

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ  
РОССИЙСКОЙ ФЕДЕРАЦИИ

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**БИОМЕДИЦИНСКИЕ ПРИБОРЫ И СИСТЕМЫ**

**МЕТОДИЧЕСКИЕ УКАЗАНИЯ**

к практическим занятиям и самостоятельной работе  
по дисциплине «Иностранный язык в профессиональной  
деятельности (английский язык)»

для студентов 4 курса специальности

12.02.10 «Монтаж, техническое обслуживание и ремонт биотехнических  
и медицинских аппаратов и систем»



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**Составители:** преп. Ю. В. Малютина,  
преп. О. В. Прибыткова,  
преп. И. В. Полухина,  
преп. Н. В.Аленькова

**Биомедицинские приборы и системы:** методические указания к практическим занятиям и самостоятельной работе по дисциплине «Иностранный язык в профессиональной деятельности (английский язык)» для студентов 4 курса специальности 12.02.10 «Монтаж, техническое обслуживание и ремонт биотехнических и медицинских аппаратов и систем» / ФГБОУ ВО «Воронежский государственный технический университет»; сост.: Ю. В. Малютина, О. В. Прибыткова, И. В. Полухина, Н. В. Аленькова. Воронеж: Изд-во ВГТУ, 2023. 42 с.

Методические указания разработаны с целью подготовки студентов к чтению и переводу иноязычной специальной литературы на базе терминологической лексики. Предусмотрены предтекстовые и послетекстовые задания. Тематика текстов определяется специальной направленностью и тем минимумом, который необходим студентам для профессиональной деятельности на английском языке.

Данные методические указания предназначены для студентов 4 курса специальности 12.02.10 «Монтаж, техническое обслуживание и ремонт биотехнических и медицинских аппаратов и систем» Строительно-политехнического колледжа, продолжающих изучение английского языка для профессиональных целей в соответствии с ФГОС СПО.

Методические указания подготовлены в электронном виде и содержатся в файле МУ\_БМПС\_ИнЯз(англ).pdf.

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**Рецензент** - А. А. Падурец, канд. филол. наук, доц. кафедры иностранных языков и технологии перевода ВГТУ

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## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №1

### Biotechnology

The term "Biotechnology" (sometimes shortened to "biotech") consists of two parts. *Bio* is a Greek word for "life" and *technology* gives an indication of human intervention. Biotechnology can be based on the pure biological sciences (genetics, microbiology, animal cell culture, molecular biology, biochemistry, embryology, cell biology). Also its interests can be outside the sphere of biology (chemical engineering, bioprocess engineering, information technology, biorobotics). Biotechnology deals with brewing, manufacture of human insulin, interferon, and human growth hormone, medical diagnostics, cell cloning and reproductive cloning, the genetic modification of crops, bioconversion of organic waste and the use of genetically altered bacteria in the cleanup of oil spills, stem cell research and much more.

As a matter of fact, biotechnology is very ancient. Six thousand years ago, micro-organisms were used to brew beers and to produce wine, bread and cheese. Yeast makes dough rise and converts sugars into alcohol. Lactic acid bacteria in milk create cheese and yoghurt. This application of biotechnology is the directed use of organisms for the manufacture of organic products (examples include beer and milk products). In this way, *classical biotechnology* refers to the traditional techniques used to breed animals and plants, as well as to the application of bacteria, yeasts and molds to make bread or cheese.

*Modern biotechnology* came into being during the nineteen seventies. It has often been divided into several categories; every field of this science is sometimes connected with the definite color.

*Green biotechnology* is biotechnology applied to agricultural processes. An example would be the selection and domestication of plants via micro propagation. Another example is the designing of transgenic plants to grow under specific environments in the presence (or absence) of chemicals. One hope is that green biotechnology might produce more environmentally friendly solutions than traditional industrial agriculture, although this is still a topic of considerable debate.

*Red biotechnology* is applied to medical processes. Some examples are the designing of organisms to produce antibiotics, and the engineering of genetic cures through genetic manipulation.

*White biotechnology*, also known as *industrial biotechnology*, is biotechnology applied to industrial processes. An example is using naturally present bacteria by the mining industry in bioleaching; so it is the designing of an organism to produce a useful chemical or destroy hazardous/polluting chemicals. White biotechnology tends to consume less in resources than traditional processes used to produce industrial goods.

*Blue biotechnology* is a term that has been used to describe the marine and aquatic applications of biotechnology, but its use is relatively rare.

*Bioinformatics* is an interdisciplinary field which addresses biological problems using computational techniques, and makes the rapid organization and analysis of biological data possible. Bioinformatics plays a key role in various areas, such as functional genomics, structural genomics, and proteomics, and forms a key component in the biotechnology and pharmaceutical sector.

In conclusion biotechnology can be referred to any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use.

### Vocabulary

|                         |                       |
|-------------------------|-----------------------|
| Absence                 | brew (v)              |
| Antibiotics             | chemicals             |
| Bioconversion           | cleanup               |
| computational technique | marine                |
| consume (v)             | molecule              |
| convert (v)             | polluting             |
| deal with (v)           | presence              |
| domestication           | produce (v)           |
| genetic manipulation    | rare                  |
| hazardous               | selection             |
| hormone                 | solution              |
| indicate (v)            | stem cell research    |
| interferon              | technique             |
| intervention            | transgenic plant      |
| key role                | pharmaceutical sector |

### I. Translate the sentences into English using the words you learned.

1. Все живые организмы либо, как многоклеточные животные, растения и грибы, состоят из множества *клеток*, либо, как многие простейшие бактерии, являются одноклеточными организмами.
2. *Антибиотики* подавляют рост бактерий и других микробов, а также вирусов и клеток.
3. *Генетический* код — свойственный всем живым организмам способ кодирования аминокислотной последовательности белков при помощи последовательности нуклеотидов.
4. В настоящее время существуют различные способы ликвидации *разливов нефти* на почву, такие как, механические, физико-химические, агротехнические и биологические.
5. *Гормоны* есть у всех млекопитающих, включая человека.
6. Биотехнологи *производят* лекарственные препараты из трупных ядов, обычно считающихся *опасными химическими веществами*.

7. *Ключевую роль в исследовании трансгенных растений играют последние открытия.*
8. *Развитие фармацевтического сектора указывает на увеличение открытий в сфере фармацевтики.*

## **II. Give detailed answers to the questions.**

1. What does the term 'biotechnology' consist of?
2. Can you count the areas of biotechnology?
3. Is biotechnology a new science or not? Give facts to prove it.
4. What is classical and modern biotechnology?
5. When did modern biotechnology begin?
6. What is bioinformatics? What is its role?
7. What biotechnology applies to agricultural processes?
8. What can green biotechnology design?
9. What does red biotechnology deal with?
10. Give the examples of industrial biotechnology using?
11. What does blue biotechnology deal with?

## **III. Write out the sentences expressing the main ideas of each logical part of the text.**

## **IV. Test your knowledge in biotechnology. Choose the correct answer.**

1. The vector (DNA carrier) we used to put the glowing gene into the bacteria is called a...
  - a) Chromosome
  - b) Virus
  - c) Pipet
  - d) Plasmid
2. During a gel electrophoresis experiment, the small segment of DNA will move....
  - a) Backwards
  - b) Fast
  - c) Slow
  - d) Sideways
3. What tool do you use in lab to take very small samples of a liquid?
  - a) A beaker
  - b) A graduated cylinder
  - c) A micropipette
  - d) Safety glasses
4. In electrophoresis, where do the DNA samples go?
  - a) Straight up into the air
  - b) They move through the gel
  - c) Nowhere

- d) Into a micropipette
- 5. What do you need to use so that you can estimate the size of the DNA bands?
  - a) A micropipette
  - b) A meter stick
  - c) An electronic balance
  - d) A DNA standard
- 6. When doing gel electrophoresis, how do you know that your gel is running and the electricity is on?
  - a) You see bubbles
  - b) You see sparks
  - c) You hear a noise
  - d) The light flashes
- 7. What makes the DNA move during gel electrophoresis?
  - a) Electricity
  - b) Gravity
  - c) Water
  - d) Wind
- 8. All the cells in your body have the same DNA, even though they do not look the same or have the same job.
  - a) True
  - b) False
- 9. Stem cells can be found in your heart.
  - a) True
  - b) False
- 10. DNA fingerprinting can be used to identify a criminal.
  - a) True
  - b) False
- 11. The DNA for the glowing gene came from:
  - a) Bacteria
  - b) Octopus
  - c) Fireflies
  - d) Jellyfish
  - e) Glow worms
- 12. A small piece of extra DNA found in bacteria is called...
  - a) Chromosome
  - b) Base pair
  - c) Double helix
  - d) Plasmid
  - e) Nucleus
- 13. The letter PCR stands for...
  - a) Pretty cool reaction
  - b) Polymerase chain reaction
  - c) Partly complete RNA
  - d) Partly complete reaction

- e) Pure chain reaction
- 14. GFP (green fluorescent protein) makes jellyfish....
  - a) Reproduce
  - b) Glow
  - c) Shrink
  - d) Bigger
  - e) Sleepy

## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №2

### Physicochemical methods of analysis

It seems that this term can be met only in Russian. In the English language literature, they usually speak and write about instrumental methods of analysis. The name instrumental is evidently not ideal; analytical balances or titrimeters used in classical chemical methods also belong to instruments.

Physicochemical methods of analysis have wider application. Without them it is hard to control and manage production processes and research. It should be noted that physicochemical methods of analysis solve the problems of chemical control and analysis; they constitute to one of the parts of analytical chemistry. The essence of the physical and chemical methods of analysis is to study relations between structure and properties of systems. For the analysis of substances chemical reactions are widely used. They are accompanied by changes in the physical properties of the analyzed system, for example, the color intensity of fluorescence, etc. So physicochemical methods of analysis is a field of analytical chemistry that investigates analyses using scientific instruments. There are several types of instrumental analyses.

*Spectroscopy* measures the interaction of the molecules with electromagnetic radiation. Spectroscopy consists of many different applications such as atomic absorption spectroscopy, atomic emission spectroscopy, ultraviolet-visible spectroscopy, x-ray fluorescence spectroscopy, infrared spectroscopy, Raman spectroscopy, nuclear magnetic resonance spectroscopy, photoemission spectroscopy and so on.

*Mass spectrometry* measures mass-to-charge ratio of molecules using electric and magnetic fields. There are several ionization methods: electron ionization, chemical ionization, electrospray, fast atom bombardment, matrix-assisted laser desorption/ionization, and others.

*Crystallography* is a technique that characterizes the chemical structure of materials at the atomic level by analyzing the diffraction patterns of electromagnetic radiation or particles that have been deflected by atoms in the material. X-rays are most commonly used. From the raw data the relative placement of atoms in space may be determined.

*Electroanalytical* methods measure the electric potential in volts and/or the electric current in amps in an electrochemical cell containing the analyte. These methods can be categorized according to which aspects of the cell are controlled and

which are measured. The three main categories are potentiometry (the difference in electrode potentials is measured), coulometry (the cell's current is measured over time), and voltammetry (the cell's current is measured while actively altering the cell's potential).

*Calorimetry* and *thermogravimetric analysis* measure the interaction of a material and heat.

*Separation processes* are used to decrease the complexity of material mixtures. Chromatography and electrophoresis are representative of this field.

*Microscopy*. The visualization of single molecules, single biological cells, biological tissues and nanomaterials is very important and attractive approach in analytical science.

Also, hybridization with other traditional analytical tools is revolutionizing analytical science. Microscopy can be categorized into three different fields: optical microscopy, electron microscopy, and scanning probe microscopy. Recently, this field is rapidly progressing because of the rapid development of the computer and camera industries. Combinations of the above techniques produce a "hybrid" or "hyphenated" technique. Several examples are in popular use today and new hybrid techniques are under development, for example, gas chromatography-mass spectrometry, gas chromatography-infrared spectroscopy, liquid chromatography mass spectrometry and so on.

A general method for analysis of concentration involves the creation of a calibration curve. This allows for determination of the amount of a chemical in a material by comparing the results of unknown sample to those of a series known standards. If the concentration of element or compound in a sample is too high for the detection range of the technique, it can simply be diluted in a pure solvent. If the amount in the sample is below an instrument's range of measurement, the method of addition can be used. In this method a known quantity of the element or compound under study is added, and the difference between the concentration added, and the concentration observed is the amount actually in the sample.

### ***Vocabulary***

|                                |                       |
|--------------------------------|-----------------------|
| Accompanied                    | calorimetry           |
| analytical chemistry           | decrease (v)          |
| atomic absorption spectroscopy | method                |
| atomic emission spectroscopy   | electric potential    |
| biological tissues             | fluorescence          |
| calibration curve              | electrospray          |
| chemical structure             | fast atom bombardment |
| color intensity                | microscopy            |
| coulometry                     | investigate (v)       |
| crystallography                | instrumental analyse  |
| electric current               | mass-to-charge ratio  |
| electroanalytical              | potentiometry         |



electromagnetic radiation  
hybridization ionization methods  
infrared spectroscopy  
mass spectrometry  
resonance spectroscopy  
photoemission spectroscopy  
separation processes  
ultraviolet-visible spectroscopy

property  
pure solvent  
single molecule  
solve (v)  
production processes  
voltammetry  
x-rayfluorescence

### **I. Translate the sentences with the words from vocabulary after the text.**

1. *Флюоресценция* - свечение некоторых тел под влиянием освещения, по прекращении которого свечение не наблюдается.
2. *Чистый растворитель* не обладает запахом и не токсичен.
3. Достаточно знать *химический состав* вещества и его плотность, чтобы предсказать и все его прочие свойства.
4. Ученым необходимо измерить оптические линии *одиночных молекул*.
5. Спектроскопия обнаруживает и определяет вещества при помощи измерения их характеристических спектров.
6. После изучения теории ученые принялись *исследовать* новый материал.
7. В этом эксперименте необходимо *понизить* уровень абсорбации.

### **II. Fill in the gaps in these sentences:**

1. Physicochemical methods of \_\_\_\_\_ have wider application.
2. Spectroscopy measures the interaction of the molecules with \_\_\_\_\_.
3. From the raw data the relative placement of \_\_\_\_\_ in space may be determined.
4. Separation processes are used to decrease the complexity of \_\_\_\_\_.
5. The visualization of single molecules, single biological cells, biological tissues and nanomaterials is very important and attractive approach in \_\_\_\_\_.
6. Microscopy can be categorized into three different fields: \_\_\_\_\_, \_\_\_\_\_, and scanning probe microscopy.

### **III. Write out the sentences expressing the main ideas of each logical part of the text.**

### **IV. Write a summary of the text in your own words making use of plan and the sentences you've written out.**

### **V. Past Perfect and Past Perfect Progressive. Choose the correct sentence from each pair.**

1. I knew the facts of the case because I had read / had been reading the report.
2. My eyes ached because I had read / had been reading for three hours.

3. The children were filthy. They had played / had been playing in the garden, and they were covered in mud.
4. I was very nervous at the beginning of the match. I had never played/ had never been playing her before, and I didn't know how good she was.
5. Donald excelled himself as a cook. He had cooked / had been cooking a wonderful Spanish dish.
6. Donald was very cross. He had worked/ had been working in the kitchen all morning, and none had offered to help.

#### **VI. Define if the verb tenses in these sentences are correct.**

1. He had been sitting here for 40 minutes when the telephone rang.
2. I had tried to get him on the phone all day.
3. When Sarah arrived at the party, Paul had been already going home.
4. When we got back the babysitter had gone home.
5. Tom had done his homework for an hour when his friend came to see him.
6. They had hoped to get the summit but Travers fell ill at base camp.
7. When we got home last night, we found that somebody had been breaking into the flat.

### **ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №3**

#### **Medical equipment**

##### **I. Read and translate the text using a dictionary.**

Medical equipment is designed to aid in the diagnosis, monitoring or treatment of medical conditions. There are several basic types:

- Diagnostic equipment includes medical imaging machines, used to aid in diagnosis. Examples are ultrasound and MRI machines, PET and CT scanners, and x-ray machines.
- Treatment equipment includes infusion pumps, medical lasers and LASIK surgical machines.
- Life support equipment is used to maintain a patient's bodily function. This includes medical ventilators, anaesthetic machines, heart-lung machines and dialysis machines.
- Medical monitors allow medical staff to measure a patient's medical state. Monitors may measure patient vital signs and other parameters including ECG, EEG, and blood pressure.
- Medical laboratory equipment automates or helps analyze blood, urine, genes, and dissolved gases in the blood.
- Diagnostic Medical Equipment may also be used in the home for certain purposes, e.g. for the control of diabetes mellitus

- Therapeutic: physical therapy machines like continuous passive range of motion (CPM) machines

## **II. Answer the questions.**

1. What is medical equipment?
2. What types of medical equipment are there?
3. Are x-ray machines diagnostic equipment?
4. What can medical monitors measure?
5. When are life support equipment used?
6. Dialysis machine is life support equipment, isn't it?
7. Are MRI machines treatment or diagnostic equipment?

## **III. Make up 3 questions to the text.**

## **IV. Find the English equivalent of the following words in the text.**

Медицинское оборудование, диагностическое оборудование, рентген аппарат, аппарат УЗИ, томограф, аппараты жизнеобеспечения, аппарат ИВЛ, наркозный аппарат, измерять, основные показатели, исследовать, использовать, контролировать терапевтическое оборудование.

## **V. Fill the table.**

| <b>Diagnostic equipment</b> | <b>Therapeutic equipment</b> | <b>Life support equipment</b> |
|-----------------------------|------------------------------|-------------------------------|
|                             |                              |                               |

## **VI. Translate the sentences into English.**

1. Существует несколько видов медицинского оборудования.
2. Современное медицинское оборудование предназначено для диагностики и лечения заболеваний.
3. Диагностическое оборудование позволяет выявлять заболевания на ранней стадии.
4. При помощи терапевтического оборудования осуществляется лечение различных заболеваний.
5. Медицинские мониторы отслеживают состояние организма.

## **ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №4**

### **The history of medical equipment**

#### **I. Read and translate the text using a dictionary.**

It is clear to see that medicine has advanced massively through the years along with the equipment and resources that are used. Medical instruments that were used in the past may not be in use any more as with each day new and advanced resources and equipment are constantly being updated to facilitate the growing demand on the medical industry and the renowned breakthroughs that are happening in medicine every day. Antique medical equipment that has been used within the previous years can become extremely valuable to collectors.

In 15th century Europe, during and after the horrors of the bubonic plague, autopsies began to be performed at universities, and a primitive form of 'scientific method' began to take hold in the minds of the educated. Practical surgery and anatomy studies began. These curious medieval Europeans laid the foundation for modern science.

The use of medical technologies in diagnosis and treatment started in the nineteenth century. The sphygmomanometer was invented by Samuel Siegfried Karl Ritter von Basch and was used to measure blood pressure. The spirometer was invented by John Hutchinson in 1846 and was used to measure the vital capacity of the lungs. The last half of the twentieth century witnessed a tremendous growth in the use of technology in medicine. It is estimated that the growth of medical technology in the past five decades exceeded all advances made during the previous two millennia. One major factor responsible for the growth of medical technology is the integration of science and engineering with medicine. For instance, imaging devices such as X-ray or magnetic resonance imaging (MRI) are based on advanced physics principles and specifically engineered for medical applications.

The applications of medical technologies include diagnosis of diseases (e.g. X-ray), treatment of diseases (e.g. chemotherapy for cancer), prevention of diseases (e.g. immunization), screening for diseases (e.g. mammography), rehabilitation (e.g. physical therapy), automation and reducing errors (e.g. computerized order physician entry ) and improving quality of life of patients (e.g. artificial legs and arms).

## **II. Read the text again to decide whether these statements are true or false.**

1. Medical equipment which was used a millennium ago may be in use to present day.
2. Because of the smallpox epidemics, autopsies began to be performed at universities.
3. The sphygmomanometer was used to measure blood pressure.
4. The inquisitive ancient Greeks initiated the modern science.
5. Enormous growth of medical equipment was at the beginning of 20<sup>th</sup> century.
6. The main reason of the growth of medical technology is the integration of science and engineering with medicine.

## **III. Match the words (1-5) with the correct meanings (a-e).**

- |             |                                                     |
|-------------|-----------------------------------------------------|
| 1. catheter | a. a medical instrument for listening to the action |
|-------------|-----------------------------------------------------|

- |                  |                                               |
|------------------|-----------------------------------------------|
| 2. syringe       | of someone's heart or breathing               |
| 3. thermometer   | b. a medical device for determining the       |
| 4. stethoscope   | concentration of glucose in the blood         |
| 5. glucose meter | c. a tube with a hollow needle for injecting  |
|                  | d. a flexible tube inserted through a narrow  |
|                  | opening into a body                           |
|                  | e. an instrument for measuring and indicating |
|                  | temperature                                   |

#### **IV. Make 5 questions to the text.**

#### **V. Give a summary of the text (8-10 sentences). Use some words and expressions:**

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

### **ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №5**

#### **Therapeutic ultrasound**

##### **I. Read and translate the text using a dictionary.**

Ultrasound therapy is the use of sound waves above the range of human hearing to treat injuries like muscle strains or runner's knee. It is mostly used by physical therapists since the 1950s. Ultrasound is a method of stimulating the tissue beneath the skin's surface using very high frequency sound waves, between 800,000 Hz and 2,000,000 Hz, which cannot be heard by humans.

This affects the body in two ways, thermal and nonthermal. The thermal effects of ultrasound occur as kinetic energy from the ultrasound waves is absorbed by the patient's tissues, generating heat. The nonthermal effects are mechanical effects caused by the ultrasound waves in the medium they pass through.

A common application of therapeutic ultrasound is in physical therapy for people with injuries. This is especially common for treating patients with injuries to connective tissues such as tendons and ligaments, although it can be used for muscular and skeletal injuries as well. The heat generated as the vibrations are absorbed stops muscle spasms and increases blood flow to the affected area, reducing pain and promoting healing.



A typical ultrasound treatment will take from 3-5 minutes depending on the size of the area being treated. In cases where scar tissue breakdown is the goal, this treatment time can be much longer. During the treatment the head of the ultrasound probe is kept in constant motion. If kept in constant motion, the patient should feel no discomfort at all. If the probe is held in one place for more than just a few seconds, a build up of the sound energy can result which can become uncomfortable. Interestingly, if there is even a very minor break in a bone in the area that is close to the surface, a sharp pain may be felt. This occurs as the sound waves get trapped between the two parts of the break and build up until becoming painful. In this way ultrasound can often be used as a fairly accurate tool for diagnosing minor fractures that may not be obvious on x-ray.

## **II. Answer the questions.**

1. What is ultrasound therapy?
2. How long is ultrasound therapy used in medicine?
3. What does ultrasound therapy treat?
4. How do sound waves act on the patient's body?
5. Why must be ultrasound probe kept in constant motion?
6. When can patients feel a sharp pain?

## **III. Translate the underlining words in the text and make five sentences with these words.**

## **IV Translate the sentences into English.**

1. Одним из современных методов лечения различных заболеваний является ультразвуковая терапия.
2. Ультразвук используется для лечения поврежденных тканей.
3. Для ультразвуковой терапии используются звуковые колебания различной частоты.
4. Небольшие дозы ультразвука оказывают влияние на процессы регенерации в различных тканях.
5. Ультразвуковое лечение широко распространено в дерматологии, стоматологии и косметологии.

## **V. Retell the text.**

## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №6

### Electrotherapy units

#### I. Read and translate the text using a dictionary.

Electrotherapy is used as a medical treatment to aid in a variety of disorders such as neurological disease, chronic pain, damaged tissue and compromised joint mobility. It is also used in the alternative medicine field.

In electrotherapy, an electric current is applied directly to a muscle or tissue in order to stimulate a body part that trauma or natural conditioning weakened. Electrotherapy's effects are very dependent on the amount of electricity used, the type of current that is used, the body part that electricity is applied to, and the condition that the body part is in. Electrotherapy can be used to increase blood circulation, increase the body's absorption rate during drug delivery, and speed up the healing of different types of wounds.

Although electrotherapy is advantageous, it also has several disadvantages. Contrastingly, when direct current is used, the current must be restarted after each application and only produces a strong effect if the muscle is already strong. Electrotherapy is used in a wide variety of applications and has been used in one form or another since 1855.



An electrotherapy unit is a portable or clinical device typically used to apply electrical current to muscles and nerves as a means of pain relief and healing. Portable units tend to be found in the home and clinical units are generally found in medical offices.

There are a number of types of electrotherapy units that are commercially available. Covering a range of treatments, the portable units are usually small, handheld battery-powered devices, whereas the clinical units tend to be larger and use alternating current electricity. Portable units come in a variety of shapes and sizes and can be purchased with accessories such as lead wires and electrodes as well as a hard carry case.

Electrical stimulation for pain control was used in ancient Rome, 63 A.D. In the 16th through the 18th century various electrostatic devices were used for headache and other pains. Benjamin Franklin was a proponent of this method for pain relief. In the 19th century a device called the electreat, along with numerous other devices were used for pain control and cancer cures. Only the electreat survived into the 20th century, but was not portable, and had limited control of the stimulus.

#### II. Complete the sentences.

1. Electrotherapy is used to treat ...  
a) bone fracture

- b) neurological disease
- c) muscle strains
- 2. An electrotherapy unit applies ... .
  - a) electrical current
  - b) sound waves
  - c) x-rays
- 3. Electrotherapy's effects are dependent on ... .
  - a) the amount of time
  - b) the qualification of a doctor
  - c) the type of current
- 4. Electrotherapy is used ... .
  - a) since the early 19<sup>th</sup> century
  - b) since the mid-19<sup>th</sup> century
  - c) since the late 19<sup>th</sup> century
- 5. Electrotherapy can be used to ... .
  - a) to speed up the healing
  - b) to stop muscle spasms
  - c) to treat internal organs

### **III. Answer the questions.**

1. When is electrotherapy used?
2. Are electrotherapy's effects dependent on the amount of electricity?
3. What effects are from electrotherapy?
4. What are disadvantages from electrotherapy?
5. When did electrotherapy become to use?
6. What is an electrotherapy unit?
7. Can we use an electrotherapy unit at home?

### **IV. Find the English equivalent of the following words in the text.**

Электрический ток, электротерапия, сустав, применяется, кровообращение, ускорить выздоровление, часть тела, портативное устройство, электроды, провод, мышцы.

### **V. Describe advantages and disadvantages of electrotherapy.**

## **ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №7**

### **Inhaler**

#### **I. Read and translate the text using a dictionary.**

An inhaler is a medical device used for delivering medication into the body via the lungs. It is mainly used in the treatment of asthma.



The most common type of inhaler is the pressurized metered-dose inhaler. A metered-dose inhaler (MDI) is a device that delivers a specific amount of medication to the lungs, in the form of a short burst of aerosolized medicine that is usually self-administered by the patient via inhalation. In MDIs, medication is typically stored in solution in a pressurized canister that contains a propellant, although it may also be a suspension. The MDI canister is attached to a plastic, hand-operated actuator.

A dry powder inhaler (DPI) is a device that delivers medication to the lungs in the form of a dry powder. DPIs are an alternative to the aerosol based inhalers commonly called metered-dose inhaler.

In medicine, a nebulizer is a drug delivery device used to administer medication in the form of a mist inhaled into the lungs.

Nasal inhalers contain decongestant drugs to relieve nasal congestion in the upper respiratory tract.

## **II. Answer the questions.**

1. What is an inhaler?
2. When is an inhaler applied?
3. What types of inhalers do you know?
4. What is MDI?
5. Where is medication stored in MDI?
6. What is DPI?
7. What do nasal inhalers contain?

## **III. Find the English equivalent of the following words in the text.**

Медицинское устройство, ингалятор, лечение астмы, дозированный ингалятор, суспензия, легкие, лекарство, содержать, сухой порошок, разбрызгивать, ингаляция, дыхательные пути, носовые ингаляторы.

## **IV. Complete the sentences using the text.**

1. It ... in the treatment of asthma.
2. ... an alternative to the aerosol ... called metered-dose inhaler..
3. The most common type of inhaler is ... .
4. The ... is attached to a plastic, hand-operated actuator.
5. ... is a medical device used for ... into the body via the lungs.
6. Nasal inhalers ... to relieve nasal congestion in the upper respiratory tract.

## **V Translate the sentences into English.**

1. Ингалятор – устройство, которое доставляет лекарство в организм через легкие.
2. Ингалятор применяется при лечении астмы.

3. Существует несколько видов ингаляторов: дозированный, порошковый и носовой.
4. Ингаляторы для носа можно носить с собой и применять по необходимости.

## V. Retell the text.

# ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №8

## Ultrasound machine

### I. Read and translate the text using a dictionary.

Medical ultrasound is a diagnostic technique based on the application of ultrasound. It is used to see internal body structures such as tendons, muscles, joints, vessels and internal organs. The aim is to find a source of a disease or to exclude any pathology.

Ultrasound is sound waves with frequencies which are higher than those audible to humans. Ultrasound images also known as sonograms are made by sending pulses of ultrasound into tissue using a probe. The transducer probe is the main part of the ultrasound machine. The transducer probe makes the sound waves and receives the echoes. It is, so to speak, the mouth and ears of the ultrasound machine. The transducer probe generates and receives sound waves using a principle called the piezoelectric (pressure electricity) effect, which was discovered by Pierre and Jacques Curie in 1880. In the probe, there is one or more quartz crystals called piezoelectric crystals. When an electric current is applied to these crystals, they change shape rapidly. The rapid shape changes, or vibrations, of the crystals produce sound waves that travel outward. Transducer probes come in many shapes and sizes.



The central processing unit (CPU) is the brain of the ultrasound machine. The CPU is basically a computer that contains the microprocessor, memory, amplifiers and power supplies for the microprocessor and transducer probe. The CPU sends electrical currents to the transducer probe to emit sound waves, and also receives the electrical pulses from the probes that were created from the returning echoes. The CPU does all of the calculations involved in processing the data. Once the raw data are processed, the CPU forms the image on the monitor. The CPU can also store the processed data and/or image on disk.

Many different types of images can be formed using ultrasound. The most well-known type is a B-mode image. Typical diagnostic sonographic scanners operate in the frequency range of 1 to 18 megahertz.

Ultrasonic energy was first applied to the human body for medical purposes by Dr George Ludwig at the Naval Medical Research Institute, Bethesda, Maryland in

the late 1940s. English-born physicist John Wild (1914–2009) first used ultrasound to assess the thickness of bowel tissue as early as 1949; he has been described as the "father of medical ultrasound".

## **II. Answer the questions.**

1. What is medical ultrasound?
2. For what purposes is it used?
3. Can you call three main parts of ultrasound machine?
4. What are the functions of the transducer probe?
5. What are the functions of the CPU?
6. Are there many different types of images?
7. George Ludwig first applied ultrasound energy to the human body, didn't he?
8. Who is the father of medical ultrasound?
9. When did ultrasound become to use for medical purposes?

## **III. Decide whether these statements are true or false.**

1. Medical ultrasound is used to see internal body structures such as tendons, muscles and internal organs.
2. Ultrasound is sound waves with frequencies which are lower than those audible to humans.
3. The transducer probe is the brain of the ultrasound machine.
4. There is only one type of ultrasound image.
5. Typical diagnostic sonographic scanners operate in the frequency range of 20 to 25 megahertz.
6. The CPU sends electrical currents to the transducer probe to emit sound waves.

## **IV. Find the English equivalent of the following words in the text.**

Применение ультразвука, аппарат УЗИ, внутренние органы, найти источник болезни, исключить патологию, звуковые волны, частотность, слышимый для людей, контактный датчик, создавать и получать звуковые волны, электрический ток, данные, формировать изображение на мониторе.

## **V. Give a summary of the text (8-10 sentences). Use some words and expressions:**

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №9

### X-ray generator

#### I. Read and translate the text using a dictionary.

X-Rays make up a unique form of electromagnetic radiation that carries energy, which is absorbed by some substances but not by others. X-ray machines are used to take pictures of dense tissues such as bones and teeth. This is because bones absorb the radiation more than the less dense soft tissue. X-rays from a source pass through the body and onto a photographic cassette. Areas where radiation is absorbed show up as lighter shades of grey (closer to white). This can be used to diagnose broken or fractured bones.

This is probably the most common use of X-Rays, which allow us to see through certain objects. They have many other uses, too, whether it be for scanning luggage in airports or seeking out hidden bombs in dangerous battlefields.

In November of 1895, Wilhelm Rontgen, a physics professor from Germany, discovered X-Rays while examining Crookes tubes, which are gas-filled discharge tubes used to study electrons. In a serendipitous occurrence, after wrapping one of his tubes in thin, black cardboard, he noticed that some light managed to pass through, glowing on the wall of his laboratory. Upon further investigation, he found that the rays could also pass through paper, books, and then, momentarily, his wife's hand. The resulting photograph of his wife's hand bones, complete with a ring, is credited as being the first ever X-Ray image of a human body part.

From then on, X-Ray technology grew in concurrence with our understanding of it. Nikola Tesla and Thomas Edison, two of the greatest scientific minds in history, both experimented with X-Rays, aiding in making them one of the most useful tools in the modern hospital.

The heart of an X-ray generator is the X-ray tube. Like any vacuum tube, the X-ray tube contains a cathode, which directs a stream of electrons into a vacuum, and an anode, which collects the electrons and is made of copper to evacuate the heat generated by the collision. When the electrons collide with the target, about 1% of the resulting energy is emitted as X-rays, with the remaining 99% released as heat.

Being one of the most useful tools in the medical field, Radiologists use X-Ray Generators to produce pictures of a patients' internal structures, allowing them to diagnose broken bones, locate tumors, and even see the digestive tract. By using an ion chamber located between the patient and the X-Ray film, radiologists can regulate the amount of radiation exposure. A computer is used to process the X-Rays and create an image, which is displayed on a monitor.

Different types of X-Ray generators are used for different applications. For example, at airports, the X-Ray generators produce very low amounts of radiation, making them safe to be around.

## II. Answer the questions.

1. Where are X-ray generators used?
2. For what purposes are X-ray machines used in medicine?
3. Why do we use X-ray machines to take pictures of dense tissues?
4. How did Wilhelm Rontgen open X-rays and when?
5. What is X-ray tube?

## III. Make up 4 questions.

## IV. Match the words (1-6) with the definitions (a-f).

- |                  |                                                             |
|------------------|-------------------------------------------------------------|
| 1. X-ray machine | a. the <u>negatively charged electrode</u> by which         |
| 2. radiologist   | <u>electrons</u> enter an electrical device                 |
| 3. cathode       | b. the emission of energy as electromagnetic                |
| 4. X-ray         | waves                                                       |
| 5. radiation     | c. a person who <u>uses X-rays</u>                          |
| 6. X-ray tube    | d. a glass vacuum bulb containing two electrodes            |
|                  | e. a device used to generate <u>X-rays</u>                  |
|                  | f. an <u>electromagnetic wave</u> of high <u>energy</u> and |
|                  | very short <u>wavelength</u> , which is able to pass        |
|                  | through many materials                                      |

## V. Translate the sentences into English.

1. Рентгеновские аппарат — устройство для получения и использования рентгеновского излучения.
2. Первый рентгеновский аппарат в России появился в 1896 году практически сразу после открытия рентгеновского луча в 1895 году.
3. Сегодня ни одно исследование не проходит без участия рентгена, начиная от флюорографии и заканчивая МРТ головного мозга.

## VI. Give a summary of the text (8-10 sentences). Use some words and expressions:

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №10

### Chest photofluorography

#### I. Read and translate the text using a dictionary.

The chest X-ray is the commonest diagnostic X-ray examination. A chest X-ray produces an image of the chest and the internal organs. Normally a frontal view is obtained. The patient stands facing the photographic plate with the chest pressed to the plate, with hands on hips and elbows pushed out in front. The radiographer, the technician who takes the X-ray, asks the patient not to move, then to breathe in deeply and not breathe out. This makes a blurred, unclear X-ray image less likely and improves the quality of the image, as it is easier to see abnormalities in air-filled (inflated) lungs than in deflated lungs.

To produce a chest X-ray test, the chest is briefly exposed to radiation from an X-ray machine and an image is produced on a film or into a digital computer.

Depending on its density, each organ within the chest cavity absorbs varying degrees of radiation, producing different shadows on the film. Chest X-ray images are black and white with only the brightness or darkness defining the various structures. For example, bones of the chest wall (ribs and vertebrae) may absorb more of the radiation and thus, appear whiter on the film. On the other hand, the lung tissue, which is mostly composed of air, will allow most of the radiation to pass through, developing the film to a darker appearance.

Conventional radiography uses an X-ray emitter and a detector image (or radiographic film, now sensors connected to a computer) which is placed between the body segment studied. Increasingly, the devices used techniques involve capture of the image by computer, which allows you to work secondarily images to more accurately keep them as computer files for archiving and transmit images via Intranet or Internet to other physicians.

In radiology departments or among radiologists, radiology equipment are installed in rooms with thick walls that prevent the passage of radiation. The radiologist (or radiology technician) is generally placed behind a glass that does not pass the X-ray examination and follows in front of screens or computers that process data and visualize images.

Chest X-rays may be performed in patients bedridden non-transportable through a mobile device.

Radiology images are available immediately after the examination, but they must always be analyzed by a radiologist. It is possible that this analysis takes several hours.

The results are given in the form of a report to be transmitted to the prescriber to review images reproduced on film or on paper plates, and possibly a CD ROM which can be viewed in a computer with special programs for reading radiology.

## II. Answer the questions:

1. What is a chest X-ray?
2. How should the patient stand during X-ray examination?
3. Who is a radiographer?
4. When does a radiographer get clear images?
5. What can we see on X-ray images?
6. Why are bones white on an X-ray image?
7. What does radiography use?
8. Where are radiology equipment installed?
9. How long does it take to analyze an X-ray image?
10. How is a chest X-ray made?

## III. Find the synonyms:

A chest X-ray, to absorb, equipment, radiation, an image, a screen, to transmit, a display, emission, photofluorography, a device, to transfer, to devour, a picture.

## IV. Complete the sentences using the words from the box.

|              |              |           |             |            |
|--------------|--------------|-----------|-------------|------------|
| radiographer | radiotherapy | radiology | radiography | radiopaque |
| radiolucent  |              |           |             |            |

1. Using radiation to diagnose and treat disease is...
2. Using radiation to make is...
3. Using radiation to provide treatment is...
4. If something is not penetrable by radiation, it is...
5. If something is penetrable by radiation, it is...
6. A technician who administers X-ray is...

## V. Complete the sentences using the words from the box.

|       |      |      |        |     |      |          |
|-------|------|------|--------|-----|------|----------|
| still | push | hold | facing | out | take | sideways |
|-------|------|------|--------|-----|------|----------|

Please stand (1) .....this board.  
Put your hands on the back of your hips and your elbows forward. I'll help you.  
(2)..... your elbows(3).....  
Keep(4).....  
In a moment I'll ask you too (5) ..... a deep breath in and hold it.  
Breathe in, (6) .....it.  
That's it. Fine. You can breathe out now.  
Thank you. I'll need to check the film.  
Now I'm going to take a side view.

Can you stand (7).....with you right side close to the machine and your arms raised?

**VI. Find the English equivalent of the following words.**

Рентгеновский снимок, флюорография, поглощать, рентгеновские лучи, радиация, радиолог, плотность, рентгеновский излучатель, степень радиации, пленка, выполнять, анализировать.

**VII. Give a summary of the text (8-10 sentences). Use some words and expressions:**

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №11**

**Electrocardiograph**

**I. Read and translate the text using a dictionary.**

The EKG machine is a machine used to monitor and evaluate possible heart problems in a medical patient. Small electrodes are placed on the chest, sides, or hips. The electrical activity of the heart will then be recorded on special graph paper for a final result. There are four primary elements on an EKG machine.

**Electrodes**

Electrodes consist of two types, the bipolar and unipolar. The bipolar electrodes can be placed on both the wrists and the legs to measure the voltage differential between the two. The electrodes are placed on the left leg and both wrists. Unipolar electrodes, on the other hand, measure the voltage difference or the electrical signal between a special reference electrode. The reference electrode is a normal heart-rate electrode that doctors use to compare measurements. They can also be attached to the chest and watch for any changing heart patterns.

**Amplifiers**

The amplifier reads the electrical signal in the body and prepares it for the output device. When the electrode's signal reaches the amplifier it is first sent to the buffer, the first section of the amplifier. When it reaches the buffer, the signal is stabilized and then translated.

**Connecting Wires**



The connecting wires are a simple part of the EKG with an obvious role in the function of the machine. The connecting wires transmit the signal read from the electrodes and send it to the amplifier. These wires connect directly to the electrodes; the signal is sent through them and connected to the amplifier.

### **Output**

The output is a device on the EKG where the electrical activity of the body is processed and then recorded onto graph paper. Most EKG machines use what is called a paper-strip recorder. After the output records the device, the doctor receives a hard-copy of the measurements. Some EKG machines have record the measurements onto computers instead of a paper-strip recorder.

## **II. Answer the questions:**

1. What is the EKG machine?
2. What are the main parts of EKG machines?
3. What types of electrodes are there?
4. What is the difference between two types of electrodes?
5. What is the function of amplifiers?
6. What is the function of connecting wires?
7. What is the output?
8. Where do EKG machines record the measurements?

## **III. Guess the meanings.**

1. An electronic device for increasing the strength of electrical signals.
2. An instrument for making an electrocardiogram.
3. A conductor through which electricity enters or leaves something.
4. Metal that has been drawn into a very long, thin thread or rod, usually circular in cross section.

## **V. Decide whether these statements are true or false.**

1. An electrocardiograph is a device which records electrical activity in the heart.
2. There are two main parts of an EKG machine: the CPU and electrodes.
3. The amplifier reads the magnetic signal in the body.
4. The electrodes are placed on a chest, a waist and a neck.
5. The output is a device where the electrical activity of the body is processed.

## **V. Find the English equivalent of the following words.**

Электрокардиограф, устройство, электроды, провода, усилитель, соединять, располагаться, обрабатывать, записывать, печатная копия, сравнивать измерения, электрические сигналы.

## **VI. Describe the main parts of an EKG machine.**

## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №12

### Computer tomography

#### I. Read and translate the text using a dictionary.

For works in the field of a reconstructive tomography to Alan Cormac and Godfrey Haunsfild the Nobel Prize on physiology and medicine for 1979 was awarded. A. Cormac conducted theoretical researches, and G. Haunsfild in 1972 made the first complex of the x-ray tomograph and computer system of recovery of images. Now computer tomographs are available in any large clinic and hospital.

The reconstructive tomography was very powerful tool at statement of the diagnosis. In the x-ray computer tomography (CT) a large number of measurements is made.

The CT scan procedure uses a computer and a CT scanner containing a rotating x-ray device to create cross-sectional images of the body.



The CT scanner is a large, square machine with a doughnut-like hole in the center. The CT scanner contains a gantry: a rotating frame that contains the x-ray tubes, x-ray detectors, and a large opening into which the patient can be inserted. The patient lies still on a table that can be moved up or down, and can be placed into and out of the center of the hole.

During a CT scan, the patient lies still on a table. The table is rolled into or through the center of the hole in the scanner. As the CT scan progresses, the gantry rotates, and the x-ray tube moves around the patient's body to produce the required images.

In a CT scan, several x-ray beams pass through the body part being examined at different angles. As the beams pass through, different tissues absorb different amounts of radiation. Special sensors measure the amount of radiation absorbed by different tissues.

The scanner parts rotate around the patient and emit and record x-ray beams. One rotation takes about one second. The data is then sent to a special computer, which forms three-dimensional cross-sectional images of the scanned areas. These cross-sections are called tomograms.

An x-ray technologist will monitor the CT scan from behind a screen or through video equipment from another room, though he or she will not actually be in the room with the patient. An intercom within the scanner allows the patient and technologist to communicate throughout the procedure.

Patients should expect to hear whirring sounds throughout the CT scan; this is the sound of the gantry and x-ray tube rotating. At times, the technologist may ask the patient to hold his or her breath to prevent the CT images from blurring.

## **II. Answer the questions:**

1. Who got the Nobel Prize in 1979? For what?
2. What does computer tomography make?
3. What is a CT scanner?
4. What does a CT scanner contain?
5. Where does a patient lie during a CT scan?
6. How long does it take one rotation?
7. Where is the data sent?
8. What is a tomogram?
9. How does a doctor communicate with a patient?

## **III. Complete the sentences.**

1. Now .... are available in any large clinic and hospital.
2. ..., different tissues absorb different amounts of radiation.
3. The table ... of the hole in the scanner.
4. The data is then sent to ... three-dimensional cross-sectional images of the scanned areas.
5. ... are called tomograms.
6. An intercom ... and technologist to communicate throughout the procedure.

## **IV. Find the English equivalent of the following words.**

Компьютерная томография, использовать компьютер и сканер, изображения в поперечном сечении, вращаться, поглощать различное количество радиации, содержать, рентгеновская трубка, проходить через тело, измерять, двигать вперед и назад.

## **V. Make 5 sentences with the words from the previous exercises.**

## **VI. Give a summary of the text (8-10 sentences). Use some words and expressions:**

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №13

### Types of MRI machines

#### I. Read and translate the text using a dictionary.

A magnetic resonance imaging (MRI) machine is commonly used to help physicians diagnose their patients symptoms. It allows your physician to see images of internal structures in your body. Unlike an X-ray, and MRI is very detailed. There are different types of MRI machines in use today.

An MRI machine is basically a giant tube with a table that the patient lies on. The patient is placed into the tube either feet or head first depending on the area that is being examined. Inside the large tube there are magnets, which are not visible to the patient. When the machine is turned on the magnets rotate around the patient and create a situation where the patient is in a low strength magnetic field. The computer translates the information from the MRI to produce detailed images of your organs and tissues. The result is a document similar to an X-ray that can be interpreted by your physician.



MRI's are often used to diagnose conditions such as tumors, developmental issues, damage caused by a stroke and chronic conditions. Physicians can also gain information about changes and injuries to the spinal column and vertebrae, the joints, and the structure of the heart muscle. MRI's can also detect problems in many of the internal organs and can be used in cases of suspected breast cancer. The benefit of an MRI compared to an X-ray is that it is much more detailed, it can view more than just bones and joints, and it can produce 3-D images allowing the body to be viewed from many angles. There are two main types of MRI machines. Open and closed. They are both have a top over the patient. The main difference is in their size and how much the machine surround the patient. A closed machine is a smaller and more narrow tube and provides the best images. An open MRI machine is open on three sides, making it more comfortable for the patient. However the images are not as good since the magnet is not traveling around the whole body.



A closed machine is the preferred type of MRI by physicians due to more accurate pictures. However due to the fact that the top of the machine is just inches above a patient's face it can be uncomfortable for many patients and create feelings of claustrophobia. In addition a closed MRI machine can only take patients up to three hundred pounds. With an open MRI, the magnets do not circle around your body so its imaging capabilities are more limited. There are some tests an open MRI machine can not do. One plus is that an open machine can take patients up to four hundred and fifty pounds.

With advances in technology there are now also MRI's that allow the patient to sit or stand in the machine. In the case of back pain, the pain or pressure may subside as the patient lies down in an open or closed MRI. However upon sitting or standing the cause of the problem may be better detected.

## **II. Answer the questions:**

1. What is a MRI machine?
2. What are the functions of MRI machines?
3. What can MRI machines diagnose?
4. What images do MRI machines produce?
5. What types of MRI machines are there?
6. What are the advantages of an open MRI machine?
7. What are the disadvantages of a closed MRI machine?

## **III. Make 4 questions to the text.**

## **IV. Match the words (1-5) with the definitions (a-e).**

- |                               |                                                                                 |
|-------------------------------|---------------------------------------------------------------------------------|
| 1. CT scanner                 | a. a frame housing the x-ray tube, collimators and detectors in a CT machine.   |
| 2. magnetic resonance imaging | b. an image made by tomography                                                  |
| 3. X-ray tube                 | c. a medical instrument consisting of integrated X-ray and computing equipment  |
| 4. gantry                     | d. a noninvasive diagnostic technique that produces computerized images of body |
| 5. tomogram                   | e. a device that produces X rays                                                |

## **V. Translate the underlying words in the text.**

## **VI. Describe the difference between a CT scanner and a MRI machine.**

## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №14

### Medical ventilator

#### I. Read and translate the text using a dictionary.

Ventilators are medical devices that assist in breathing when an individual is unable to do so on their own. In an emergency setting, mechanical ventilation is typically started after intubation. During this process, a tube is inserted down the patient's throat. This tube serves as the place where the air is delivered. These ventilators can use various methods to do this.

The first ventilator came into use during the first polio epidemic and was called the "iron lung." In 1949, a ventilator for use during anesthesia was developed at Harvard by John Haven Emerson. The modern version of the ventilator, which is entirely gas-propelled, was developed in 1952 by Roger Manley in London. This version is similar to ventilators in use today.

There are two main types of ventilators. The most primitive is a negative pressure ventilator. Negative pressure ventilators use a vacuum to generate negative pressure within the chest, causing the chest to expand. This allows air to flow in. When the lungs have filled with air, the vacuum is sealed off, allowing passive exhalation. The other type of ventilator is a positive pressure one. More modern, it pushes air into the lungs and allows the natural buildup of pressure then to cause exhalation.

Most modern ventilators have settings that allow for different volumes of air to be pumped in accordance with the size of the patient's lungs. There are also settings that can vary the concentration of oxygen in the air delivered, as well as altering the end volume of air in the lungs after each breath.

Artificial ventilation is required when natural respiration is not sufficient for the patient. This can occur due to acute lung injury, as well chronic obstructive pulmonary disease. Ventilators can also be used when it is clear that there is extra effort needed to breathe, thus assisting the patient without overexerting them. They are also often used during surgery to ensure that the patient's breathing does not slow too much.

#### II. Answer the questions:

1. What is a ventilator?
2. What inserted into the patient's throat?
3. When did the first ventilator appear?
4. Who invented the modern ventilator?
5. What types of ventilators are there?
6. What is the difference between two types?
7. When is a ventilator used?

### III. Make 4 questions to the text.

#### III. Decide whether these statements are true or false.

1. There are three main types of ventilators.
2. Ventilators are medical devices that assist in breathing.
3. The first ventilator came into use during the first plague epidemic.
4. Mechanical ventilation is typically started after heart attack.
5. Artificial ventilation is required when natural respiration is insufficient for the patient.

#### IV. Find the English equivalent of the following words.

Медицинское устройство, искусственная вентиляция, легкие, вставлять трубку, для использования, объем воздуха, концентрация кислорода, выдох, создавать давление, размер легких, дышать, легкие наполненные воздухом.

#### VI. Give a summary of the text (8-10 sentences). Use some words and expressions:

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №15

### Dialysis machine

#### I. Read and translate the text using a dictionary.

Dialysis machines are used to replace the renal function in people who suffer from end stage renal disease. The function of the dialysis machine is to provide the fluids and other mechanisms necessary for the cleaning of the patient's blood and removal of excess fluid. Operation of these machines must be conducted by trained personnel only.

A dialysis machine consists of the following working parts:

- 1) a venous catheter to remove blood from the patient;
- 2) a blood pump to power the circulation;

3) two pressure monitors, one at the point where blood from the vein is pumped into the dialyzer, the other where cleansed blood is returned to the patient's body;

4) the dialyzer itself, where blood is filtered using a solution called dialysate pumped into the dialyzer from one container and pumped out of it into another container for used dialysate;

5) a heparin pump to prevent clotting,

6) a saline drip to give the cleansed blood the proper consistency before it is returned to the patient's body.

The patient's blood is removed from the body, circulated through the dialysis machine and treated, and returned to the body in an artificial circulation. The dialyzer itself has two chambers separated by a semi-permeable membrane, one for blood, the other for dialysate.

Because the dialysate solution is completely lacking or at least low in concentration of urea, creatinine, and dissolved minerals such as potassium and phosphorous, while the blood has undesirably high concentrations of these materials, so that they pass through the semi-permeable membrane from the blood into the dialysate, removing them from the blood.

A dialysis machine sets up two opposite flows, blood in one direction and dialysate in the other, with a semi-permeable membrane between them. The spent dialysate is then returned to a separate container and replaced with fresh dialysate. The exact composition of the dialysate solution varies depending on the contaminants in the patient's blood.

## **II. Answer the questions:**

1. What is a dialysis machine?
2. What is the functions of a dialysis machine?
3. What are the main parts of a dialysis machine?
4. How does a dialysis machine work?
5. What is the dialysate?
6. What is the dialyzer?

## **III. Make 4 questions to the text.**

## **IV. Match the words (1-5) with the definitions (a-e).**

- |                     |                                                            |
|---------------------|------------------------------------------------------------|
| 1. dialysis machine | a. a continuous giving of a solution                       |
| 2. dialysate        | b. a machine used to propel blood                          |
| 3. blood pump       | c. a machine that filters a patient's blood                |
| 4. dialyzer         | d. solution that passes through a membrane during dialysis |
| 5. drip             | e. a machine that performs dialysis                        |



**V. Translate the underlying words in the text and make 5 sentences with this words.**

**VI. Give a summary of the text (8-10 sentences). Use some words and expressions:**

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

## **ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №16**

### **Medical monitor**

**I. Read and translate the text using a dictionary.**

A medical monitor or display is an electronic medical device that measures a patient's vital signs and displays the data obtained, which may or may not be transmitted on a monitoring network. These units allow continuous monitoring of a patient, with medical staff being continuously informed of the changes in general condition of a patient. Medical monitor examples in hospitals are numerous. Some machines measure things like heart rate, respiration rate, blood pressure, and oxygen saturation levels at the same time. Some monitors are portable and can be taken home or worn at home to provide a more comfortable place to run tests. When people are at risk for irregular heartbeats or arrhythmia, they might wear a holter medical monitor for 24 hours, which can record any heartbeat irregularities.

When any of the readings fall out of the preset range of values, a microprocessor sets off an audible alarm to alert the staff.

#### **Advantages:**

- Lower costs using monitoring systems rather than having nurses/trained staff having to monitor each patient
- Computer systems able to detect small changes and are less prone to mistakes
- Computer systems can monitor more than one variable at the same time and while nurses can monitor more than one variable, it would be difficult for them at the same time

**Disadvantages:**

- Some monitors have an electrical contact with the patient, so they can be hazardous if electrical current passes through these electrodes in case of grounding failures
- The use of monitors means actual human nurses or doctors spend less time with patients
- In case of a special or uncommon emergency, there may be no nearby people to help the patient

**II. Answer the questions:**

1. What is a medical monitor?
2. What do medical monitors measure?
3. When is a holter monitor used?
4. What are advantages of a medical monitor?
5. What are disadvantages of a medical monitor?

**III. Make 3 questions to the text.****IV. Find the English equivalent of the following words.**

Монитор, измерять, данные, медицинский персонал, пульс, частота дыхания, состояние пациента, информировать об изменениях, звуковой сигнал, показания, электрический ток, обнаруживать, артериальное давление, нарушения сердцебиения.

**V. Retell the text.****ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №17****What is a heart defibrillator?****I. Read and translate the text using a dictionary.**

An important 20th century development in the medical field was the creation and advancement of the heart defibrillator. This device utilizes electric charges to shock the heart and establish a normal heartbeat. The heart defibrillator is used when the heart muscles are contracting abnormally, which obstructs blood flow. This device can jolt the heart muscle to correct its behavior and re-establish blood flow.

The technology and procedure for heart defibrillation was first demonstrated in 1899 by two Swiss physiologists who discovered that electrical pulses could reverse abnormal heart rhythm in dogs. In 1947, this technology was used on a human during open heart surgery. At that time, paddles that conducted electricity needed to be directly applied to the heart. In the 1950s, it was discovered that by using charges of

more than 1,000 volts, regular heart rhythm could be restored without opening the chest cavity. In the 1960s, portable defibrillators were introduced.

A heart defibrillator is used to restore the heart's normal rhythm during cardiac arrhythmia, such as fibrillation. During fibrillation, the heart contractions of the heart ventricles are sporadic and unable to properly pump blood. During ventricular tachycardia, the ventricles work too fast and can result in no pulse. Electricity from the defibrillator is used to restore a normal heart beat. The defibrillator takes about 30 seconds to gain an electrical charge and then the paddles administer the charge through paddles placed on the chest.

External defibrillators can be manually or automatically operated. External defibrillators must be used by trained medical professionals to determine the amount of electricity to be administered. Automatic external defibrillators can read cardio activity and determine what electrical treatment is necessary. Implantable defibrillators are also available. These devices constantly monitor the heart rate and administer shocks as necessary.

There are several misconceptions regarding defibrillators, most of which are perpetrated through movies and television. For example, many movies or television shows portray a cardiac arrest patient as convulsing or jerking upwards violently after defibrillation. In reality, patients treated with a defibrillator may twitch slightly but generally do not move. Defibrillators are also shown to re-establish a pulse in a patient who has flat-lined. Defibrillators are not actually used to create a heartbeat in patients who have flat-lined.

## **II. Answer the questions:**

1. What is a heart defibrillator?
2. What are the functions of a heart defibrillator?
3. Who invented a heart defibrillator?
4. When did an external defibrillator become to use?
5. How does a heart defibrillator work?
6. What types of external defibrillators are there?
7. What misconceptions are there?

## **III. Decide whether these statements are true or false.**

1. A heart defibrillator is used to restore the heart's normal rhythm.
2. British physiologists discovered that electrical pulses could reverse abnormal heart rhythm in cats.
3. External defibrillators were introduced in 1960s.
4. External defibrillators can be only automatically operated.
5. The defibrillator takes about 30 seconds to gain an electrical charge.
6. External defibrillators is used by nurses.

**IV. Translate the underlying words in the text and make 5 sentences with this words.**

**V. Give a summary of the text (8-10 sentences). Use some words and expressions:**

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

## **ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №18**

### **Anaesthetic machine**

**I. Read and translate the text using a dictionary.**

The anaesthetic machine is used by anaesthesiologists to support the administration of anaesthesia. The most common type of anaesthetic machine in use in the developed world is the continuous-flow anaesthetic machine, which is designed to provide an accurate and continuous supply of medical gases (such as oxygen and nitrous oxide), mixed with an accurate concentration of anaesthetic vapour and deliver this to the patient at a safe pressure and flow. Modern machines incorporate a ventilator, suction unit, and patient-monitoring devices.

The original concept of anaesthetic machine was invented by the British anaesthetist H.E.G. Boyle in 1917. Prior to this time, anaesthetists often carried all their equipment with them. The anaesthetic machine is usually mounted on anti-static wheels for convenient transportation.

Anaesthetic machines have six basic subsystems:

- gas supplies: pipelines and cylinders;
- gas flow measurement and control (flowmeters);
- vaporizers;
- gas delivery: breathing system and ventilator;
- scavenging;
- monitoring.

The anaesthesia machine mixes the correct concentrations of gas and drugs to be inhaled and exhaled by the patient so they lose consciousness. They are held unconscious and have no sensation while being operated on, then regain consciousness after the operation.

Physiology anaesthetic gas affects the nervous system, resulting in a numbing of the nerve pathways. The patient becomes unconscious, unaware of what is

happening, has no pain, is immobile and free from memory while under the influence of the anaesthetic agent.

Air, oxygen, and nitrous oxide are supplied from cylinders. The flow of gas is controlled by flowmeters. The gas is mixed and passed over a vaporiser containing the anaesthetic agent. The gas then goes through an over pressure relief valve and back flow valve, then to the common gas outlet, ready to be given to the patient. The gas then enters a patient circuit and ventilator. Expired gas can be stripped of CO<sub>2</sub> in a soda-lime filter and recirculated, or scavenged out of the room.

### **III. Answer the questions:**

1. What is an anaesthetic machine?
2. What is the most common type of an anaesthetic machine?
3. Who invented an anaesthetic machine? When?
4. What are the main parts of an anaesthetic machine?
5. What medical gases are used in an anaesthetic machine?
6. How does anaesthetic gas affect patients?
7. How does an anaesthetic machine work?

### **III. Match the words (1-5) with the definitions (a-e).**

- |                           |                                                                          |
|---------------------------|--------------------------------------------------------------------------|
| 1. a heart defibrillator  | a. a colourless gas used as an anaesthetic                               |
| 2. an anaesthetic machine | b. an electronic device that displays a patient's vital signs            |
| 3. a medical ventilator   | c. a machine that starts the heart beating normally                      |
| 4. a medical monitor      | d. a machine designed to mechanically move air into and out of the lungs |
| 5. nitrous oxide          | e. a medical device used in the administration of anaesthesia            |

### **IV. Find the English equivalent of the following words.**

Наркозный аппарат, смешивать, медицинский газ, правильная концентрация газа, вдыхать и выдыхать, действовать на нервную систему, терять сознание, испаритель, расходомер, доставлять.

### **V. Make 6 sentences with the words from the previous exercise.**

### **VI. Give a summary of the text (8-10 sentences). Use some words and expressions:**

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

## ПРАКТИЧЕСКОЕ ЗАНЯТИЕ №19

### Fundus camera

#### I. Read and translate the text using a dictionary.

The fundus is the rear part of the inner eye and is visible through an ophthalmoscope, which is a hand-held device with a light attached for examining the retina and other sections of the eyes. A fundus camera is actually a microscope that is connected to a digital camera to examine the inner eye. The device is able to take high-resolution photographs for the monitoring and diagnosis of degenerative eye diseases or trauma. The image is typically able to be viewed on a screen in real-time during the procedure. An ophthalmologist may choose to examine the eye by means of a dilated fundus examination, which involved administering eyes drops to enlarge the pupil for maximum viewing of the fundus.

When viewing and photographing the fundus and other parts of the eye with a fundus camera, pupil dilation allows the ophthalmologist to view right to the back of the eye. This is all accomplished without touching the eye itself. Once dilated, the doctor is able to check for conditions such as retinal tears, tumors, cataracts and hemorrhages. The eyes are typically sensitive to light after dilation and the effects can last for up to five or six hours.

There are a number of procedures that the fundus camera can be employed for. Angiography is where fluorescent dye is injected into the blood vessels and the camera records the flow of the dye through the veins in the eyes. This procedure is generally used to diagnose any underlying pathologies.

The fundus camera is actually a low powered microscope and is sometimes referred to as a retinal camera. The eye is one of the few parts of the human body where doctors can witness the flow and circulation of blood in minute blood vessels. This gives the fundus camera an important role in diagnosing diseases and hemorrhaging before they can cause blindness and affect the body in general. The actual light that is used for observing the eye is funneled through multiple lenses. Once the ophthalmologist is ready to take a picture, he depresses a button on the device and a mirror inside the fundus camera captures and reflects light down to the eye itself.

#### III. Answer the questions:

1. What is a fundus camera?
2. When is a fundus camera used?
3. What parts of an eye can it examine?
4. Why does an ophthalmologist enlarge a pupil?
5. How does it work?

#### III. Make 4 questions to the text.

IV. Translate the underlying words in the text and make 5 sentences with this words.

**V. Give a summary of the text (8-10 sentences). Use some words and expressions:**

1. This text is about ...
2. The text contains the description of ...
3. The main idea of the text is ...
4. In my opinion
5. It should be noted ...
6. In conclusion ...
7. To sum up ...

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# **БИОМЕДИЦИНСКИЕ ПРИБОРЫ И СИСТЕМЫ**

## **МЕТОДИЧЕСКИЕ УКАЗАНИЯ**

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### **Составители:**

**Малютина** Юлия Владимировна

**Прибыткова** Ольга Васильевна

**Полухина** Ирина Васильевна

**Аленькова** Наталья Валерьевна

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ФГБОУ ВО «Воронежский государственный технический университет»  
394006 Воронеж, ул. 20-летия Октября, 84