOT AN EFFICIENT WAY OF
ENERGY OUT OF THE WAVEGUIDE.

FOR THE ENERGY TO MOVE SMOOTHLY INTO OR OUT OF A WA
OPENING OF THE GUIDE MAY BE FLARED LIKE A FUNNEL. THIS MAK
SIMILAR TO A V-TYPE ANTENNA. THIS METHOD IS CALLED A H
EFFECT, ELIMINATES REFLECTION BY MATCHING THE IMPEDANCE
TO THE IMPEDANCE OF THE WAVEGUIDE. WHEN THE MOUTH OF
EXPOSED TO ELECTROMAGNETIC FIELDS, THEY ENTER AND ARE GR
TO FIT THE WAVEGUIDE. THE HORN IS DIRECTIONAL IN CHARACTE
OR RECEIVES THE GREATEST AMOUNT OF ENERGY IN FRONT OF THE

ANOTHER WAY FOR EITHER PUTTING ENERGY INTO OR REMO
WAVEGUIDES IS THROUGH SLOTS OR OPENINGS. THIS METHOD IS
USED WHEN VERY LOOSE COUPLING IS DESIRED. IN THIS METHOD E
THE GUIDE THROUGH A SMALL APERTURE. ANY DEVICE THAT WI
E-FIELD CAN BE PLACED NEAR THE APERTURE, AND THE E-FIELD
INTO THE WAVEGUIDE. E-LINES ARE SET UP PARALLEL TO THE WI
THE VOLTAGE DIFFERENCE BETWEEN PARTS OF THE WIRE. THE E-
FIRST ACROSS THE APERTURE, THEN ACROSS THE INTERIOR OF TH
THE FREQUENCY IS CORRECT AND THE SIZE OF THE APERTU
PROPORTIONED, ENERGY WILL BE TRANSFERRED TO THE WAVE
MINIMUM OF REFLECTIONS." [7]

## ? *Comprehension Check*

**1. MAKE THE RIGHT CHOICE.**

5) THE TECHNIQUES USE
A) ELECTRIC FIELDS.
B) MAGNETIC FIELDS.
C) ELECTRIC FIELDS, MAGNETIC FIELDS, OR ELECTROMAGNETIC FIELDS.

2) THE BEST PLACE TO LOCATE THE PROBE IS
A) IN THE CENTER OF THE WIDE DIMEN
B) PARALLEL TO THE NARROW DIMEN
C) ONE-QUARTER WAVELENGTH AWAY FROM THE SHORTED END OF THE GUIDE.
D) IN THE CENTER OF THE WIDE DIMENSION, PARALLEL TO THE NARROW DIMENSION, AN ONE-QUARTER WAVELENGTH AWAY FROM T SHORTED END OF THE GUIDE.

3) A WIDEBAND PROBE IS
A) SMALL IN DIAMETER.
B) LARGE IN DIAMETER AND IS CONICAL OR DOORKNOB SHAPED.
C) DOORKNOB SHAPED.
D) CONICAL.

4) THE LOOP CAN TAKE ENERGY
A) INTO THE WAVEGUIDE.
B) OUT OF THE WAVEGUIDE AS WELL AS P ENERGY INTO IT.
C) INTO THE WAVEGUIDE AS WELL AS PUT ENERGY OUT OF IT.

5) ANY DEVICE THAT WILL GENERATE AN E-FIELD CAN BE PLACED
A) INSIDE THE APERTURE.
B) FAR FROM THE APERTURE.
C) NEAR THE APERTURE.

**2. READ THE FOLLOWING STATEMENTS AND AGREE OR DISAGR DON'T KNOW».**

1) THE WIDEBAND PROBES ARE USED TO TAKE ENERGY OUT OF WAV DELIVER IT TO COAXIAL CABLES.

2) IF THE FREQUENCY OF THE CURRENT ISN'T CORRECT, ENERGY WILL E TRANSFERRED FROM THE LOOP TO THE WAVEGUIDE.
3) WHEN LESS COUPLING IS DESIRED, THE LOOP CANNOT BE R REPOSITIONED UNTIL IT ENCIRCLES A SMALLER NUMBER OF LINE
4) A GOOD WAY TO EXCITE THE WAVEGUIDE OR TO COUPLE ENERGY SIMPLY TO LEAVE THE END CLOSED.
5) THE E-LINES EXPAND FIRST ACROSS THE APERTURE, THEN ACROS OF THE WAVEGUIDE.

3. **ANSWER THE FOLLOWING QUESTIONS.**

1) IN WHAT FORM IS THE ENERGY IN WAVEGUIDES?
6) WHAT EXCITATION TECHNIQUES ARE USED IN CONVENTIONAL MIC SYSTEMS?
7) WHEN CAN FIELD HAVING CONSIDERABLE INTENSITY BE ESTABLI MAINTAINED?
4) WHERE WILL THE PROBE WORK EQUALLY WELL?
5) HOW LONG DOES A MAGNETIC FIELD BUILD UP AND EXPAND?

**4. WRITE A TEXT ANALYSIS.**

## ***Working with Vocabulary and Grammar***

**5. COMPLETE THE TABLE.**

| NOUN | ADJECTIVE | VERB |
|---|---|---|
| EXCITEMENT | | |
| | | CONNECT |
| | CONVENTIONAL | |
| | DETACHABLE | |
| FORMATION | | |
| | | LOCATE |
| IMPEDANCE | | |
| | | GENERATE |
| | DIFFERENT | |

**6. TRANSLATE THE SENTENCES PAYING SPECIAL ATTENTION TO ITALICS.**

1) *No one* KNOWS WHERE THE LASER MAY FIND ITS GREATEST USE.
2) IN THE SELECTING A STAR *as* A FIX FOR A CELESTIAL NAVIGATION SYSTE CHOOSE *one* WHOSE LIGHT HAS AN ANGLE OF INCIDENCE *as* NEARLY EQUAL *as* POSSIBLE TO THE NORMAL FOR THE EARTH'S ATMOSPHERIC LAYER.
3) THIS USAGE IS *likely* TO CONTINUE AND GROW. IT COULD *likely* BE VERY FATAL.
4) AN ADDITIONAL AREA *also* SEEMS *likely* TO EXPERIENCE A SUBSTANTIA GROWTH.
5) *On the other hand*, TO THE RADIO AND COMMUNICATIONS ENGINEE IS A SMOOTH ELECTROMAGNETIC WAVE TRAIN WHICH CA INTERFERENCE PHENOMENA, POLARIZATION, ETC.

**6. OPEN THE BRACKETS TO MAKE THE SENTENCES COMPLETE.**

1) IF THE TEMPERATURE *(to rise)* ABOVE $32^0$F THE SOLID ICE *(to become)* THE LIQUID FORM OF WATER. IF THE TEMPERATURE *(to raise)* STILL HIGHER TO $212^0$F, THE LIQUID *(vaporize)* INTO THE GAS KNOWN AS STEAM.
2) IF THE ATOM *(to be)* CONSTRUCTED AS THOMPSON VISUALIZED, THE PO ALPHA PARTICLES *(to have)* THEIR PATHS DEFLECTED BY SMALL AMOUN TO THE POSITIVE CHARGE DISTRIBUTED EVENLY THROUGH THE A
3) IF THE SECOND CRYSTAL OR SHEET *(to be)* ROTATED $90^0$ WITH RESPECT TO THE FIRST, NO LIGHT *(to pass)* THROUGH.
4) IF SLOT (TO BE) ROTATED $90^0$ IN THE FOREGOING BEFORE, THE WAVES PASS) THROUGH IT.
5) IF THE ATOM AT SOME GIVEN TIME (TO BE) IN AN EXCITED S ELECTRONS (TO BE) AT ANY LEVEL EXCEPT THE GROUND STATE.

**7. MATCH A STATEMENT WITH A SUITABLE ENDING AND TRANSL**

| | |
|---|---|
| 1) LASER OUTPUTS ARE REFERRED TO | BASICALLY JUST PRODU AND RADIANT ENERGY. |
| 2) THE SHORTER THE WAVELENGTH, RAYS, | HEAT, LIGHT, RADIO WAV COSMIC RADIATION AND ULTRAVIOLET RAYS. |

3) LASERS AND MASERS ARE
8) EXAMPLES OF ELECTROMAGNETIC WAVES ARE
5) TO THE PHYSICIST, LIGHT IS

IN TERMS OF THEIR WAVEL
COMPOSED OF QUANTA O
EACH WITH A WELL PRESCRIBE
WAVE NUMBER.
THE SMALLER THE OBJECT T
REFLECT THE WAVES EFFECTIVELY

## *Discussing the text*

**8. DISCUSS THE FOLLOWING:**

1) THE WAVEGUIDE MUST BE PROPERLY EXCITED OR FED IN ORDER
2) THE BEST PLACE TO LOCATE THE PROBE IS IN THE CENTER OF THE DIMENSION, PARALLEL TO THE NARROW DIMENSION, AND O WAVELENGTH AWAY FROM THE SHORTED END OF THE GUIDE;
3) THE PROBE IS FED WITH A COAXIAL CABLE;
4) SOMETIMES IT IS NECESSARY TO EXCITE A WAVEGUIDE WITH A OF FREQUENCIES;
5) E-LINES ARE SET UP PARALLEL TO THE WIRE.

**9. PROVE THE FOLLOWING CHOOSING THE FACTS FROM THE TEX**

1) THE WAVEGUIDE MUST BE PROPERLY EXCITED OR FED;
2) THE BEST PLACE TO LOCATE THE PROBE IS THE POINT OF MAXIM BETWEEN THE PROBE AND THE FIELD;
3) SOMETIMES IT IS NECESSARY TO EXCITE A WAVEGUIDE WITH A W OF FREQUENCIES;
4) AN EXCITATION LOOP IS USED IN RADARS;
5) THE LOOP CAN TAKE ENERGY OUT OF THE WAVEGUIDE AS WELL INTO IT.

**10. GIVE SOME MORE INFORMATION TO THE FOLLOWING:**

1) ANOTHER WAY TO EXCITING A WAVEGUIDE;
2) THE LOCATION OF THE LOOP FOR OPTIMUM COUPLING TO THE GU
3) AN EFFICIENT WAY OF GETTING THE ENERGY OUT OF THE WAVEG
6) INSERTING A SMALL PROBE OR ANTENNA INTO A WAVEGUIDE AN AN RF SIGNAL;
5)THE EXCITATION DEVICE.

## СОКРАЩЕНИЯ И УСЛОВНЫЕ ОБОЗНАЧЕНИЯ

| | | |
|---|---|---|
| AR | ARGON | аргон |
| AS | ARSENIC | мышьяк |
| CR | CHROMIUM | хром |
| CW | CONTINUOUS WAVE | незатухающие волны |
| GA | GALLIUM | галий |
| ER | ERBIUM | эрбий |
| HZ | HERTZ | герц |
| KR | KRYPTON | криптон |
| LED | LIGHT-EMITTING DIODE | светодиод |
| MKJ | MICROJOULE | микроджоуль |
| MKM | MICROMETER | микрометр |
| MKS | MICROSECOND | микросекунда |
| MW | MILLIWATT | милливатт |
| ND | NEODYMIUM | неодим |
| NEAR-IR | NEAR INFRARED | ближнийинфракрасный диапазон |
| NEAR-UV | NEAR ULTRAVIOLET | ближний ультрафиолетовый диапазон |
| NM | NANOMETER | нанометр |
| PB | LEAD | свинец |
| PDT | PHOTODYNAMIC THERAPY | световая терапия |
| SI | SILICON | кремний |
| TI | TITANIUM | титан |
| RF | RADIO FREQUENCY | высокочастотный |
| HENE | HELIUM-NEON | гелий-неоновый |

# ENGLISH-RUSSIAN VOCABULARY

## СОКРАЩЕНИЯ

*a* – ADJECTIVE – прилагательное
*adv* – ADVERB – наречие
*cj* – CONJUNCTION – союз
*n* – NOUN – существительное
*num* – NUMERAL – числительное
*pl* – PLURAL – множественное число
*pron* – PRONOUN – местоимение
*prp* – PRONOUN – предлог
*v* – VERB – глагол

### A

| | | | |
|---|---|---|---|
| ACCEPTANCE | [∂K'SEPT∂NS] | *n* | 1. принятое значение слова; 2. принятие; прием |
| ACCOMPANY | [∂'K^MP∂NI] | *v* | сопровождать; сопутствовать |
| ACTUATOR | ['ÆKTJUEIT∂] | *n* | силовой привод; рукоятка привода; соленоид |
| AFFECT | [∂'FEKT] | *v* | воздействовать; влиять |
| ALUMINIUM | [ˌÆLJU'MINI∂M] | *n* | алюминий |
| AMAZE | [∂'MEIZ] | *v* | удивлять; поражать |
| AMORPHOUS | [∂'MO:F∂S] | *a* | бесформенный; аморфный; некристаллический |
| APPEAR | [∂'PI∂] | *v* | показываться; появляться; проявляться |
| APPROXIMATELY | [∂'PROKSIMITLI] | *adv* | приблизительно; приближенно; почти |
| ARCHITECTURE | [':KITEKʃ∂] | *n* | архитектура |
| ARSENIC | [:S∂NIK] | *n* | мышьяк |
| ARSENIDE | [α:SNID] | *n* | арсенид |
| ASSORTMENT | [∂'SO:TMENT] | *n* | ассортимент; сортировка |
| ATTAINABLE | [∂'TEIN∂BL] | *a* | достижимый |
| AUDIENCE | ['O:DI∂NS] | *n* | зрители; аудиенция |

| | | | |
|---|---|---|---|
| AWARE | ∂′[Wɛ∂] | *a* | знающий; сознающий |

**B**

| | | | |
|---|---|---|---|
| BARRIER | ['BÆRI∂] | *n* | барьер; препятствие; помеха |
| BEHAVE | [BI'HEIV] | | 1.поступать, вести себя; |
| BEND | [BEND] | *n* | 1. изгиб |
| | | *v* | 2. гнуть; изгибать; связывать; направлять |
| BIOLOGICAL | [ˌBAI∂'LOʒIK∂L] | *a* | биологический |
| BIREFRINGENCE | [BIRE'FRIʒENS] | *n* | двойное лучепреломление |
| BIREFRINGENT | [BIRE'FRIʒENT] | *a* | двоякопреломляющий |
| BORE | [BO:] | *n* | 1. диаметр отверстия; калибр; |
| | | *v* | 2. сверлить; растачивать |
| BROADEN | [′BRO:DN] | *v* | расширять(ся) |
| BUILD-UP | ['BILDΛP] | *n* | построение, нарастание; образование; повышение (параметра) |
| BULKY | ['BΛLKI] | *a* | большой; объемистый; громоздкий |

**C**

| | | | |
|---|---|---|---|
| CALIPERS = CALLIPERS | [′KÆLIP∂Z] | *n* | кронциркуль; калибр |
| CATASTROPHIC | [ˌKÆT∂S'TRƆFIK] | *a* | катострофический |
| CAVITY | [′KÆVITI] | *n* | 1. кювета; полость; впадина; 2. резонатор |
| CHAMBER | [′TʃEIMB∂] | *n* | камера |
| CODOPE | [K∂U'D∂UP] | *n* | вкрапление |
| COHERENCE | [K∂U'HI∂R∂NS] | *n* | когерентность |
| COLLATERAL | [KƆ′LÆT∂R∂L] | *a* | побочный; второстепенный |
| COLLIDE | [K∂′LAID] | *v* | 1. сталкиваться; 2. вступать в противоречие |
| COMBINE | [K∂M'BAIN] | *v* | объединять; комбинировать; смешивать; сочетать(ся |
| COMPANY | [′KΛMP∂NI] | *n* | общество; компания |

| | | | |
|---|---|---|---|
| COMPULSORY | [K∂M'P∧LS∂RI] | *a* | принудительный; обязательный |
| CONFINE | [K∂N'FAIN] | *v* | ограничивать |
| CONGENITAL | [K∂N'DЗENITL] | *a* | прирожденный; врожденный |
| CONSTRAIN | [K∂N'STREIN] | *v* | принуждать; вынуждать |
| CRITERION | [KRAI'TI∂RI∂N] | *n* | критерий |
| CRYOGENIC | [ˌKRAI∂U'DЗENIK] | *a* | криогенный; низкотемпера-турный |
| CYLINDRICAL | [SI'LINDRIK∂L] | *a* | цилиндрический |

**D**

| | | | |
|---|---|---|---|
| DAMAGE | ['DÆMIDЗ] | *n* | 1.повреждение; ущерб; |
| | | *v* | 2. повреждать; наносить ущерб |
| DENTISTRY | ['DENTISTRI] | *n* | лечение зубов |
| DERMATOLOGY | [ˌD∂:M∂'TOL∂DЗI] | *n* | дерматология |
| DESIRABLE | [DI'ZAI∂R∂BL] | *a* | желательный; подходящий |
| DESIRE | [DI'ZAI∂] | *n* | 1. желание; просьба; |
| | | *v* | 2. желать; хотеть |
| DETOUR | ['DI:TU∂] | *n* | обход; окольный путь |
| DIAGRAM | ['DAI∂GRÆM] | *n* | диаграмма |
| DISCHARGE | [DIS'TʃA:DЗ] | *n* | разряд |
| DYE | [DAI] | *n* | 1. краситель; 2. окрашивать |

**E**

| | | | |
|---|---|---|---|
| EMPLOY | [IM'PLOI] | *n* | 1. служба; работа |
| | | *v* | 2. применять |
| ENGRAVER | [IN'GREIV∂] | *v* | гравировать |
| ENTIRE | [IN'TAI∂] | *a* | полный; совершенный; |
| ESTABLISH | [IS'TÆBLIʃ] | *v* | основывать; создавать; устанавливать |
| ESTATE | [IS'TEIT] | *n* | положение |
| EXCESS | [IK'SES] | *n* | избыток |

| | | | |
|---|---|---|---|
| EXPERIENCE | [ɪKSʹPɪ∂Rɪ∂NS] | *n* | 1. Опыт; эксперимент; |
| | | *v* | 2.испытывать; знать по опыту |
| EXPOSURE | [ɪKSʹPUʒ∂] | *n* | 1. количество освещения; |
| | | | 2. фото выдержка; экспонирование |
| | | *v* | 3. работать (о приборе) |
| EVENTUALLY | [ɪʹVENʃ∂Lɪ] | *adv* | в конечном счете; в конце концов; со временем |

**F**

| | | | |
|---|---|---|---|
| FACILITATE | [F∂'SɪLɪTEɪT] | *v* | облегчать; содействовать; способствовать; продвигать |
| FAILURE | [ʹFEɪLJ∂] | *n* | недостаток, отсутствие; неудача;провал; небрежность |
| FEATURE | [ʹFɪ:Tʃ∂] | *n* | особенность;свойство; черта |
| FIXTURE | [ʹFɪKSTʃ∂] | *n* | приспособление; прибор; арматура |
| FLUORESCENCE | [FLU∂ʹRESNS] | *n* | свечение; флуоресценция |
| FURNISH | [ʹF∂:Nɪʃ] | *v* | снабжать; предоставлять; доставлять |

**G**

| | | | |
|---|---|---|---|
| GALLIUM | [ʹGÆLɪ∂M] | *n* | галий |
| GAUGE | [GEɪʒ] | *n* | 1.мера; масштаб; размер; |
| | | *v* | 2. измерять; проверять; оценивать |
| GROOVE | [GRU:V] | *v* | желобить; делать канавки |
| GUIDE | [GAɪD] | *v* | вести; направлять; быть причиной |
| GARNET | [Gα:NɪT] | *n* | гранат |

**H**

| | | | |
|---|---|---|---|
| HALOGEN | [ʹHÆL∂ʒ∂N] | *n* | галоген |
| HEADSET | ['HEDSET] | *n* | головной телефон |

| | | | |
|---|---|---|---|
| HEART | [HɑːT] | *n* | сердцевина; ядро; сердечник |
| HEAVY | ['HEVɪ] | *a* | тяжелый |
| HELIUM | ['HIːLɪ∂M] | *n* | гелий |
| HETEROSTRUCTURE | [HET∂RƏU'STR∧KT∫∂] | *n* | гетероструктура |
| HOMOJUNCTION | [ˌHOMƏU'D3∧NK∫∂N] | *n* | гомопереход |

**I**

| | | | |
|---|---|---|---|
| INCORPORATE | [ɪN'KOːP∂RɪT] | *a* | соединенный; объединенный; нераздельный |
| INJECT | [ɪN'D3EKT] | *v* | вбрызгивать; вдувать; вводить; впрыскивать |
| INSULATOR | [ɪNSJULEɪT∂] | *n* | изолятор |
| INTERACTION | [ˌɪNT∂R'ÆK∫∂N] | *n* | взаимодействие |
| INTERFEROMETRY | [ˌɪNT∂Fɪ∂'ROMɪTRɪ] | *n* | интерферометрия |
| ION | ['Aɪ∂N] | *n* | ион |

**J**

| | | | |
|---|---|---|---|
| JAMMER | ['D3ÆM∂] | *n* | передатчикпомех |
| JAMPROOF | [D3ÆMPRU:F] | *a* | помехозащищенный |
| JITTER | ['D3ɪT∂] | *n* | дрожание; разброс |
| JOINING | ['D3OɪNɪη] | *n* | соединение; сочленение |
| JUNCTION | ['D3∧ηK∫N] | *n* | 1. переход; 2. соединение |

**K**

| | | | |
|---|---|---|---|
| KERF | [K∂ːF] | *n* | разрез; прорезь |
| KEY | [KIː] | *n* | ключ |
| KINETIC | [KAɪ'NETɪK] | *n* | кинетический |
| KIT | [KɪT] | *n* | комплект; набор |
| KNOB | [NOB] | *n* | шар; рукоятка; кнопка |
| KRYPTON | ['KRɪPTON] | *n* | криптон |

## L

| | | | |
|---|---|---|---|
| LATERAL | ['LÆT∂R∂L] | *a* | боковой; горизонтальный; побочный |
| LATHE | [LEIÐ] | *n* | токарный станок |
| LAYER | ['LEI∂] | *n* | слой; пласт; наслоение |
| LENS | [LENZ] | *n* | линза |
| LIQUID | ['LIKWID] | *a* | 1. жидкий; 2. жидкость |
| LOITER | ['LOIT∂] | *v* | медлить; отставать |
| LONGITUDINAL | [LONʒI'TJU:DINL] | *a* | продольный |

## M

| | | | |
|---|---|---|---|
| MEASURE | ['MEʒ∂] | *n* | 1. мера; предел; степень; |
| | | *v* | 2. мерить |
| MENTION | ['MEN∫N] | *n* | упоминание; ссылка |
| MIRROR | ['MIR∂] | *n* | 1. зеркало; 2. зеркальная поверхность; 3. отображение |
| MIXTURE | ['MIKST∫∂] | *n* | смесь; примесь |
| MODE | [M∂UD] | *n* | мода; тип колебания |
| MOLD | ['M∂ULD] | *n* | 1. форма; пресс; |
| | | *v* | 2. пресовать |
| MOLECULAR | [M∂U'LEKJUL∂] | *a* | молекулярный |

## N

| | | | |
|---|---|---|---|
| NARROW | ['NÆR∂U] | *n* | 1. узкая часть; |
| | | *a* | 2. узкий; |
| NEODYMIUM | [NI:OU'DIMI∂M] | *n* | неодим |
| NEON | ['NI:∂N] | *n* | неон |
| NERVINESS | [N∂:VINES] | *n* | высокоэластическое восстановление |
| NERVY | ['N∂:VI] | *a* | высокоэластически восстанавливающийся |

| | | | |
|---|---|---|---|
| NOTORIOUS | [NO'TɔːRɪ∂S] | *a* | 1. пользующийся дурной славой;печально известный; отъявленный; пресловутый; 2. известный |
| NOTORIOUSLY | [NO'TɔːRɪ∂SLɪ] | *adv* | пресловуто |

**O**

| | | | |
|---|---|---|---|
| OPHTHALMOLOGY | [,OFθÆL'MOLƷɪ] | *n* | офтальмология |
| ORIGINATE | [∂'RɪDƷɪNEɪT] | *v* | давать начало; порождать; создавать |
| ORTHOGONAL | [ɔːθOG∂NL] | *a* | ортоганальный; прямоугольный; перпендикулярный |

**P**

| | | | |
|---|---|---|---|
| PHOTOABLATION | [F∂UT∂U'ÆBLEɪʃ∂N] | *n* | фотоудаление |
| PHOTOLITHOGRAPHY | [F∂UT∂UL'ɪθOGR∂Fɪ] | *n* | фотолитография |
| PLASTIC | ['PLÆSTɪK] | *n* | 1. пластмасса; пластичность; |
| | | *a* | 2. пластический |
| PLETHORA | ['PLEθ∂R∂] | *n* | 1. полнокровие; 2. изобилие; большой избыток |
| PREDICT | [PRɪ'DɪKT] | *v* | предсказывать |
| PREFERRED | [PRɪ'F∂ːD] | *a* | привилегированный |
| PRIMARY | ['PRAɪM∂Rɪ] | *a* | начальный |
| PROFOUND | [P∂'FRAUND] | *a* | 1. глубокий; основательный; 2. полный; абсолютный |
| PROMPT | [PROMPT] | *a* | быстрый; точный |
| PROPEL | [PR∂'PEL] | *v* | 1. продвигать вперед; толкать; приводить в движение; 2. двигать; стимулировать; 3. побуждать |
| PROPORTIONAL | [PR∂'POːʃ∂NL] | *a* | пропорциональный |
| PROPORTIONATELY | [PR∂'POːʃNɪTLɪ] | *a* | соразмерно; пропорционально |
| PUBLIC | ['P∧BLɪK] | *a* | 1. общественный; |

| | | | |
|---|---|---|---|
| | | | государственный; 2. общественность |
| PULSE | [ʌPLS] | *n* | пульс; биение |

**Q**

| | | | |
|---|---|---|---|
| Q-FACTOR | ['KJU:FÆKT∂] | *n* | добротность |
| Q-SWITCH | [KJU:SWIʃ] | *n* | модулятор добротности |
| QUALITY | ['KWOLIT] | *n* | качество |
| QUANTITY | ['KWONTIT] | *n* | 1. величина; 2. количество |
| QUANTUM | ['KWONT∂M] | *n* | 1. квант; фотон; |
| | | *a* | 2. квантовый |
| QUENCH | ['KWENʃT] | *v* | тушить; гасить |
| QUIVERING | ['KWIV∂RIŋ] | *n* | угловые флуктуации направления |

**R**

| | | | |
|---|---|---|---|
| RAIL | [REIL] | *n* | рельс; ограда; брусок; перекладина |
| RARE-EARTH | [R ε∂'∂:θ] | *a* | редкоземельный |
| RELEGATE | ['RELIGEIT] | *v* | 1. отсылать; направлять; относить; 2. классифицировать |
| RESEMBLE | [RI'ZEMBL] | *v* | походить; иметь сходство |
| RESOLVE | [RI'ZOLV] | *n* | решение; решителность; |
| | | *v* | решаться |
| RESTRICT | [RIS'TRIKT] | *v* | ограничивать |
| REVOLUTION | [ˌREV∂'LU:ʃ∂N] | *n* | революция; переворот |
| RIBBON | [RIB∂N] | *n* | лента; узкая полоска; |
| | | *a* | ленточный |
| ROBUST | [R∂U'BʌST] | *a* | 1. крепкий; здоровый; сильный; 2. здравый, ясный |

## S

| | | | |
|---|---|---|---|
| SCAR | [SKɑː] | *n* | 1.рубец; |
| | | *v* | 2. оставлять шрам; рубцеваться |
| SHAPE | [ʃEIP] | *n* | форма; вид |
| SHIFT | [ʃIFT] | *n* | изменение; перемещение; сдвиг |
| SHRINK | [ʃRIŊK] | *v* | сокращаться; усыхать; отступать |
| SIMPLIFY | [ʹSIMPLIFAI] | *v* | упрощать |
| SOLVENT | [ʹSOLV∂NT] | *n* | 1. растворитель; |
| | | *a* | 2. растворяющий |
| SPAN | [SPÆN] | *n* | 1. период времени; диапозон; |
| | | *a* | 2. измерять; охватывать |
| SPATIAL | [ʹSPEIʃ∂L] | *a* | пространственный |
| SPECIES | [ʹSPI:ʃI:Z] | *n* | разновидность; вид |
| SPROUT | [SPRAUT] | *n* | отросток; *v*отращивать |
| SUBSEQUENT | [ʌSIKW∂NT] | *a* | последующий |
| SURGICAL | [ʹS∂:DʒIK∂L] | *a* | хирургический |
| SYMMETRICAL | [ʹMETRIK∂L] | *a* | симметричный |

## T

| | | | |
|---|---|---|---|
| TEMPERATURE | [ʹTEMPRIʃ∂] | *n* | температура |
| TERMINAL | [ʹT∂:MINL] | *a* | 1. заключительный; конечный; 2. периодический |
| THRESHOLD | [ʹθREʃH∂ULD] | *n* | порог; начало |
| TISSUE | [ʹTIʃU:] | *n* | ткань |
| TRANSFER | ["TRÆNSF∂] | *n* | перемещение; передача |
| TRANSVERSE | [ʹTRÆNZV∂:S] | *a* | поперечный |
| TREATMENT | ["TRI:TM∂NT] | *n* | обработка; лечение; уход |
| TUNABLE | [ʹTJU:N∂BL] | *a* | гармоничный |
| TYPICAL | [ʹTIPIK∂L] | *a* | 1.типичный; 2. символический |

## U

| | | | |
|---|---|---|---|
| UNIQUELY | ′[NKLI] | *adv* | уникально |
| UTILIZE | ['JULAIZT]I | *v* | использовать |

## V

| | | | |
|---|---|---|---|
| VAPOUR | ′V[EP∂] | *n* | 1. пар; испарения; |
| | | *v* | 2. испаряться |
| VEIN | [VEIN] | *n* | прожилка; кровеносный сосуд |
| VIA | ′[VA∂] | *prep* | через |
| VIBRATIONAL | I'B[REI∫ANL] | *a* | вибрационный |
| VIBRONIC | I[BRAONIK] | *a* | виброниковый |
| VIOLET | ′V[A∂LIT] | *a* | фиолетовый |
| VITAL | [f'VIT∂L] | *a* | жизненно важный |
| VIVID | [I'VID] | *a* | яркий; ясный |

## W

| | | | |
|---|---|---|---|
| WART | [WO:T] | *n* | нарост |
| WAVEGUIDE | I['WGEAD] | *n* | волновод |
| WORTH | ∂:[Wθ] | *n* | цена; достоинство |

## X

| | | | |
|---|---|---|---|
| XENON | ['ZENON] | *n* | ксенон |
| XEROGRAPHY | 'NO[Z∂R] | *n* | ксерография; электрофотография |
| X-IRRADIATED | I,[REEKS'EI∫∂N] | *a* | облученный рентгеновскими лучами |
| X-RAYS | ['EKS]'RE | *n* | рентгеновское излучение |

## Y

| | | | |
|---|---|---|---|
| YAWN | [JO:N] | *n* | зазор; просвет |
| YIELD | I:[JLD] | *n* | 1. текучесть; выход; отдача; производительность; |
| | | *v* | 2. течь; переходить в состояние текучести |

| | | | |
|---|---|---|---|
| YIELDABILITY | ɪ:LDƏ[BɪLɪT] | *n* | 1. пластичность; способность давать остаточные деформации без разрушения; 2. наличие низкого предела текучести; |
| | | *v* | 3. Сжимаемость *(структурированных дисперсных систем)* |
| YIELD-WEIGHTED | ELD [WEɪD] | *a* | взвешенный по выходу |
| YOKE | ə[UK] | *n* | 1. зажим; хомут; 2. отклоняющая система |
| Y-SHAPED | [WAɪʃEɪPT] | *a* | Y-образный |
| YTTRIUM | TRɪ[ɪM] | *n* | иттрий |

**Z**

| | | | |
|---|---|---|---|
| ZONE | [ZəUN] | *n* | зона, область |

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## СОДЕРЖАНИЕ

Методическая заметка . . . . . . . . . . . . . . . . . . . 3

**РАЗДЕЛ I:**
**ВВЕДЕНИЕ В ОПТОЭДЕКТРОНИКУ**
UNIT 1.1 . . . . . . . . . . . . . . . . .. . . . . . . . . . . . 5
PART 1 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .5
PART 2 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .18
UNIT 2.1 . . . . . . . . . . . . . . . . .. . . . . . . . . . . 24
PART 1 . . . . . . . . . . . . . . . . .. . . . . . . . . . . . 24
PART 2 . . . . . . . . . . . . . . . . .. . . . . . . . . . . . 39
UNIT 3.1. . . . . . . . . . . . . . . . .. . . . . . . . . . . . . 46
PART 1 . . . . . . . . . . . . . . . . .. . . . . . . . . . . . 46
PART 2 . . . . . . . . . . . . . . . . .. . . . . . . . . . . . 58
UNIT 4.1. . . . . . . . . . . . . . . . .. . . . . . . . . . . . . 66
PART 1. . . . . . . . . . . . . . . . .. . . . . . . . . . . . . 66
PART 2 . . . . . . . . . . . . . . . . . .. . . . . . . . . . . . .78

**РАЗДЕЛ II:**
**ОПТОЭДЕКТРОНИКА. ЛАЗЕРЫ**
UNIT 1.2 . . . . . . . . . . . . . . . . .. . . . . . . . . . . . 85
PART 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 85
PART 2 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 99
UNIT 2.2 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 105
PART 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 105
PART 2 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 118
UNIT3.2 . . . . . . . . . . . . . . . . . . . . . . . . . . . . 126
PART 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .126
PART 2 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .138
UNIT 4.2 . . . . . . . . . . . . . . .. . . . . . . . . . . . . . . .145
PART 1 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .145
PART 2 . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .157

**РАЗДЕЛ III:
ДОПОЛНИТЕЛЬНЫЙ МАТЕРИАЛ ДЛЯ ПЕРЕВОДА, РЕФЕРИРОВАНИЯ И АННОТИРОВАНИЯ**

UNIT 1.3 . . . . . . . . . . . . . . . . .. . . . . . . . . . . . .164
PART 1 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .164
PART 2 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .170
UNIT 2.3 . . . . . . . . . . . . . . . . .. . . . . . . . . . . . 178
PART 1 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .178
PART 2 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .184
UNIT 3.3 . . . . . . . . . . . . . . . . .. . . . . . . . . . . 192
PART 1 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .192
PART 2 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .198
UNIT 4.3 . . . . . . . . . . . . . . . . .. . . . . . . . . . . 206
PART 1 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .206
PART 2 . . . . . . . . . . . . . . . . .. . . . . . . . . . . .213

Сокращения и условные обозначения . . . . . . .220
ENGLISH-RUSSIAN VOCABULARY. . . . . . . . . . . . . . . . 221
Библиография . . . . . . . . . . . . . . . . . . . . . . . . . 232

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**Щапова И.А.**

**ОСНОВЫ ОПТОЭЛЕКТРОНИКИ
И ЛАЗЕРНОЙ ТЕХНИКИ**

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для технических вузов*

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