ENGLESKI JEZIK

ZA

INŽENJERE

SMER E1

V SEMESTAR

ENGLESKI JEZIK ZA INŽINJERE 1

školska godina 2022/2023 fond časova 2+0
predmetni nastavnik: Ivana Mirović, kabinet 109, blok F
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V semestar – stručni kurs engleskog jezika za studente na odseku: EET

Materijal za kurs obuhvata odabrana poglavlja iz udžbenika:
Oxford English for Electronics, E. Gledinning, J. McEwan, OUP, 1993
Oxford English for Electrical and Mechanical Engineering. E. Gledinning, N. Gledinning, OUP, 2008
Oxford English for Information Technology, E. Gledinning, J. McEwan OUP, 2002

PREDISPITNE OBAVEZE: **Test (30) poena**. Može se polagati samo jednom tokom semestra na času. **Ne postoji mogućnost popravljanja testa**.

Proverava se - znanje novog vokabulara (Povežite reči i objašnjenja – 6 poena)
- znanje novog vokabulara (Dopunite rečenice – 6 poena)
- znanje novog vokabulara (Navedite sinonim/ antonim – 4 poena)
- upotreba specifičnih izraza (Zaokružite tačan odgovor – 6 poena)
- upotreba veznika (Dopunite rečenice odgovarajućim veznikom – 10 poena)

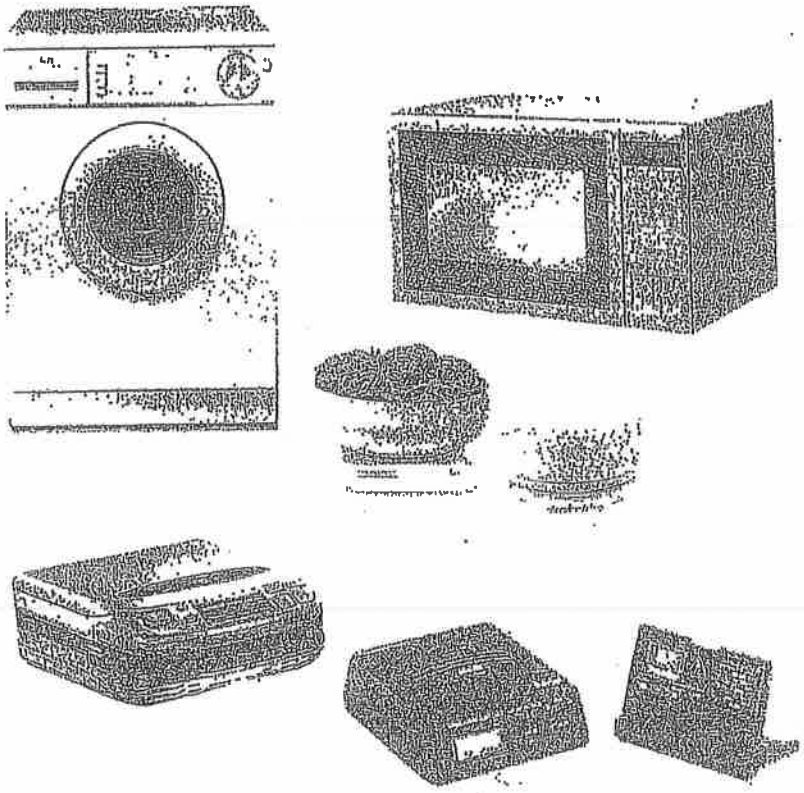
ISPIT: maksimalno **70 poena**. Ispit je pismeni i usmeni.

Pismeni ispit nosi 20 poena.
I zadatak: Dopunite tekst odgovarajućim recima
Dat je jedan pasus nepoznatog teksta iz koga je izvadjeno 8 reci. Reči su date odvojeno, u odgovarajućem obliku (to mogu biti imenice, glagoli, pridevi, prilozi, veznici itd.). Koristeći znanje stečeno obradom sličnih tekstova na času, kao i poznavanje vokabulara, konstrukcije engleske rečenice i sl. treba dopuniti tekst.
II zadatak: Stavite glagol iz zgrade u odgovarajući glagolski oblik (8 poena)
Ovaj zadatak se zasniva najvećim delom na vežbama iz *Language study* i obuhvata: pasivne rečenice, relativne rečenice *(reduced relative clauses: active and passive)*, vremenske rečenice *(reduced time clauses: active and passive)*, glagole: *allow, let, prevent, cause, make* i sl.
III zadatak: Koji pojmovi su opisani ovim definicijama? (4 poena)
Na osnovu opisa nekog stručnog pojma ili reči treba se setiti o kojoj se reči radi.

- **Usmeni deo ispita** 50 poena
Student izvlači ispitno pitanje (naslov jednog od obrađenih tekstova iz skripte, tekstovi koji dolaze na usmeni su navedeni jačim slovima u planu rada), i odgovara na pitanja koja postavlja nastavnik.

FORMIRANJE KONAČNE OCENE: prema skali koja je prihvaćena na Fakultetu.
(51 – 100 poena)

1 Electronics in the home



Tuning-in

Task 1

Make a list of things in your house which use electronics. Compare your list with that of another group.

Task 2

Find out the meaning of these abbreviations. You can use Appendix 1 on page 188 to help you.

1 IC 2 CD 3 hi-fi

Reading *Reading for a purpose*

In your study and work, it is important to have a clear purpose when you read. At the start of most units in this book, you will find tasks to give you that purpose.

Task 3

Read quickly through the text on the next page. Tick [✓] any items mentioned in the list you made in Task 1.

Reading *Understanding diagrams*

In electronics, you have to read not only texts, but also diagrams. You have to be able to combine information from both diagram and text. This text introduces two kinds of diagrams often used in electronics.

Task 6

Read the text below to find the answers to these questions:

1 What do we call the two types of diagrams shown in the text?
2 What do we call the approach to electronics which focuses on the function of units?

Understanding electronic diagrams

Although electronic devices may look complicated, they are made up of common basic units ('building blocks') connected together. The function of each of these units and the path of the signals between them can be shown in a block diagram. For example, the block diagram of a simple radio is shown in Fig. 1.

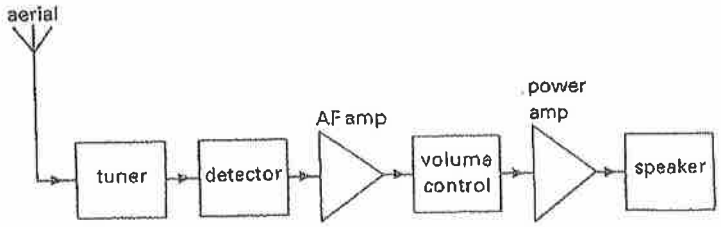


Fig. 1

To understand how the radio works, it is more important to understand the function of each unit than to know what components are used. This is known as a systems approach to electronics. For example, in Fig. 1 the tuner selects the required signal, the detector then separates off the audio part of the signal, and the AF amplifier (amp) amplifies it.

The connections and values of the components inside these basic units can be shown in a circuit diagram using standard electronic symbols. Fig. 2 shows the circuit diagram for the simple radio.

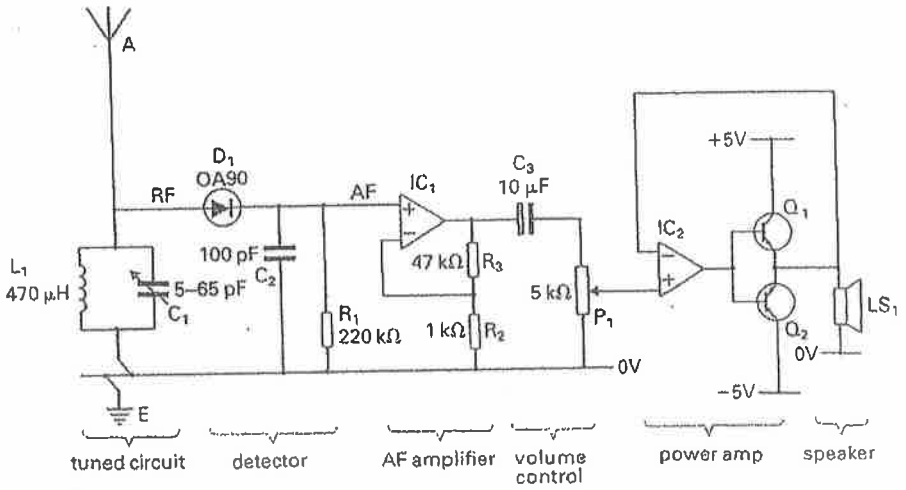


Fig. 2

two

Task 7 How many of the circuit symbols in Fig. 2 can you identify? Use Appendix 2 on page 206 to help you.

Language study *Describing block diagrams and circuits*

Look again at Fig. 1 above. We can describe it like this:

The radio | ***consists of*** / ***is composed of*** | *a tuner, a detector, and an AF amplifier.*

Using *comprise*, we can start our description with the blocks:

A tuner, a detector, and an AF amplifier | ***comprise*** | *the radio.*

We can describe the links between each building block using these expressions:

The tuner | ***is connected to*** / ***is linked to*** | *the detector.*

Look again at Fig. 2. We can describe the values of the components like this:

R1 *a two-hundred-and-twenty-kilohm resistor*
C2 *a hundred-picofarad (puff) capacitor*

Task 8 Describe the value of these components:

1 R2
2 C1
3 R3
4 C3
5 P1
6 L1

This table provides the terms you need.

Prefix	Symbol	Multiple	Example
giga	G	10^9	GHz gigahertz
mega	M	10^6	MΩ megohms
kilo	k	10^3	kV kilovolts
deci	d	10^{-1}	dB decibels
milli	m	10^{-3}	mW milliwatts
micro	μ	10^{-6}	μH microhenries
nano	n	10^{-9}	nF nanofarads
pico	p	10^{-12}	pF picofarads

Looking now at the basic units of the circuit, we can describe the volume control like this:

The volume control consists of a ten-microfarad electrolytic capacitor connected in series with a five-kilohm potentiometer (pot). The positive terminal of the capacitor is connected to the output of the AF amplifier and the wiper of the pot is connected to the power amp. The third terminal of the pot is connected to the zero voltage supply rail, which is earthed.

Task 9

Fill in the gaps in this description of the tuned circuit shown in Fig. 2. Each gap represents one word.

The circuit [1]_____ of a four hundred and seventy [2]_____ inductor which is connected in parallel with a [3]_____ capacitor. The [4]_____ can be varied between five and sixty-five [5]_____. The aerial is [6]_____ to the top end of the tuner. It is also connected to the positive terminal of the [7]_____ in the detector. The bottom end of the tuner is connected to earth via the zero voltage [8]_____ rail.

Speaking practice

Task 10

Work in pairs, **A** and **B**. Complete your circuit diagram with help from your partner.

Ask questions like these:

What kind of component is P1?
What's the value of C1?
What is connected between the collector of Q2 and the positive side of the battery?

If you don't understand your partner, say:

I'm sorry, I don't understand. Could you say that again, please?
Could you speak more slowly?

If your partner doesn't understand you at first, try phrasing your answer in a different way. For example:

It's a variable resistor. It's a resistor which you can vary or change by turning the control. It's called a variable resistor.

Student A: Your circuit diagram is on page 174.
Student B: Your circuit diagram is on page 181.

Writing *Describing diagrams*

Task 11

With the help of the diagram, fill in the gaps in the description on page 12. Each gap represents one word. The description should answer these questions:

1 What is the diagram of?
2 What does it consist of in terms of blocks?
3 How are the blocks connected?
4 What is the function of each block?

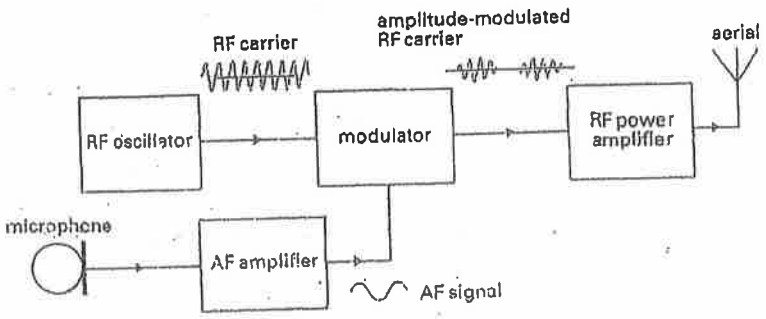


Fig. 3

Fig. 3 shows the block diagram of an amplitude-modulated (AM) radio transmitter. It [1] _____ of a radio frequency (RF) oscillator, a [2] _____, an audio frequency (AF) amplifier, and an RF power amplifier. The RF [3] _____ generates an RF [4] _____ wave which is fed into the modulator.

The microphone converts sounds into audio frequency signals which are amplified by the AF [5] _____. The modulator then uses the amplified AF [6] _____ to modulate the RF carrier wave.

The power of the modulated carrier wave is increased by the RF [7] _____ amplifier. The strong modulated output signals are fed to the [8] _____ which enables them to be transmitted over long distances.

5 Batteries

Tuning-in

Task 1

Study this statement:

Twenty billion batteries are sold every year.

Why do you think this is so? What different kinds of batteries are there? List some of the things you use which contain batteries. Compare your list with someone else's.

Task 2

Try to complete this table of the differences between two kinds of cells. Use these terms:

secondary, manganese dioxide, cadmium, primary, nickel, zinc, portable phones, torches

	Zinc-carbon cell	NiCad cell
Type of cell		
Positive electrode		
Negative electrode		
Example of use		

Task 3

B4 Now listen to the tape to check your answers.

7

Task 4

Now read this text. Note any further information about these cells.

	Zinc-carbon cell	NiCad cell
Electrolyte		
EMF		

Zinc-carbon cell

It has a zinc negative electrode, a manganese dioxide positive electrode, and the electrolyte is a solution of ammonium chloride. The carbon rod is in contact with the positive electrode (but is not involved in the chemical reaction) and is called the current collector. The EMF is 1.5V and the internal resistance about 0.5Ω. This is the most popular cell for low-current or occasional use, e.g. in torches.

Nickel-cadmium cell (NiCad)

The electrodes are of nickel (+) and cadmium (–) and the electrolyte is potassium hydroxide. It has an EMF of 1.2V and is made in the same sizes as primary cells, e.g. HP2, PP3; button types are also available. High currents can be supplied. Recharging must be by a constant current power supply because of the very low internal resistance.

Task 5

Label this diagram of a Zinc-carbon cell with these terms. More than one term can refer to the same part of the diagram.

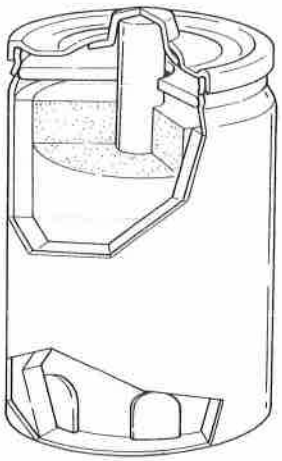
a zinc can
b current collector
c jacket
d carbon rod
e positive electrode
f electrolyte

1 .....

2 .....

3 .....

4 .....



Language study *Describing components*

Two questions we may need to answer when we describe components are:

1 What is it called?
2 What does it do?

In other words, we need to be able to:

1 label components.
2 describe their function.

We can use these ways of labelling components:

*It **is called** a Zinc-carbon cell.*
*It **is known as** a NiCad cell.*

We can describe the function of components like this:

*A cell **provides** electricity.*
*Cells **change** chemical energy into electricity.*

Task 6

Here are some circuit symbols. Label them and describe their function. For example:

5 h *It's called a transformer. It steps AC voltages up or down.*

This list of functions may help you.

a	varies capacitance in a circuit
b	rectifies alternating current
c	adds resistance to a circuit
d	measures very small currents
e	breaks a circuit
f	protects a circuit
g	varies the current in a circuit
h	steps AC voltages up or down
i	receives RF signals
j	measures voltages

1 

6 

2 

7 

3 

8 

4 

9 

5 

10 

Speaking practice

Task 7

Work in pairs, **A** and **B**. You have some details, but not all, about two kinds of cells. Find out the missing details from your neighbour so that you can complete your table.

Student A: Your table is on page 174.
Student B: Your table is on page 181.

Word study *Verbs and related nouns*

Task 8

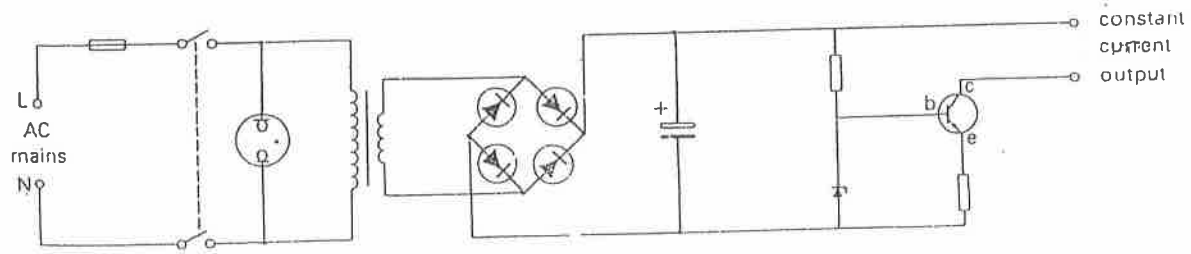
Each of these verbs has a related noun ending in *-er* or *-or* which refers to an instrument or component. Complete the column of nouns. You have met these nouns in this and earlier units.

	Verb	Noun
Example	*record*	*recorder*
1	oscillate	_____
2	transmit	_____
3	transform	_____
4	charge	_____
5	rectify	_____
6	process	_____
7	amplify	_____
8	collect	_____
9	detect	_____
10	tune	_____

Technical reading *Battery charger*

Task 9

Study this circuit diagram of a battery charger and try to name all the components.



Now read this text to check your answers:

The power to drive an electronic circuit is normally provided by an AC mains power supply but batteries are often used for portable equipment. Secondary cells can be recharged to their original voltage and can therefore be used many times over.

Recharging is done using a battery charger which consists of a mains power supply with a DC output slightly larger than the required battery EMF. A current is driven through the battery in the opposite direction to its normal output current. The block diagram of a battery charger is shown in Fig. 1.

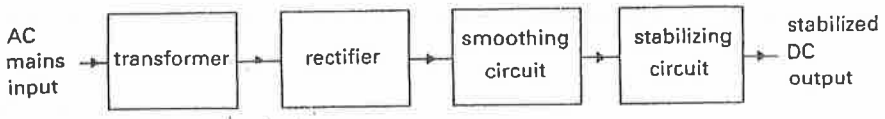


Fig. 1

The first stage consists of a transformer which steps down the voltage of the AC mains (see Fig. 2).

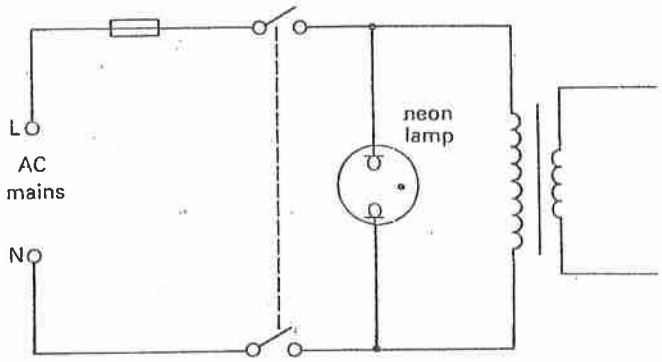


Fig. 2

The charger is switched on and off by a double-pole switch connected in series with the mains input. A neon lamp, connected across the primary of the transformer, shows when the charger is on. A fuse is connected in the live side of the supply to protect the transformer.

The second stage is a bridge rectifier which converts the AC voltage to a DC voltage (see Fig. 3).

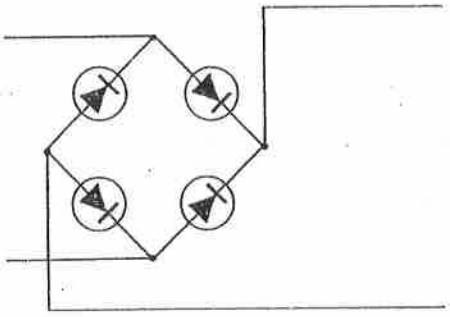


Fig. 3

This can be made from discrete components but more usually consists of four diodes contained in one package. It is mounted on an aluminium heatsink to keep the diodes from overheating.

The third stage is a smoothing circuit. It removes the fluctuations in the DC output of the rectifier. It consists of a large electrolytic capacitor connected in parallel with the rectifier as shown in Fig. 4.

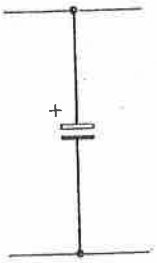


Fig. 4

The final stage is a stabilizing circuit consisting of a transistor biased by two resistors and a zener diode. This prevents the output from changing when the load varies. NiCad batteries have such a small internal resistance that the charger must produce a constant current output (see Fig. 5).

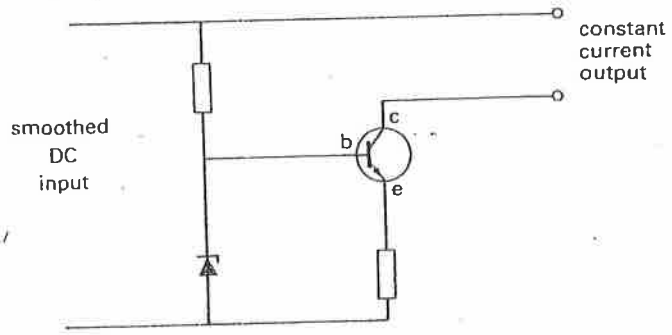


Fig. 5

Task 10

Match each component or unit with its function in a battery charger. For example:

The transformer steps down the AC mains voltage.

Component/Unit	Function in a battery charger
1 transformer	a steps down the AC mains voltage
2 double-pole switch	b prevents the output from changing when the load varies
3 neon lamp	c keeps the diodes from overheating
4 fuse	d shows when the charger is on
5 rectifier	e removes the fluctuations in the DC output of the rectifier
6 aluminium heatsink	f protects the transformer
7 smoothing circuit	g converts the AC voltage to a DC voltage
8 stabilizing circuit	h switches the charger on and off

UNIT 3

Computer Applications

STARTER **1** Work in groups. List as many uses as you can for computers in one of these areas.

1 supermarkets
2 hospitals
3 airports
4 police headquarters

READING **2** Study this diagram. Using only the diagram, try to list each stage in the operation of this computerised speed trap to make an explanation of how it operates. For example:

1 Camera 1 records the time each vehicle passes.

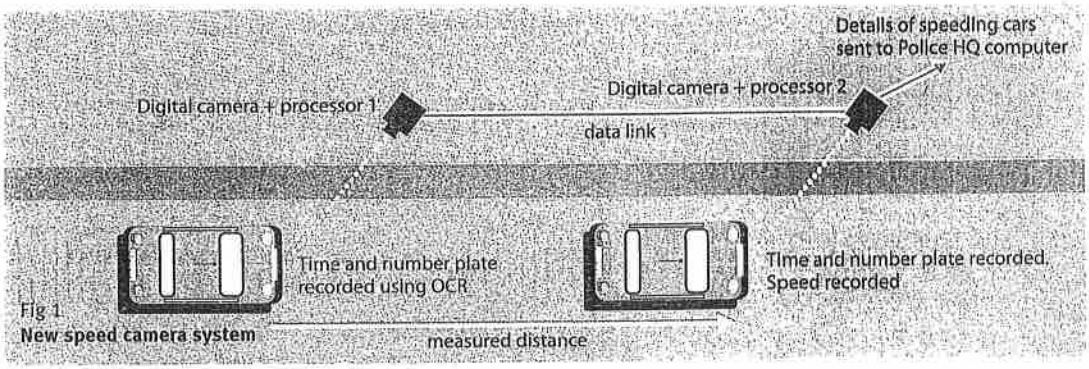


Fig 1
New speed camera system

3 Part 1 of the text describes the system which predates the one shown in Fig 1. Does it contain any information that may help complete your explanation? Read it quickly to find out. Ignore any information which is not helpful to you.

In the last ten years, police have installed speed trap units on many busy roads. These contain a radar set, a microprocessor and a camera equipped with a flash. The radar sends out a beam of radio waves at a frequency of 24 gigahertz. This is equivalent to a wavelength of 1.25 cms. If a car is moving towards the radar, the reflected signal will bounce back with a slightly smaller wavelength. If away from the radar, the waves will reflect with a slightly longer wavelength. The microprocessor within the unit measures the difference in wavelength between outgoing and returning signals and calculates the speed of each vehicle. If it is above the speed pre-set by the police, the camera takes a picture of the vehicle. The information is stored on a smart card for transfer to the police computer. The owner of the vehicle can then be traced using the Driver and Vehicle Licensing Centre database.

4 Part 2 describes the new system. Read it to complete the stages in your explanation.

Some drivers have now got used to these traps. They slow down when they approach one to ensure that the camera is not triggered. They speed up again as soon as they have passed. This is known as 'surfing'. One way of outwitting such motorists is a new computerised system. This consists of two units equipped with digital cameras positioned at a measured distance apart. The first unit records the time each vehicle passes it and identifies each vehicle by its number plates using optical character recognition software. This information is relayed to the second unit which repeats the exercise. The microprocessor within the second unit then calculates the time taken by each vehicle to travel between the units. The registration numbers of those vehicles exceeding the speed limit are relayed to police headquarters where a computer matches each vehicle with the DVLC database. Using mailmerge a standard letter is then printed off addressed to the vehicle owner.

LANGUAGE WORK Present passive

Study these sentences.

1 The radar sends out a beam of radio waves.
2 The information is stored on a smart card.

In 1 the verb is active and in 2 it is passive, the Present passive. Why is this so? What difference does it make? In 1 the agent responsible for the action is included – the radar. In 2 the agent is not included although we know what it is – the microprocessor. The passive is often used to describe the steps in a process where the action is more important than the agent and where the agent is already known to the reader. If we need to add the agent, we can do so like this:

3 The information is stored on a smart card *by the microprocessor.*

5 Describe the operation of the new speed trap by converting each of these statements to the Present passive. Add information on the agent where you think it is necessary.

1 The first unit records the time each vehicle passes.
2 It identifies each vehicle by its number plates using OCR software.
3 It relays the information to the second unit.
4 The second unit also records the time each vehicle passes.
5 The microprocessor calculates the time taken to travel between the units.
6 It relays the registration numbers of speeding vehicles to police headquarters.
7 A computer matches each vehicle with the DVLC database.
8 It prints off a letter to the vehicle owners using mailmerge.

6 With the help of this diagram, sequence these steps in the operation of an EPOS till. Then write a description of its operation in the Present passive.

a The scanner converts the barcode into electrical pulses.
b The branch computer sends the price and description of the product to the EPOS till.
c The scanner reads the barcode.
d The branch computer records the sale of the product.
e The till shows the item and price.
f The checkout operator scans the item.
g The scanner sends the pulses to the branch computer.
h The till prints the item and price on the paper receipt.
i The branch computer searches the stock file for a product matching the barcode EAN.

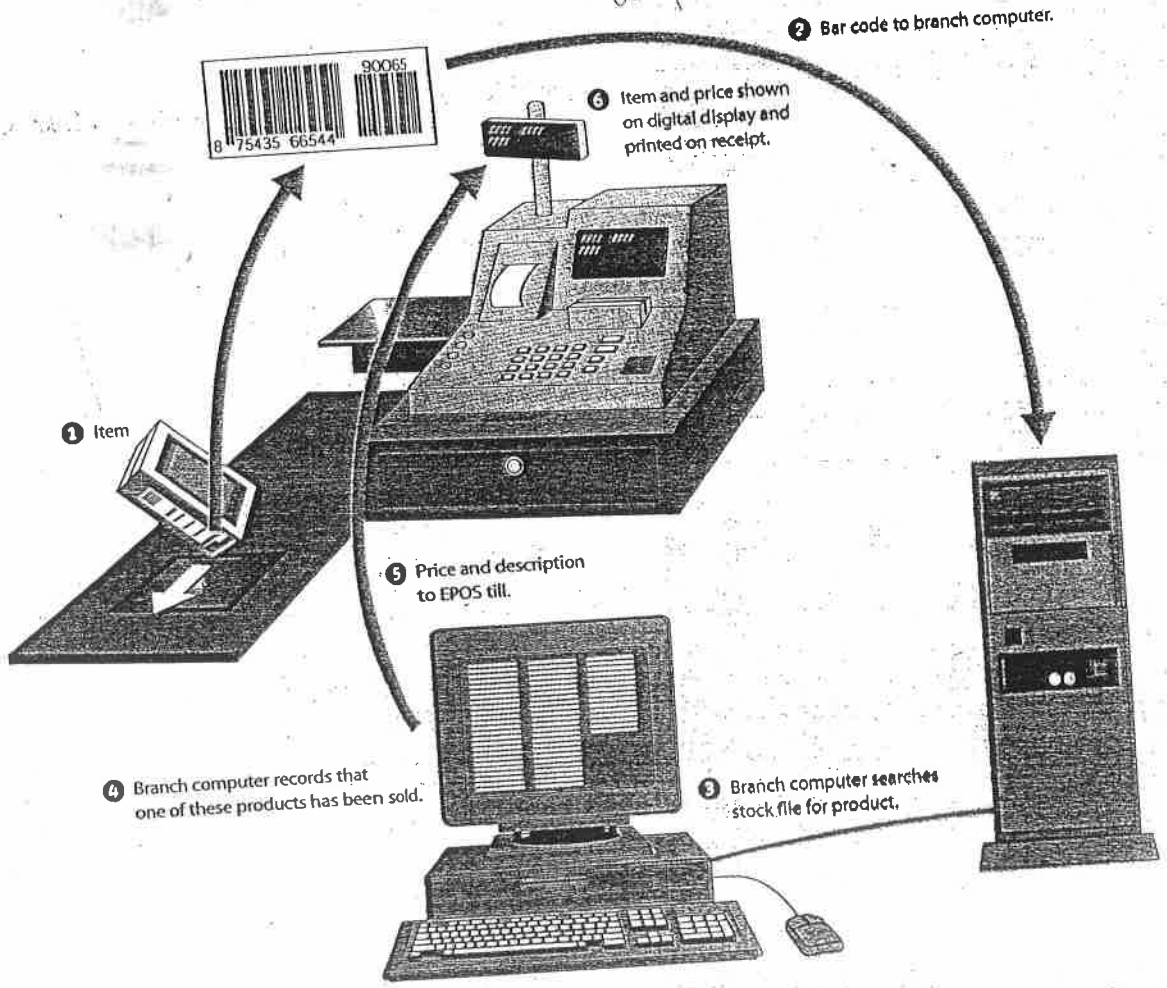


Fig 2
Operation of EPOS till

6 The electric motor

Tuning-in

Task 1

Working in your group, list as many items as you can in the home which use electric motors. Which room has the most items?

Reading *Skimming*

In Unit 3 you studied scanning – locating specific information quickly. Another useful strategy is reading a text quickly to get a general idea of the kind of information it contains. You can then decide which parts of the text are worth reading in more detail later, depending on your reading purpose. This strategy is called *skimming*.

Task 2

Skim this text and identify the paragraphs which contain information on each of these topics. The first one has been done for you.

a What electric motors are used for *paragraph 1*

b The commutator _____

c Why the armature turns _____

d Electromagnets _____

e Effect of putting magnets together _____

f The armature _____

para

In an electric motor an electric current and magnetic field produce a turning movement. This can drive all sorts of machines, from wrist-watches to trains. The motor shown in Fig. 1 is for a washing machine. It is a universal motor, which can run on direct current or alternating current. 1

An electric current running through a wire produces a magnetic field around the wire. If an electric current flows around a loop of wire with a bar of iron through it, the iron becomes magnetized. It is called an electromagnet; one end becomes a north pole and the other a south pole, depending on which way the current is flowing around the loop. 2

▶

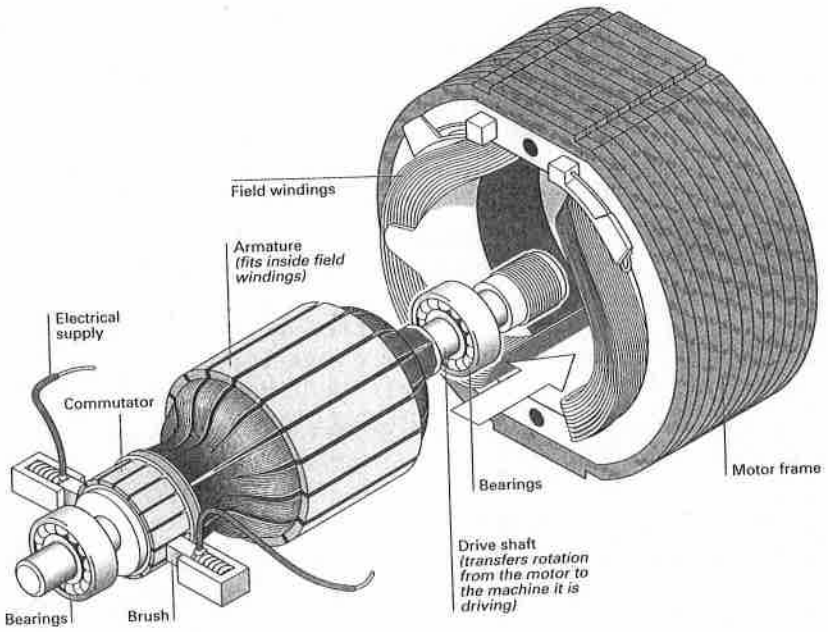


Fig. 1

If you put two magnets close together, like poles – for example, two north poles – repel each other, and unlike poles attract each other. 3

15 In a simple electric motor, like the one shown in Fig. 2, a piece of iron with loops of wire round it, called an armature, is placed between the north and south poles of a stationary magnet, known as the field magnet. When electricity flows around the armature wire, the iron becomes an electromagnet. 4

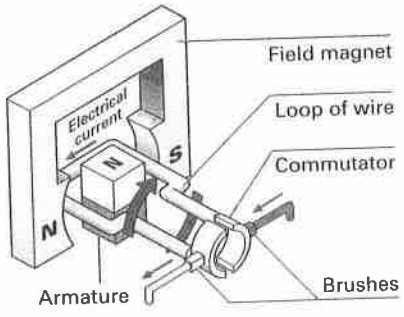


Fig. 2

▶

The attraction and repulsion between the poles of this armature magnet and the poles of the field magnet make the armature turn. As a result, its north pole is close to the south pole of the field magnet. Then the current is reversed so the north pole of the armature magnet becomes the south pole. Once again, the attraction and repulsion between it and the field magnet make it turn. The armature continues turning as long as the direction of the current, and therefore its magnetic poles, keeps being reversed. 5

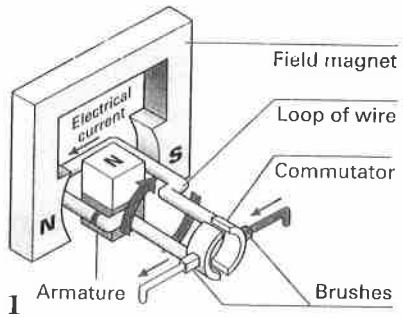
To reverse the direction of the current, the ends of the armature wire are connected to different halves of a split ring called a commutator. Current flows to and from the commutator through small carbon blocks called brushes. As the armature turns, first one half of the commutator comes into contact with the brush delivering the current, and then the other, so the direction of the current keeps being reversed. 6

Source: Adapted from 'Inside out: Electric Motor', *Education Guardian*

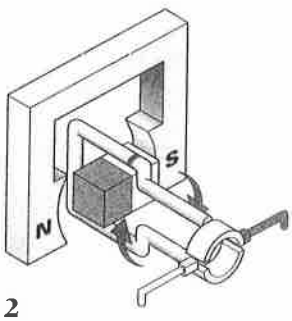
Task 3

Match each of these diagrams with the correct description, **A**, **B**, **C**, or **D**. One of the descriptions does *not* match any of the diagrams. (The diagrams are in the correct sequence, but the descriptions are not.)

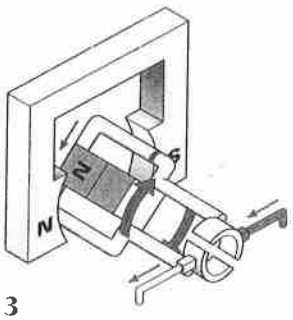
Motor run on direct current



1



2



3

A
The armature turns a quarter of a turn. Then electric contact is broken because of the gap in the commutator, but the armature keeps turning because there is nothing to stop it.

B
When current flows, the armature becomes an electromagnet. Its north pole is attracted by the south pole and repelled by the north pole of the field magnet.

C
When a universal motor is run on direct current, the magnetic poles in the armature change while those of the field magnet remain constant.

D
When the commutator comes back into contact with the brushes, current flows through the armature in the opposite direction. Its poles are reversed and the turn continues.

13 Music centre

Tuning-in

Task 1

Study this picture of a music centre.

1 What forms of audio input does it have?
2 What other forms of audio input might be added?

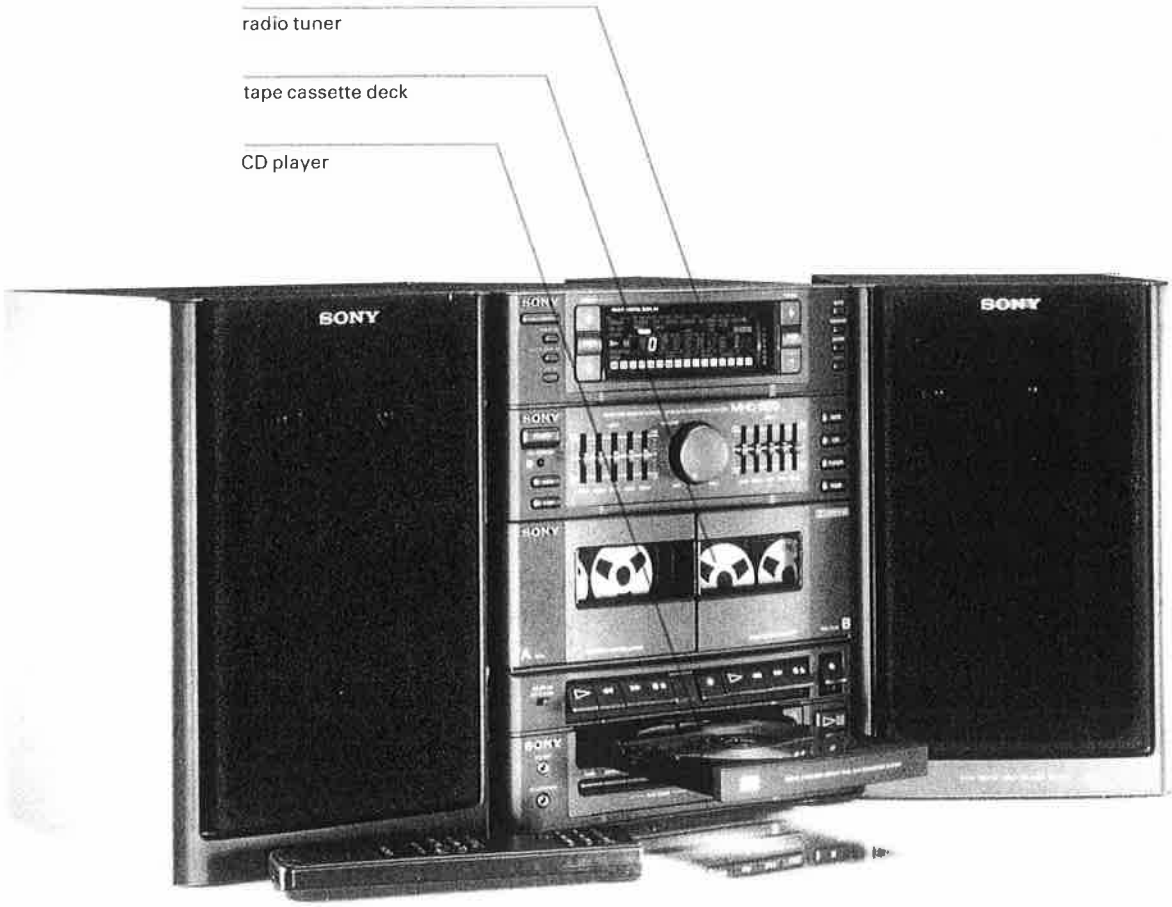


Fig. 1

Task 2

Read this text to check your answer to question 1 of Task 1.

Fig. 1 shows a music centre. It contains a number of audio input devices: a CD player, a radio tuner, and a tape cassette deck. These allow the user to play music recorded in different formats. All these devices share a common amplifier and speaker system. Each part of the music centre is stacked one on top of the other.

Task 3 Read the rest of the text to find out:

1 the function of a pre-amplifier
2 the function of a power amplifier
3 the function of a graphic equalizer
4 the difference between a hi-fi and a midi-fi system

As Fig. 2 shows, the common amplifier is made up of two sections. The first section is the pre-amplifier (pre-amp), which provides tone, volume, and balance controls as well as amplification of the input signal voltages. The second section is the power amplifier (power amp). This amplifies the power of the pre-amp signals to enable them to drive the loudspeaker system.

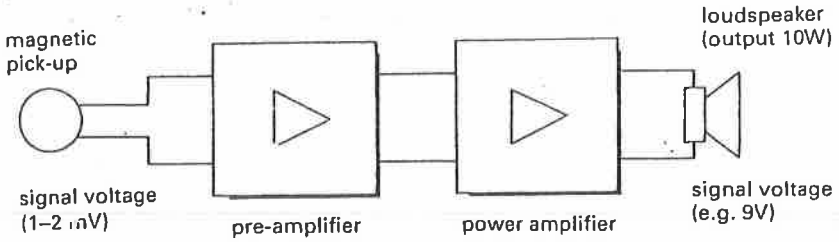


Fig. 2

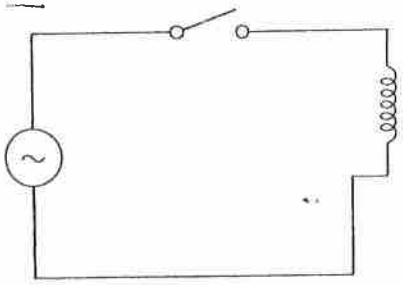
Some music centres also contain a graphic equalizer. This allows the user to adjust the amplification of particular frequency ranges by moving an array of slider controls. In this way the reproduced sound can be varied to suit different acoustic conditions.

A music centre can be classified as a hi-fi (high-fidelity) system or a mid-fi system depending on the quality of its sound reproduction.

Language study *Allowing and preventing verbs*

What happens as a result of . . .

closing the switch?
opening the switch?



Closing the switch:
We can describe the result using these verbs:

Closing the switch | ***allows*** / ***permits*** / ***enables*** | *current* ***to*** *flow through the coil.*

Note that verbs like *allow* are followed by *to* and the infinitive.

Opening the switch:
We can describe the result using these verbs:

Opening the switch | ***prevents*** / ***stops*** | *current* ***from*** *flowing through the coil.*

Note that verbs like *prevent* are followed by *from* and the *-ing* form.

Task 4

Now fill in the gap in each sentence with an allowing or preventing verb. Also put each verb in brackets in the correct form.

1 A graphic equalizer ..... the user (adjust) the amplification of different frequency ranges.

2 A fuse ..... a sudden rise in current (damage) equipment.

3 A mixing desk ..... the sound engineer (improve) the quality of the sound recorded.

4 A heatsink ..... output transistors (overheat).

5 A surge suppressor ..... large current fluctuations (damage) computers.

6 Special effects like reverb ..... the engineer (alter) the sound of the recording.

7 Different inputs on the music centre ..... the user (play) CDs, cassettes, and MDs.

8 A safety tab ..... the user (erase) the tape by accident.

Task 5

Complete the gap in each sentence with the correct form of the verb in brackets.

1 The Help facility enables users ..... (get) advice on most problems.

2 Adding more memory lets your computer ..... (work) faster.

3 Windows allows you ..... (display) two different folders at the same time.

4 The Shift key allows you ..... (type) in upper case.

5 The MouseKeys feature enables you ..... (use) the numeric keypad to move the mouse pointer.

6 ALT + TAB allows you ..... (switch) between programs.

7 The StickyKeys feature helps disabled people ..... (operate) two keys simultaneously.

8 ALT + PRINT SCREEN lets you ..... (copy) an image of an active window to the Clipboard.

17 Portable generator

Tuning-in

Task 1

List the different ways in which electricity can be generated.

Reading *Reading diagrams*

Task 2

Study the diagram below of a portable generator. Answer these questions using the diagram and your own knowledge of engineering.

1. What are its main parts?
2. What does the engine run on?
3. What are the four strokes called?
4. What is the function of the crankshaft?
5. What do both stator and rotor have?
6. What is the difference between stator and rotor?

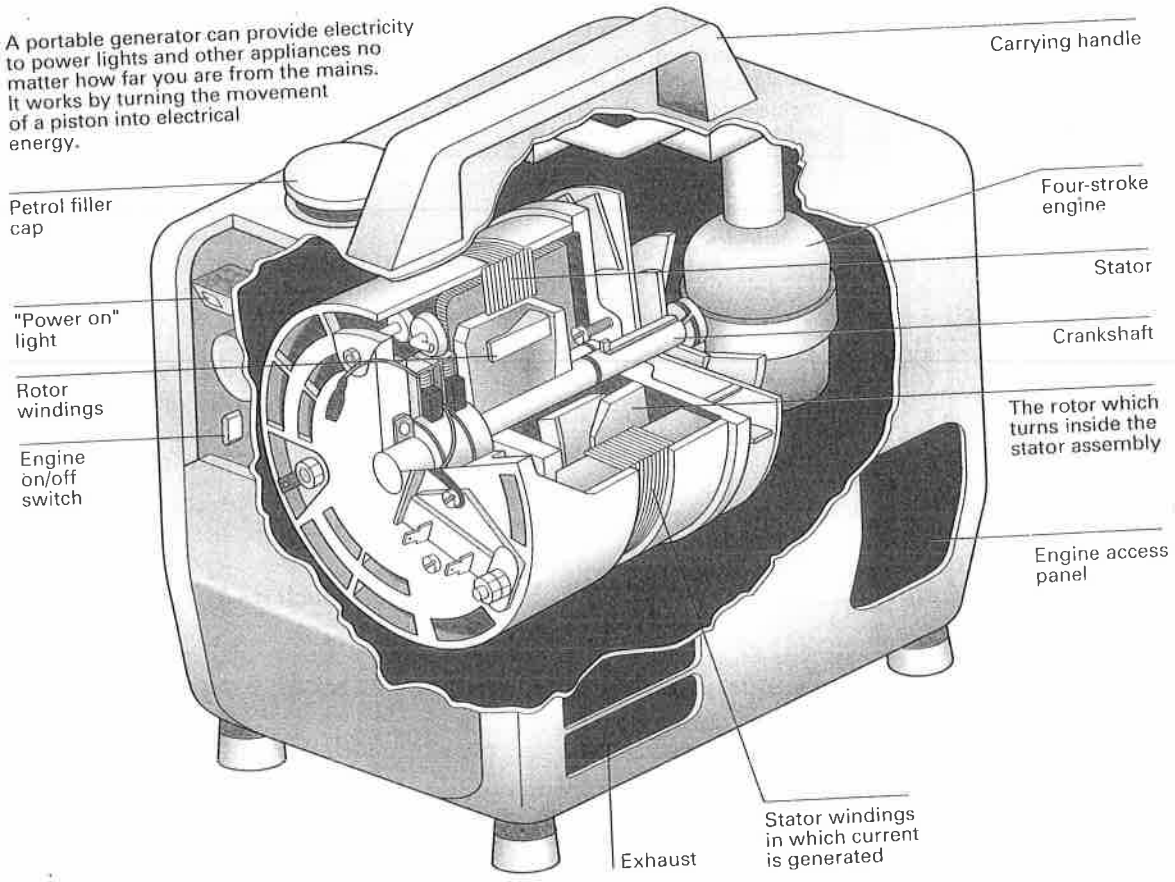


Fig. 1

Task 3

Read this text to check as many of the answers as you can. You will not find complete answers to all of the questions.

Portable generator

Although most electricity comes from power stations, power can also be generated by far smaller means. Nowadays, electricity generators can be small enough to hold in the hand.

Portable generators are made up of two main parts: an engine, which powers the equipment, and an alternator, which converts motion into electricity.

The engine shown (Fig. 1) runs on petrol. It is started by pulling a cord. This creates a spark inside which ignites the fuel mixture.

In a typical four-stroke engine, when the piston descends, the air inlet valve opens and a mixture of air and petrol is sucked in through a carburettor.

The valve closes, the piston rises on the compression stroke and a spark within the upper chamber ignites the mixture. This mini-explosion pushes the piston back down, and as it rises again the fumes formed by the ignition are forced out through the exhaust valve.

This cycle is repeated many times per second. The moving piston makes the crankshaft rotate at great speed.

The crankshaft extends directly to an alternator, which consists of two main sets of windings – coils of insulated copper wire wound closely around an iron core. One set, called stator windings, is in a fixed position and shaped like a broad ring. The other set, the armature windings, is wound on the rotor which is fixed to the rotating crankshaft. The rotor makes about 3,000 revolutions per minute.

The rotor is magnetized and as it spins round, electricity is generated in the stator windings through the process of electromagnetic induction. The electric current is fed to the output terminals or sockets.

This type of generator can produce a 700 watt output, enough to operate lights, television, and some domestic appliances. Larger versions provide emergency power to hospitals and factories.

Source: Adapted from 'Inside out: Portable generator', *Education Guardian*

Task 4

Study this text on the four-stroke cycle. Then label each stroke correctly in Fig. 2 opposite.

In the four-stroke cycle, the piston descends on the intake stroke, during which the inlet valve is open. The piston ascends on the compression stroke with both valves closed and ignition takes place at the top of the stroke. The power or expansion stroke follows. The gas generated by the burning fuel expands rapidly, driving the piston down, both valves remaining closed. The cycle is completed by the exhaust stroke, as the piston ascends once more, forcing the products of combustion out through the exhaust valve. The cycle then repeats itself.

Time clauses

– Study these two actions:

1 *The sky wave strikes the earth.*
2 *The sky wave bounces back again.*

Again we can link these actions to make one sentence, using a time clause:

***When** the sky wave strikes the earth, it bounces back again.*

We can also link the actions in a shorter way:

***On** striking the earth, the sky wave bounces back again.*

On** + **-ing shows that Action 2 follows immediately after Action 1.

Task 5

Link these pairs of actions. Use short ways when this is possible.

1 **a** The switch is closed.
b Current flows through the primary of the transformer.

2 **a** The radar signal strikes a plane.
b The radar signal is reflected.

3 **a** A cell discharges quickly.
b A cell may become hot.

4 **a** The TV receives signals from the remote control.
b The TV follows your instructions.

5 **a** The radar receiver receives the reflected signal.
b The signal is compared with the transmitted signal.

6 **a** You choose a course in electronics.
b You think carefully about your future.

7 **a** Microwave signals strike a high building.
b Microwave signals are deflected.

8 **a** You make a recording.
b You should ensure the recording levels are satisfactory.

9 **a** The alarm detects an intruder.
b The alarm triggers an audible warning.

10 **a** The remote control button is pressed.
b The television set changes channel.

Speaking practice

Task 6

Work in pairs, **A** and **B**. Fill the gaps in your table of frequency bands and their uses with the help of your partner. Ask questions like these:

What does VLF stand for/mean?
What are very low frequencies used for?
What is the frequency range of very low frequencies?

Frequency band	**Some uses**
Very low (VLF)	communication
3kHz–30kHz	with submarines

Student A: Your table is on page 176.
Student B: Your table is on page 183.

LANGUAGE WORK Time clauses

What is the relationship between each of these pairs of action?

1. a) You click on a URL.
   b) Your browser sends it to a DNS server.

2. a) The packets are passed from router to router.
   b) They reach the WEB server.

3. a) The packets may travel by different routes.
   b) They reach the Web server.

4. a) The individual packets reach the Web server.
   b) They are put back together again.

Each pair of actions is linked in time. We can show how actions are linked in time by using time clauses. For example:

We can use ***when*** to show that one action happens immediately after another action:

1. When you click on a URL, your browser sends it to a DNS server.

We can use ***once*** in place of *when* to emphasise the completion of the first action. It often occurs with the Present Perfect. For example:

Once the DNS server has found the IP address, it sends the address back to the browser.

We can use ***until*** to link an action and the limit of that action:

2. The packets are passed from router to router until they reach the Web server.

We can use ***before*** to show that one action precedes another.

3. The packets may travel by different routes before they reach the Web server.

We can use ***as*** to link two connected actions happening at the same time:

4. As the individual packets reach the Web server, they are put back together again.

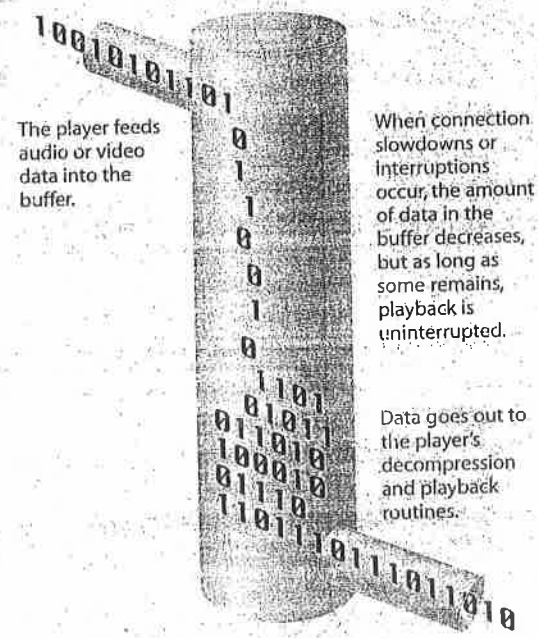
PRACTICE!

E3 Link each pair of actions using a time clause.

1 a You use a search engine.
  b It provides a set of links related to your search.
2 a With POP3, email is stored on the server.
  b You check your email account.
3 a You have clicked on a hyperlink.
  b You have to wait for the webpage to be copied to your computer.

4 a You listen to the first part of a streamed audio file.
b The next part is downloading.
5 a The graphics can be displayed gradually.
b The webpage is downloaded.
6 a You receive an email message.
b You can forward it to another address.
7 a You click on a hyperlink.
b The browser checks to see if the linked webpage is stored in the cache.
8 a You can bookmark a webpage to make it easier to find in the future.
b You find a webpage you like.
9 a You type in a Web address.
b You should press the Enter key.
10 a You click on the Home button.
b The browser displays your starting webpage.

6 Fill in the gaps in this description of buffering, a way of ensuring that Web video runs smoothly.



Streaming is a way of dealing with bandwidth problems .....[1] you download video from the Internet. One key to successful streaming is the process of buffering. .....[2] you download a movie, the video player stores part of the movie in memory .....[3] playing it. Imagine the buffer as a container filled from the top as shown in Fig 3. .....[4] the container is full, the player sends data on for playback from the bottom. Data keeps coming in .....[5] a clip plays. The user can view the beginning of the movie .....[6] the rest of the clip downloads. .....[7] connection slowdowns or interruptions occur, the amount of data in the buffer decreases but as long as some remains, playback is uninterrupted. Playback continues at a steady rate .....[8] the buffer is empty.

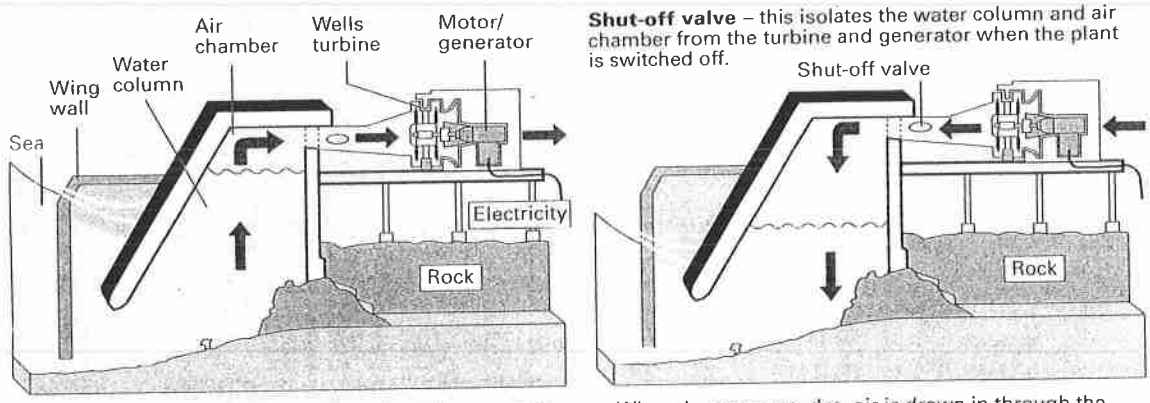
Fig 3
Video buffering

Technical reading *Wave power*

Task 9

The two texts which follow describe two plants for generating electricity from wave power. Note the similarities and differences between the plants.

Wave power



When a wave enters the gully, the water column moves up and the air above is forced out through the turbine, making the rotors turn.

Shut-off valve – this isolates the water column and air chamber from the turbine and generator when the plant is switched off.

When the wave recedes, air is drawn in through the turbine, but because of their special design the rotors keep turning in the same direction.

Fig. 4

This prototype wave-power plant on the Scottish island of Islay was constructed by building a concrete water column across a natural gully on the shoreline. Waves flowing in and out of the gully cause water in the column to move up and down. As the water moves up it compresses the air above and forces it through a wide tube at the back of the water column. As the water moves down, air is drawn into the water column.

The moving air passes through a turbine coupled to a generator. Both the turbine and generator are unusual. The turbine is a Wells turbine (named after its inventor) which keeps turning in one direction even though the air flow is constantly changing direction. It has two rotors, each with four blades.

The generator is a wound rotor induction motor, which acts as a generator when it is turning at speeds greater than 1,500 rpm. Below that speed it operates as a motor and takes power from the grid. This motor/generator is used because the turbine takes some time to build up to a speed where it can generate electricity. When the turbine slows down due to a lull in wave activity, the generator becomes an electric motor and keeps the turbine running at a minimum speed so that it is ready to accept the power from the next batch of waves.

The plant is controlled by a computer. It includes a PLC (programmable logic controller), which monitors the operation of the motor/generator and the amount of electricity going to or being taken from the grid. There is also testing equipment to monitor how much electricity the plant is producing and the efficiency of the water column, turbine, and generator.

This experimental plant generates 150 kW. Plans have been approved for the construction of a 1 MW scheme.

Source: Adapted from 'Inside out: Wave power', *Education Guardian*

VEZNICI

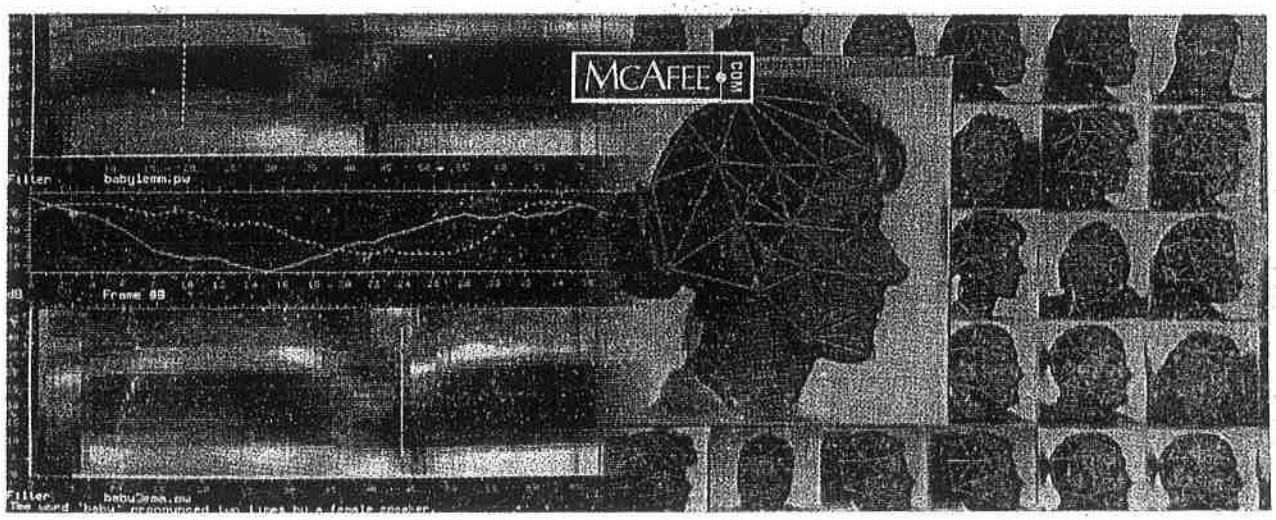
Upotreba veznika

Decide on the relationship between these events. Then jo
them using structures from this and earlier units.

1 Anti-virus program
   a A user runs anti-virus software.
   b The software checks files for virus coding.
   c Coding is matched to a known virus in a virus database.
   d A message is displayed to the user that a virus has been found.
   e The user removes the virus or deletes the infected file.
   f The virus cannot spread or cause further damage.

2 Face recognition
   a You approach a high-security network.
   b Key features of your face are scanned.
   c The system matches your features to a database record c authorised staff.
   d Your identity is verified.
   e You can log on.
   f Your identity is not verified.
   g You cannot use the system.

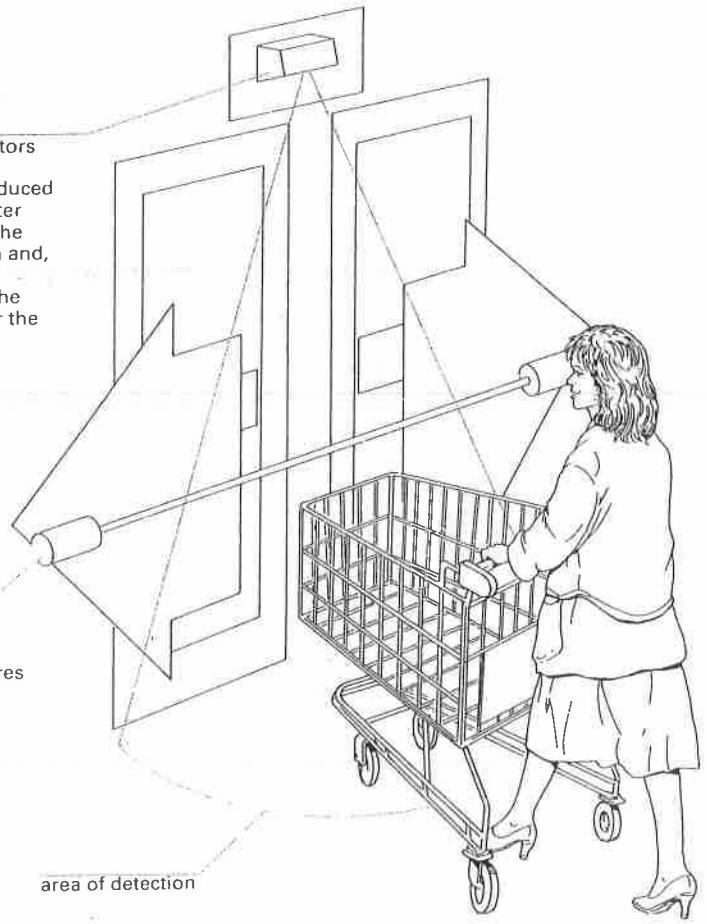
3 Voice recognition
   a Computers without keyboards will become more commor
   b These computers are voice-activated.
   c The user wants to log on.
   d She speaks to the computer.
   e It matches her voice to a database of voice patterns.
   f The user has a cold or sore throat.
   g She can use the system.
   h Stress and intonation patterns remain the same.



Writing *Linking facts and ideas, 3*

Task 7

Study this diagram, which explains the operation of automatic doors. Then turn to the next page and link each set of statements using words or phrases of your own to make your own explanation. Omit unnecessary words and make any other changes required.



1 Automatic doors are used in places such as airports, supermarkets, and hospitals.
Traditional doors would be a nuisance in these places.

2 Automatic doors are fitted with a microwave sensor.
The sensor detects movement.

3 The doors are switched on.
A microwave transmitter sends out a microwave beam.

4 The beam is in a semicircular pattern.
The doors open when you approach from any angle.

5 The microwaves are reflected back to the sensor.
The reflected microwaves are analysed by a microprocessor.

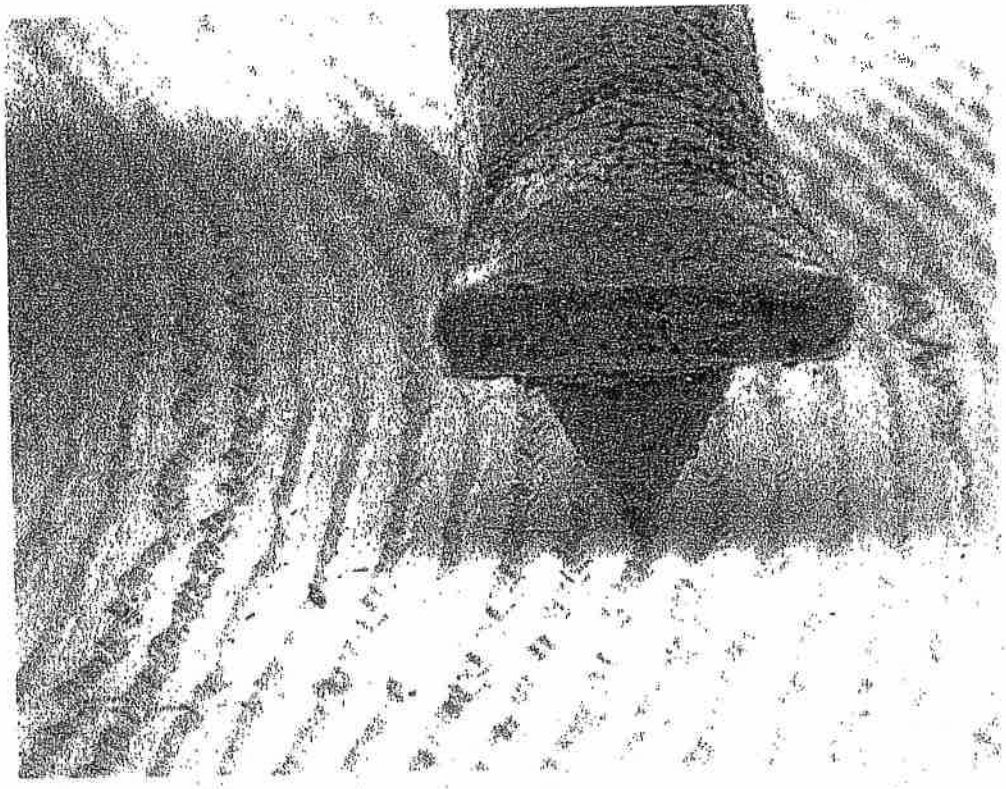
6 A person or object moves towards the doors.
The waves are reflected back to the sensor at a different frequency.

7 The microprocessor detects this change.
The microprocessor instructs the motor to open the doors.

8 The doors are fitted with a time-delay mechanism.
The doors remain open for about four seconds before closing again.

9 A person remains standing in the doorway.
A safety beam prevents the doors from closing.

16 Audio recording systems



Tuning-in

Task 1

Try to answer these questions:

1 What problems are there with records?
2 What other recording systems are there?
3 What do these abbreviations mean?
   a LP
   b CD

Task 2

Read quickly through this text to check your answers to Task 1.

Audio recording systems

For a long time hi-fi recordings have been produced on vinyl gramophone records. Records use an analogue recording system, which stores patterns by cutting a continuous groove in a vinyl disk. The shape of the sides of the groove represents the audio pattern. The sound can be reproduced by spinning the record and using the movement of a metal needle in the groove to produce varying magnetic fields (see Fig. 1). These magnetic fields are then processed to produce the sound. A typical LP (long-playing record) has a recording capacity of about 45 minutes.

The stylus vibrates in the groove and recreates the recorded sound.

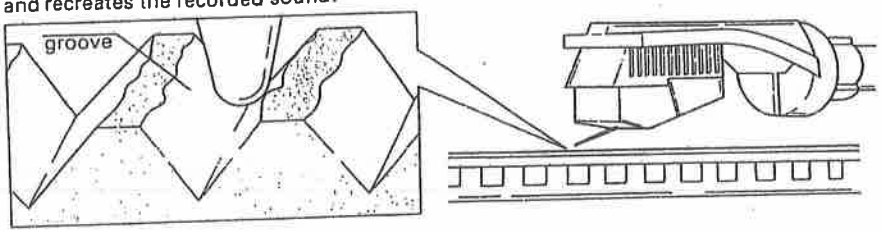


Fig. 1

A digital recording system, known as a compact disc (CD) system, was introduced in 1982. This uses a laser optical mechanism in which a laser beam reads marks on the surface of a specially prepared perspex disc. It gives near-perfect reproduction of sound and the sound quality does not deteriorate with use. Some of the problems associated with vinyl records are eliminated such as 'crackle' caused by dust and static, and 'jumping', due to scratches on the recording surface.

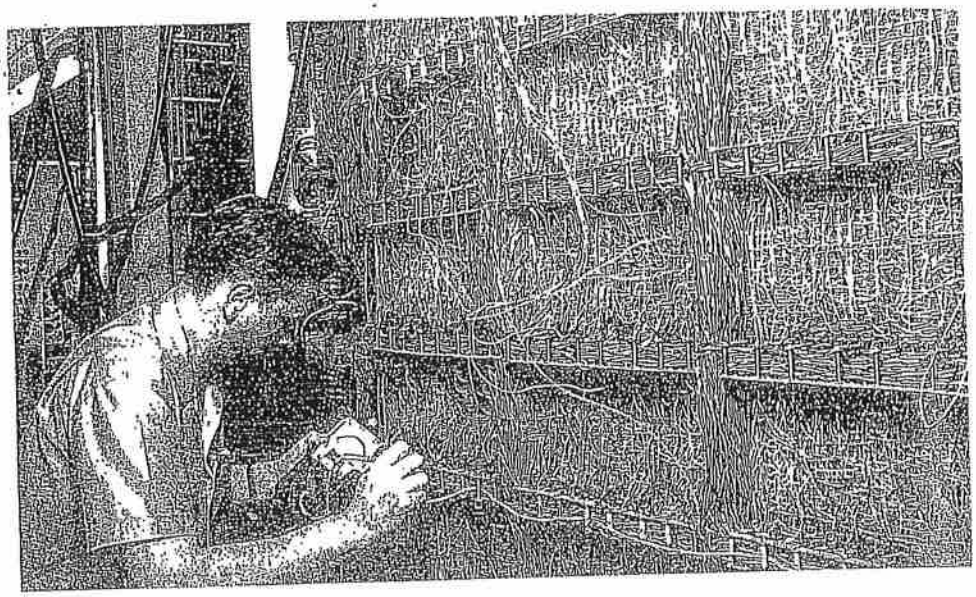
In a CD system, a recording is made by electronically sampling the sound 44,100 times every second. The electronic samples are used to control a laser beam, which makes a pattern of very small pits in the surface of the perspex disc. The audio pattern is represented by the length of the pits and the distance between them. The pits are arranged in circular tracks. A typical CD has about 20,000 circular tracks and a maximum recording capacity of 74 minutes.

To play back the recording, the disc is made to revolve at a constant speed and a laser beam is directed at its surface. The varying reflection of the laser beam is fed into a digital-to-analogue converter (DAC). This produces the electronic signals, which are amplified to drive a loudspeaker.

Task 3 Use the text above to complete this table of differences between LPs and CDs:

		LPs	CDs
1	Recording system	analogue	
2	Sound quality	poorer than the original	
3	Access	serial	random
4	Audio pattern		pits
5	Material		perspex
6	Playing mechanism	mechanical	
7	Durability	easily damaged	
8	Size	12 inches	12cm
9	Playing time		

19 Test and repair instruments

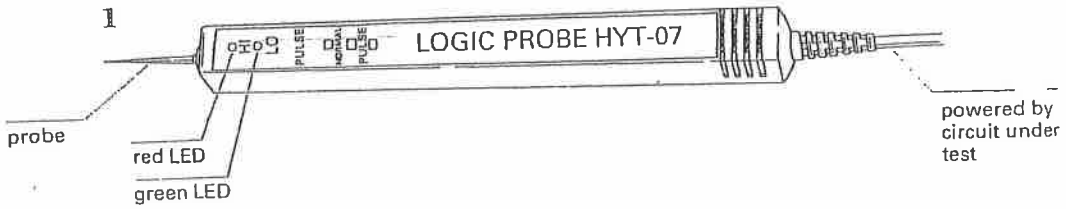


Tuning-in

Task 1 List as many instruments used for testing and repair in electronics as you can. Compare your list with that of another group.

Task 2 How many of these instruments can you identify? Can you explain their use?

1



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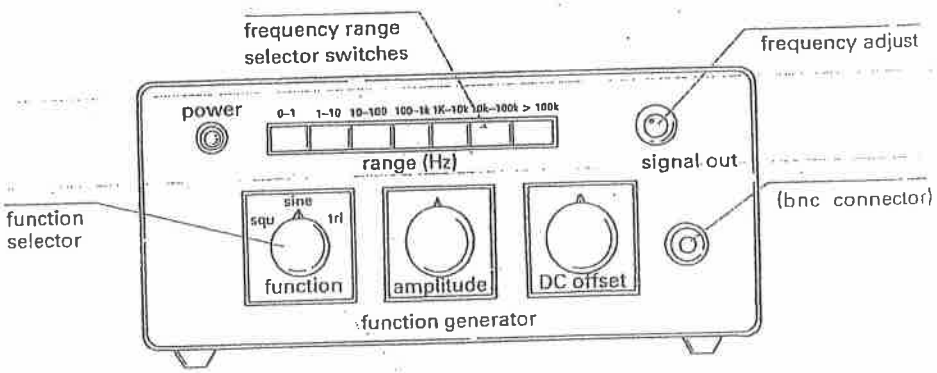
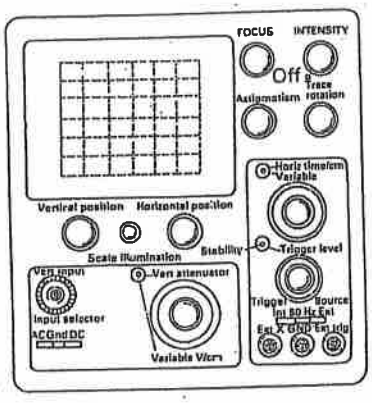
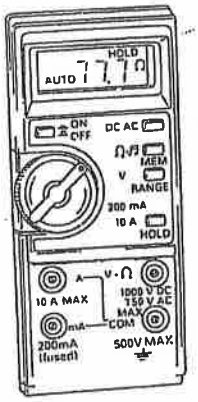


30

3



4



Task 3

Check your answers to Tasks 1 and 2 by reading this text:

The following instruments are commonly used for the test and repair of electronic circuits.

Multimeter
This instrument can be used to measure a number of different electrical quantities, such as voltage, current, and resistance, i.e. it is a combined voltmeter, ammeter, and ohmmeter. Multimeters can have analogue or digital displays and can be switched to different measuring ranges.

Logic probe
This instrument is used for measuring voltage levels and pulses in digital logic circuits. When the probe is placed on the pin of a logic IC, small coloured LEDs light up to indicate if a pulse is detected or whether the pin is at a high or a low logic level.

Oscilloscope
This instrument is used to measure fast-moving signals. It shows how a signal varies with time or relative to another signal. It uses a cathode ray tube to display the waveform of the measured signal on a screen.

Function generator
This instrument contains a triangular wave oscillator which can be switched to produce triangular, square, or sine waves over a range of frequencies. It is used to test and adjust a variety of electronic equipment such as audio amplifiers. The function generator provides a known signal which can be injected into a circuit. Often it is used with an oscilloscope so that a visual display of the waveform can be seen.

Task 4

Which of the instruments would you use to do the following?

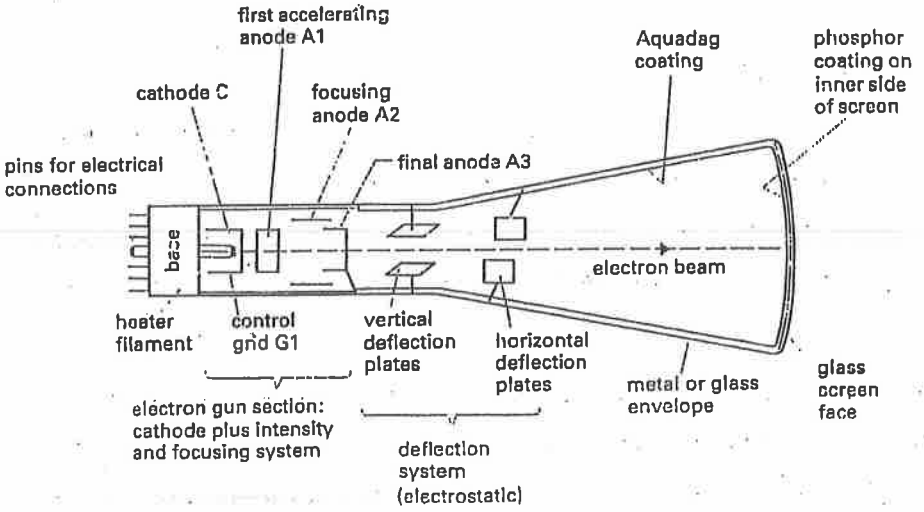
1 to check a fuse 4
2 to determine the frequency response of an audio amplifier 2
3 to test for the presence of a control signal on the output pin of a computer chip 1
4 to determine the value of the current through a transformer 3
5 to measure the frequency of an oscillator 2

Reading *Information transfer*

The task which follows provides further practice in combining information from a diagram and a text when reading.

Task 5

With the help of this diagram, complete the gaps in the text.



CRT construction

Fig. 1

Cathode ray tube

Televisions as well as computers, radar systems, and oscilloscopes use a cathode ray tube (CRT) to produce an output display. The construction and operation of the CRT is similar in each case but the simplest type of CRT is found in oscilloscopes.

A CRT is really a large vacuum tube valve. It has [1] ____ main sections. The first section is an electron [2] ____ which emits a stream of electrons. The electron gun contains an electron lens which [3] ____ the electrons into a narrow electron [4] ____

The second section is a [5] ____ system, which allows the beam to be moved [6] ____ or horizontally. Oscilloscopes use charged metal [7] ____ to give [8] ____ deflection, whereas television sets use electromagnetic coils to give electromagnetic [9] ____

The last section is a screen with a [10] ____ coating. The electron beam hits the screen, making the phosphor glow and causing a spot to be displayed. The colour of the spot depends on the type of phosphor used.

Language study *Cause and effect, 2*

Study these statements:

1 *The electron beam hits the screen.*
2 *The phosphor glows.*

Why does the phosphor glow? What is the relationship between statement (1) and (2)?

Statement (1) is a *cause* and statement (2) is an *effect*. We can link cause and effect statements in a number of ways. Study these ways, which use *cause* and *make*.

The electron beam hits the screen ***causing*** *the phosphor to glow.*

The electron beam hits the screen ***making*** *the phosphor glow.*

Now study these cause and effect statements:

3 *The phosphor glows.*
4 *A spot is displayed.*

The effect is in the passive. We can link cause and effect like this:

The phosphor glows ***causing*** *a spot* ***to be*** *displayed.*

Task 6 Link each of these cause and effect statements to make one sentence:

1 a A magnetic field is set up in the speaker coil.
  b The coil vibrates.
2 a The coil pushes and pulls the speaker cone.
  b Sound waves are produced.
3 a A voltage is applied to a quartz crystal.
  b The quartz crystal expands and contracts.
4 a A voltage is applied to the Y-plates.
  b The electron beam is deflected.
5 a Current flows through the filament.
  b The heater glows.

Word Study *Compound nouns, 2*

Task 7 Study these examples of compound nouns:

a signal generator = equipment for generating signals
a cassette player = equipment for playing cassettes
a battery tester = equipment for testing batteries

What do we call equipment for . . .

1 playing CDs?
2 receiving radio (signals)?
3 charging batteries?
4 amplifying aerial (signals)?
5 filtering (out) noise?
6 synthesizing speech?
7 cleaning cassette heads?
8 amplifying (the) power (of a signal)?
9 sensing vibration?
10 scanning (the human) body (for disease)?

Technical reading *Cathode ray oscilloscope*

Task 8

Work in groups of three: **A**, **B**, and **C**.

Student A: Read *Electron gun* and take notes.
Student B: Read *Deflection system* and take notes.
Student C: Read *Phosphor screen* and take notes.

Using your notes and Fig. 1 on page 104, explain to the others in your group how your section of the CRT works. **A** should start. **B** may use Fig. 2 as part of the explanation.

Electron gun

para

A stream of electrons is released from the surface of the cathode (C) when it is heated by the heater filament. The electrons are accelerated towards the screen by a set of three positively-charged cylindrical anodes (A1, A2, A3). Each anode has a higher charge than the one before. As the electrons move towards the anodes, they pass through a hole in a negatively-charged metal disc. This disc is known as the control grid. By adjusting the intensity control on the oscilloscope, the charge on the grid can be varied. This allows the number of electrons reaching the screen, and therefore the brilliance or brightness of the spot on the screen, to be adjusted. 1

The three anodes form the electron lens. The oscilloscope focus control allows the voltage on the second anode (A2) to be varied and causes the stream of electrons to be focused into a narrow beam. If the oscilloscope has an astigmatism control, it is used to vary the voltage on the third anode (A3). This allows the shape of the spot on the screen to be adjusted to make it perfectly round. 2

Deflection system

After leaving the electron gun, the electron beam is deflected by two pairs of parallel metal plates. The pairs of deflection plates are situated at right angles to each other. 3

The signal to be measured is amplified by the Y-amplifier in the oscilloscope, then applied to the first set of deflection plates, known as the Y-plates. This causes the electron beam to be deflected vertically in proportion to the magnitude of the input signal. 4

The oscilloscope has a timebase generator which produces a sawtooth wave output as shown in Fig. 2. 5

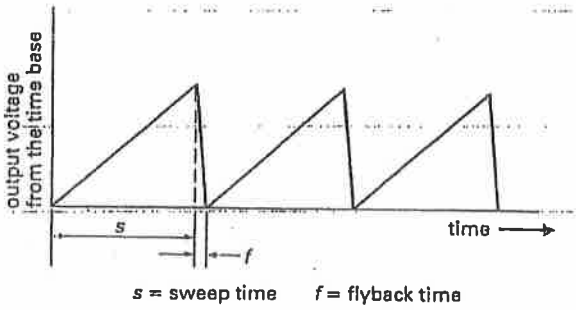


Fig. 2.

This is fed into the X-amplifier of the oscilloscope, then applied to the second set of deflection plates, known as the X-plates. This causes the electron beam to be deflected in the horizontal direction in such a way that the spot moves from left to right across the screen at a steady rate. When it reaches the right side of the screen, it rapidly returns to the left side again. This allows the screen to show how the measured signal varies with time. 6

Phosphor screen

The X and Y deflections of the electron beam cause the signal being measured to be displayed in the form of a wave, with the magnitude of the signal being given on the vertical axis and the time variation on the horizontal axis. A piece of transparent plastic known as a graticule is attached to the front of the screen. This has a grid of horizontal and vertical lines marked on it and allows accurate measurements of the signal to be made. 7

A large build-up of negative charge could be caused by the electron beam hitting the phosphor screen. To help prevent this, the inside of the CRT, between the deflection system and the screen, is coated with a carbon compound known as Aquadag. This is attached to the high voltage anode (A3) to provide an escape path for the excess electrons. 8

The CRT is enclosed in a metal casing made from an alloy of nickel, known as mu-metal. This has a very high magnetic permeability and prevents external magnetic fields from causing unwanted beam deflections. 9

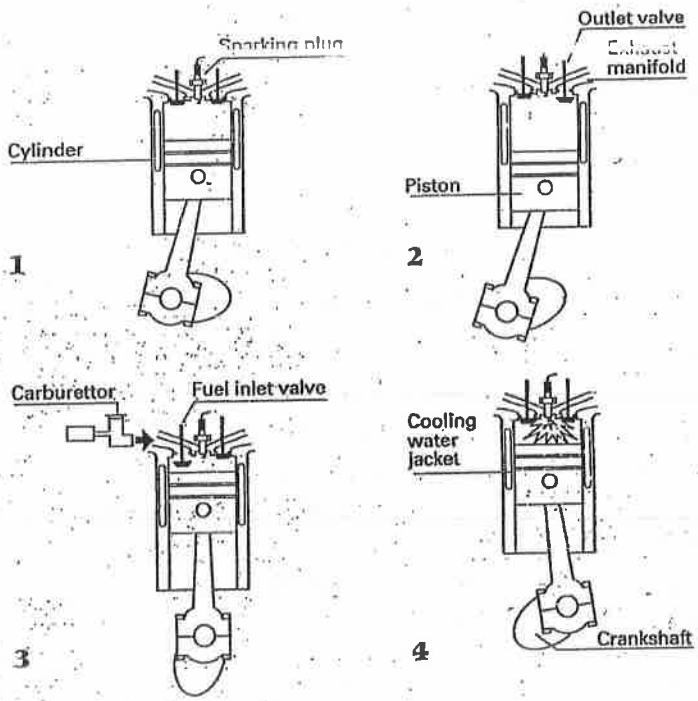


Fig. 2

Language study *Cause and effect, 2*

Study these pairs of actions. What is the link between each pair?

1 The gas expands.
2 This drives the piston down.
3 The piston ascends.
4 This forces the products of combustion out.

There are two links between the actions:

They happen at the same time. We can show this using *As* (see Unit 8).

1+2 *As the gas expands, it drives the piston down.*
3+4 *As the piston ascends, it forces the products of combustion out.*

One is a cause and the other an effect.

1 Cause: The gas expands.
2 Effect: This drives the piston down.
3 Cause: The piston ascends.
4 Effect: This forces the products of combustion out.

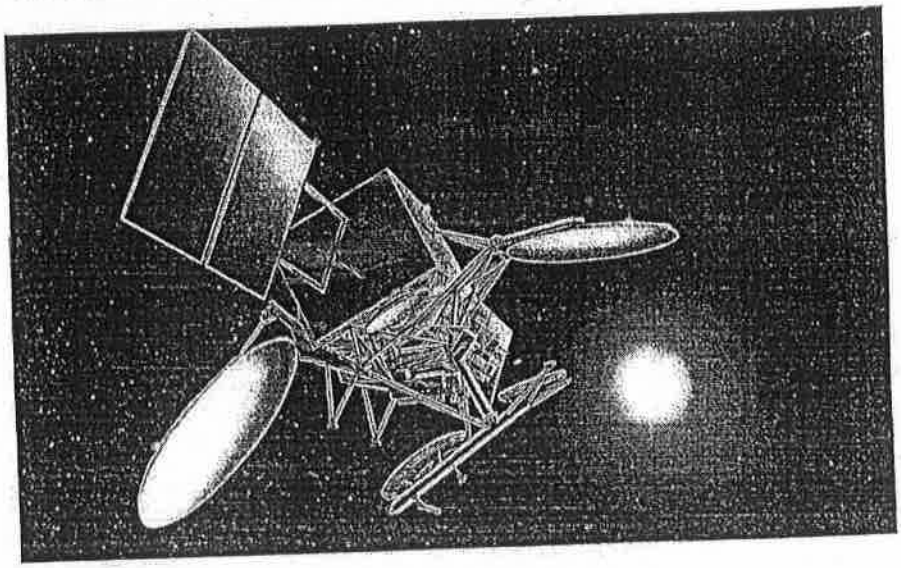
We can show both the time link and the cause and effect link like this:

1+2 *The gas expands, **driving** the piston down.*
3+4 *The piston ascends, **forcing** the products of combustion out.*

Task 5 Link these actions in the same way.

	Cause		Effect
1	The piston moves down the cylinder.	—	This creates a partial vacuum.
2	The piston creates a vacuum.	—	This draws in fuel from the carburettor.
3	The piston moves up the cylinder.	—	This compresses the mixture.
4	The gas expands quickly.		This pushes the piston down.
5	The piston moves up and down.		This rotates the crankshaft.
6	The crankshaft spins round.		This turns the rotor at 3,000 rpm.
7	The armature of the alternator rotates.		This induces a current in the stator windings.
8	The alternator runs at a steady 3,000 rpm.		This generates around 700 watts.

26 Telecommunications



Tuning-in

Task 1

Put these developments in telecommunications in the order in which they were invented. Compare your answer with your partner.

a telex
b communication satellites
c modems
d telegraphy
e television

Telecommunications: a brief historical review

para

The first true telecommunications system using electrical signals to carry messages started in the 1840s with machine telegraphy. Samuel Morse first developed the telegraph in 1832 but it was not until the mid-1840s that the system was put into practical use – sending coded electrical messages (Morse Code) along the wires. The telegraph became a rapid success, its speed quickly outdating the Pony Express for long-distance communications. 1

The next major step forward came in 1878 with the invention of the telephone by Bell. This enabled speech to be transported as electrical signals along wires and revolutionized personal communications. 2

In 1886, Hertz verified experimentally that electrical energy could be radiated and thus proved the existence of electromagnetic waves. This opened the way for the free-space transmission of information without wires. This provided the basis for all radio and TV broadcasting. 3

In 1901, Marconi established long-distance telegraph communication by transmitting between England and Canada. Although he did not realize it at the time, he achieved such long distances by reflecting radio waves in the ionosphere (layers of ionized gases and electrons existing in the earth's upper atmosphere at heights of 50–500 km). This overcame the problem of transmitting round the earth from one side of the Atlantic to the other. 4

para

With the discoveries of the diode and thermionic valve in the early part of this century, advances were made in both receiver and transmitter design with an associated impact in telegraphy, telephony, and civil and military communications. Radio broadcasting soon followed, with powerful transmitters serving to communicate over wide areas. Television (TV) was first established in 1937. Radar (radio detection and ranging) was also developed from the 1930s and played a vital role in aircraft detection and navigation in World War II. 5

As further advances in technology took place (e.g. the invention of the transistor in 1947 and the subsequent development of microelectronic integrated circuit technology), new applications became feasible, and new systems were developed. 6

Data communications – the transmission of coded data (e.g. text, graphics, financial information) between 'intelligent' terminals and computers – was first established in the early 1950s using modems, equipment which enables the telephone network to convey data as well as speech. Other improvements in materials and devices also led to the transmission of information via cables. Much of today's long-distance telephone traffic is by submarine cable. 7

The space race led to yet another means of long-distance communication, via fixed and mobile earth stations to satellites. Today, several hundred satellites orbit the earth, and satellite links provide all forms of communication and related services such as telephony, data, TV, navigation, meteorology, and surveillance. 8

One of the very latest developments is the optical fibre cable – a tiny glass fibre which can be used to convey signal information by light pulses. Optical fibre cable with extremely low loss at low cost has now been developed with very high data-carrying capacity. Several thousands of telephone messages can be carried down a single fibre. 9

Perhaps the greatest change which has occurred in the last twenty years is that from analogue to digital methods of information transmission. The very first commercially employed telecommunication system, telegraphy, was and still is a digital system. However, telephony, radio, and TV all started as analogue systems. Today, the general trend is strongly towards the digital, and within the next ten years the vast majority of telecommunications systems will be digital. Problems of noise and interference can be combated much more successfully in a digital system. 10

The advances in microelectronics and the merging of communications with computers have led naturally to the digital transmission mode with its advantages of computer control, automatic error checking of signals, excellent memory storage facilities for data, and intelligent terminals. The market need for vast quantities of information transmission and processing at very high speed can only be reliably catered for by using digital techniques. In fact the most rapidly growing field is almost certainly in data communications employing high-speed digital techniques. 11

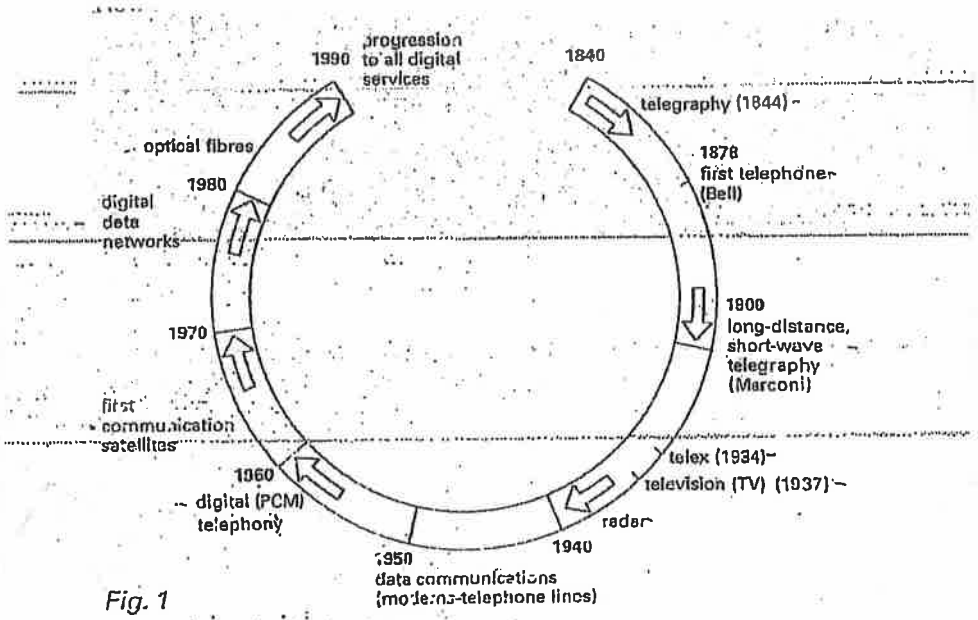


Fig. 1

Transmission lines

Technical reading *Transmission lines*

Task 8

Write down any types of cable and transmission lines used in telecommunications that you can think of.

Now read the text to find answers to the following:

1. Why are wires sometimes twisted together in transmission lines?
2. What is the purpose of the dielectric material in coaxial cable?
3. What frequencies can be carried by the following types of transmission lines?
   - **a** coax
   - **b** waveguides
4. What are the advantages of optical fibre cable?

Transmission lines

Telecommunications involves the transmission of information, including voice, data, TV, and radio over long distances. The transmission medium can be free space (ground, space, and sky waves), or the information can be guided between transmitters and receivers using transmission line cables of various kinds. These include:

Parallel wires

This is the simplest type of transmission line consisting of a pair of insulated copper wires running side-by-side and covered by a plastic sheath (see Fig. 1). It is prone to interference and is only used to carry information over small distances such as telephone connections within a building.

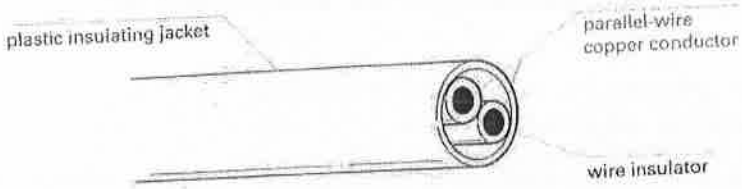


Fig. 1

Twisted pair

Two insulated copper wires are twisted together to reduce interference effects and are enclosed in an insulating polyethylene sheath (see Fig. 2). Because the wires are twisted, unwanted stray signals picked up by one tend to be cancelled by similar signals picked up by the other. They are used for communications over longer distances, for example to connect telephones to their local exchange.

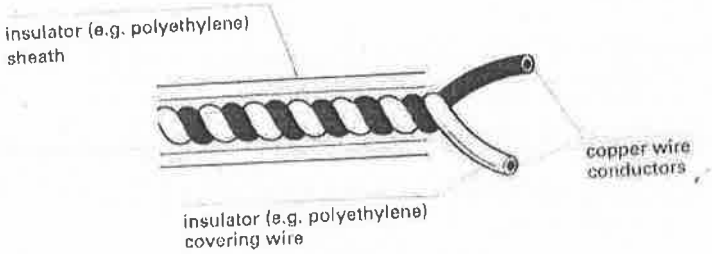


Fig. 2

Coaxial cable (coax)

Flexible coax has a copper wire core surrounded by copper braid. The core and braid are insulated from each other by a dielectric material such as polyethylene and covered by a PVC sheath (see Fig. 3).

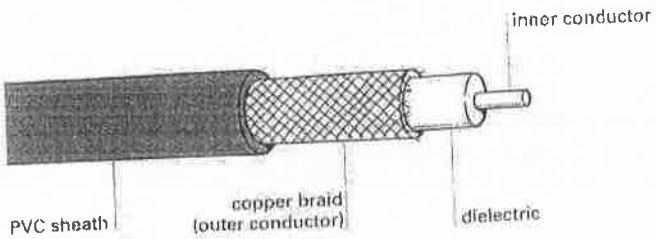
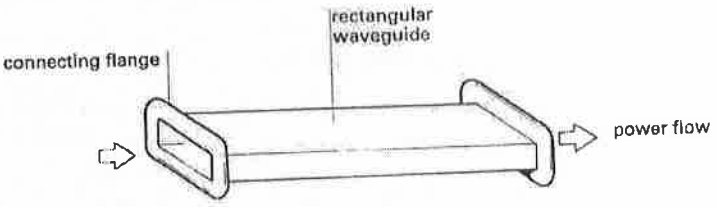


Fig. 3

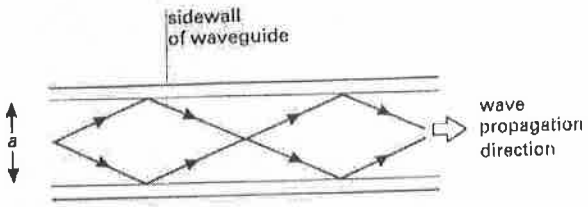
The braid helps to screen the signals from interference. Coax can carry a large number of signals over long distances at frequencies up to 1 000MHz. It is used to connect telephone exchanges and for cable television.

Waveguides

Microwaves can be guided along rectangular copper ducts by a series of reflections from the inner walls (see Fig. 4).



(a) rectangular waveguide for microwave transmission



(b) 'guiding' of electromagnetic waves in a waveguide

Fig. 4

The exact dimensions of the ducts are determined by the frequency to be transmitted. Suitable frequencies are between 1GHz and 300GHz. Waveguides are used to carry microwave signals between dish aerials and receivers.

Optical fibres

An inner core made from very pure silica fibre is surrounded by a similar glass sheath, known as cladding. This is covered by a protective plastic sheath. Non-visible light from lasers or LEDs can travel along the fibre by reflection from the surface where the core and cladding meet (see Fig. 5).

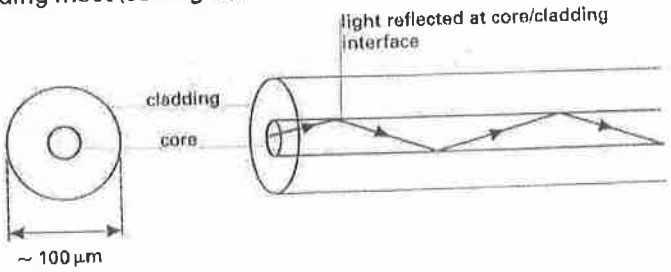


Fig. 5

Although the optical fibre has a smaller diameter than a human hair, it can be used to transmit tens of thousands of signals at high speed with very low loss and no interference from other signals. Optical fibre cable can be used in corrosive environments and is light, flexible and cheap. This type of cable is gradually replacing conventional copper wire for connecting telephones and computer networks.

Task 4 Which lines in Text 2 contain similar information to the paragraphs in Text 1?

Text 1 paragraphs	Text 2 lines
1	
2	
3	
4	
5	
6	
7	
8	

Task 5 Work in pairs. Discuss which text contains the best explanation. Which is the easier to understand?

Task 6 Find the references in Text 2 for each of the following:

1 a *body* based in France (lines 3–4)
2 *those* made by the same manufacturer (line 5)
3 The latest *machines* (line 7)
4 *This information* is converted (lines 18–19)
5 converts the *binary data* into digital information (lines 21–22)
6 The first machine transmits *these tones* (lines 25–26)
7 *It* sends a signal (in binary code) (lines 28–29)
8 If *the line* is noisy (lines 35–36)

Language study *Reduced relative clauses*

One way of adding extra information to an explanation, or any other text, is to use relative clauses. For example:

1 *The thermal head is a mechanism.*
2 *The head contains a line of dots.*
1+2 *The thermal head is a mechanism* ***which contains a line of dots.***

We can make this sentence shorter by omitting *which* and using an *-ing* clause:

The thermal head is a mechanism ***containing a line of dots.***

Study this example:

1 *The microprocessor converts the information into signals.*
2 *The signals are called analogue tones.*
3 *The signals are suitable for telephone transmission.*
1+2+3 *The microprocessor converts the information into signals,* ***which are called analogue tones, which are suitable for telephone transmission.***

We can make this sentence shorter by omitting *which* + *to be*:

The microprocessor converts the information into signals, ***called analogue tones, suitable for telephone transmission.***

Language study *Reduced relative clauses*

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Study this example:

1 *The microprocessor converts the information into signals.*
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1+2+3 *The microprocessor converts the information into signals,* ***which are called analogue tones, which are suitable for telephone transmission.***

We can make this sentence shorter by omitting *which + to be*:

The microprocessor converts the information into signals, ***called analogue tones, suitable for telephone transmission***.

Task 7

Shorten this summary of the technical reading passage in Unit 26, pages 144–6, by reducing the relative clauses where possible.

Transmission lines

The lines which connect telephones within a building are the simplest type of transmission line, which consists of parallel wires. Those which link telephones to a local exchange may be twisted pairs, although these are being replaced. Coaxial cable, which is formed from a copper core which is surrounded by a copper braid, is used to carry a large number of signals over long distances. The cables which provide connections between telephone exchanges are often coaxial. Waveguides, which are made of copper, are used to carry microwave signals between dish aerials and receivers. They are suitable for frequencies which are between 1GHz and 300GHz. Optical fibres, which are made from very pure silica fibre, are the form of transmission line which is most often used these days.

Word study *Short forms*

Some technical words have common short forms. In some cases the short form is used much more frequently than the full form. For example:

Full form	Short form
a facsimile message	*a fax*

Task 8

What are the short forms for these terms?

1 amplifier
2 video recorder
3 television
4 potentiometer
5 coaxial cable

Task 9

What terms are represented by these short forms?

1 puff
2 phones
3 mike
4 CRT
5 phone

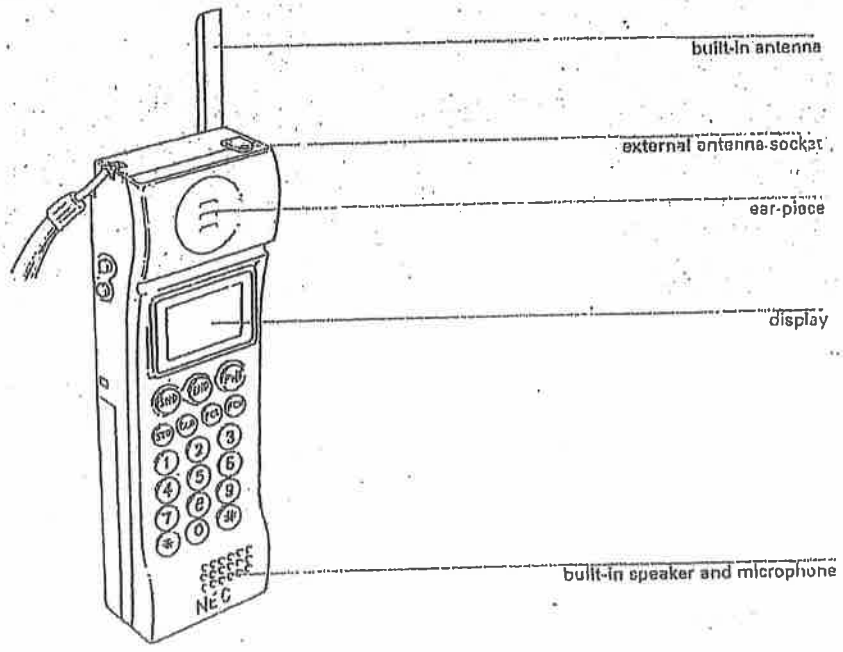
27 Cellphones

Tuning-in

Task 1

Study this diagram of a cellphone. Note the buttons marked:

a SND c PWR e CLR g FCN
b END d STO f PCL



44

Task 4

Decide which paragraphs are most likely to contain answers to these questions. Compare your decisions with your partner, then search for the answers.

1 Who uses mobile phones?
2 What does the MSC register of cellphones contain?
3 What is the difference between a mobile phone and a cellphone?
4 Why is a cellphone called a cellphone?
5 How large is a cell?
6 How does the MSC prevent interference due to too strong a signal level?
7 What's the best number of cells to form a cluster?
8 When were radiophones developed?
9 How does an MSC ensure that a cellphone is using the right frequency for a call?
10 What is the MSC permanently connected to?

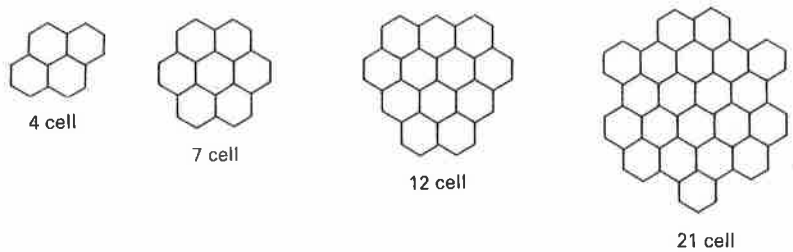
Cellphones

para

Radiophones, using the VHF band, were developed during the Second World War to provide communications for ships and aeroplanes. At the end of the war they were further developed as mobile phones for use by the emergency services and other services such as taxis. 1

With mobile phone systems, all communications take place through a central control base station. Mobile units normally do not communicate directly with other mobile units. They send messages to the control base station and the base station controller relays the messages to other mobile units. Although mobile phones can be moved, they must stay within fixed areas. This type of system is limited by the fact that there are not enough VHF frequencies available for large numbers of communications between individual users. 2

The problem of a lack of suitable frequencies can be overcome by using a cellphone network. A cellular phone (cellphone) is a lightweight, portable radio transceiver which can transmit and receive telephone calls anywhere in the cellular network area. In the network, the same frequencies can be used for many different telephone calls at the same time. To achieve this, each communications area is divided into a number of hexagonal-shaped cells, as shown in Fig. 1. 3



cell clusters

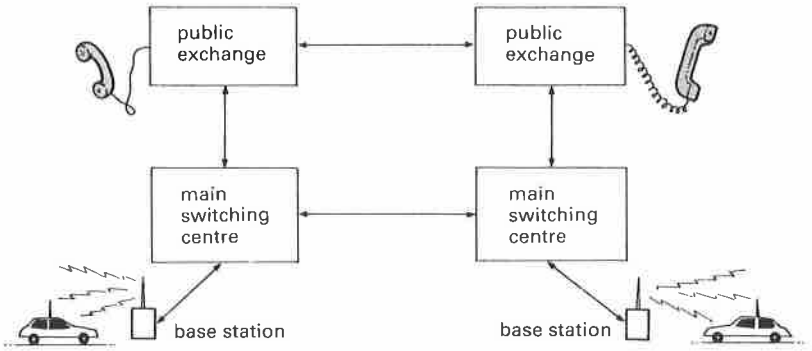
Fig. 1

45 ~~50~~

para

4 Each cell is allocated a number of frequency channels for communications. Although the frequencies used in any one cell are not used in its neighbouring cells, the same frequencies can be used in cells further away without causing interference. The size of the cells vary between 1 km to about 30 km across, depending on the output power of the cellphone transmitters. Each area can have a different number of cells, but a cluster of seven cells gives a good compromise between the number of frequency channels available in each cell and the interference between communications in different cells.

5 Each cell has a small electronic base station situated in a public place such as a car park or shopping centre. All the base stations for a cluster of cells are permanently connected to a main switching centre (MSC). This contains a computer to select suitable frequencies and control the communications for that cluster of cells. The MSC is also connected to other MSCs and to the public telephone exchange, allowing cellphones to make calls or receive calls from other cellphones and fixed telephones throughout the whole telephone system (see Fig. 2).



mobile and fixed networks

Fig. 2

6 The MSC keeps a register of cellphones indicating their cell position. If the cellphone moves to another cell, its new position is signalled to the MSC. In this way, the MSC knows where to send signals to contact each cellphone. When a call is made to a cellphone, the MSC first checks the registrations to find the position of the cellphone. It then pages the cellphone and causes it to tune to the allocated frequency channel. The cellphone then begins sending an 8kHz signal to the base station. When the user takes the call, the 8kHz signal is discontinued and the speech channel is enabled.

7 The base station constantly monitors the signal level of a call. If the signal level becomes too strong it will cause interference to other users. To prevent this, the power level of the cellphone is automatically reduced. If the signal level becomes too weak, the MSC tests the signal strength from neighbouring base stations and switches the call to another base station and speech channel if necessary. This may cause a period of silence of up to about 400 ms while the switching takes place.

Vezbe Engleski za inženjere 1

Computer applications

– Pitanja

Old system

- What kind of device are we talking about?
- What does a speed trap unit consist of?
- Can you explain how a radar works?
- How is the information from the radar used to determine the speed of the vehicle?
- What happens if the speed is above the speed pre-set by the police?
- How can the police identify the owner of the car?

New system:

- What is the problem with the old, radar, system?
- Explain the term 'surfing'
- How can the police outwit these motorists?
- What does the new system consist of? Where are the two cameras positioned?
- What does each unit do? How is the vehicle identified?
- What does the microprocessor do?
- What information is relayed to the police headquarters? How do they identify the driver?
- What is mail merge?

Electric motor

Pitanja

1. What is the basic principle of the operation of an electric motor?

2. Where are electric motors used?

3. A motor shown in Fig 1 is a universal motor. What does that mean?

---

4. What happens if you put a bar of iron inside a loop of wire with an electric current running through the wire?

5. What do we know about magnets in general?

---

6. Describe the basic parts of an electric motor

7. What happens when electricity flows around the armature wire?

8. Why does an armature turn?

9. What happens when the north and the south poles are close together?

10. Why do you need to reverse the direction of the current?

---

11. What is the function of the commutator?

12. What does a commutator look like?

Dopunite tekst odgovarajućim rečima

drive, repulsion, loops, commutator, delivering, field, reversed, iron, direction, brushes.

Electric motors are used to ..... all sorts of machines. A simple electric motor consists of a piece of iron with .....of wire wound round it, called an armature and a stationary magnet known as the ..... magnet. When electricity flows round the armature wire the ..... becomes an electromagnet.

There is attraction and ..... between the armature magnet and the field magnet which makes the armature turn. Then the direction of the current is ..... to change the polarity. As long as the ..... of the current keeps being reversed, the armature will continue turning. To achieve this we need a ..... The ends of the armature wires are connected to different halves of the commutator through ..... As the armature turns, first one half of the commutator comes into contact with the brush ..... the current and then the other. In this way the direction of the current keeps being reversed and the armature keeps turning.

Portable generator

Pitanja

- What is the function of a portable generator? When are portable generators used?
- What are the two main parts of a portable generator? What is the function of each of them?
- How is a portable generator started?
- What happens when you pull a cord?
-
- What are the main parts of a four stroke engine?
- What is the situation with the valves in the first stroke?
- What happens when the piston goes down in the cylinder?
- What is the situation with the valves when the piston goes up?
- What happens with the mixture when it is compressed?
- What is the function of the spark?
- What is the result of the mini explosion?
- What is the situation with the valves when the piston rises again?
- How fast does this happen?
- What is the practical result of the piston movement?
-
- What is the crankshaft connected to?
- What does the alternator consist of?
- How would you describe windings?
- What are the two sets of windings? What is the difference between them?
- How fast does the rotor turn?
- What is the consequence of the rotor movement?
- Where is the current fed?
- What can the power from the generator be used for?

Wave power

-
- UVOD:
- https://www.youtube.com/watch?v=gcStpg3i5V8&ab_channel=IdeasfortheGreenPlanet wave power
- **Pitanja**
- Where is this prototype wave power built?
- What kind of construction was made across the gully?
- What happens as the waves flow in and out of the gully?
-
- What can you say about the turbine and the generator used in this power plant?
- What kind of turbine did Wells construct? Why is it unusual?
- https://www.youtube.com/watch?v=kXfSrCWA7qA&ab_channel=IdeasfortheGreenPlanet wells turbine
-
- What is unusual about the generator used in this plant?

- Why is it used here?
-
- What is the function of a PLC here?
- What does the testing equipment do?
-
- **Zadatak:**
- Complete the text using the following words:
- ***concrete, acts, generate, turning, column, flow, grid, coupled, lull, amount, operation***
- This prototype power plant was constructed by building a ..... water column across a natural gully on the shoreline. Waves in the gully cause water in the column to move up and down which also causes the air in the ..... to move up and down.
- The moving air passes through the turbine. This co-called Wells turbine is unusual because it keeps ..... in one direction even though the air ..... keeps changing direction.
- The turbine is ..... to a generator. The generator is unusual because it ..... as a generator at speeds greater than 1, 500 rpm. Bellow this speed it operates as a motor and takes power from the ..... This is useful because the turbine takes some time to build up to a speed when it can ..... electricity and sometimes it slows down because of the ..... in wave activity.
- The operation of the plant is controlled by a PLC which monitors the ..... of the motor/generator and the .....of electricity produced.

Audio recording systems

1. Dopunite tekst datim rečima

stores, grove, beam, due to, tracks, associated, mechanism, pits, deteriorate, sampled,

Gramophone records use analogue recording system which [[1]] .....patterns by cutting a continuous [[2]] ..... in a vinyl disk. The sound is reproduced by spinning a record and using the movement of a metal needle in the groove to produce varying magnetic fields. This system is [[3]] ..... with numerous problems such as crackle caused by dust and static and jumping [[4]] .....scratches on the recording surface.

A CD system uses a laser optical [[5]] ..... in which a laser [[6]] ..... reads marks on the surface of a perspex disk. This system gives near perfect quality and does not [7]] .....with time. To make a CD the sound must first be [[8]] ..... 44,100 times per second. These samples are used to control a laser beam which marks a pattern of very small [[9]] ..... on the disk surface. The pits are arranged in circular [[10]]..... The typical recording capacity of a CD is 74 minutes.

II. Pitanja:

1. Have a quick look at the text (skim through the text). What two audio systems are described?
2. What kind of recording system is used for gramophone records?
3. How are gramophone records made? How do we get different audio patterns?
4. How is the sound reproduced?
5. What is the capacity of an LP?

6. When was a digital recording system introduced?
7. What kind of mechanism does it use?
8. What can you say about the quality of CD sound? How does it compare to the sound of LPs? What problems are associated with LPs?

9. How is a recording made on a CD? What is done first?
10. How do we get different audio patterns?
11. What is the capacity of a CD?

12. How is the sound reproduced from a CD?
13. What is the function of a DAC? Why do we need it?

Transmission lines

I Make connections:

a) parallel wires

b) twisted pair

c) coax cable

d) waveguides

e) optical fibres

1. transmission by light pulses
2. prone to interference
3. twisted wires reduce interference
4. has a braid that helps to screen signals from interference
5. rectangular in shape
6. carry microwave signals between dish aerials and receivers
7. core made of pure silica
8. smaller than a human hair
9. connect telephones to their local exchange
10. used for cable television

II Complete the text

copper, reduced, loss, sheath, exchange, rectangular, advantages, hair, interference, core, depend, environments.

The simplest form of transmission is parallel wires. They consist of two..... wires running side by side and covered by a plastic ..... Because they are prone to ..... they are only used for short distances.

If the two wires are twisted, as is the case with twisted pairs, the interference is ..... Twisted pairs can be used for connecting telephones to their local.....

Coaxial cable consists of a wire ..... surrounded by copper braid. The braid helps to screen the signals from interference. Coax is used to connect telephone exchanges and for cable television.

Waveguides are ..... copper ducts where transmission is achieved by a series of reflections from the inner walls. The exact dimensions ..... on the frequency to be transmitted.

Optical fibres are now replacing copper wires because they have a number of ..... They can be used to transmit thousands of signals with very low ..... and little interference. They are light, flexible and cheap and can be used in corrosive ..... Although they are smaller than a human ....., they can transmit tens of thousands of signals.

https://www.youtube.com/watch?v=N_kA8EpCUQo&ab_channel=CorningIncorporated

Pitanja:

1. What transmission lines are described in this text?
2. What is the simplest type of transmission line?
3. What does it look like?
4. What is the problem with this type of wire? Where are they used?

5. What does a twisted pair look like?
6. Why are twisted pairs better than parallel wire? How is the problem of interference reduced?

7. Where are twisted pairs used?

8. How would you describe coaxial cable or coax?
9. What is the function of the braid?
10. Where are coax cables used?

11. What is the shape of the waveguides?
12. How do microwaves travel through the waveguides?
13. What are the suitable frequencies for this type of transmission?
14. Where are waveguides used?

Telecommunications a brief historical review

Pitanja

Part 1 questions

- What was the first telecommunications system? When was it invented?
- How would you describe it?
- Who was the inventor?

Paragraphs 2 & 3

- What was the next major step? When was it invented? By whom?
- What did it enable people to do?
- What did Hertz do?
- What did he prove?
- Why was this important? What later inventions relied on this?

Paragraph 4

- What did Marconi do? What two countries did he connect?
- How did he achieve such a long distance? Did he realize this?

Paragraph 5

- What were the important discoveries in the early part of the XX century?
- What impact did they have?
- What important discoveries were made before World War II?

I Put the following events in correct chronological order:

a) Bell's invention, the telephone, revolutionized personal communication.
b) Marconi established long-distance telegraphy by transmitting between England and Canada.
c) Radio and television broadcasting.
d) Sending coded electrical messages through the wire (telegraphy)
e) The use of satellites (thanks to the space race)
f) Merging of communications with computers.
g) The development of radar.
h) The invention of transistors in 1947.
i) Data communications using modems.
j) Hertz proved the existence of electromagnetic waves
k) The use of optical fiber.

II Complete the sentences:

verified, rapid, layers, major, vital, established, advances, achieved, powerful,

1. The telegraph soon became a ..... success.
2. The invention of the telephone was a ..... step forward.
3. Hertz ..... experimentally that electrical energy could be radiated.
4. Although he did not realize it, Marconi ..... such long distances by reflecting radio waves in the ionosphere.
5. ..... of ionized gasses and electrons in the earth's upper atmosphere is called the ionosphere.
6. Discoveries of diodes and thermionic waves were important for the ..... in the transmitter and receiver design.
7. Radio broadcasting used ..... transmitters.
8. TV was first ..... in 1937.
9. Radar played a ..... role during World War II.

Navedite reč sličnog značenja:	**Navedite reč suprotnog značenja:**
major	- with
verify	- forward
vital	- receiver
rapid	- powerful

TELECOMMUNICATIONS: A BRIEF HISTORICAL REVIEW – part 2

I Put the following events in correct chronological order:

a) The invention of transistors in 1947.
b) The use of optical fibre.
c) Merging of communications with computers.
d) The use of satellites (thanks to the space race)
e) Data communications using modems.

Part 2 questions

Pitanja:

1) When was the transistor discovered?
2) What important invention followed?
3) What was the result of these new advances?

4) When were data communications first established?
5) What was used first for the transmission of data?

6) What was the result of the space race?
7) What are satellites used for today?

8) How is optical fibre described in the text?
9) What are the advantages of optical fibres?

10) What is the greatest change that happened in the last 20-30 years?
11) How did telephony radio and TV start? As analogue or digital systems?
12) What is the advantage of digital systems?

II Complete the sentences:

feasible, loss, military, coded, tiny, error, submarine, vast, meteorology,

10. Thanks to the invention of transistors and integrated circuits new applications became .....
11. Data transmission enabled the transmission of ..... data such as text, graphics, or financial information using modems.

12. Much of today's long-distance telecommunication traffic is by..... cables.
13. First satellites were developed for ..... purposes during the co-called 'space race'.
14. Today satellites are used for communications, TV, navigation, ... etc.
15. Optical fiber is a ..... glass fiber that can be used to carry information by light pulses.
16. The advantage of optical fibers is their low ..... and low cost with high data caring capacity.
17. Digital transmission mode has numerous advantages: computer control, automatic ..... checking for data, excellent memory facilities, etc.
18. Data communications enables rapid processing of ..... quantities of data.

IV Povezite reci koje imaju suprotno znacenje

1. rapid	a) huge
2. fixed	b) small
3. tiny	c) slow
4. vast	d) mobile
5. analogue	e) disadvantage
6. advantage	f) digital

CELLPHONES

Pitanja

1. When were the first radiophones developed? What were they used for?
2. How were these phoned developed after the war?
3. What is the limitation of this system?
4. How can the problem of the lack of frequency be solved?
5. How is a cellphone defined in this text?
6. Why is it called a cellphone?

7. How can the same frequencies be used for many different telephone calls?
8. What can you say about the frequencies in different cells?
9. What is the size of one cell?
10. What is the usual number of cells?

11. What do we have in each cell?
12. What are all the base stations connected to?
13. What do we have in each MSC? What is the function of the MSC?
14. What is an MSC connected to?

15. What does an MSC do first when a call is made to a cellphone?
16. "It pages the cellphone" do you understand what happens?
17. What is the use of an 8Khz signal?

18. What happens if a cell phone moves to another position?
19. What happens if the signal level is too strong or too weak? Why is this important?
20. Will the user notice this?

Can you explain these new words from the text?

to lack

transceiver

lightweight

to achieve

to allocate

cluster

MSC

to page

Upotreba veznika

Dve kraće rečenice se mogu spojiti veznikom.

Ukoliko koristimo veznike kao što su ***when, after, before, while, until*** pokazujemo da između radnji opisanih ovim rečenicama postoji određeni **vremenski** odnos.
Npr
When they improved their IT system, they got much better results

when – dve radnje se odvijaju u istom vremenskom periodu
When you enter this area you should wear protective clothing.

after – jedna radnja se dešava posle druge
After they finished the experiment, they wrote a report .

before – jedna radnja se dešava pre druge radnje
Before he started this course, he knew very little about electric motors.

while - jedna radnja se dešava paralelo sa drugom radnjom
While they were waiting for the bus, it started to rain.

until – jedna radnja traje sve dok druga ne počne
The virus is not activated until you open the infected file.

Although i **Even though** imaju isto značenje = iako, mada
Npr:
1. It was raining.
2. They went for a walk.

Although it was raining, they went for a walk.
Even though it was raining, they went for a walk.

Despite i **in spite of** imaju isto značenje = uprkos
Ako pogledamo iste primere:
1. It was raining.
2. They went for a walk.

Sa ovim veznicima spojićemo ih:
In spite of the rain they went for a walk.
Despite the rain they went for a walk.

Sa ovim veznicima rečenica se menja jer oni „traže" iza sebe imenicu (the rain) a ne celu rečenicu . Zbog toga možemo da spojimo rečenice i na ovaj način:
In spite of the fact that it was raining, they went for a walk. (the fact je ovde imenica koja je potrebna iza **in spite of**)

Veznici koji povezuju **uzrok i posledicu** su **since** (= pošto) i **therefore** (= stoga)
Npr:
3. They were tired.
4. They went home.

Since they were tired, they went home.
(Pošto su bili umorni, otišli su kući.)
Ili:
They were tired, therefore they went home.
(Bili su umorni, stoga su otišli kući.

Veznici koji izražavaju **kontrast** su **while** i **whereas** (isto značenje = dok)
Npr:
5. He likes football.
6. His brother likes volleyball.
Možemo da spojimo:
He likes football while his brother likes volleyball.
He likes football whereas his brother likes volleyball.

Nasuprot tome rečenice:
7. He likes football.
8. His brother likes football.
Možemo da spojimo:
Both he and his brother like football.
Both = oba, i jedan i drugi

Veznik **however** = međutim (ne: bilo kako bilo!!!) se koristi da poveže rečenicu koja je na neki način kontradiktorna sa onim što je prethodno rečeno, npr:
9. They worked hard.
10. They could not solve the problem
They worked hard. However, they could not solve the problem.

Vežbe za veznike

I Dopunite rečenice odgovarajućim veznikom

***in spite of / despite* (znače isto) ili *although / even though* (znače isto)**

1. .....the rain, we still went to the park.
2. ..... it was raining, we decided to go for a walk.
3. ..... the fact that it wasn't easy, I finished the homework.
4. ..... the restaurant has a good reputation, the food was terrible.
5. .....I waited for a long time, he didn't come
6. He finished on time ..... the initial problems.
7. They solved the problem..... it was not easy.

whereas / while* (znače isto) ili *both

1. They interviewed ..... students and teachers.
2. They worked for two hours ..... we finished in only 40 minutes.
3. Our engineers investigated ..... the position and the type of the device.
4. I wake up at 7 every day ..... my brother doesn't get up before midday.

since, therefore oba veznika iskazuju uzročno-posledične odnose. Obratite pažnju na njhovo mesto u rečenici:

since + uzrok + nastavak rečenice (posledica).....

uzrok + **therefore** + posledica....

1. ..... this material is very expensive, it is not often used.
2. Our experts studied every aspect of the problem ..... there were no surprises.
3. ..... he was the strongest candidate, he got a scholarship in Japan.
4. The system is highly sensitive .....it records all the changes.
5. ..... we had no other option we accepted this offer.

when, while, until, after

1. The phone can't be used again ..... It is recharged.

2. ..... you were watching TV, I finished my homework. 3. You must study regularly ..... you study engineering.

4. You can ask questions ..... Mr Sloane finishes his presentation.

II Dopunite rečenice odgovarajućim veznikom – primer kako će izgledati zadatak na testu:

however, before, although, while, despite, until, even though, when, therefore

1. ..... the restaurant has a good reputation, the food was terrible.
2. I waited..... everyone left the room. Then I left, too.
3. I played a lot of tennis ..... I was on holiday
4. People in our group did the job early ..... the people in other groups did not finish on time.
5. They tried to solve the problem. ....., they could not find the solution.
6. You must hand in your project ..... you go on holiday.
7. They have a very systematic approach..... they don't make mistakes.
8. ..... his good results, the boss does not really like him.