











Název: Electrical engineering

Autor: RNDr. Věra Vachalcová (lekce 1-5, 8-10),

Mgr. Zdeňka Vojtáková (lekce 6,7)

RNDr. Jitka Kunčarová

Odborné konzultace: Mgr. Jaromír Macháček (lekce 5, 8-10)

Odpovědný redaktor: Mgr. Vladislav Niedoba, RNDr. Jitka Kunčarová

Sazba a ilustrace: MgA. Anna Lamačová

Počet stran: 45

Měsíc a rok vydání: srpen 2022

Vydavatel: Krajské zařízení pro další vzdělávání pedagogických pracovníků a informační centrum,

Nový Jičín, příspěvková organizace

Zhotovitel: OPEN AGENCY, s.r.o.



Publikace vznikla v rámci projektu Odborné, kariérové a polytechnické vzdělávání v MSK II, reg. č. CZ.02.3.68/0.0/0.0/19_0 78/0019613, který byl podpořen z Operačního programu Výzkum, vývoj a vzdělávání a je financován z Evropského sociálního fondu, ze státního rozpočtu České republiky a z rozpočtu Moravskoslezského kraje.

UPOZORNĚNÍ

Toto dílo, včetně všech svých částí, je opatřeno výhradou autorských práv a je chráněno. Jiné, než zákonem předepsané užití je trestné – jde především o přísný zákaz dalšího rozmnožování bez písemného souhlasu vydavatele. Za jazykovou a obsahovou stránku díla odpovídá autor.

 ISBN
 978-80-87744-13-0 (brožováno)

 ISBN
 978-80-87744-14-7 (online; html)

 ISBN
 978-80-87744-15-4 (soubor)

CONTENTS CHART

Unit title	Page
1 Electrical engineering	5
2 Electricity and electric circuit	9
3 Electrical and electronic components	13
4 Transistors and integrated circuits	17
5 Electrical measurements	21
6 Domestic electrical installation I	25
7 Domestic electrical installation II	29
8 Electrical machines and devices	33
9 Electric motors	37
10 Safety at work in electrical engineering	41
Obrazové zdroje	45

Unit 1 Watch the video record presenting how useful electricity is in our lives. **Electrical engineering**





Exposition Read and listen.

You certainly know what electrical engineering is, don't you? Let's start with a very simple definition: electrical engineering deals with practical applications of **electricity** in all its forms. At its core, it involves the study and design of devices and equipment that use electricity, electromagnetism, and electronics.

Electrical engineering is divided into a wide range of fields. Let's take a closer look at the field of power engineering. It deals with the generation, transmission, distribution, and utilization of electricity. The electrical devices and electrical machines related to this field are transformers, turbines, electric generators, and electric motors. For transmission and distribution, power engineering uses an electrical network called a **power grid**. The grid often covers large areas and connects a number of power plants with users who buy the electrical energy.

Telecommunications is another very important field. It deals with the transmission of signals over significant distances via wire, radio, optical or other electromagnetic systems.

Control engineering involves the design

of electronic controllers such as the flight system of an aircraft, automation system in factories, cruise control in a motor vehicle, and others.

READING

Signal processing focuses on analysis and manipulation of both analogue and digital signals to optimize or improve their efficiency or performance. It has a wide range of applications, from radios and smartphones to radars and satellites.

Electrical engineering also includes radiofrequency engineering, instrumentation, and **electronic**s. Many of the disciplines are closely connected with other engineering branches such as hardware engineering, power electronics, electromagnetics waves, microwave engineering, nanotechnology, electrochemistry, renewable energies, and many others.

mention finally, we should mechatronics. It is an interdisciplinary branch of mechanical engineering that deals with the integration of mechanical, electronic and electrical engineering systems. Mechatronics includes combination of robotics, electronics, computers, telecommunications, control systems, and product engineering.

Match the Czech words with their English equivalents.

- 1 power engineering
- control engineering
- 3 electricity
- 4 mechatronics
- 5 electrical machine
- 6 electrical engineering
- 7 telecommunications
- 8 electronics
- 9 power grid
- 10 electrical device
- A elektronika
- B telekomunikace
- C mechatronika
- D elektroenergetika
- E elektrická distribuční sír
- F elektrický stroj
- G elektrický přístroj
- H řídicí technika
- elektrotechnika
- J elektřina

Choose the expressions from the text and write them next to their definitions.
obor, který se zabývá řídicími

- systémy pro automatizační úlohy
- 2 Obor, který se zabývá praktickým využitím elektrické energie 3 Souhrnný název elektrostatických
- a elektrodynamických jevů včetně elektromagnetismu
- 4 Podobor, který se zabývá procesy výroby, dopravy a užití elektrické energie
- 5 Propojující technologie, která zajišťuje rozvod elektrické energie z přenosové soustavy jednotlivým koncovým uživatelům
- 6 Zařízení, které přeměňuje elektrickou energii na mechanickou nebo naopak
- 7 Zařízení, které vyrábí elektřinu nebo je napájeno elektřinou
- 8 Obor, který se zabývá aplikací elektronických zařízení, jako jsou integrované obvody a tranzistory
- 9 Podobor, který se zabývá předáváním informací na dálku
- 10 Nový obor, který spojuje strojírenství, elektrotechniku a informatiku

7	Choose the expressions from the text
	and write them next to their definitions.

1 A new field that combines mechanical engineering, electrical engineering and informatics

2 An interconnected network for delivering electricity from producers to consumers

3 Equipment that generates electricity or is powered by electricity

- 4 A field that deals with control systems for automation tasks
- 5 A field that deals with the practical use of electricity
- 6 Equipment which converts electrical energy into mechanical energy or vice versa
- 7 A field that deals with the transmission of information over great distances
- 8 General name of electrostatic and electrodynamic phenomena, including electromagnetism
- 9 A field that deals with the application of electronic devices such as integrated circuits and transistors
- 10 A field that deals with the processes of production, transport and use of electricity



OF THE STATE OF TH	
WRITIN	G
	H
	H
	н



A: Let's talk about jobs we can do after graduation.

B: Well. I think that as graduates we can work in professions in both production and non-production organizations wherever it is necessary to ensure trouble-free **operation** of electrical

A: What are the widely spread professions in electrical engineering?

B: In my opinion these are electrical engineering technician, electrical inspector, electrical tester, and electrical repairman. The true scope of jobs of electrical engineering technicians will depend upon the job they are hired for. But there are several primary responsibilities that can be applied to nearly all electrical engineering technician positions.

A: I agree. Their duties are to design, **assemble**, install, evaluate electrical systems, and create documentation. They order the necessary parts and equipment for the project and then either perform the installation themselves or assist in the

installation process. They must ensure all circuits and parts are correctly installed and function as intended. They keep detailed documentation on all the systems and equipment they work on.

- B: Of course, and prior to the installation, all electrical parts, assemblies, and accessories must be inspected and tested. This is a job of electrical inspectors. They check conformance to specifications and quality standards, using precision measuring instruments and test equipment.
- A: Sure. An electrical tester's duty is to test electrical systems and equipment to identify faults. They measure a variety of electrical parameters, from electric current and voltage to resistance, continuity and so on.
- B: And finally, an electrical repairman maintains, repairs, **adjust**s, replaces and installs electrical equipment and systems in commercial, industrial, power environments as well as in

Choose the correct term from the dialogue and match it with one of the definitions. 1 Osoba, která opravuje, udržuje technické zařízení 2 Mírně upravit zařízení, aby lépe vyhovovalo podmínkám nebo aby lépe fungovalo 3 Způsobit, aby se něco konkrétního stalo nebo zůstalo jistým, nepochybným, pevným 4 Fungování technického zařízení 5 Uvést do předchozího stavu bez závad 6 Osoba, která před instalací kontroluje a testuje elektrické součásti, sestavy a příslušenství 7 Osoba odpovědná za testování elektrických systémů a zařízení a detekci vadného zapojení 8 Sestavovat, skládat části do určitého celku 9 Osoba, která se zabývá instalací, údržbou a hodnocením elektrických systémů 10 Zajišťovat zachování systémů, přístrojů a součástek v provozuschopném stavu

Choose the correct term from the dialogue and match it with one of the definitions. WRITIN 1 A person who deals with installation, maintenance and evaluation of electrical systems 2 To make something certain to happen 3 A person who inspects and tests electrical parts, assemblies, and accessories prior to installation 4 To fit together the parts or pieces 5 To keep something (a building, machine, or road) in good condition by checking or repairing it regularly 6 A person who repairs or maintains electrical equipment 7 To fix something that is broken or damaged 8 The action of functioning or the fact of being active or in effect 9 To change something slightly to make it more suitable for a new set of conditions or to make it work better 10 Person responsible for testing electrical systems and equipment to detect faulty wiring

Listen to the dialogue and decide if the statements are true or false. 1 Electrical engineering is a branch of electronics. 2 There are many different fields within electrical engineering. 3 The fields of electrical engineering are not connected. true 🗀 false 🗀 4 Electrical engineering fields include telecommunications and signal processing. true 🗆 false 🗅 5 The relationship between electrical engineering and electronics may vary depending true 🗆 false 🗅 on the country where you want to study the subjects.

- 1. Pay attention to the multiple meaning of some English words, e.g. the word "wire" can be translated into Czech as drát, struna, telegraf, telegram.
- 2. The word **electrical** can be used generally to talk about anything that uses electricity or more specifically for things that process or develop electricity, such as an electrical engineer, electrical component, electrical outlets, electrical system, electrical faults, etc.
- 3. Whereas the word **electric** describes an appliance or machine that functions on electricity, such as an electric iron, electric oven, electric guitar, electric shock, electric motor, etc.
- 4. Electrical tester may be a person responsible for testing electrical equipment, or an instrument for measuring a variety of electrical parameters, from current and voltage to resistance, continuity, and so on.

Vocabulary

adjust BrE/ə dznst/ AmE/ə dznst/ assemble BrE/əˈsembl/ AmE/əˈsɛmbl/

control engineering BrE/endzi'niərin /AmE /endzi'nirin/ electrical device BrE/ı lektrıkl dı vaıs/ AmE/ı lektrıkl dı vaıs/ electrical machine BrE/I lektrIkl mə fi:n/ AmE/I lektrIkl mə fin/

electrical engineering BrE/I lektrikl end3I niərin/ AmE/I lektrikl end3ə nirin/ electrical engineering technician BrE/T lektrıkl endər nıərın tek nısın/ AmE/T lektrıkl endə nırın

electrical inspector BrE/I 'lektrIkl In 'spektə(r)/ AmE/I 'lektrIkl In 'spektər/ electrical repairman BrE/I lektrIkl rI peamæn/ AmE/I lektrIkl rI permæn/

BrE/I lektrIkl testə(r)/ AmE/I lektrIkl testər/ electrical tester

electricity BrE/I lek trɪsəti/ AmE/I lek trɪsəti/ electronics BrE/I lek troniks/ AmE/I lek traniks/ ensure BrE/ɪnˈʃʊə(r)/AmE/ɪnˈʃʊr/

maintain BrE/mein tein/ AmE/mein tein/

BrE/ mekə troniks/ AmE/ mekə tra:niks/ mechatronics

operation BrE/ ppa rei[n/ AmE/ apa rei[n/

power engineering BrE/'pavə(r) endzı'nıərın/ AmE/'pavər endzə'nırın/

power grid BrE/'pavə(r) grɪd/ AmE/'pavər grɪd/ repair BrE/rr'peə(r)/ AmE/rr'per/

telecommunications BrE/ telikə mju:nı keı[nz/ AmE/ teləkə myunə keı[nz/



READING

seřizovat montovat. řídicí technika elektrický přístroj elektrický stroj elektrotechnika elektrotechnik

> revizní technik opravář zkušební elektrotechnik

elektřina

elektronika zajistit udržovat mechatronika běh, chod (stroje) energetika

elektrická distribuční síť

opravovat telekomunikace

Example sentences

The machine must be switched off, before taking any action to clean or **adjust** the machine.

We usually fear to **assemble** and disassemble a computer system by ourselves.

Control engineering is a key in many user control systems from a simple dishwasher to an airplane.

Electrical devices use electric current or electromagnetic fields as a power source.

Electric machines are of three main types: transformers, generators, and motors.

Electrical engineering is one of the newer branches of engineering, and dates back to the late 19th century.

Electrical engineering technicians install and maintain electrical control systems and equipment.

An **electrical inspector** rejects or accepts a piece of electrical equipment for installation.

An **electrical repairman** provides a wide variety of services, from major installation to changing over a broken socket or breaker.

An **electrical tester** inspects and tests the installation of the electrical wiring for heating and air-conditioning systems, appliances, etc.

Electricity is a secondary energy source that we get from the conversion of other sources of energy.

Electronics focuses on the construction and optimization of electronic equipment for various applications.

Regularly check all equipment and tools to **ensure** that they are well maintained and safe to use.

We have to service and maintain machines regularly in order to keep them functioning and operating at 100% efficiency.

Mechatronics integrates the principles of mechanical, computer, electrical, and controls engineering into a unified discipline.

The safe **operation** of machinery has become an important concern across all industries.

Power engineering deals with distribution, transmission and generation of electric power.

A power grid includes generator stations, transmission lines and towers, and individual consumer distribution lines.

Only a person with the sufficient amount of skill and experience can **repair** an electrical device safely.

A modern digital **telecommunications** system must be capable of transmitting voice, data, radio, and television signals.









Choose the correct spelling (only one for each sentence).

- 1 The field of electrical engineering that delas with transmission of information over great distances is called
- c) telecommunications
- d) tevecommunications
- 2 To make regular repairs to a building, road, vehicle, etc. so that it stays in good condition means to
- c) meintain
 d) maintein
- 3 The field of electrical engineering that combines electronics and mechanical engineering is called
- a) mechatronics
- b) mechatronic
- c) mekatronics
- d) mechatroniks

Test 2



Decide which statement is correct (only one definition is correct).

1

- a) A power grid is information technology used to enable the exchange of data and information.
- b) A power grid is an interconnected network for delivering electricity from producers to consumers.
- c) A power grid is a system of devices that ensure the transmission of electricity from large sources (power plants) to large substations.

2

- a) Control engineering deals with analogue and digital signals to optimize or improve their efficiency or performance.
- b) Control engineering involves the use of high voltages in an electrical network called a power grid.
- c) Control engineering deals with electronic controllers such as the flight system of an aircraft, automation system in factories, cruise control in a motor vehicle, and others.

3

- a) Electrical engineering does not include fields like radio-frequency engineering, instrumentation, and electronics engineering.
- b) Electrical engineering deals with the study, design and application of electrical equipment and systems.
- c) Mechatronics is not a field of electrical engineering.

Written task



Answer the following questions:

What field are you studying?

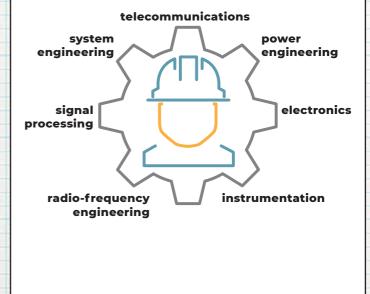
Do you like your field of study?

Do you plan on working in the field you are studying?

Do you think it will be easy to find a job after graduation?

Write 80 - 120 words.			

ELECTRICAL ENGINEERING



Unit 2 **Electricity & electric circuit**

Watch the video record presenting how electric circuit works.

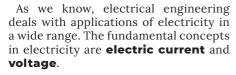






Exposition

Read and listen.



Electric current is the flow of **electric** charge carriers. The carriers of electric charge can be particles such as electrons, protons, ions, and holes. Electrons have negative charge while protons are charged positively. Ions are atoms that have lost or gained one or more electron. Electron holes are areas with missing electrons and may be thought of as positive particles.

Voltage is a quantity closely related to current. Voltage can be defined as the **potential difference** between two points. A material's tendency to resist the flow of electric charge, or current, is called resistance.

Electric current is usually denoted I = E/R.

As we know, electrical engineering by the symbol I. The unit of electric current is the ampere, or amp; that is the **flow** of electric charge across a charge.

> Ohm's law is the most fundamental and at the same time the simplest law when dealing with electric circuits. It describes the relationship between current, voltage, and resistance in an electric circuit. It says that voltage symbolized by V is equal to current symbolized by I multiplied by resistance symbolized by R; that is, V=I x R. If we divide both sides of the equation by resistance, we get that current is equal to voltage divided by resistance; that is, I = V/R. Ohm's law may also be expressed in terms of the electromotive force, or voltage symbolized by E, of the source of electric energy, such as a battery, e.g.,

> surface at the rate of one coulomb per second. The coulomb is a unit of electric



Match the Czech words with their English equivalents.

- electric charge
- resistance
- potential difference
- unit
- 5 electric circuit
- 6 voltage
- 7 flow
- carrier
- quantity
- 10 electric current
- elektrický proud
- elektrický obvod
- elektrický náboj
- rozdíl potenciálů
- veličina
- odpor
- H nosič
- jednotka
- napětí

7	Choose the expressions from the text	
4	and write them next to their definition	S

In IEEE and American standards, voltage is described by "V" letter. In European

notation, "U" describes voltage source while "V" describes rather voltage potential.

1 Uspořádaný pohyb volných částic s elektrickým nábojem

2 Vodivé spojení několika elektrických prvků

3 Vlastnost hmoty, která vyjadřuje schopnost působit elektrickou silou a způsobuje tuto sílu, pokud jsou nabitá pole

4 Stabilní a nepřetržitý pohyb něčeho v jednom směru

5 Rozdíl množství energie, kterou mají nosiče náboje, mezi dvěma body v elektrickém poli

6 Vlastnost jevu, tělesa nebo látky, mající velikost, kterou lze vyjádřit číslem a referencí

7 Veličina vyjadřující schopnost vodiče omezovat průchod elektrického

8 Částice nebo díra, která se volně pohybuje v materiálu a nese elektrický náboj

9 Standardní míra fyzikální veličiny

10 Elektromotorická síla nebo rozdíl potenciálů mezi dvěma body vyjádřená ve voltech



1 The degree to which a substance limits the flow of electricity through it_

2 A property of matter carried by some elementary particles that governs how the particles are affected by an electric or magnetic field

3 The steady and continuous movement of something in one direction

4 A particle or a hole that freely moves within a material and carries an electric charge

5 A standard for the measurement of a physical quantity

6 An electromotive force or potential difference between two points expressed in volts

7 The difference in the amount of energy that charge carriers have between two points in a circuit

8 A flow of electric charge carriers in a circuit

9 A path for transmitting electric

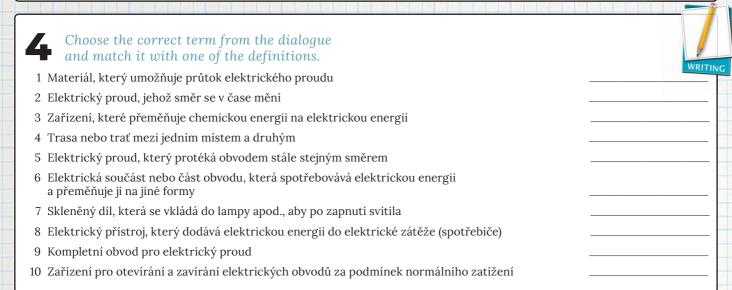
10 A property of a phenomenon, body or substance, the magnitude of which can be expressed by number and reference







- sources, let's explain what an electric circuit is and what components it includes.
- B: All right. An electric circuit is a closed path, or let's say loop, through which current can flow. Every electric circuit, regardless of where it is or how large or small it is, has four basic parts: a power source (AC or DC), a conductor, such as a wire, an electrical load, e.g., a bulb, and at least one controller, such as a switch. Simplified circuit diagrams usually show the load with the symbol for resistors.
- A: Well, it follows that there are a power sources which produce electricity in the form of direct current (DC) and other ones producing the alternating current (AC). And thus, the first classification of electric circuits results from what current is used as a power source in the given circuit.
- A: Before talking about types of electric circuits and power B: Sure. Simple DC power sources involve primary or secondary cells and batteries. They convert stored chemical energy into electrical energy. An AC power source is the standard electricity that comes out of wall outlets. Another AC power source can be for example an alternator, or let's say an AC generator.
 - A: Is there another classification of electric circuits?
 - B: Of course. We distinguish between series circuits and parallel circuits. A series circuit has more than one resistor but only one path. A parallel circuit has more than one resistor and more than one branch for electrons to flow. The main disadvantage of series circuits is that if there is a break in any of the resistors, the entire circuit is open and does not function. While if there is a break in one branch of a parallel circuit, the electrons can flow in other branches.



Choose the correct term from the dialogue and match it with one of the definitions. 1 A route or track between one place and anothers 2 An electrical device that supplies electric power to an electrical load 3 A complete circuit for electrical current 4 An electric current that reverses its direction many times a second at regular intervals 5 A device for opening and closing electrical circuits under normal load conditions 6 The glass part that fits into an electric lamp, etc. to give light when it is switched on An electrical component or part of a circuit that consumes electrical energy and transforms it into other forms 8 A device, which converts chemical energy into electrical energy 9 An electrical current which flows consistently in one direction only 10 The type of metal which allows the electric current to flow through it

Listen to the dialogue and decide if the statements are true or false. 1 Electrical conductivity is the ability of a material to transmit electrical energy. true 🗆 🛮 false 🗀 2 Silver, copper and gold are good insulators. true 🗆 🛮 false 🗅 3 Silver has tendency to tarnish and thus increase conductivity. true 🗆 false 🗅 4 Glass, rubber, plastic, dry wood, and air are semiconductors. true 🗆 🛮 false 🗀 5 Silicon and germanium are semiconductors. true 🗆 false 🗅

- 1. When an electrician describes actions in his work, he usually uses verbs such as: light up - rozsvítit se, gather shromáždit, bend - ohnout, screw - zašroubovat, tighten utáhnout, loosen - povolit (šroub), attach - připevnit, make sure - ujistit se, slip - zasunout.
- 2. When describing electrical wiring diagrams, commonly used words are: consist of - skládat se, contain - obsahovat, function - fungovat.
- 3. When troubleshooting a circuit, the important words are: open and closed. We use them to determine whether the circuit is open, or closed. When the circuit is open, electrons cannot flow through it, and loads do not function in the circuit. For example, a light bulb will not light up in an open circuit. When the circuit is closed, it functions properly as it allows a current to flow through it.

Vocabulary



alternating current (AC) BrE/'ɔ:ltəneɪtɪŋ 'kʌrənt/ AmE/'ɔltərnətɪŋ 'kərənt/ střídavý proud bulb BrE/bʌlb/ AmE/bʌlb/ žárovka carrier BrE/'kæriə(r)/ AmE/'kæriər/ nosič cell BrE/sel/ AmE/sɛl/ článek conductor BrE/kən'dnktə(r)/ AmE/kən'dnktər/ vodič

direct current (DC) BrE/də rekt, daɪ rekt 'kʌrənt/ AmE/də rekt, daɪ rekt 'kərənt/ stejnosměrný proud electric circuit BrE/I lektrik 'ss:.kit/ AmE/I lektrik 'sərkət/ elektrický obvod electric current BrE/I lektrik karent/ AmE/I lektrik kerent/ elektrický proud electric charge BrE/I lektrik t[a:d3/ AmE/I lektrik t[ard3/ elektrický náboj electrical load BrE/I lektrikl loud/ AmE/I lektrikl loud/ spotřebič

flow BrE/flอช/ AmE/floช/ tok BrE/lu:p/ AmE/lup/ loop smyčka path BrE/pa:θ/ AmE/pæθ/ dráha

potential difference BrE/pəˈtenʃl ˈdɪfrəns/ AmE/pəˈtɛnʃl ˈdɪfrəns/ rozdíl potenciálů power source BrE/'pavə(r) so:s/ AmE/'pavər sors/ zdroj energie quantity BrE/'kwpntəti/ AmE/'kwantəti/ veličina resistance BrE/rɪˈzɪstəns/ AmE/rɪˈzɪstəns/ odpor switch BrE/swit[/ AmE/swit[/ spínač unit BrE/'ju:.nɪt/ AmE/'yunət/ jednotka

Example sentences

Alternating current can easily be converted to higher and lower voltages by a transformer.

Switch the light off before you change the **bulb**.

voltage

In electric circuits, the charge **carrier**s are often electrons moving through a wire.

A battery is a source of electric power consisting of one or more electrochemical **cells**.

Different types of atoms make a substance a **conductor** or an insulator.

Direct current may flow through a conductor, but can also flow through semiconductors and insulators.

BrE/'vəultidʒ/ AmE/'voultidʒ/

An **electrical circuit** is a conductive connection of electrical elements.

Electric current is any movement of electric charge carriers such as electrons, protons, ions, and holes.

Electric charge is a basic property of elementary particles giving rise to all electric and magnetic forces and interactions.

In a household setting, the most obvious examples of **electrical loads** include light bulbs and appliances.

Current in gases and liquids generally consists of a **flow** of positive ions in one direction together with a flow of negative ions in the opposite direction.

Unless there is an unbroken **loop** of conductive material for electrons to flow through, a sustained flow simply cannot be maintained. An electric current can only flow when there is a closed **path** in which electrons can move.

The **potential difference** or voltage of a battery is the potential energy difference across its terminals for every Coulomb of charge. Wind is one of the greatest available potential **power sources**.

Quantities are characteristics or properties we are trying to measure, such as voltage and electric current.

Resistance is also known as ohmic resistance or electrical resistance.

A switch can disconnect or connect the conducting path in an electrical circuit, interrupting the electric current or diverting it from one conductor to another.

Units of measure are how we express measurements of quantities.

The voltage, or potential difference, across each branch of a parallel circuit is the same, but the currents may vary.



napětí







Choose the correct spelling (only one for each sentence).

- 1 A physical property of a phenomenon, body, or substance, that can be quantified by measurement is called
- a) kuantity
 b) quantity
 c) quantiti
 d) quontity
- 2 The opposition of a substance or device to the flow of an electrical current is called
- a) resistanc
 b) resistanse
 c) resistence
 d) resistance
- 3 The type of metal which allows the electric current to flow through it is called

current to flow thre	շաջ
a) conductor	
b) konductor	
c) conduktor	
d) conducter	

Test 2



Decide which statement is correct (only one definition is correct).

- a) A carrier is a unit for the measurement of a physical
- quantity. \Box b) A single electrical energy source is called a carrier. \Box
- c) A carrier is a particle or a hole that freely moves within a material and carries an electric charge.
- 2
- a) An electric current flowing in one direction only is called alternating current.
- b) An alternating current is a current that reverses its direction many times a second at regular intervals.
- c) Alternators are used as a power source of a direct current.

3

- a) If we want to convert mechanical energy into electrical energy we use a cell.
- b) We use an electric cell to convert chemical energy into electrical energy to do useful work like power a load.□
- c) A cell can be used as a power source of an alternating current.

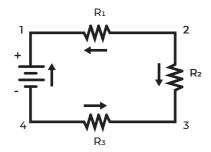
Speaking task



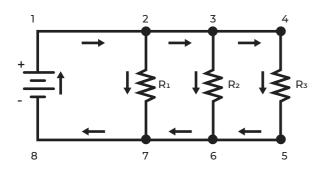
Describe the electric circuits below, and explain the differences between them. Try to use as many new words as possible.

Your speaking task will have 100 - 150 words.

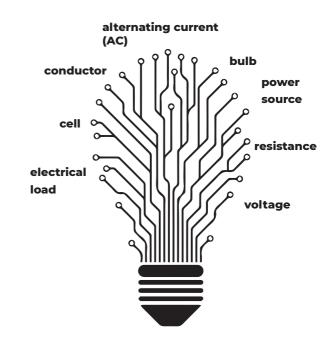
Series



Parallel



ELECTRIC CIRCUIT



Unit 3 Watch the video record presenting schematic diagrams.



Electrical & electronic components

another part of the circuit.

Exposition Read and listen.

Let's proceed to an element called

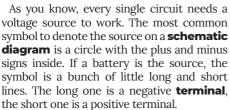
an **inductor**. Its symbol in a schematic looks

like a coil of wire. This shape forms a magnetic

field around the wire and concentrates it

One more circuit element which is very

common is called the **diode**. A diode allows



A resistor is another important circuit element. A resistor is trying to limit the amount of current in the circuit or in a branch of a circuit. A **fixed resistor** on a schematic is usually represented by a rectangle, while a variable resistor is depicted by a rectangle with a cross arrow to illustrate variability. A resistor has one more symbol which is a zigzag line. The chosen symbol depends on which standard is used, IEC or NEMA.

The next most common element is what we

call a capacitor. Its symbol is two parallel lines (plates) not touching each other. The capacitor stores energy as an electric field which is formed between the two plates.

the electric current to flow only in one direction. The symbol for the diode looks like a triangle with a line at the end of the triangle. The current can only flow this way. A light emitting diode (LED) has a symbol like a diode plus two little lines with arrows.

inside the coil.

And finally, a transistor. A transistor can function like an electronic switch, or an **amplifier**. When you turn the volume knob on your stereo system, you are basically manipulating the transistors in there to push out more current.

It is important to know the symbols and names in English. In on-line worksheet, you will find the link to the overview of symbols and names of various electrical and electronic components https://www.electrical-symbols.com/electric-electronic-symbols/resistor-symbols.htm.

The energy stored can be used later to feed



Match the Czech words with their English equivalents.

- 1 terminal
- 2 variable resistor
- 3 diode
- 4 inductor
- 5 capacitor
- 6 store
- 7 limit
- 8 fixed resistor
- 9 amplifier
- 10 schematic diagram

L	vývod	

- B dioda
- C zesilovač
- D omezovat
- E pevný rezistor
- F schéma zapojení G proměnný rezistor
- H induktor
- I kondenzátor
- J ukládat

T Choose the expressions from the text

the state of the s	The state of the s
2 Choose the expressions fr and write them next to the 1 Schéma, které pomocí grafických s ukazuje elektrická připojení a funkc	neir definitions. ymbolů
2 Zařízení se dvěma koncovkami, kte umožňuje průtok proudu pouze jedním směrem	eré
3 Pasivní dvouvývodový prvek určen k ukládání energie do magnetickéh pole	
4 Prvek elektického obvodu, který m pevně danou hodnotu odporu	á
5 Rezistor s nastavitelnou hodnotou odporu	
6 Bod, ve kterém lze provést spojení v elektrickém obvodu	
7 Zařízení, které uchovává elektricko energii v elektrickém poli	ou
8 Shromažďovat energii pro použití v době vysoké spotřeby	
9 Elektrické zařízení, které zesiluje zvuky nebo rádiové signály	
10 Ovládat něco tak, aby to nepřekro	

and write them next to their	definitions. 📗 🖊
1 A device with two terminals, typically allowing the flow of current in one direction only	WRITI
2 A point at which connections can be made in an electric circuit	
3 To control something so that it is not greater than a particular amount, number, or level	
4 A drawing which shows, by means of graphic symbols, the electrical connections and functions of a circuit_	
5 An electrical device or piece of equipment that makes sounds or radio signals louder	
6 To put or keep energy for use in the future	
7 A passive two-terminal electrical component that stores energy in a magnetic field	
8 A circuit element which has a fixed	

value of resistance

in an electric field

9 A device that stores electrical energy

10 A type of resistor whose electrical resistance value can be adjusted



- A: Do you know that circuit elements are classified into active and passive elements?
- B: Of course. Active elements supply energy to a circuit. Common examples of active elements include generators, sources, and operational amplifiers. An **operational** amplifier, or op-amp for short, is a voltage amplifying device. It is used with external feedback components such as resistors and capacitors connected to its output and input terminals. Thanks to the different **feedback** configurations, the amplifier can perform a variety of different operations. It is basically a three-terminal device consisting of two high impedance inputs. One of the inputs is called the inverting **input** and is marked with the minus sign, (-). The other input is called the **non-inverting input** and is marked with the plus sign, (+).
- A: Sure, a passive element cannot generate an electrical signal.

- It can only receive energy, and then, possibly, store it in an electric field or a magnetic field. **Two-terminal** components such as resistors, inductors, and capacitors, are typical passive elements.
- B: Well, sources are then divided into voltage sources and current sources. The sources can be either dependent or **independent**. It means whether the voltage or current sources either depend upon some other source, or they act independently. Dependent sources are either voltage **controll**ed or current controlled. It means that there are four types of dependent sources. For example, batteries and generators are independent active devices.
- A: Circuit elements are also classified according to the number of terminals they have to connect to other components. Two-terminal components represent the simplest elements that have only two terminals to connect to.

Choose the correct term from the dialogue and match it with one of the definitions.	WRITING	
1 Odpor kladený střídavému proudu		
2 Vstup, který přijímá pozitivní zpětnou vazbu z výstupu zesilovače		
3 Poskytnout něco, co je žádoucí, například elektrickou energii		
4 Přivedení výstupního signálu operačního zesilovače zpět na vstup		
5 Nařizovat, omezovat, rozhodovat		
6 Vstup, který přijímá negativní zpětnou vazbu z výstupu zesilovače		
7 Potřebující vnější energii		
8 Nepotřebující vnější energii		
9 Provádějící (matematické) operace		
10 Mající dva vývody		

Choose the correct term from the dialogue and match it with one of the definitions. 1 Not influenced or controlled in any way by other people, events, or things 2 Having two terminals 3 Needing the support of something or someone in order to continue existing or operating 4 An input which receives a positive feedback from the output of the amplifier 5 Reaction to a process or activity 6 Performing (mathematical) operations 7 An input which receives a negative feedback from the output of the amplifier 8 To order, limit, or rule something 9 Resistance applied to the alternating current (AC) 10 To provide something that is needed or wanted

Listen to the dialogue and decide if the statements are true or false. READING 1 Block diagrams only show the main components in a complex system. true 🗆 false 🗅 2 Schematic diagrams are typically associated with electrical circuits. true 🗆 🏻 false 🗀 3 The wires can be found in a table of electrical and electronic symbols. true 🗆 false 🗅 4 The symbol for a capacitor is a zigzag line or a rectangle. true 🗆 false 🗅 true 🗆 false 🗅 5 Schematics show the actual physical location of the components.

Pay attention to the multiple meaning of some English words:

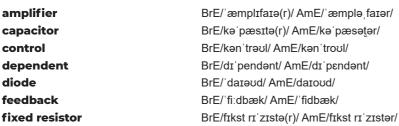
The word **terminal** in Czech also means: konečná stanice, mezní značka, odbavovací hala na letišti, překladiště, svorka.

The word **operational** in Czech may be: akční, akceschopný, funkční, provozní, operativní.

The word **drawing** has the following meanings: výkres, náčrt, rys, zobrazení, nákres, kresba, kreslení, but also čepování (nápojů), čerpání (prostředků), odčerpání.

The word **supply** can be translated into Czech like this: napájet (elektrickým proudem), napájení, napájecí, but also the word has meanings like dodávat, dodávka, doplnit, doplněk, nabídka (na trhu).

Vocabulary



 impedance
 BrE/Im'pi:dns/ AmE/Im'pidns/

 independent
 BrE/IndI pendent/ AmE/, IndI pendent/

 inductor
 BrE/In'dAkte(r)/ AmE/In'dAkter/

inverting input BrE/ɪnˈvɜːtɪŋ ˈɪnpʊt/ AmE/ɪnˈvərtɪŋˈɪnpʊt/

mit BrE/'lɪmɪt/ AmE/'lɪmət/

non-inverting input BrE/npnɪnˈvɜːtɪŋ ˈɪnpʊt/ AmE/nɑnɪnˈvərtɪŋ ˈɪnpʊt/

operational BrE/ˌppəˈreɪʃənl/ AmE/ˌapəˈreɪʃənl/

schematic diagram BrE/ski: 'mætɪk 'daɪəgræm/ AmE/ski 'mætɪk 'daɪəˌgræm/

 store
 BrE/sto:(r)/ AmE/stor/

 supply
 BrE/se plat/ AmE/se plat/

 terminal
 BrE/ta:mrnl/ AmE/termenl/

 two-terminal
 BrE/tu:'ta:mrnl/ AmE/tu'termenl/

variable resistor BrE/'veəriəbl rɪ'zɪstə(r)/ AmE/'vɛriəbl rɪ'zɪstər/





zesilovač kondenzátor řídit závislý dioda zpětná vazba pevný rezistor impedance nezávislý induktor invertující vstup

omezovat neinvertující vstup

operační

schéma zapojení

ukládat dodávat vývod dvouvývod

dvouvývodový proměnný rezistor







Example sentences

The **amplifier** is the device that will supply power to your speakers.

We recently had a **capacitor** fail on a computer motherboard.

It is possible to **control** many different circuits at the same time.

A **dependent** current source delivers a current which is proportional to some other voltage or current in the circuit.

For example, diodes are used to regulate voltage (Zener diodes).

Feedback is a phenomenon by which the signal at input of a system is affected by change in output.

Resistors are usually divided into three groups: **fixed resistor**s, variable resistor, special resistance.

Impedance is represented by the letter "Z" and measured in ohms.

The current source can be either **independent** (ideal) or dependent (controlled) by a voltage or current elsewhere in the circuit.

Inductor values are measured in henrys (symbol H).

The input signal is connected to the **inverting input** of the operational amplifier.

When you need to **limit** the flow of current to a device a resistor would be the component used.

The reference voltage is connected to the **non-inverting** input of the operational amplifier.

The inverting **operational** amplifier configuration is one of the simplest and most commonly used op-amp topologies.

Schematic diagrams are used by electrical engineers to describe the electron source, electron path, and components of a circuit.

Capacitors are used to **store** energy and then release it when needed.

The battery **supplies** energy to the circuit.

Wire **terminal**s are important in any kind of electrical installation or electrical application.

A resistor is a perfect **two-terminal** device and it controls current though it by the applied voltage.

An external, variable resistor controls the motor speed.



Choose the correct spelling (only one for each sentence).

- 1 A drawing which shows the electrical connections and functions of a circuit is called
- a) schematik diagram
- b) schematic diagram c) schematik diagrem
- d) schemetic diagram
- 2 A circuit element which has a fixed value of resistance is called
- a) fixd resistor
- b) fixed resistr
- 3 A type of resistor whose electrical resistance value can be adjusted is called
- a) variabl resistor
- b) varieble resistor
- c) veriable resistr
- d) variable resistor

Test 2



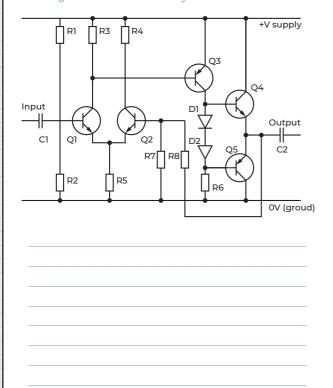
Decide which statement is correct (only one definition is correct).

- 1
- a) A diode only allows the electric current to flow in one direction.
- b) The symbol of a diode looks like a coil of wire.
- c) A diode can function like an electronic switch, or an amplifier.
- 2
- a) An inductor stores energy as an electric field.
- b) An inductor on a schematic is usually represented by a zigzag line.
- c) An inductor is a passive two-terminal electrical component that stores energy in a magnetic field.
- 3
- a) An amplifier belongs to the circuit elements that have two terminals.
- b) Two-terminal components represent the elements that have three terminals
- c) A terminal is a point at which connections can be made in an electric circuit.

Written task

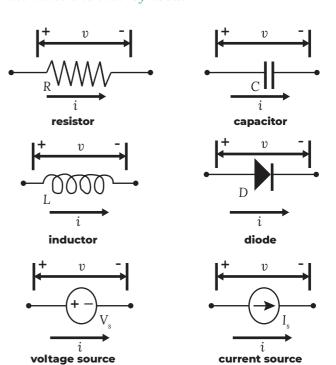


Read the schematic and describe it in detail. The enclosed table of electrical and electronic components may help you. Your writing task will consist of 100–150 words.



Two-terminal circuit

elements and their symbols:



Unit 4 Watch the video record presenting different types of transistors and how they are used.







Transistors & integrated circuits

Exposition Read and listen.

An electrical network or circuit is a collection of circuit elements connected to each other at their terminals. If the number of terminals of a circuit element is greater than two, then it is a multi-terminal component. Multi-terminal components include transistors, thyristors, DIACs, TRIACs, and so on.

We can briefly say that a DIAC is a diode alternating current switch while a TRIAC is a semiconductor switching element capable of conducting electric current in both directions.

Now let's look closely at transistors.

There are two main types of transistors: bipolar junction transistors (BJTs) and field effect transistors (FETs).

A bipolar junction transistor is a threeterminal semiconductor device. It consists of two p-n junctions which are able to amplify or magnify a signal. It is a currentcontrolled device. The three terminals of the BJT include the emitter (E), the base (B), and the collector (C). The base is responsible for controlling the transistor. The collector is the positive lead, and the emitter is the negative lead. BJTs are configured either as NPN or

PNP. It is obvious that the current directions and voltage polarities in PNPs and NPNs are always opposite to each other.

In an NPN transistor, a positive voltage is given to the collector terminal to produce a current flow from the collector to the emitter. In a PNP transistor, a positive voltage is given to the emitter terminal to produce current flow from the emitter to the collector.

The FET transistors are divided into junction field effect transistors (JFET) and MOSFETS.

A junction field effect transistor is the simplest type of three-terminal semiconductor transistor. It is widely used as an electronically controlled switch, a voltagecontrolled resistor or an amplifier.

The MOSFET includes three terminals - gate, source, and drain. In a MOSFET, the drain is controlled by the voltage of the gate terminal, thus a MOSFET is a voltagecontrolled device. The voltage that is applied across the gate controls how much current flows into the drain. MOSFETs are divided into two types, "p-channel" and "n-channel". Both of these types can either be in enhancement or depletion modes.





Match the Czech words with their English equivalents.

- thyristor
- bipolar junction transistors (BJT)
- 3 TRIAC
- transistor
- field effect transistor (FET)
- DIAC
- 7 gate
- 8 base
- p-n junction
- 10 MOSFET
- tranzistor MOSFET
- tyristor
- Cpřechod
- řídicí elektroda FET (hradlo
- Е TRIAK
- F báze
- bipolární tranzistor (BJT)
- tranzistor
- unipolární tranzistor (FET)
- DIAC

2	Choose the expressions from the text
	and write them next to their definitions.

- 1 Typ tranzistoru, jehož funkce se účastní pouze nosiče náboje jednoho druhu (díry nebo elektrony)
- 2 Typ tranzistoru, jehož funkce se účastní nosiče náboje obou
- 3 Řídicí elektroda tranzistorů typu FET
- 4 Rozhraní polovodiče typu P a polovodiče typu N
- 5 Tranzistor řízený polem vytvářeným ve struktuře kov-oxid-polovodič napětím přiloženým mezi řídící elektrodu G a elektrodu S
- 6 Vstupní elektroda bipolárního tranzistoru
- 7 Polovodičová součástka, která slouží ke spínání elektrického proudu
- 8 Polovodičový prvek, který se používá k zesilování, řízení a generování elektrických signálů
- 9 Trioda pro střídavý proud
- 10 Dioda pro střídavý proud

Choose the expressions from the text and write them next to their definitions.



- 1 A semiconductor device which is used to amplify, control, and generate electrical signals
- 2 A metal-oxide-semiconductor field effect transistor
- 3 A device that is used as a switch to control the amount of electricity passing through a particular point
- 4 An interface between two types of materials, p-type and n-type, inside a single crystal of semiconductor
- 5 A type of transistor that uses only one kind of charge carrier
- 6 A triode for alternating current
- 7 A type of transistor that uses both electrons and electron holes as charge carriers
- 8 The control electrode of FET type transistors
- 9 A diode for alternating current
- 10 The input electrode of a bipolar transistor

		1		
	1			
W	RI	ГП	VC	
	WI	WRI	WRITH	WRITING



- A: As we know, integrated circuits (ICs) are a keystone of modern electronics. Let's talk a little bit about them.
- B: OK. An IC is a circuit where all discrete components are fabricated either on a single chip or by interconnecting a number of individual chips. In the first case, it is called a monolithic integrated circuit, while the latter is called a hybrid integrated circuit. Some hybrid circuits may contain monolithic ICs. The components can be passive elements (e.g., capacitors and resistors) as well as active elements (e.g., transistors and diodes) interconnected by conductors. The chip is enclosed in a protective package from which pins extend for connecting the IC to other devices.
- A: We also can divide them into analogue and digital integrated A: Yes. As the number of components (or transistors) per circuit circuits.
- B: Well. Analogue ICs work on analogue signals. We can find them in various amplifiers. Digital circuits work on discrete signals.
- A: Sure. The packages of ICs are also classified according to the

way they are mounted on printed circuit boards (PCBs). Then they are either through-hole type packages or surface-mount technology (SMT) packages. The through-hole packages have longer pins (leads) that are inserted through holes in the printed circuit board. Thus, they can be **solder**ed to conductors on the opposite side. The most common type of through-hole package is a dual inline package (DIP). In contrast, the surface mount IC packages have shorter pins that do not extend to the other side of the board.

- B: And, it's admirable that an IC that has the size of a fingernail consists of more than a million of transistors and other discrete components.
- increased, the technology was developed from the lowest to highest levels of **integration**. It means small-scale integration (SSI), medium-scale integration (MSI), large-scale integration (LSI), and very large-scale integration (VLSI).

Choose the correct term from the dialogue and match it with one of the definitions.	
1 Postup, kdy se elektronické součástky pájením osazují přímo na povrch plošného spoje	WRITIN
2 Malá destička, obvykle vyrobená z křemíku, která pojme stovky až miliony tranzistorů, rezistorů a kondenzátorů	
3 Spojovat kusy kovu dohromady pomocí přídavného materiálu (pájky)	
4 Proces spojování dvou nebo více věcí efektivním způsobem	
5 Malá destička z polovodičového materiálu, která tvoří základ pro integrovaný obvod	
6 Vytvořený z jednoho kusu, jednolitý, pevně spojený	
7 Spojující dva různé prvky	
8 Deska určená k osazení elektronických součástek, které propojují vodiče vytvořené v tenké kovové vrstvičce na povrchu desky	
9 Pouzdro se dvěma řadami pinů	
10 Nezávislý na ostatních věcech stejného typu	

Choose the correct term from the dialogue	7
and match it with one of the definitions.	Work
1 To join pieces of metal together using solder	WRITIN
2 An integrated circuit package with two rows of pins	
3 A small wafer of semiconductor material that forms the base for an integrated circuit	
4 A small wafer, usually made of silicon, that can hold from hundreds to millions of transistors, resistors, and capacitors	
5 Independent of other things of the same type	
6 A set of electrical connections made by thin lines of metal fixed onto a surface	
7 Combining two different things	
8 A method in which the electrical components are mounted directly onto the surface of a PCB	
9 Made of one piece, uniform, firmly connected	
10 The action or process of combining two or more things in an effective way	

6 Listen to the dialogue and decide if the statements are true or false.		An arrangement was a construction of the const	U
1 DIACs, TRIACs and thyristors are semiconductor switching components.	true 🗆	false	LISTENING
2 DIAC is a diode for direct current	true 🛚	false 🗆	80
3 TRIAC is a diode for alternating current.	true 🛚	false □	
4 Thyristors are mainly used where high currents and voltages are involved.	true 🗆	false 🗆	
5 Thyristors can be made to operate as either an open-circuit switch or as a rectifying diode.	true 🗆	false 🗆	

Pay attention to the multiple meaning of some English words, e.g., the word "drain" that can be translated into Czech as drenáž, kanál, výpusť, strouha, and so on.

The meaning of the word "lead" in Czech can be olovo, vodítko, vedoucí, vedení, tuha, etc.

The word "wafer" has meanings in Czech like membrána, oplatek, plátek, etc.

The word "rectify" may be translated into Czech like napravit, korigovat, napřímit, narovnat, etc.

báze

bipolární tranzistor (BJT)



BrE/beis/AmE/beis/

bipolar junction transistor (BJT) BrE/ baɪ pəʊlə(r) 'dʒʌŋkʃn træn 'zɪstə(r)/

AmE/ bar pouler 'dʒʌŋk[n træn zɪstər/

BrE/d'aīək/AmE/d'aĭək/ DIAC diak discrete BrE/dɪ'skri:t/AmE/dɪ'skrit/ diskrétní

dual inline package (DIP) BrE/'dju:əl 'ın laın 'pækıdʒ/ pouzdro integrovaných obvodů (DIP)

AmE/'duəl 'ınlaın 'pækıdʒ/ field effect transistor (FET)

BrE/fi:ld I fekt træn zistə(r)/AmE/fild I fekt træn zistər/ unipolární tranzistor (FET) gate BrE/geɪt/AmE/geɪt/ třídicí elektroda FET (hradlo)

hybrid BrE/'haɪbrɪd/AmE'haɪbrɪd/ hybridní chip BrE/t[rp/AmE/t[rp/ čip

integrated circuit BrE / intigreited 'ss:kit/AmE / intigreited 'ss:kit/ integrovaný obvod

integration BrE/ inti grei[n/AmE/ intə grei[n/ integrace monolithic BrE/ monə li0ik/AmE/ manə li0ik/ monolitický MOSFET BrE/'mäs-,fet/AmE/'mäs-,fet/ tranzistor MOSFET p-n junction BrE /pee en 'dʒʌŋkʃn/AmE pee en 'dʒʌŋkʃn/ přechod PN

printed circuit board (PCB) BrE/ printid 'sa:kit bo:d/AmE/ printid 'sarkat bord/ deska plošných spojů (DPS)

solder BrE/'səʊldə(r)/AmE'sadər/

surface-mount technology (SMT) BrE/'s3:fis maunt tek'npledzi/AmE/'serfes maunt tek'npledzi/ povrchová montáž

thyristor BrE /θaɪˈrɪs.tər/AmE/θaɪˈrɪs.tə/ tvristor transistor BrE/træn zistə(r)/AmE/træn zistər/ tranzistor **TRIAC** BrE/'trviak/ AmE 'traiæk/ triak

Example sentences

The **base** of a bipolar transistor, the gate of a field-effect transistor, and the inputs of a logic gate are common examples of control electrode.

A BJT allows a small current injected at one of its terminals to control a much larger current flowing between two other terminals

A **DIAC** is a bi-directional semiconductor switch that can be turned on in both forward and reverse polarities above a certain voltage.

The change happens in a series of **discrete** steps.

Dual in-line packages come in either plastic or ceramic versions and have two rows of pins along two opposite sides of the package.

FETs control the flow of current by the application of a voltage to the gate,

which in turn alters the conductivity between the drain and source.

In an n-channel JFET, when no voltage is applied across the **gate** terminal, the channel becomes a wide-open path for electrons to

Hybrid teaching combines traditional in-class teaching with online teaching.

A chip can contain hundreds of millions or even billions of transistors, each of which can be switched on or off individually.

Modern LCD television monitors usually incorporate only two or three **integrated circuits**.

The number of components fitted into an integrated circuit represents its **integration** scale.

A monolithic IC is a set of electronic circuits on one small flat piece of semiconductor material.

Signals flow in both directions across a **MOSFET** switch.

Double **p-n junction**s are used to build bipolar transistors.

In the design of **printed circuit board**, gold is an important element.

Fewer workers are needed to **solder** circuit boards.

Boards can be made faster because **surface mount technology (SMT)** eliminates drilling holes for thru-hole devices.

The first **thyristor** devices were released commercially in 1956.

Each pixel in the display is controlled by its own silicon-based **transistor**.

The motion sensor probably has a thyristor or **TRIAC** switch in the output.









Choose the correct spelling (only one for each sentence).

1 A drawing which shows the electrical connections and functions of a circuit is called

- a) fild effect transistor
- b) field effect tranzistor
- c) field efect transistor
- d) field effect transistor

2 A circuit element which has a fixed value of resistance is called

 \Box

- a) p-n juntion
- b) p-n janction
- c) p-n junction
- d) p-p junction

3 A type of resistor whose electrical resistance value can be adjusted is called

- a) TRIAC
- b) TRIAK
- c) TRAIAC
- d) TRIEC

Test 2

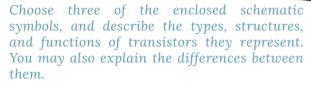


 \Box

Decide which statement is correct (only one definition is correct).

- a) The three terminals of a BJT are the emitter, the gate, and the collector.
- b) The control electrode of FET type transistors is called a gate.
- c) A gate is the input electrode of a bipolar transistor. \Box
- a) A transistor is a semiconductor device which is used to amplify, control, and generate electrical signals.
- b) A transistor is a device that is used as a switch to control the amount of electricity passing through a particular point.
- c) A transistor is a small wafer of semiconductor material that forms the base for an integrated circuit.
- a) The MOSFET includes three terminals
 - base, emitter, and collector.
- b) A MOSFET is a metal-oxide-semiconductor field effect transistor.
- c) A MOSFET is a type of transistor that uses both electrons and electron holes as charge carriers.

Speaking task



Your speaking task will have 100 - 150 words.

Bipolarní

NPN:







Unipolarní JFET

MOSFET s indukovaným kanálem

MOSFET s vodivým kanálem





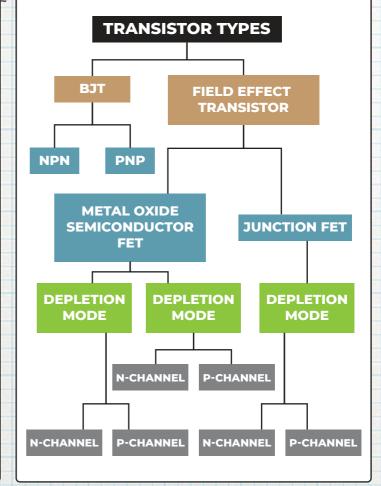








Transistor types



Unit 5 Watch the video record to practice English words and sentences when using a multimeter for testing continuity and other quantities. **Electrical measurements**







Read and listen.

In the process of measurement, a value of a quantity is determined, with a known uncertainty, by comparison with the standard unit.

Let us briefly describe the methods of measurements and their classification.

According to the way of determination of the measurand, they are divided into direct and indirect methods. In the direct method, the value is read directly on a measuring instrument, while in the indirect method, the value is calculated from the measured values of other quantities on which it depends.

According to the function and arrangement of the measuring instrument, we distinguish **deflection** and null measurement methods.

In the deflection measurement method, the value of measurand is determined through the deflection of the **pointer**.

The null measurement is a method in which the measuring instrument is used as a zero indicator. The null deflection indicates the value of the measured quantity. It is also known as the balance method or the zero method.

And finally, we can mention measurement methods that are classified according to the way of obtaining the value. These are absolute, comparison, substitution, compensation, and differential methods.

The differential measurement is a method according to which the difference between a known physical quantity and a physical quantity that is being measured is established.

In the compensation method, we determine the difference between two values, the measured and standard ones. We are able to precisely determine the state when this difference is equal to zero. It is a technique used to compensate for an error added during a measurement.

The comparison measurement method is a direct measurement procedure as the quantity to be measured is compared directly with a standard which is an agreed unit of measurement.

We may improve the accuracy of measurement applying the substitution measurement method. It is a method for eliminating systematic measurement errors caused by errors in the measuring instrument.

Measurements can be carried out under different conditions. For example, in laboratories, production, in the terrain. The conditions may affect the measuring instruments.





Match the Czech words with their English equivalents.

- 1 uncertainty
- 2 measurement
- 3 standard unit
- 4 measuring instrument
- 5 compensation method
- 6 pointer
- 7 deflection
- 8 comparison
- 9 value
- 10 accuracy
- A vychýlení
- B měřicí přístroj
- C ručička
- D přesnost
- E hodnota
- F porovnání
- G kompenzační metoda
- H standardní jednotka
- I měření
- J neurčitost

7	Choose the expressions from the text
	and write them next to their definitions.



- 1 Metoda měření používaná ke kompenzaci chyby způsobené během měření
- 2 Vlastnost nebo stav správnosti nebo přesnosti
- 3 Proces porovnávání neznámé veličiny se známou nebo standardní veličinou
- 4 Číselný výsledek měření, údaj měřicího přístroje
- 5 Odhad přiřazený k výsledku charakterizující interval hodnot, o němž se tvrdí, že uvnitř něho leží správná hodnota
- 6 Úkon zjišťování rozdílů a podobností mezi dvěma nebo více lidmi nebo věcmi
- 7 Určitá veličina, která je brána jako standard pro měření fyzikálních veličin
- 8 Zařízení, které slouží k měření fyzikální
- 9 Odchylka indikátoru nebo ukazatele od nulové hodnoty na stupnici přístroje
- 10 Ukazatel měřené hodnoty

Choose the expressions from the text and write them next to their definitions.



- 1 The quality or state of being correct or precise
- 2 The act of finding out the differences and similarities between two or more people or things
- 3 A number or a symbol that represents an amount
- 4 A definite magnitude that is taken as a standard for measuring physical quantities
- 5 A measurement method used to compensate for an error added during a measurement
- 6 An indicator on a measuring instrument
- 7 The diversion of an indicator or a pointer from the zero reading on the scale of an instrument
- 8 The process of comparison of an unknown quantity with a known or standard quantity
- 9 A device used to measure a physical
- 10 The range of possible values within which the true value of the measurement lies





Dialogue Read and listen to the following dialogue. A: Whereas recording in

- instruments. Could you start with their classification?
- B: Well, electrical measuring instruments may be divided into two categories: absolute and secondary ones. They don't require calibration or comparison with any other instrument. They give the value of the electrical quantity to be measured in terms of absolute quantities, or let's say, constants of the instruments and their deflections. In contrary, secondary instruments obtain the value of a measurand directly by taking the deflection from the instrument. But it can be done only after they've been precalibrated.
- A: That's right, secondary instruments are further classified into three groups based on the nature of their operation. These are indicating, integrating, and recording instruments. Can you tell me anything about them?
- B: Of course, indicating instruments **indicate** the quantity to be measured only at a particular instant. The indication of the values is done with a pointer which moves on a scale. Examples of indicating instruments may be voltmeters, ammeters, and wattmeters.

- A: Now, it's the time to proceed to electrical and electronic measuring A: Whereas **recording instrument**s record the value to be measured or observed. A storage oscilloscope can be used as an example.
 - B: Sure, and integrating instruments record the consumption of the total quantity of energy during a particular period of time. Some widely used integrating instruments are: watt-hour and ampere-hour meters.
 - A: Depending on the way electrical instruments present the result of measurements, they can be classified into two major categories: deflection-type and null-type instruments.
 - B: I like that topic. In a null type instrument, the one known and one unknown quantities are used. When the values of both quantities are equal, the pointer shows the null deflection. A potentiometer is a null measurement device for measuring voltages. In a deflection type instrument, the quantity being measured is displayed in terms of the movement of the pointer.
 - A: In conclusion, we could say that the basic requirements for measuring instruments include low error rate, negligible effect on the object of measurement, high degree of reliability, ease of use and repair, readiness for operation.

4 Ci	hoose the correct term from the dialogue nd match it with one of the definitions.	
1 Proce	es konfigurace přístroje tak, aby poskytoval výsledek v přijatelném rozsahu	RITING
2 Pouk	ázat na něco nebo předložit důkaz	
3 Měřio	zí přístroj, který měří celkovou dodanou energii v určitém časovém intervalu	
4 Měřio	zí přístroj, který zaznamenává stav obvodu v určitém časovém intervalu	
5 Stav,	kdy je někdo nebo něco připraveno k něčemu, například k provozu	
6 Žádos	st vyjadřující potřebu nebo povinnost	
7 Majíc	í velmi malý význam nebo velikost a nestojící za zvážení	
8 Schoj	pnost předmětu plnit požadovanou funkci za stanovených podmínek po určitou dobu	
9 Zákla	dní pojem, který popisuje, jak snadno mohou uživatelé produkt používat	. 6
	ení k měření velikosti protékajícího elektrického proudu, který je na ukazateli přístroje vyjádřen vérech	

Choose the correct term from the dialogue and match it with one of the definitions.	WRITIN
1 The ability of an item to perform a required function under stated conditions for a specified period of time _	WKITIK
2 A measuring instrument which records the circuit condition at a particular interval of time	
3 To point something out or to present evidence	
4 Of very little importance or size and not worth considering	
5 A basic concept that describes how easily users can use a product	
6 The process of configuring an instrument to provide a result for a sample within an acceptable range _	
7 The condition of being ready or prepared for something, e.g. for operation	
8 A measuring instrument which measures the total energy supplied at a particular interval of time	
9 An instrument for measuring the strength of an electric current in units called amps	
10 Something demanded or imposed as an obligation	

$\overline{}$				
			June 12-man Albahar saturah managarah	L'
•	Listen to the dialogue and decide if the statements are true or false.		The state of the s	
	1 An error may be defined as the difference between the measured value and the measurand.	true 🗆	false	LISTENING
4	2 We distinguish gross errors, systematic errors, and random errors.	true 🗆	false □	
	3 Gross errors include all man-made mistakes while reading, and recording the readings.	true 🗆	false □	
4	4 Instrumental errors can be prevented by regular calibration.	true 🗆	false □	
1	5 Random errors can be minimized by decreasing the number of measurements.	true 🗆	false 🗆	

Focus on the lexical meanings of words: reading = nam measure (v) = měřit, measurement = měření x measures = opatření čtení, přednes

alternating (current) = střídavý x alternative = alternativní, jiný, zástupný

control = řízení, ovládaní (zřídka kontrola)

minute = minuta / mɪnɪt/, nepatrný /maɪ 'nju:t/ process = proces (soudní), postup, metoda, způsob

solid = solidní, důvěryhodný, pevný, tuhý

standard = standard, norma

reading = naměřená hodnota, odečet (na stupnici), indikace, četba, čtení, přednes

short = elektrický zkrat, zkratovat, krátký, nedostatečný, omezený, stručný

Pay attention to the difference between a watt-hour meter, also known as an energy meter, and a wattmeter. The energy meter measures the total energy consumed by the load, while the wattmeter measures the power in a circuit.

Vocabulary

accuracy
BrE/ˈækjərəsi/ AmE/ˈækyərəsi/
BrE/ˈæmiːtə(r)/ AmE/ˈæˌmitər/
calibration
BrE/ˌkælɪˈbreɪʃn/ AmE/ˌkæləˈbreɪʃn/
comparison
BrE/kəmˈpærɪsn/ AmE/kəmˈpærəsn/

compensation method BrE/ kpmpen'seɪ[n 'meθəd/ AmE/ kqmpən'seɪ[n 'mεθəd/

 deflection
 BrE/dɪˈflekʃn/ AmE/dɪˈflɛkʃn/

 ease of use
 BrE/li:z əv ju:z/ AmE/iz əv yuz/

 indicate
 BrE/ 'ɪndɪkeɪt/ AmE/ 'ɪndəˌkeɪt/

integrating instrument BrE/'Intigreitin 'Instrement/ AmE/'Integreitin 'Instrement/

measurement BrE/'meʒəmənt/ AmE/'meʒərmənt/

measuring instrument BrE/'meʒə(r)ɪŋ 'ɪnstrəmənt/ AmE/'mɛʒərɪŋ 'ɪnstrəmənt/

 negligible
 BrE/'neglidʒəbl/AmE/'nɛglidʒəbl/

 pointer
 BrE/'pɔɪntə(r)/AmE/'pɔɪntər/

readiness (operational)

BrE/(ˌppəˈreɪʃənl) ˈredinəs/ AmE/(ˌapəˈreɪʃənl) ˈrɛdinəs/

recording instrument

BrE/ rekɔːdɪŋ ˈɪnstrəmənt/ AmE/ rɛkərdɪŋ ˈɪnstrəmənt/

 reliability
 BrE/rɪˌlaɪəˈbɪləti/ AmE/rɪˈlaɪəˈbɪləti/

 requirement
 BrE/rɪˈkwaɪəmənt/ AmE/rɪˈkwaɪərmənt/

 standard unit
 BrE/ˈstændəd ˈjuːnɪt/ AmE/ˈstændərd ˈyunət/

uncertaintyBrE/ʌnˈsɜːtnti/ AmE/ʌnˈsərtnti/valueBrE/ˈvæljuː/ AmE/ˈvælyu/

The state of the s

READING



přesnost ampérmetr

kalibrace porovnání

kompenzační metoda

vychýlení

snadnost použití

indikovat

integrační přístroj

měření

měřicí přístroj zanedbatelný ručička

připravenost (provozní) záznamový přístroj

spolehlivost požadavek

standardní jednotka

neurčitost hodnota

Example sentences

Assuming the **accuracy** of the estimate just made, we see that a thousand years ago the sun must have had a diameter of 100 m.

A standard **ammeter** needs millions of electrons to flow before it can provide a measurement of the current.

The device requires no user specific **calibration**, and, therefore, can be used right out of the box.

When you make a **comparison**, you consider two or more things and discover the differences between them.

The Poggendorff **compensation method** is used for the measurement of electromotive force of voltaic cells.

The meteor is headed straight for Earth – our only chance is to cause a **deflection** using the space laser!

This device is outstanding for both its size and **ease of use**.

Integrating instruments are typically used by energy distribution companies to measure the amount of power consumed by customers.

Magnetic field **measurement** determines the effect of a magnetic field on solids.

The **measuring instrument** provides the measured value of a measurand and is used in metrology applications.

An amount or effect that is **negligible** is so small that it is not worth considering or worrying about.

The **pointer** is still oscillating.

We have to ensure the operational **readiness** of the measuring instruments we use for fault finding.

The watt-hour meter is an example of recording instruments.

Validity and **reliability** are two important factors to consider when developing and testing any instrument.

 $Reliability, ease of use, and readiness for operation belong to the basic {\bf requirement} s for measuring instruments. \\$

Various empirically derived **standard units** for electrical resistance were developed in connection with early telegraphy practice.

The accuracy of a measuring instrument **indicate**s the closeness of the output reading to the true value.

The climate crisis has created vast **uncertainty** about the future demand for fossil fuels.

A **value** is a particular number or quantity that can replace a symbol such as 'x' or 'y' in a mathematical expression.









Choose the correct spelling (only one for each sentence).

1 The diversion of an indicator or pointer from the zero reading on the scale of an instrument is called

a) diflection	
b) deflektion	
c) deflection	
d) deflecion	

2 A measurement method used to compensate for an error added during measurement is called

a) compensacion method	
b) compensation method	
c) compensation metod	
d) compensation method	

3 A definite magnitude that is taken as a standard for measuring physical quantities is called

a) stendard unit	Ę
b) standerd unit	Ę
c) standrd unit	Ę
d) standard unit	Ę

Test 2



Decide which statement is correct (only one definition is correct).

_	
7	

a) Accuracy refers to how closely the measured value
of a quantity corresponds to its true value.
1 \ A

b) Accuracy is the ability t	to do something skilfully
with making mistakes.	

c)	The accuracy	of	measurements	is	their	qualit	y
	of being false	or	incorrect.				

2

a) We usually obtain the result of a measurement by estimation without validation.

b) It's impossible to make measurements using
a measuring instrument.

c) A measurement means the process of comparison of an unknown quantity with a known or standard quantity.

3

a) Uncertainty means the quality or state of being certain especially on the basis of evidence.

b) A situation in which something is known, or something that is known or certain.

c) The range of possible values within which the true value of the measurement lies.

Written task

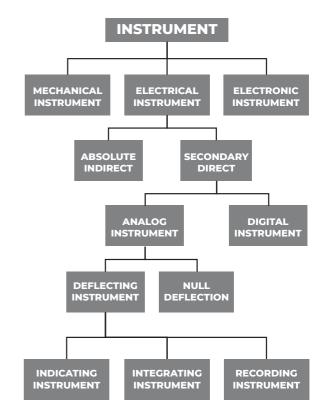


Explaintheprocess of fault finding in an electric circuit. Start with a visual inspection, then continue with measuring voltage, current, a continuity test, etc. Specify the instruments you use.

Your writing task will have 100 - 150 words.



Classification of measuring instruments



Unit 6

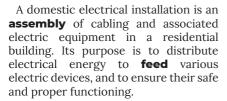
Watch the video record showing how electricity is delivered to consumers.



Domestic electrical installation

Exposition

Read and listen.



All of us know that electricity is dangerous and can be fatal. It is evident that only qualified and competent electricians can carry out any electrical work then. They have to keep to the valid **standard**s and rules very strictly. As to low-voltage electrical installations, the Czech standard ČSN 332130 provides the rules for their design, erection and verification. It is harmonized with IEC 60364 Electrical Installations for Buildings EU standard.

This standard also contains the documentation that must be designed out before starting the work. It includes a plot plan that shows the building's location and its connection

to the public distribution network. Other documents needed comprise an electrical installation schematic (also called a house wiring diagram), bill of materials, price quotation, etc.

The wiring diagram is the visual representation of the wiring system. It shows how the electrical items and wires are connected, where the **socket**s (also called electrical outlets), **light fixtures** (or light fittings), switches, appliances, etc. are located. The ways of protection against an electric shock, direct and indirect contacts are stressed there.

The wiring diagram contains symbols, lines, dimensions, and notations. These things are a sort of guide for electrical engineers and electricians to locate the electrical system correctly and quickly. That saves people, animals and buildings from dangers and damage, as well as from future problems.



Match the Czech words with their English equivalents.

- assembly
- distribution network
- electric shock
- feed
- harmonize
- light fixture
- plot plan
- socket
- standard
- 10 verification

A	dodávat energii, napájet	_
В	koordinovat	_
C	norma	

- pevné připojení svítidla
- potvrzení správnosti, revize
- F rozvodná síť
- sestava
- situační plán
- úraz elektrickým proudem Ī
- zásuvka

L	- 3	1
		1
H	A/DITIN	

Choose the expressions from the text and write them next to their definitions.

- 1 Úraz, ke kterému dochází při kontaktu člověka se zdrojem elektrického proudu
- 2 Technický celek tvořený vhodně volenými částmi
- 3 Uvádět cílevědomě do souladu, součinnosti
- 4 Zařízení ve zdi, které slouží pro připojení elektrických spotřebičů k rozvodné síti
- 5 Technický výkres zobrazující umístění objektu a připojení k elektrické síti
- 6 Soustava propojující přenosovou elektrickou síť se spotřebiteli elektrické energie
- 7 Zásobovat elektrická zařízení elektrickým proudem
- 8 Součást svítidla, které je pevně připojeno ke zdi nebo stropu
- 9 Kontrola funkce systému konfrontací s jeho specifikacemi
- 10 Podrobný předpis, který stanoví důležité parametry či vlastnosti materiálu, výrobku nebo pracovního postupu

Choose the expressions from the text and write them next to their definitions.

- 1 An official rule that is used in a particular area of manufacturing or services
- 2 To make systems or rules similar in different countries or organizations
- 3 The act of checking and testing the system to prove that it meets its specifications
- 4 A part of a light that is attached to the wall or ceiling
- 5 A system of wires through which electricity is connected to different consumers
- 6 A technical drawing showing the building's location and outside electrical wiring
- 7 To supply a piece of electrical equipment with the energy that makes it work
- 8 A device in a wall to which a piece of electrical equipment can be connected
- 9 A number of components connected together to perform a specific function
- 10 A dangerous and painful injury caused by a passing electric current





- A: Do you know what the electrical installation is made up of?
- B: Definitely. It's an assembly of interconnected conductors, appliances, control and protective accessories. Am I right?
- A: Yes, you are. But first of all, we're going to see how this system is fed with electricity. The underground **service cable** or overhead service line brings the electricity from the grid to the service entrance equipment. Its location varies with each installation - it may be located in a street-side cabinet, or in a wall cabinet. In any case, it should contain the main breaker and the electricity meter.
- B: I remember that! The main switch protects the building against an accidental power surge.
- A: Not exactly that's the role of the surge protective device. Then the electricity flows to the distribution board. It varies in size depending on the size of the building and the number of circuits there are. Inside the distribution board, there are the

- main breaker, residual current devices (RCD's) and circuit breakers (MCB's).
- B: I understand that both the RCD's and MCB's are protective accessories. How do they differ in their function?
- A: Well, the RCD constantly checks if the current in the phase line is equal to the current in the neutral line. If it is not, then there's an electrical fault in the circuit, and the device breaks it automatically. The MCB protects the circuit in two ways, from overload and a short circuit.
- B: I see. Could we return to the conductors now? What's the most common type of wiring?
- A: That's a non-metallic (NM) cable which consists of two or more individual wires protected by insulation and a plastic **sheath.** The cable contains phase (or current-carrying), neutral, and protective wires (symbolized by PE). Well, we'll have to focus on the types, colour codes and cable cross sections in detail.

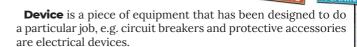
Choose the correct term from the dialogue and match it with one of the definitions.	
1 Plocha řezu vodiče v milimetrech čtverečních vypočtená podle vzorce π (3,14) x poloměr	WRITIN
2 Elektrické zařízení, které chrání elektrický obvod před zkratem a přetížením	
3 Zařízení zajišťující rozvod, ovládání a jištění elektrického proudu v budově	
4 Zařízení, ve kterém je ukončena přípojka nízkého napětí a připojena domovní instalace	
5 Nadměrný odběr elektrického proudu, který vzniká při připojení velkého počtu spotřebičů	
6 Napětí, které přesahuje nejvyšší hodnotu provozního napětí v elektrickém obvodu	
7 Elektrický přístroj chránící elektrický obvod při poruše	
8 Elektrické zařízení, které detekuje proud unikající z obvodu	
9 Elektrické vedení, které odbočuje z rozvodné sítě k odběrateli	
10 Těsně přiléhající ochranná vrstva	

Choose the correct term from the dialogue and match it with one of the definitions. 1 A sudden increase of voltage to an unusually high level 2 An assembly to control and distribute electrical energy in a building 3 A device protecting an electric circuit against short circuit, overload and any fault 4 A layer that covers and fits closely over something for protection A conductor supplying electricity to a building, either by an overhead line or in an underground cable 6 An excessive amount of current in the electrical system 7 An electrical device that protects an electric circuit against overload and a short circuit 8 An electrical device that detects the leakage of current in a circuit 9 A cross sectional area of a wire given in square millimetres = π (3.14) x diameter

10 A piece of equipment where the service cable and the house internal wires are connected Listen to the dialogue and decide if the statements are true or false. 1 There is only one type of cable used for an electrical installation. true 🗆 false 🗅 2 The number of circuits is strictly limited in an electrical installation. true 🗆 🏻 false 🗆 3 The circuit breaker protects the residual current device. true 🗆 false 🗅 true 🗆 false 🗅 4 The broken or damaged switches are dangerous and must be replaced. true 🗆 false 🗅 5 The residual current device protects the consumer against overload.

The terms **equipment**, **device**, **appliance** may be confusing. Let's have a closer look at them.

Equipment is a set of things which are used for a particular purpose. For example, the electrical equipment is material, fixtures, devices, and appliances that are used as a part of an electrical installation.



Appliance is a machine or device, especially an electrical one, used in the home, such as irons, dishwashers, washing machines and so on.

Vocabulary

assembly cable cross section

circuit breaker distribution board distribution network

electric shock

feed

harmonize light fixture overload plot plan power surge

protective accessory

residual current device

service cable

service entrance equipment

sheath socket standard

verification

BrE/ə sembli/AmE/ə sembli/

BrE/'keibl'kros'sek[n/AmE/'keibl'kro:s'sek[n/ BrE/'ss:kɪt'breɪkə(r)/AmE/'ss:rkɪt'breɪkər/ BrE/_drstrr'bju:[n bo:d/AmE/_drstrr'bju:[n bo:rd/ BrE/_drstrr'bju:[n'netw3:k/AmE/_drstrr'bju:[n'netw3:rk/

BrE/i lektrik fok/AmE/i lektrik fa:k/

BrE/fi:d/AmE/fi:d/

BrE/'ha:mənaɪz/AmE/'ha:rmənaɪz/ BrE/laɪt fɪkst[ə(r)/AmE/laɪt fɪkst[ər/ BrE/ auva laud/AmE/ auvar laud/ BrE/plot'plæn/AmE/pla:t'plæn/ BrE/'pavə'ss:dz/AmE/'pavər'ss:rdz/

BrE/prə tektīv ək sesəri/AmE/prə tektīv ək sesəri/

BrE/rɪˈzɪdjuəlˈkʌrənt dɪˈvaɪs /AmE/rɪˈzɪdʒuəlˈkɜːrənt dɪˈvaɪs/

BrE/'s3:vis'keibl/AmE/'s3r:vis'keibl/

BrE/'ss:vis'entransi'kwipmant/AmE/'ssr:vis'entransi'kwipmant/

BrE/ʃi:θ/AmE/ʃi:θ/ BrE/'spkrt/AmE/'sa:krt/ BrE/'stændəd/AmE/'stændərd/

BrE/ verifi kei[n/AmE/ verifi kei[n/

sestava

průřez vodiče

jistič rozvaděč rozvodná síť

> úraz elektrickým proudem dodávat energii, napájet

koordinovat

pevné připojení svítidla proudové přetížení situační plán přepětí jisticí prvek

proudový chránič

přípojka

přípojková skříň ochranný plášť

zásuvka norma

ověření správnosti, revize

Example sentences

An **assembly** is a set of pieces that work together in unison as a mechanism or device.

It is important to select a cable with the right **cross-section** to transmit the required current.

There is an internal **circuit breaker** to protect the instrument from overload.

A distribution board is also known as a panel board, breaker panel, electric panel, DB board or DB box.

There are several companies in this country that use the same **distribution network**.

He got a massive **electric shock** from loose wires in the street when he was just a year old.

To **feed** something to a place means to supply it to that place continuously.

In the European Union, the governments or organizations **harmonize** laws, systems, or regulations to make them the same or similar.

Someone, perhaps taking his life into his hands, had connected electricity to the broken light fixture.

An electrical **overload** caused the fuse to blow.

The **plot plan** shows the present or intended connection of the house to the distribution network.

An unexpected **surge** in electrical power caused the computer to crash.

A successful electrical installation needs various control and protective accessories.

The **residual current device** can protect your home against the risk of fire caused by faulty wiring or appliances.

This **service cable** is manufactured using excellent quality material according to valid standards.

The service cable terminates in the **service entrance equipment**.

The cable has a copper wire surrounded by a plastic **sheath**.

It is comfortable if you can switch an electrical **socket** off by remote control.

There are many different electrical safety **standard**s that electricians have to follow.

Only a person with relevant education and experience can carry out the process of verification.











Choose the correct spelling (only one for each sentence).

1 A dangerous and painful injury caused by a passing electric current

a) electric shot
b) electric shoe
c) electric shock
d) electric show

2 A number of components connected together to perform a specific function

a) assemble
b) assembly
c) assemblage
d) assembler

3 A system of wires through which electricity is connected to different consumers

a) distribution net
b) transmission net
c) transmission network
d) distribution network

Test 2



Decide which statement is correct (only one definition is correct).

1

- a) A protective accessory is a device protecting an electric circuit against short circuit, overload and any fault.
- b) A device protecting a building from lightning damage is a protective accessory.
- c) A protective accessory is a device connecting an electric circuit with an appliance.

2

- a) A sheath is a collection of items laid and tied together.
- b) A sheath is a layer of sand on the floor after installing a house wiring.
- c) A sheath is a layer that covers and fits closely over something for protection.

3

- a) A cable cross section is the needed length of a conductor that will be used for the installation.
- b) A cable cross section is its cross sectional area given in square millimetres = π (3.14) x diameter.
- c) The diameter of a cable needed for the installation is its cross section.

Speaking task

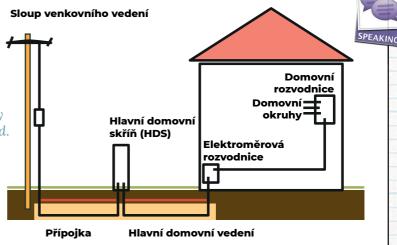
Describe the adjacent picture in detail.

Firstly, explain how the residential building is connected to the distribution network.

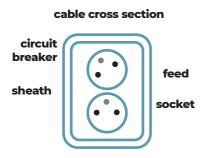
Secondly, focus on the location of the electricity meter and the function of the distribution board. What doesn't comply with the valid standard?

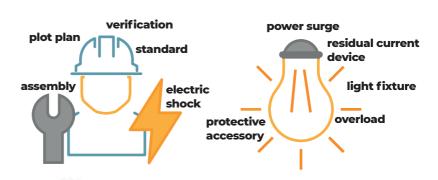
Thirdly, think of the number of circuits in a two-storied house with a cellar and loft.

Your speaking task will have 100 - 150 words.



Domestic electrical installation





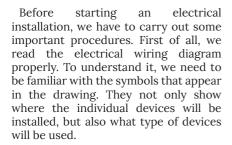
Unit 7 Watch the video record presenting how domestic electrical installations are carried out.



Domestic electrical installation

Exposition

Read and listen.



For example, a surface ceiling light is shown by one symbol, a recessed ceiling light or a fluorescent light have their own symbols, etc. Similarly, each type of switch has a different symbol (such as a one way switch, a dimmer switch), and so do various sockets. The diagram also shows the location of the distribution board and the path of the wires to each outlet.

The next procedure is so called conductor sizing. The cables and wires are selected according to the current carrying capacity and



voltage drop when the rated current flows in them. The current carrying capacity of an insulated conductor is the maximum current that it can continuously carry without exceeding its temperature rating. It is also known as ampacity. There are certain restrictions concerning the environmental These are surrounding conditions. temperatures, moisture levels, the exposure to sunlight and chemicals. For domestic indoor installations, the conductors of copper are compulsory

Then we concentrate on materials needed - distribution boards, circuit breakers and residual current devices, terminal plates, switches, sockets, etc. When we have the idea of what electrical components are required, we decide which tools are necessary for placing them. They are, for example, pliers, screwdrivers, wire strippers, power drills, hammers, and what's the most important - the tester.



Match the Czech words with their English equivalents.

- ceiling light
- conductor sizing
- current carrying capacity
- fluorescent light
- moisture
- pliers 6
- recessed
- terminal plate
- voltage drop
- 10 wire strippers

A	dimenzování vodiče	
В	kleště	
C	proudová zatížitelnost	
D	stropní svítidlo	
E	svorkovnice	
F	odizolovací kleště	
G	úbytek napětí	
Н	vlhkost	
I	zapuštěný, zahloubený	
J	zářivka	

Choose the expressions from the text and write them next to their definitions.

1 Svítidlo umístěné na stropu místnosti

- 2 Nástroj k uchopování a stlačování předmětů, k ohýbání a stříhání drátů
- 3 Nástroj sloužící k odstranění izolace
- 4 Zapuštěný do stropu, stěny nebo jiného povrchu
- 5 Přítomnost kapaliny, obvykle vody, ve stopovém množství
- 6 Schopnost vodiče trvale přenášet jmenovitý proud, aniž by docházelo k jeho nadměrnému oteplení
- 7 Skleněná trubice, ve které se ultrafialové záření výboje mění ve světlo podobné dennímu
- 8 Součástka sloužící k připojení přívodního vodiče nebo k propojení více vodičů
- 9 Úbytek napětí způsobený odporem, který je kladen protékajícímu proudu
- 10 Volba správného druhu vodiče do daného prostředí a provozních podmínek

Choose the expressions from the text and write them next to their definitions.



- 1 The presence of liquid, especially water, often in trace amounts
- 2 The loss of voltage caused by the flow of current through a resistance
- 3 A specific type of a gas-charged lighting unit producing light through a chemical reaction
- 4 The maximum amount of current that a wire or cable can safely carry_
- 5 A tool for removing the plastic layer that covers electric wires
- 6 The process of identifying and selecting wiring material
- 7 A metal tool with handles, used for holding things or for bending and cutting wire
- 8 Installed directly inside a ceiling, a wall, or other surface
- 9 A device that produces electric light, mounted on the top part of the room
- 10 An electrical device that fastens two or more wires together



A: Which wiring method are we going to use here?

B: Well, we'll lay the cables directly under the **plaster**. It's a B: Right. Just think of the proper size of the **hole cutter**, and the traditional way of hiding and protecting them. Alternatively, cables are laid inside a plastic casing (so called casing-capping wiring), or in flexible plastic tubing called conduit.

A: I remember – there's a surface conduit wiring where the pipes run on the walls and ceilings. If the conduits are covered with plastering, it's called a concealed conduit wiring. The surface wiring is used mainly for industrial applications, while the concealed wiring is used for residential purposes.

B: Great! I'm sure you also remember that before the installation, you have to mark the zones for laying the cables and junction

A: Yes, I know. The switch circuits are usually laid 1,200 mm above the finished floor level, and sockets 300 mm above the finished floor level. **Chase**s must be cut only vertically or horizontally. Which tools shall I use? A wall chaser and a power drill?

personal protective equipment! After drilling the holes, place the junction boxes in them and plaster them over. Then fix the distribution board and light fittings.

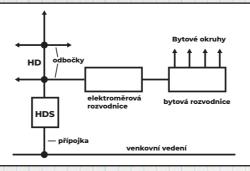
- A: Sure. In the end, I'll pull the wires through the chases according to the wiring diagram. I'll remove the plastic coating from the ends of the wires and **attach** them, according to the instruction on the box, at each outlet, light fitting or switch. After installing the individual circuits, I'll check their functionality.
- B: Well, it's necessary to carry out several tests, such as the insulation resistance test, the earth resistance test, the earth loop impedance test, etc. But final inspection and testing can only be carried out by a competent person with relevant experience and qualifications.

Choose the correct term from the dialogue and match it with one of the definitions.	
1 Spojit s něčím v jeden celek	WRITIN
2 Plastová lišta ve tvaru U se zaklepávacím víkem, určené k ukládání elektrických kabelů	
3 Trvale ukrytý na místě, kde není vidět	
4 Pevný nebo ohebný dutý válec, určený k uložení elektrických vodičů	
5 Nástroj připojený k elektrické vrtačce, kterým se vytvářejí kulaté otvory	
6 Dlouhý, úzký zářez ve stěně, vzniklý záměrně, sloužící k uložení vodičů	
7 Měření odporu mezi každým pracovním vodičem a ochranným vodičem spojeným se zemničem	
8 Elektrotechnická součástka, která slouží k umístění prvků pro propojení vodičů a kabelů	
9 Vrchní krycí vrstva, kterou se pokrývají stropy a stěny, především cihlové	
10 Obráběcí přístroj určený k vrtání otvorů pomocí vrtáků	

Choose the correct term from the dialogue and match it with one of the definitions. 1 A groove or a channel, especially one that is cut in a wall to take a pipe, a cable, etc. 2 A plastic U-shaped container, covered with a cap, that encloses and protects conductors 3 To fasten or join one thing to another 4 Kept hidden where it cannot easily be seen 5 An electric hand tool with a pointed end for making holes 6 A smooth paste made of sand, lime, and water used to cover walls and ceilings 7 Measurement of the total resistance between any two points separated by electrical insulation 8 A small pipe, channel or tube through which liquid, gas or electrical wire can pass 9 A tool attached to a power drill used to saw holes 10 A box in which electrical wires can be safely joined together

Listen to the dialogue and decide if the statements are true or false. 1 The term "smart" denotes the latest model of a famous brand. true 🗆 false 🗆 2 Smart physical objects are active, but can't operate autonomously. true false true 🗆 false 🗅 3 The inhabitants of smart cities have the right to influence the city's matters. true 🗆 false 🗅 4 Smart home's appliances cannot be controlled remotely. true 🗆 false 🗀 5 A smart electrical installation is a very important improvement.

Domestic electrical installation







Vocabulary

 attach
 BrE/e 'tætʃ/AmE/e 'tætʃ/

 casing
 BrE/ 'keɪsɪŋ/AmE/ 'keɪsɪŋ/

 ceiling light
 BrE/ 'si:lɪŋ laɪt/ 'si:lɪŋ laɪt/

 chase
 BrE/tʃeɪs/AmE/tʃeɪs/

concealed BrE/kənˈsiːld/AmE/kənˈsiːld/

conductor sizing BrE/kənˈdʌktəˈsaɪzɪŋ/AmE/kənˈdʌktərˈsaɪzɪŋ/

conduit BrE/'kondjuɪt/AmE/'ka:nduɪt/

current carrying capacity

BrE/ˈkʌrəntˈkæriiŋ kəˈpæsəti/AmE/ˈkɜːrəntˈkæriiŋ kəˈpæsəti/

 fluorescent light
 BrE/fləˈresntˈlaɪt/AmE/fləˈresntˈlaɪt/

 hole cutter
 BrE/həʊl ˈkʌtə(r)/AmE/həʊl ˈkʌtər/

insulation resistance test BrE/ˌɪnsjuˈleɪʃn rɪˈzɪstəns test/AmE/ˌɪnsəˈleɪʃn rɪˈzɪstəns test/

junction box BrE/'dʒʌŋkʃn bɒks/AmE /'dʒʌŋkʃn bɑ:ks/

 moisture
 BrE/'mɔɪstʃə(r)/AmE/'mɔɪstʃər/

 plaster
 BrE/'plæstər/AmE/'plɑːstə(r)/

 pliers
 BrE/'plaɪəz/AmE/'plaɪərz/

 power drill
 BrE/'paʊə drɪl/AmE/'paʊər drɪl/

 recessed
 BrE/rɪ'sest/AmE/rɪ'sest/

 terminal plate
 BrE/'ts:mɪnl pleɪt/AmE/'tsr:mɪnl pleit/

 voltage drop
 BrE/'vəʊltɪdʒ drɒp/AmE/'vəʊltɪdʒ drɑ:p/

 wire strippers
 BrE/'waɪə strɪpəz/AmE/'waɪər 'strɪpərz/

připojit, upevnit elektroinstalační lišta stropní svítidlo

drážka skrytý

dimenzování vodiče elektroinstalační trubka proudová zatížitelnost zářivkové světlo vrtací korunka

zkouška izolačního odporu elektroinstalační krabice

vlhkost omítka kleště

> elektrická vrtačka zapuštěný, zahloubený

svorkovnice úbytek napětí odizolovací kleště

Example sentences

Use this cable to **attach** the printer to the computer.

A **casing** and capping wiring system is easy to inspect by opening the capping.

Water poured through the kitchen **ceiling light** socket, fusing the electricity.

Tool selection is normally determined by the width and depth of the **chase**.

The room had **concealed** lighting.

Conductors are **sized** to prevent the overheating of terminals, in accordance with listing standards.

Today almost 100 percent of wiring done in buildings is concealed, which increases the need for strong and safe **conduits**.

Current carrying capacity of a wire is defined as how much load a conductor can carry (in amperage).

In the past, **fluorescent light**s required a "warm up" period.

A **hole cutter**, also known as a hole saw, uses a rotary motion but is different from a circular saw.

How do you perform an **insulation resistance test**?

The **junction box** serves as the meeting spot for electrical wires, where they connect before moving on.

The following cases illustrate three ways **moisture** can enter electrical components.

The plaster on the walls was cracked and flaking.

This pair of **pliers** unites high-quality materials and ergonomic comfort.

Do you know how to use a power drill?

The lights should be recessed into the ceiling.

Single level pass-through **terminal plate**s simply connect two wires together, i.e. wire-to-wire connection.

To decrease the ${\bf voltage}\ {\bf drop}$ in a circuit, you need to increase the cross section of your conductors

Wire strippers are best for removing the insulation from wire, while cutters are best for cutting wire.







Language spot Word formation in English



You have certainly mentioned how easy it is to form new terms in English. Almost any noun may combine with any other noun to form a new compound (složené slovo), such as electricity meter, junction box, voltage drop. There are, of course, other kinds of word formation, so let's have a closer look at some

We add a **prefix** (předpona) before the base of a word, such as multimeter. In modern English, the prefix e- is used to create new words that are connected with the use of the Internet, e.g. e-bank, e-commerce, e-learning.

We add a **suffix** (přípona) after the base of a word. For example, **-er** and **-or** are used to form nouns to describe people who do things, such as teacher, inspector, or to describe tools and devices, such as cutter, conductor, dimmer.

Conversion (změna) involves the change of a word from one word class to another. For example, the verbs to email and to chase are formed from the nouns email and chase. The verb text means to send a text-message.

Then there are abbreviations (zkratka), e.g. lab - laboratory, maths - mathematics, initials (iniciálová zkratka), such as PE standing for protective earth, and acronyms (akronym) that we pronounce as one word, such as **NATO** or **LASER**.

Test 1

Choose the correct spelling (only one for each sentence).

- 1 A device that produces electric light, mounted on the top part of the room
- a) surface ceiling lite
- b) surface cellar light
- c) surface ceiling light
- d) service ceiling light
- 2 Installed directly inside a ceiling, a wall, or another surface.
- a) recession
- b) recessed
- \Box c) receive
- d) recess
- 3 A specific type of a gas-charged lighting unit producing light through a chemical reaction
- a) fluoride light
- b) fluorescence light
- c) fluorescent flight
- d) fluorescent light

Test 2



Decide which statement is correct (only one definition is correct).

- a) A power drill is an electric hand tool with a pointed end for making holes.
- b) An electric hand tool used to run wiring through conduit piping is called a power drill.
- c) A power drill is an electric tool used to test outlets for power.
- a) Plaster is a smooth paste made of sand, lime, and water used for spreading on the floor.
- b) Plaster is a smooth paste made of sand, lime, and water used to cover walls and ceilings.
- c) A pasty composition that hardens on drying and is used for coating electrical appliances is called plaster.
- a) To attach means to prevent unauthorized persons to open a distribution board.
- b) To attach means to fasten or join one thing to another.
- c) To attach means to disconnect a broken appliance from an electric supply.

Written task

Design a wiring diagram for a bathroom - determine its dimensions, equipment, and electrical devices needed for its proper and convenient functioning.

Keep in mind the number of socket outlets, wall switches and light fittings, and their safe location according to the valid standard.

Your writing task will have 150 - 200 words.



Unit 8 Watch the video record about the classification of electrical machines.



Electrical machines and devices

Exposition

Read and listen.

An electrical machine is a general term for machines that use electromagnetic forces. They convert electrical energy into mechanical energy or vice versa. In contrast, electrical devices produce or are powered by electricity.

The examples of electrical devices can be: switches, circuit breakers, solenoids. commutators, and many others, as well as electrical measuring instruments.

Basically, electrical machine are classified into two main categories: static electrical **machine**s and rotating electrical machines.

Rotating machines include generators and electric motors.

A transformer is an example of a static machine. It is a device that can transfer alternating current from one circuit to another circuit by electromagnetic induction.

There are three basic types of rotating electrical machines.

are These direct current electrical machines like DC motors and DC generators; synchronous machines like alternators and synchronous motors; and asynchronous machines like induction generators and induction motors. All rotating electrical machines have two basic parts in common. They are the rotating part known as the rotor and the stationary part called the stator. A DC machine has a field winding at the stator and an armature at the rotor.

A DC generator operates on the principle of Faraday's laws of electromagnetic induction. The laws say: whenever a conductor is placed in a fluctuating magnetic field, or when a conductor is moved in a magnetic field, an electromagnetic force is induced in the conductor.

Based on the stator and rotor winding connections, a DC machine can be classified as follows: a separately excited DC machine and a **self-excited** DC machine. In a separately excited DC machine, the armature and field windings are excited separately. The field winding can be replaced by a permanent

In the self-excited motors, the armature and field windings are excited from the same power supply. The following connections are possible: a shunt connection – the armature and the field are connected in parallel; series connection – the armature and the field windings are connected in series; and a compound connection.





Match the Czech words with their English equivalents.

- 1 transformer
- 2 commutator
- 3 rotating electrical machine
- 4 synchronous
- 5 self-excited
- 6 static electrical machine
- separately excited
- 8 induction
- 9 winding
- 10 electromagnetic
- A s vlastním buzením
- B točivý elektrický stroj
- C vinutí, cívka
- D synchronní
- E indukce
- F s cizím buzením
- G netočivý elektrický stroj
- H komutátor
- I transformátor
- J elektromagnetický

2 Choose the expressions from and write them next to their	
1 Vyskytující se nebo existující současně	WRITING
2 Mající elektrické i magnetické charakteristiky či vlastnosti	
3 Zařízení pro změnu směru proudění elektřiny	
4 Proces, při kterém elektřina nebo magnetismus přechází z jednoho předmětu na druhý, aniž by se dotýkaly.	
5 Jeden nebo více závitů drátu tvořících souvislou cívku, kterou může procházet elektrický proud	
6 Stroj, který umožňuje přenášet elektrickou energii z jednoho obvodu do druhého pomocí elektromagnetické indukce	
7 Stroj s rotujícím členem, který vyrábí, přeměňuje, transformuje nebo upravuje elektrickou energii	
8 Stroj generující elektrickou energii, který nemá žádnou pohyblivou část	
9 Mající magnetické pole buzené proudem ze samostatného zdroje	
10 Buzený proudem, který vyrábí samotný generátor	

1 One or more turns of wire forming a continuous coil through which	W
an electric current can pass	
2 A machine for generating electric power which has no moving part	
3 A form of apparatus which has a rotating member and generates, converts, transforms, or modifies electric power	
4 Having both electrical and magnetic characteristics, or properties	

Choose the expressions from the text and write them next to their definitions.

- 5 A device for changing the direction
- in which electricity flows
- 6 A device that transfers electrical energy from one circuit to another through the process of electromagnetic induction
- 7 Happening or existing at the same time
- 8 The process by which electricity or magnetism passes from one object to another without them touching
- 9 Having the field magnets excited by a current from a separate source
- 10 Excited by a current produced by the generator itself





A: Let's talk about transformers.

B: Well, it's an interesting part of static electrical machines. Depending on the type of construction, transformers are classified into two categories: core type and shell type transformers. They are used for reducing or increasing the voltage of an alternating current.

A: More precisely, a transformer transfers alternating electrical power from one circuit to another through the process of electromagnetic induction. It is most commonly used to increase ("step up") or decrease ("step down") voltage levels between circuits. Based on that, they are divided into step-up transformers and step-down transformers.

B: That's right. Depending on the type of service, the transformers are further classified into power transformers, distribution transformers, and instrument transformers. The instrument transformers are then divided into current transformers, potential transformers, and auto-transformers.

A: I would also mention the classification depending on the supply. Here we have two categories: single-phase transformers and

three-phase transformers.

B: Sure. The working principle of a transformer is very simple. A basic transformer consists of two coils that are coupled using a magnetic core. In the case of three-phase transformers, two sets of coils per phase will be present. One set of coils is known as the primary winding and the other is known as the secondary winding. Mutual induction between two or more windings (also known as coils) allows for electrical energy to be transferred between circuits.

A: Say you have one winding which is supplied by an alternating electrical source. The alternating current passing through the winding produces a continually changing and alternating flux that surrounds the winding. If another winding is brought close to this winding, some portion of this alternating flux will link with the second winding. According to Faraday's law, there will be an electromagnetic force induced in the second winding. If the circuit of this secondary winding is closed, then a current will flow through it. This is the basic working principle of a transformer.

4	Choose the correct term from the dialogue and match it with one of the definitions.	/
1	Nejdůležitější nebo ústřední část něčeho	WRIT
2	Elektrické zařízení vysoké třídy přesnosti používané k izolaci nebo transformaci napětí nebo proudu	
3	Netočivý stroj sloužící k transformaci energie z jednoho obvodu do druhého beze změny frekvence	
4	Netočivý stroj, který zajišťuje konečnou transformaci napětí v rozvodné soustavě elektrické energie	
5	Zařízení, které přenáší střídavý proud z jednoho obvodu do jednoho nebo více jiných obvodů se zvýšením napětí	
6	Mající, vyrábějící nebo používající tři střídavá napětí o stejné frekvenci, fázově posunutá o 120°	
7	Zařízení, které přenáší střídavý proud z jednoho obvodu do jednoho nebo více jiných obvodů se snížením napětí	
8	Mající, vyrábějící nebo používající jediné střídavé napětí	
9	Konstrukce, která tvoří pevný vnější rám	
10	Elektrický transformátor s jedním vinutím	

5	Choose the correct term from the dialogue and match it with one of the definitions.	
1	A device that transfers an alternating current from one circuit to one or more other circuits with an increase of voltage	 WRIT
2	A device that transfers an alternating current from one circuit to one or more other circuits with a decrease of voltage	
3	The most important or central part of something	
4	A structure that forms a hard outer frame	
5	A static machine used for transforming power from one circuit to another without changing the frequency	
6	A static machine that provides the final voltage transformation in the electric power distribution system	
7	A high accuracy class electrical device used to isolate or transform voltage or current	
8	An electrical transformer with only one winding	
9	Having, generating, or using a single alternating voltage	
10	Having, generating, or using three alternating voltages of the same frequency, displaced in phase by 120 $^\circ$	

riaving, generating, or using three afternating voltages of the same frequency, displaced in phase by 120				
Listen to the dialogue and decide if the statements are true or false.			The elements with our of an armony to the control of the control o	0
1 A dynamo is an electrical generator that makes direct current using a commutator.	true 🗆	false 🗆	READING	LISTENING
2 It is not possible to produce DC voltage directly on the output of the rotating machines.	true 🗆	false □		
3 A commutator is installed in a car alternator.	true 🗆	false 🗆		
4 The bridge rectifier uses diodes which are made of a semiconductor material.	true 🗆	false 🗆		
5 Diodes do not allow current to flow in only one direction.	true 🗆	false 🗆		



Pay attention to the meanings of the words:

"different" = různý, jiný, odlišný, rozdílný, rozmanitý, různorodý, nápadný, zvláštní x "differ" = být odlišný, být rozdílný, lišit se, rozcházet se, být různý, být v rozporu x "differ from" = lišit se od, odlišovat se od, být v rozporu od, neshodovat se s něčím

"varied" = odlišný, rozličný, různorodý, kolísavý, proměnlivý, pozměněný, střídavý, smíšený x "vary" = být proměnlivý, kolísat, lišit se, měnit, měnit se, obměnit, odchýlit, odchýlit se, odlišovat, odlišovat se, pozměnit x "vary from ... to" = kolísat mezi ... a, pohybovat se mezi ...

Vocabulary



commutator

distribution transformer

electromagnetic

induction

instrument transformer

power transformer

rotating electrical machine

self-excited

separately excited

shell

single-phase

static electrical machine step-down transformer

step-up transformer synchronous

three-phase

transformer

winding

BrE/'o:təʊ træns'fo:mə(r)/ AmE/'otoʊ træns'formə/

BrE/'kpmjutertə(r)/ AmE/'kamyə tertər/

BrE/ko:(r)/ AmE/kor/

BrE/ distri bju:[n træns fo:mə(r)/ AmE/ distrə byu[n træns formə/

BrE/I_lektrəumæg'netɪk/ AmE/I_lektroumæg'netɪk/

BrE//ɪnˈdʌk[n/ AmE/ɪnˈdʌk[n/

BrE/'Instrement træns'fo:me(r)/ AmE/'Instrement træns'forme/

BrE/'paʊə(r) træns'fɔːmə(r)/ AmE/'paʊər træns'fɔrmə/

BrE//rəʊˈteɪtɪŋ ɪˈlektrɪkl məˈʃiːn/ AmE/ˈroʊteɪtɪŋ ɪˈlɛktrɪkl məˈʃin/

BrE/self ik saitid/ AmE/self ik saited/

BrE/'sepretli ik'saitid/ AmE/'sepretli ik'saited/

BrE/[el/ AmE/[ɛl/

BrE/'singl feiz/ AmE/'singl feiz/

BrE/'stætik i 'lektrikl mə' [i:n/ AmE/'stætik i 'lektrikl mə' [in/ BrE/step dawn træns forme/r)/ AmE/step dawn træns forme/

BrE/step λp træns fɔ:mə(r)/ AmE/stεp λp træns fɔrmə/

BrE/'sınkrənəs/ AmE/'sınkrənəs/

BrE/θri: feɪz/ AmE/θri feɪz/

BrE/træns fo:mə(r)/ AmE/træns formər/

BrE/'waindin/ AmE/'waindin/

autotransformátor

komutátor

iádro

distribuční transformátor

elektromagnetický

indukce

přístrojový transformátor výkonový transformátor točivý elektrický stroj

s vlastním buzením s cizím buzením

plášť

jednofázový

netočivý elektrický stroj snižovací transformátor zvyšovací transformátor

synchronní třífázový transformátor

vinutí

Example sentences

Autotransformer is mostly used in a low-voltage range, for industrial, commercial and laboratory purposes.

Using an ohmmeter, check the resistance between the **commutator** and the armature core.

Any type of transformer is mainly constructed with three parts and those are **core**, a primary winding, and a secondary winding.

Distribution transformers are generally used in electrical power distribution and transmission systems.

Light is the form of **electromagnetic** radiation which our eyes are able to see.

Electromagnetic **induction** phenomena can be explained by a simple example of a coil and a magnet.

Instrument transformers are used to transform the primary voltage or current to values that are suitable for measuring instruments.

Distribution transformers function in distribution networks defined by lower voltages than **power transformers** do.

The rotary converter consists of two **rotating electrical machine**s that are directly connected together.

In the **self-excited** mode, the induction generator is excited with three-phase AC capacitors.

Separately excited generators like this are commonly used for large-scale power transmission plants.

When windings are surrounded by the core, the transformer is a **shell** type transformer.

Single-phase motors are not usually produced above 5 hp.

Static electrical machines also include inverters and rectifiers.

All the street transformers which we see near our homes are **step-down transformers**.

Generally, step-up transformers are located at power generation plants.

The most common types of three-phase motors are **synchronous** motors and induction motors.

Direct use of **three-phase** electricity is common for big motors.

The **transformer** is connected to a junction box, usually in the basement.

An armature **winding** is the winding, in which voltage is induced.









Choose the correct spelling (only one for each sentence).

1	Being excited by a current produced
	by the generator itself is called

a) selve-excited	
b) self-excited	
c) self-exciated	
d) self-exited	

2 A machine for generating electric power which has no moving part is called

a) static electrical machine 🖵
b) statik electrical machine 🗖
c) static electrikal machine 🖵
d) static electrical machin

3 The process by which electricity or magnetism passes from one object to another without them touching is called

another	without	uieiii
a) indaction		
b) inductien		
c) induktion		
d) induction		

Test 2

and magnetic properties.



Decide which statement is correct (only one definition is correct).

1	
a) The hole in the center of the coil is called the winding.	
b) A winding is one or more turns of wire forming a continuous coil through which an electric current	_
can pass.	
c) An autotransformer has more than one windings.	
2	
a) A rotating electrical machine has a rotating member and generates, converts, transforms, or modifies electric power.	
b) A rotating electrical machine has no rotating member and generates, converts, transforms, or modifies electric power.	
c) A rotating electrical machine is a machine for generating electric power which has no moving part.	
3	
a) Electromagnetic means having no electrical properties.	
b) Electromagnetic means having electrical properties only.	
c) Electromagnetic means having both electrical	

Speaking task



What is an electrical machine and a device?

What is the classification of electrical machines in terms of motion?

What is the classification of electrical machines in terms of the direction of flow and the type of input and output energy?

What is the classification of transformers in terms of construction?

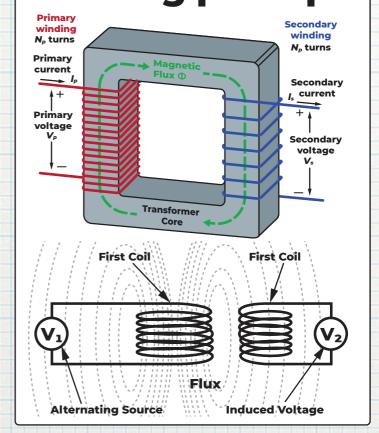
What is the classification of electrical machine according to the type of electrical energy?

What are the types of DC generators?

What are the types of alternating current generators?

Your speaking task will have 150 - 200 words.

Transformer definition and working principle



Unit 9 Watch the video record about the classification **Electric motors**



Exposition

Read and listen.

An electric motor is a machine for converting electrical energy into mechanical energy. Most electric motors use the interaction of a magnetic field and an electric current passing through a coil. This results in a torque transmitted to a driven device (e.g. a vacuum cleaner, an elevator, an electric car). The reverse process, producing electrical energy from mechanical energy, is done by generators such as an alternator or a dynamo. Many types of electric motors can be run as generators and vice versa. For example, a starter for a gas turbine or traction motors used on vehicles often performs both tasks.

Electric motors run on a direct current or an alternating current. They consist of a stationary stator and a moving rotor attached to the output shaft. Motors are usually connected to a power supply through a terminal box with connecting terminals placed on the stator.

They are classified into DC and AC motors. The DC motors are then divided into selfexcited, separately excited, and permanentmagnet motors. The self-excited motors are further divided into series, compound and



In the self-excited motors, the armature

and field windings are excited from the same

power supply. The following connections are

possible: a shunt connection - the armature

and the field windings are connected in

parallel; series connection - the armature and the field windings are connected in

On the contrary, the AC motors are

then classified into induction motors,

synchronous motors, and linear motors.

The induction motors are either single-phase

It's worth mentioning the linear motors.

A linear motor has the stator and the rotor

"unrolled", thus, instead of producing a

torque, it produces a linear force along its

The advantage of linear induction motors

which use electromagnets is that no physical

contact is required and, thus, wear and

maintenance are minimized. Such linear

motor enables achieving the tremendous 2G

or three-phase asynchronous motors.

series; and a compound connection.

of electric motors.



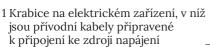




Match the Czech words with their English equivalents.

- 1 maintenance
- 2 armature
- 3 asynchronous motor
- 4 synchronous motor
- 5 terminal box
- 6 linear motor
- 7 stator
- 8 wear
- 9 rotor
- 10 terminal
- A opotřebení
- B svorkovnice
- C stator
- D kotva E svorka
- F asynchronní motor
- G rotor
- H lineární motor
- I synchronní motor
- J údržba

2	Choose the expressions from the text
	and write them next to their definitions



- 2 Motor, jehož otáčky jsou úměrné frekvenci napájecího napětí
- 3 Pohyblivá součást elektrického stroje
- 4 Nepohyblivá součást elektrického stroje, v níž nebo kolem níž se otáčí rotor
- 5 Součást elektrického stroje (např. motoru nebo generátoru), která přenáší střídavý proud
- 6 Postupné snižování kvality způsobené nepřetržitým používáním
- 7 Motor, jehož magnetické pole vytvořené ve statoru indukuje magnetické pole v rotoru
- 8 Činnost spočívající v udržování dobrého stavu věci pravidelnou kontrolou a v případě potřeby opravou
- 9 Elektrický motor, který nevykonává pracovní pohyb rotační, ale pohyb
- 10 Bod, ve kterém proud vstupuje do elektrického zařízení nebo jej opouští _



acceleration at the start of the ride.

shunt motors.

length.

Choose the expressions from the text and write them next to their definitions.

1 The component of an electric machine (i.e. a motor or a generator) that carries alternating current

2 The rotating member of an electrical

- 3 The activity of keeping something in a good condition
- 4 A point at which current enters or leaves an electrical device
- 5 A motor whose magnetic field created in the stator induces a magnetic field in the rotor
- 6 A motor in which the motion between the rotor and the stator i s linear, not rotary
- 7 A gradual decrease in quality caused by continuous use
- 8 A motor that runs at a speed proportional to the frequency of the electric power source
- 9 A box located on a piece of electrical equipment that contains lead-in cables ready for connecting to a power source
- 10 A stationary part in a machine in or about which a rotor revolves





- A: When talking about electric motors, we could say that the information needed for connecting the motor is given on a **nameplate**. It contains all necessary parameters like an output power, revolutions per minute, rated voltage, frequency, rated current, and the starting torque.
- B: Sure. Do you know what the most commonly used electric motor is?
- A: Of course, it's a three-phase asynchronous AC motor. Compared to a synchronous motor, in an asynchronous motor, the speed of the rotor must be less than the speed of the rotating magnetic field in the stator. The difference between the speeds is called a slip.
- B: Well. I would like to mention briefly how to connect such a three-phase asynchronous AC motor.
- A: OK. It's an interesting topic. First, we connect the ends of the three separated sets of coils in the stator with the connecting

terminals in the terminal box. For the motor to run, we need to complete the circuit. There are two ways to do this. The first way is the delta connection. For this, we connect the terminals like this: u1 to w2, v1 to u2, and w1 to v2. The other way of connecting the terminals is to use the star **connection**, also called wye connection. In this method, we connect between w2, u2, and v2 on only one side.

- B: In the star **configuration**, the terminals of the three branches are connected to a common neutral point. In the delta configuration, the three branches of the network are connected in such a way that it forms a closed loop.
- A: That's right. There are far more differences between the two ways. For example, the speed of the delta connected motors is higher because each phase gets the total of the line **voltage**. The speed of the star connected motors is slow as they receive a much lower voltage.

Choose the correct term from the dialogue and match it with one of the definitions.	
1 Tabulka umístěná na elektromotoru, na níž jsou uvedeny všechny jeho param	netry potřebné pro zapojení
2 Veličina, která vyjadřuje množství práce vykonané za jednotku času	
3 Jednotka, která se používá k vyjádření rychlosti otáčení nejrůznějších mecha např. točivých strojů	nických zařízení,
4 Napětí, kterým je označena síť nebo zařízení a na které se vztahují provozní o	charakteristiky
5 Krouticí moment, který vzniká na hřídeli elektromotoru při rozběhu	
6 Rozdíl mezi otáčkami rotoru a otáčkami točivého magnetického pole ve stato	oru
7 Napětí mezi libovolnými dvěma fázovými vodiči	
8 Uspořádání, nastavení nebo seskupení	
9 Zapojení, v němž jsou začátky nebo konce vinutí zapojeny do uzlu a druhé vývody vinutí jsou připojeny ke svorkám	
10 Zapojení, v němž je začátek jedné fáze spojen s koncem vinuti sousední fá	

Choose the correct term from the dialogue and match it with one of the definitions. 1 The torque applied by an electric motor when it starts from a stationary state 2 The voltage given to electrical equipment or devices which refers to specified operating conditions 3 The difference between the speed of the rotor and the speed of the rotating magnetic field in the stator 4 A plate on an electric motor showing all its necessary parameters for connecting 5 A connection in which the terminals of the three branches are connected to a common neutral point 6 The voltage between any of the two-phase lines 7 The number of turns completed in one minute around an axis 8 A connection in which the beginning of one phase is always connected with the end of the adjacent phase 9 Work or energy produced per unit of time 10 A group of components interconnected to perform a desired circuit function

Listen to the dialogue and decide if the statements are true or false. 1 An electric motor is connected to a power supply through a terminal box located on the stator.**true l false l** 2 The 1LA7-130 motor by Siemens is a synchronous motor. true 🗆 false 🗆 3 When ordering a motor from a manufacturer, it is necessary to know its order number. true 🗆 false 🗅 4 The rated current of the 1LA7-130 motor by Siemens is 10.3 A. true 🗆 false 🗆 5 The rated voltage, frequency and shaft diameter of both motors are different. true 🗆 false 🗆

Pay attention to the meanings of the words: "solenoid" and "electromagnet".

A solenoid is an electromagnet, but an electromagnet need not necessarily be a solenoid. An electromagnet is an electrically induced magnet. As the name implies, it is a core of magnetic material such as iron surrounded by a coil of wire through which an electric current is passed in order to magnetise the core.

A solenoid is a cylindrical coil of wire acting as a magnet

when carrying an electric current. A solenoid is the same as an electromagnet but without a core of material that can be magnetised, i.e. iron.

A solenoid still produces a magnetic field, but not as strong as an electromagnet of the same size. In fact, the magnetic field with the iron core is more than one thousand times stronger.

So, we can say that an electromagnet is a coil of wire around an iron core. A solenoid is just a cylindrical coil of wire.

Vocabulary

 $\label{eq:armature} \textbf{BrE/'a:met[er/)/AmE/'armet[er/)}$

asynchronous motor BrE/eɪ'sɪŋkrənəs 'məʊtə(r)/ AmE/eɪ'sɪŋkrənəs 'moʊtər/

 configuration
 BrE/kən,frgə rerʃn/ AmEkən,frgyə rerʃn/

 delta connection
 BrE/ deltə kə nekʃn/ AmE/ deltə kə nekʃn/

 line voltage
 BrE/ larn 'vəʊltrdʒ/ AmE/larn 'vəʊltrdʒ/

 linear motor
 BrE//ˈlɪniə(r) 'məʊtə(r)/ AmE/ˈlɪniər 'moʊtər/

 maintenance
 BrE/ˈmeɪntənəns/ AmE/ˈmeɪntnəns/

 nameplate
 BrE/ˈneɪmpleɪt/ AmE/ 'neɪmpleɪt/

 output power
 BrE/ autput 'paue(r)/ AmE/ autput 'pauer/

 rated voltage
 BrE/ 'rertid 'veultidʒ/ AmE/ 'rertid 'voultidʒ/

revolutions per minute, rpm BrE/ˌrevəˈluːʃnz pə(r) 'mɪnɪt/ AmE/ˌrevəˈluʃn pər 'mɪnət/

 rotor
 BrE/ route(r)/ AmE/ router/

 slip
 BrE/slrp/ AmE/slrp/

star connectionBrE/sta:(r) kəˈnekʃn/ AmE/star kəˈnɛkʃn/starting torqueBrE/ 'sta:tɪŋ tɔ:k/ AmE/'sta:rtɪŋ tɔ:rk/

stator BrE/'steɪə(r)/ AmE/'steɪtər/

synchronous motor BrE/sɪŋkrənəs 'məʊtə(r)/ AmE/sɪŋkrənəs 'moʊtər/

terminal BrE/'tɜ:mɪnl/ AmE/'tərmənl/

terminal box BrE/ 'ta:mɪnl bɒks/ AmE/'ta:mɪnl ba:ks/

wear BrE/weə(r)/ AmE/wer/



kotva

asynchronní motor

konfigurace

zapojení do trojúhelníku

sdružené napětí lineární motor

údržba

výrobní štítek

výkon

jmenovité napětí

otáčky za minutu

rotor skluz

zapojení do hvězdy

záběrový moment

stator

synchronní motor

svorka svorkovnice opotřebení

LISTENING SPEAK

Example sentences

The main function of the **armature** is to rotate the shaft or axel to which it is attached.

An induction motor never rotates at synchronous speed; therefore, it is called an **asynchronous motor**.

A variety of different **configuration**s are possible for these devices.

After the start, the circuit is switched to **delta connection** and the motor receives the rated voltage.

Three-phase motors run on **line voltage**.

The main advantage of a **linear motor** is its ability to generate large forces and, as a result, to develop significant acceleration.

Electric motors need preventive **maintenance** in order to function well.

When the motor is used at other voltages than the voltage indicated on the **nameplate**, its performance will be affected.

A surround sound system from BOSE drives 14 loudspeakers with up to 465 watts of **output power**.

A **rated voltage** is one of the parameters which are shown on a motor's nameplate.

Calculating **revolutions per minute** is one of the parameters which are essential when choosing a motor for a given application.

The term of a **rotor** refers to alternating-current machines while in direct-current machines, the rotor is called an armature.

The **slip** will never become zero in an induction motor.

A half-wave rectifier may be considered as a **star connection**, because it returns the current through the centre (neutral) wire.

The **starting torque** is usually less than the torque when the motor is running at full speed.

In linear motors, the core of the **stator** is unrolled into a line.

The **synchronous motor** uses a stator just like an induction motor to generate a rotating magnetic field.

A stator of an asynchronous motor has three sets of coils connected with **terminal**s in a terminal box.

Generators, motors and their **terminal box**es shall be accessible for inspections, measurements and repairs.

The parts of a motor showing **wear** must be replaced.



Choose the correct spelling (only one for each sentence).

- 1 A box, located on a piece of electrical equipment that contains lead-in cables ready for connecting to a power source is called
- a) teminal boks b) terminal box
- 2 A motor, in which the motion between the rotor and the stator is linear, not rotary is called
- a) liner motor
 b) linear motor
 c) linear motr
 □

d) liniar motor

- 3 A gradual decrease in quality caused by continuous use is called
- a) vear
 b) weer
 c) wier
 d) wear

Test 2



 \Box

Decide which statement is correct (only one definition is correct).

- a) A rotor is a moving part of an electric motor.
- b) A rotor is a stationary part of an electric motor. c) A rotor is a moving part of a transformer.
- c) A rotor is a moving part of a transformer.
- a) A synchronous motor is an induction motor.
- b) A synchronous motor runs at a speed proportional to the frequency of the electric power source.
- c) There is a slip between the speed of the rotor and the speed of the rotating magnetic field in a synchronous motor.
- 3
- a) There is no terminal box on the stator.
- b) A stator is a moving part of an electric motor.
- c) A stator is a stationary part of an electric motor.

Written task

Describe the star and delta connections of a three-phase asynchronous motor. The pictures can help you.

Your written task will have 150-200 words.

The nameplate of the electric motor and its connection according to data

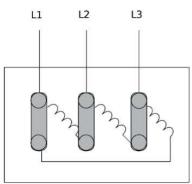


SIEMENS	3 ~ Mot.	EN 60034	CB
NoUD 0015563-0010-00 50 Hz A / Y 230/4	00 V 60 Hz	IP 55 IM E Y 460 V	33
0.55 kW 2.5/1.4 cos φ 0.82 1395/1 Δ/ Y 220-24 /380-4	min cosy	V 1,41 A 0,81 1695/min -480 V	ч
26-26/15-15 4 32143 1001	145-14-	00/05	(H)

The star connection of the electric motor

The star connection of the electric motor corresponds to the voltage of 3x400V

The terminal box of a 3-phase asynchronous electric motor – star connection/Y





The terminal box of a 3-phase asynchronous motor - star connection/Y

Unit 10 Safety at work in electrical engineering

action of an electric current on the human

body by touch or by adverse effects caused

by an electric current. Electrical energy

flows through a portion of the body causing

a shock. The exposure to electrical energy

may result in no injury at all, or may result

in major damage, or death. The electric

a contact with dangerous live parts

against the ground, a contact between

dangerous live parts of different polarity, a

contact with non-living parts of electrical

equipment, where dangerous voltages can

Electrical accidents may occur at any

time or place. They cause countless injuries.

Injury could be minimised and many lives

saved if proper rescue techniques are

used and first aid provided. There should

always be an emergency response plan for

shock by contact may result from:

be generated in the event of a fault.

electrical maintenance or work.

Exposition

Read and listen

Safety at work in electrical engineering means to recognize hazards associated with the use of electrical energy and to take precautions so that hazards do not cause **injury** or death. The safe operation of electrical equipment is verified by regular inspections, and the operators are regularly trained and tested. Everyone at the workplace shares the responsibility to identify and control the hazards. Only persons with an electrical qualification and sufficient experience may perform work under voltage.

If a technician comes into contact with energized equipment, then the equipment may **harm** the technician. There is a possibility of suffering **electric shock** or getting an arc flash burn, a thermal burn or a blast injury.

An electric shock occurs when a person comes into contact with an electrical energy source. That means the direct









Match the Czech words with their English equivalents.

- 1 accident
- 2 energized equipment
- 3 precaution
- 4 injury
- 5 harm
- 6 rescue
- 7 first aid
- 8 live part
- 9 electric shock
- 10 hazard
- A riziko B ublížit
- C opatření (bezpečnostní)
- D úraz el. proudem
- E zranění, úraz
- F zařízení pod napětím
- G část pod napětím
- H první pomoc
- I záchrana
- J nehoda, havárie

7	Choose the expressions from the text
	and write them next to their definitions.



- 2 Poškodit někoho fyzicky, morálně nebo psychicky
- 3 Něco, co se dělá předem, aby se předešlo problémům nebo nebezpečí
- 4 Náhlý průtok elektřiny částí těla, který způsobuje bolest a někdy i smrt
- 5 Poškození způsobené na těle člověka nebo zvířete, například při nehodě
- 6 Zařízení, které je elektricky připojeno nebo má zdroj napětí
- 7 Vodivý díl pod napětím
- 8 Jednoduché lékařské ošetření, které je někomu poskytnuto před příchodem lékaře nebo před tím, než může být osoba převezena do nemocnice
- 9 Čin, kterým se někomu pomáhá z nebezpečné nebo nepříjemné
- 10 Nepříjemná událost, která se stane nečekaně a způsobí zranění nebo škodu



Choose the expressions from the text and write them next to their definitions.



- 1 Something that is done in advance in order to prevent problems or to avoid danger
- 2 A harm done to a person's or an animal's body, for example in an accident
- 3 The act of helping someone out of a dangerous or unpleasant situation
- 4 To injure physically, morally, or mentally
- 5 A source of possible injury or damage to health
- 6 The equipment that is electrically connected to or having a source of voltage
- 7 A sudden flow of electricity through a part of the body, causing pain and sometimes death
- 8 An unpleasant event that happens unexpectedly and causes injury
- 9 An energized conductive component
- 10 A simple medical treatment that is given to someone before a doctor comes or before the person can be taken to a hospital

r		
1		
۱		
ŀ	VRITING	Ī



- precautions must be taken. Do you know any of them?
- B: Sure. First, we have to watch out for loose cords and wires. Loose cords and wires can cause physical hazards and even electrical hazards
- A: Of course. Electricians must wear proper **personal protective equipment (PPE)**. The kind of PPE required will depend on the type of the electrical machine or device, and the task to be performed. Nevertheless, insulated gloves, goggles or a **shield**, and other means are important to use where necessary. **Safety sign**s must be posted at a workplace to warn the workers of the risks of electrical accidents and remind them to wear PPE.
- B: Well, some panels and equipment get hot while operating. In that case, the workers have to use caution around such heat sources. PPE like gloves or flame-resistant clothing may be required in these areas, and a fire extinguisher may come in handy.
- A: In order to prevent electrical accidents at a workplace, relevant A: They must **be cautious** while testing or replacing electrical components. All levels of voltage should be considered equally dangerous. Even the voltage levels which cannot produce electric shock should also not be ignored. The electricians should check and confirm that the circuit is dead before touching it for repairing, maintenance or any other work. Never try to repair energized equipment. Always check whether it is **de-energized** first by using a tester. Always use insulated tools while working on an electrical device or an electric circuit.
 - B: It's also necessary to **avoid** water at all times when working with electricity. Never touch or try to repair any electrical equipment or circuits with wet or damp hands. Wet hands reduce the resistance of the human body and result in more current passing through the body when touching a live part of an electrical device.
 - A: Electricians cannot wear any metal objects because these are very good conductors of electric current and when working under voltage, an accidental contact of a metal part with a live part could result in a very serious injury.

Choose the correct term from the dialogue and match it with one of the definitions.

- 1 Konání, které pokud možno zmenšuje rizika
- 2 Dávat si pozor na to, co říkáte nebo děláte, zejména abyste se vyhnuli nebezpečí nebo chybám
- 3 Ochranný oděv, přilba, ochranné brýle apod. určené k ochraně těla uživatele před zraněním nebo infekcí
- 4 Oděv na ruku s oddělenými částmi pro každý prst a palec
- 5 Brýle, které těsně přiléhají k obličeji a chrání oči před větrem, prachem, vodou atd.
- 6 Zabránit tomu, aby se stalo něco špatného
- Kovová nádoba s vodou nebo chemikáliemi uvnitř k hašení malých požárů
- 8 Rozpoznatelný symbol, který varuje před potenciálním elektrickým nebezpečím nebo je identifikuje
- 9 Odpojený od zdroje energie
- 10 Ochranný kryt obličeje, který je obvykle vyroben z průhledného plastu a nosí se zejména proto, aby se zabránilo zranění

Choose the correct term from the dialogue and match it with one of the definitions.

- 1 Being careful about what you say or do, especially to avoid danger or mistakes
- 2 A pair of glasses that fit closely to the face to protect the eyes from wind, dust, water, etc.
- 3 Care that you take in order to avoid danger or mistakes; not taking any risks
- 4 Disconnected from a power source
- 5 A protective covering for the face that is commonly made of clear plastic and is worn specially to prevent injury
- 6 Protective clothing, helmets, goggles, etc. designed to protect the wearer's body from injury or infection
- 7 To prevent something bad from happening
- 8 A piece of clothing for the hand with separate parts for each finger and the thumb
- 9 A recognizable symbol that warns of or identifies potential electrical hazards
- 10 A metal container with water or chemicals inside for putting out small fires



Listen to the dialogue and decide if the statements are true or false.

- 1 An electric current passing through the body can cause internal damage, a cardiac arrest or another injury. **true** false
- 2 Even a small amount of electricity can be fatal.
- 3 A person who has been injured by contact with electricity shouldn't be seen by a doctor.
- 4 Move the source away from you and the person using a dry, non-conducting object.
- 5 If the person shows no signs of breathing, or movement, don't carry out an indirect cardiac massage.











true□ false □

true□ false □

true false

how to express "to provide"; for example, to render, to supply, to grant, to give.

For example, the word "wear". In relation to equipment or its parts, it means "opotřebení". In relation to "personal protective equipment", it means "nosit", "mít na sobě".

Pay attention to the English words that have different meanings.

There are several options how to express "to avoid"; for example, to prevent (from), to keep from; and how to express "to follow"; for example, to meet, to observe, to adhere to, to comply with; and

All these words concern, among others, safety and are frequently used in professional practice.

Vocabulary

accident BrE/'æksident/ AmE/'æksedent/ nehoda, havárie be cautious BrE/bi 'kɔː[əs/ AmE/bi 'kɔ[əs/ opatrný, obezřetný caution BrE/'ko:[n/ AmE'ko[n/ opatrnost de-energized BrE/dɪ enədʒaɪzd/ AmE/dɪ enər dʒaɪzd/ bez napětí

electric shock BrE/I lektrIk '[pk/ AmE/I lektrIk [ak/ úraz elektrickým proudem

energized equipment BrE/'enədʒaɪzd ɪ'kwɪpmənt/ AmE/'ɛnərˌdʒaɪzd ɪ'kwɪpmənt/ zařízení pod napětím fire extinguisher BrE/'faɪər ɪkstɪngwɪ[ə(r)/ AmE/'faɪər ɪk'stɪngwɪ[ər/ hasicí přístroj

first aid BrE/f3:st etd/ AmE/fərst etd/ první pomoc BrE/glnv/ AmE/glnv/ rukavice glove goggles BrE/'gpglz/AmE/'gaglz/ ochranné brýle harm BrE/ha:m/ AmE/harm/ ublížit

hazard BrE/'hæzəd/AmE/'hæzərd/ riziko injury BrE/'Indzəri/AmE/'Indzəri/ zranění, úraz live part BrE/lazv pa:t/ AmE/lazv pa:rt/ část pod napětím

personal protective equipment BrE/'ps:sənl prə'tektrv ı'kwɪpmənt/ AmE/'pərsənl prə'tektrv ı'kwɪpmənt/ ochranné pomůcky precaution BrE/prɪˈkɔː[/ AmE/prɪˈkɔː[n/ opatření (bezpečnostní)

BrE/'reskju:/ AmE/'reskyu/ záchrana rescue safety sign BrE/'seɪfti saɪn/ AmE/'seɪfti saɪn/ bezpečnostní značky

shield BrE/fi:ld/ AmE/fild/ štít

to avoid BrE/tə ə'voɪd/ AmE/tə ə'voɪd/ vyhnout se

Example sentences

Accidents at work can sometimes result in serious injury.

Auto companies are taking a cautious approach toward introducing electric cars.

Be sure to use **caution** when walking across a patch of ice.

Electrical work can be performed only on **de-energized** equipment.

The ground connection prevents a person from receiving an **electric shock** from the appliance.

Only employees qualified for the task may work on or near **energized equipment**.

Notices give details of how to evacuate and where to find **fire extinguisher**s in the event of a fire.

While one of you gives **first aid**, the other should call the ambulance.

Rubber-insulated **glove**s are differentiated by classes that correspond with voltage ratings.

Goggles provide better protection than safety glasses, and are effective in preventing eye injury from chemical hazards, dusty environments and welding.

Thankfully no one was **harm**ed in the accident.

Safe work practices and the use of protective equipment may be needed for exposures to electrical hazards.

The passengers escaped with only minor injuries.

Coming in contact with **live part**s can cause an injury or death.

The purpose of **personal protective equipment** is to reduce employee exposure to hazards.

You must take all reasonable **precaution**s to protect yourself and your family.

The victims were taken to hospital by the **rescue** team.

Electrical **safety sign**s and signals play a vital role in safeguarding from electrical hazards.

Safety glasses or goggles must always be worn underneath face **shield**s.

The entire system is designed to be water resistant in order **to avoid** electrical hazards.











Choose the correct spelling (only one for each sentence).

- 1 A sudden flow of electricity through a part of the body, causing pain and sometimes death is called
- a) electrik shock
 b) electric shok
 c) electric shock

d) elektric shock

- 2 The equipment that is electrically connected to or having a source of voltage is called
- a) enrgized equipment
 b) energized ekvipment
 c) energaized equipment
 d) energized equipment
- 3 An energized conductive component is called
- a) liv part
 b) laiv part
 c) live part
 d) laive part

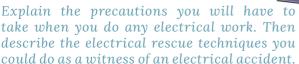
Test 2



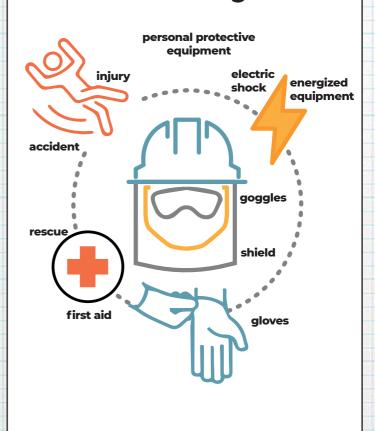
Decide which statement is correct (only one definition is correct).

- -1
- a) There are no hazards when carrying out maintenance work on an electrical machine.
- b) An electrical hazard is a serious workplace hazard that exposes workers to burns, electric shocks, or explosions. □
- c) A hazard is not a source of possible injury or damage to health
- 2
- a) To harm means to prevent something bad from happening.
- b) To harm someone means to help her of him get out of a dangerous or unpleasant situation.
- c) Live parts of an electrical machine may harm persons that are working on or with the machine.
- 3
- a) Precaution is something that is done after an accident in order to prevent problems or to avoid danger.
- b) Precaution is something that is done in advance in order to prevent problems or to avoid danger.
- c) When working with electrical equipment, it is not necessary to take any precautions.

Speaking task



Workplace safety



Obrazové zdroje:

- · Picture 1 (Unit 1), Electrical Engineering, zdroj: Anna Lamačová
- Picture 2 (Unit 2), Electric Circuits [public domain], via allaboutcircuits.com: > https://www.alla-boutcircuits.com/textbook/direct-current/chpt-7/what-is-a-series-parallel-circuit/ [cit. 2022-28-04]
- · Picture 2 (Unit 2), Electric Circuit, zdroj: Anna Lamačová
- Picture 4 (Unit 3): Electronic components [public domain], via Wikimedia Commons: → https://az.m.wikipedia.org/wiki/Fayl:Amplifier_Circuit_Small.svg [cit. 2022-28-04]
- Picture 5 (Unit 3): Elements and symbols [public domain], via researchgate.net: → https://www.researchgate.net/figure/Two-terminal-circuit-components-resistor-top-left-Capacitor-topright-inductor_fig2_328530866 [cit. 2022-28-04]
- Picture 6 (Unit 4): schematic symbols [public domain], via web-19dkuckovskyj.panska.cz: > http://web-19dkuckovskyj.panska.cz/soucastka/dokumenty/Tranzistor.pdf [cit. 2022-28-04]
- Picture 7 (Unit 4): Transistor types [public domain], via electronicshub: → https://www.electronicshub.org/transistors-classification-and-types/ [cit. 2022-28-04]
- Picture 8 (Unit 5): Classification of measuring instruments [public domain], via circuitglobe: > https://circuitglobe.com/classification-of-measuring-instruments.html [cit. 2022-28-04]
- Picture 9 (Unit 6): Electrical installation scheme [public domain], via dspace.cvut.cz: → https://dspace.cvut.cz/bitstream/handle/10467/76722/F3-BP-2018-Simka-Pavel-Navrh%20elektroinstalace%20rodinneho%20domu.pdf?sequence=-1&isAllowed=y strana 13 [cit. 2022-28-04]
- · Picture 10 (Unit 6): Domestic electrical installation, zdroj: Anna Lamačová
- Picture 11 (Unit 7): Domestic electrical installation [public domain], via publi.cz. → https://publi.cz/books/260/02.html [cit. 2022-28-04]
- Picture 12 (Unit 7): Wiring diagram for a bathroom [public domain], via levna-koupelna.cz: → htt-ps://www.levna-koupelna.cz/umisteni-zasuvek-a-vypinacu-v-koupelne?fbclid=IwAR0V9iycNBLyN-St6WS7oQp_tvQb0MkdXtPR0tSA58ol1LomWejcMG4v87tQ [cit. 2022-28-04]
- · Picture 13 (Unit 5): Classification of measuring instruments, zdroj: Jitka Kunčarová
- Picture 14 (Unit 5): Transformer definition and working principle [public domain], via crushtymks:
 https://crushtymks.com/cs/electrical-lectures/98-the-essentials-of-ac-power-transformers-for-students-and-beginners.html [cit. 2022-28-04]
- Picture 15 (Unit 9): The nameplate of the electric motor [public domain], via mylms.cz: > https://www.mylms.cz/prehled-a-zapojeni-motoru/[cit. 2022-28-04]
- Picture 16 (Unit 9): The terminal box of a 3-phase asynchronous electric motor [public domain], via Wikimedia Commons: → https://cs.wikipedia.org/wiki/Soubor:Svorkovnice_asynchronniho_motoru_do_hvezdy_a_do_trojuhelnika.svg [cit. 2022-28-04]
- · Picture 17 (Unit 10): Workplace safety, zdroj: Anna Lamačová
- · Picture 18 (Unit 7): Domestic electrical installation I, zdroj: Jitka Kunčarová
- \cdot Picture 19 (Unit 7): Domestic electrical installation II, zdroj: Jitka Kunčarová
- · Picture 20: Title photo, zdroj: Jitka Kunčarová