Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/22**

Paper 2 Multiple Choice (Extended) **February/March 2022**

45 minutes

You must answer on the multiple choice answer sheet.

You will need: Multiple choice answer sheet
Soft clean eraser
Soft pencil (type B or HB is recommended)

INSTRUCTIONS

- There are **forty** questions on this paper. Answer **all** questions.
- For each question there are four possible answers **A**, **B**, **C** and **D**. Choose the **one** you consider correct and record your choice in soft pencil on the multiple choice answer sheet.
- Follow the instructions on the multiple choice answer sheet.
- Write in soft pencil.
- Write your name, centre number and candidate number on the multiple choice answer sheet in the spaces provided unless this has been done for you.
- Do **not** use correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.

INFORMATION

- The total mark for this paper is 40.
- Each correct answer will score one mark.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **20** pages. Any blank pages are indicated.

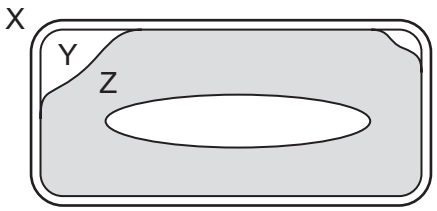
[Turn over

1 Plant nutrition needs light and water.

Which row shows what else needs to be taken in?

	carbon dioxide	ions	organic compounds
A	✓	✓	✓
B	✗	✗	✓
C	✓	✓	✗
D	✓	✗	✗

2 The diagram shows a cell starting to plasmolyse.



In which direction is osmosis occurring?

A X to Y **B** Y to X **C** Y to Z **D** Z to Y

3 Which chemical element is found in all proteins, but **not** in all carbohydrates or fats?

A carbon

B hydrogen

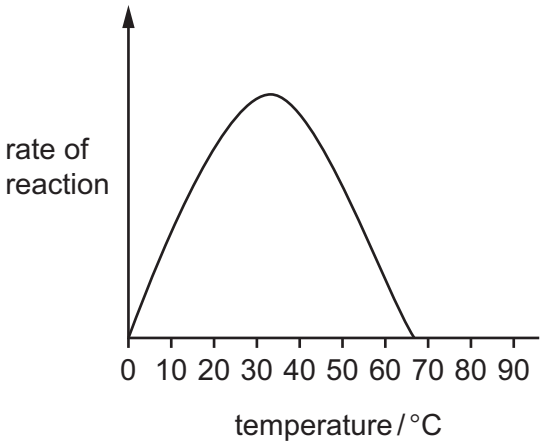
C oxygen

D nitrogen

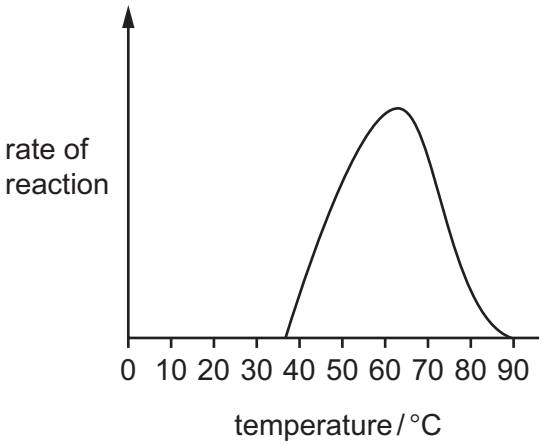
4 The Pompeii worm lives in deep-sea hydrothermal vents where **average** temperatures are often as high as 68 °C.

Which graph represents the activity of enzymes found in the Pompeii worm?

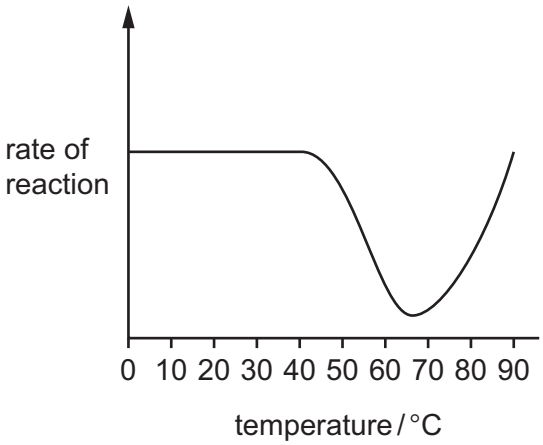
A



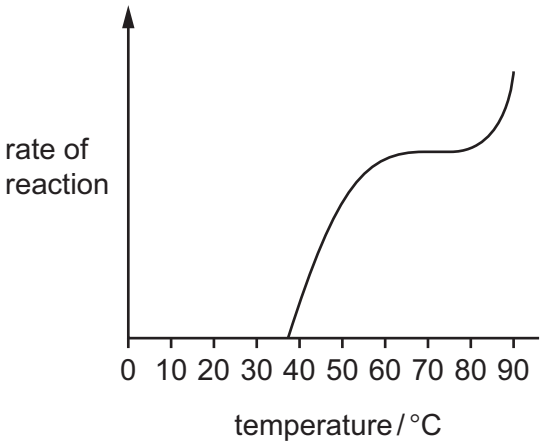
B



C

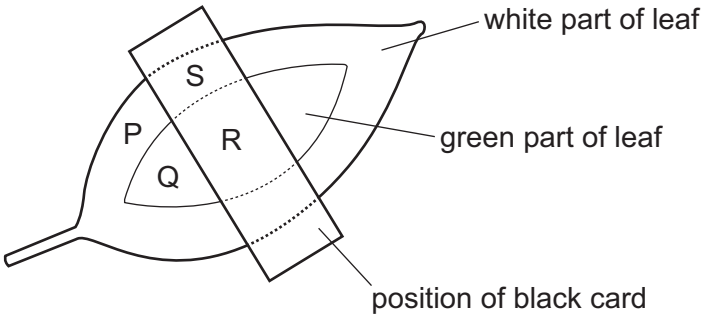


D



[Turn over

5 A plant has leaves which have white parts and green parts. One of the leaves is partly covered by a piece of black card on both sides. The plant is left in the light for two days.



The leaf is then removed and tested for the presence of starch.

Which row is correct?

	P	Q	R	S
A	✓	✗	✗	✓
B	✗	✓	✓	✗
C	✗	✓	✗	✗
D	✓	✗	✓	✓

key

✓ = starch present

✗ = starch absent

6 What is assimilation?

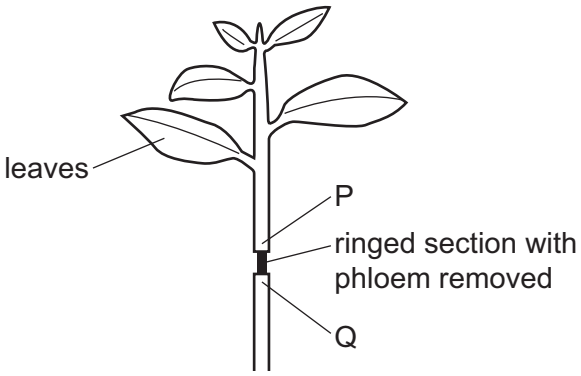
A the movement of digested food molecules into the cells of the body where they are used, becoming part of the cells

B the movement of digested food molecules through the wall of the intestine into the blood

C the passing out of food that has not been digested, as faeces, through the anus

D the taking of food and drink into the body through the mouth

7 The diagram shows a plant shoot that is ringed. This removes the phloem from a section of the shoot.

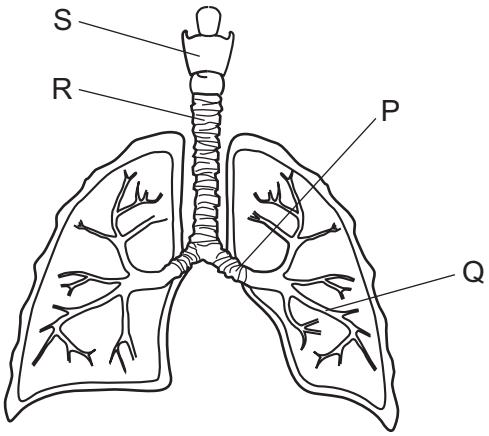


The plant is left in bright light for 24 hours. Plant tissues are then tested for the presence of sucrose above the ringed section at P and below the ringed section at Q.

Which row shows the expected results?

	presence of sucrose	
	P	Q
A	✓	✓
B	✗	✓
C	✓	✗
D	✗	✗

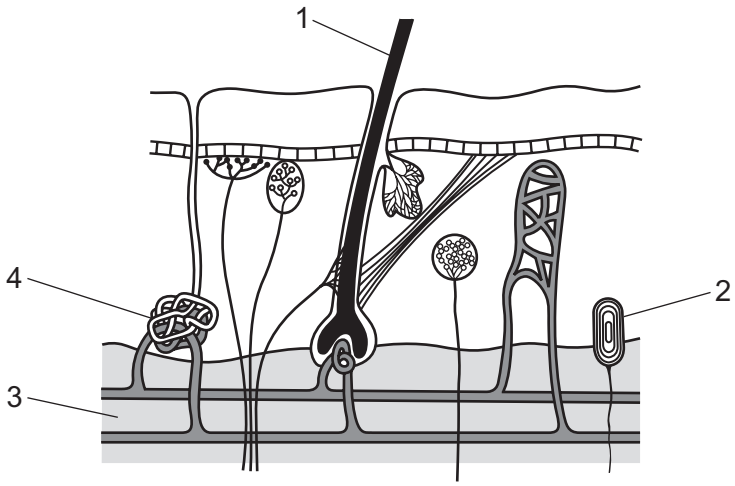
8 The diagram shows the main structures in the breathing system of humans.



Which row identifies the larynx, bronchus, trachea and bronchioles?

	larynx	bronchus	trachea	bronchioles
A	P	Q	R	S
B	R	P	S	Q
C	S	P	R	Q
D	S	Q	P	R

9 The diagram shows a section through the skin.



Which labelled structures help to maintain body temperature in the cold?

A 1 and 3 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

10 Which statements correctly describe the human male gamete?

1 contains enzymes

2 food stores present

3 flagellum present

4 surrounded by a jelly coating

A 1 and 2 **B** 1 and 3 **C** 2 and 3 **D** 3 and 4

11 The table gives statements about a human haploid nucleus.

Which row is correct?

	a single set of unpaired chromosomes	found in gametes	produced by mitosis
A	✗	✗	✓
B	✓	✓	✗
C	✗	✓	✓
D	✓	✗	✗

key

✓ = true

✗ = false

12 What is the main factor which determines the number of trophic levels in food chains?

A competition between organisms

B efficiency of energy transfer between trophic levels

C removal of a member of a food chain

D unstable ecosystem due to changing environment

13 Which row shows an effect of a human activity on the environment?

	activity	effect
A	cutting down forests	acid rain
B	cutting down forests	eutrophication
C	overuse of fertilisers	acid rain
D	overuse of fertilisers	eutrophication

14 Substance P is separated into different parts using simple physical techniques.

Substance Q is only separated into simpler parts using chemical processes.

Substance R is not separated into simpler parts by either physical or chemical processes.

Which type of substance are P, Q and R?

	P	Q	R
A	compound	mixture	element
B	element	compound	mixture
C	mixture	element	compound
D	mixture	compound	element

15 Hydrogen chloride is a gas. It dissolves in water to form an acidic solution.

Three different samples of hydrogen chloride are listed.

1 73.0 g of hydrogen chloride gas

2 7.30 dm^3 of hydrogen chloride gas at r.t.p.

3 730 cm^3 of 1.00 mol/dm^3 aqueous hydrogen chloride

Which row shows the relative number of moles of hydrogen chloride in these samples?

	fewest →		most
A	1	2	3
B	1	3	2
C	2	3	1
D	3	2	1

16 Aluminium is extracted from aluminium oxide by electrolysis.

What is added to aluminium oxide in this process?

A concentrated aqueous sodium chloride

B cryolite

C dilute sulfuric acid

D water

17 Which statements about the reduction of copper(II) oxide by heating with carbon are correct?

1 Copper(II) ions lose electrons.

2 Copper(II) oxide acts as an oxidising agent.

3 Copper(II) oxide loses oxygen.

4 Oxide ions are reduced.

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

18 Copper carbonate is insoluble in water.

Which method can be used to make copper carbonate?

A adding aqueous sodium carbonate to aqueous copper sulfate and filtering off the product

B adding solid calcium carbonate to aqueous copper sulfate and filtering off the product

C adding solid copper oxide to solid calcium carbonate and heating the mixture

D heating copper metal in carbon dioxide

19 Which test and its result identifies aqueous bromide ions?

A adding acidified aqueous silver nitrate forming a cream precipitate

B adding acidified aqueous silver nitrate forming a white precipitate

C adding aluminium foil and heating with sodium hydroxide forming a gas that turns red litmus paper blue

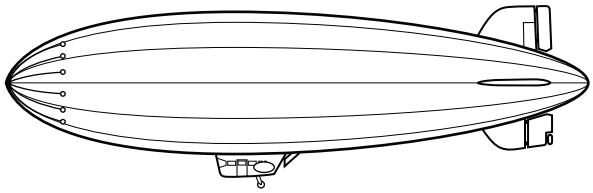
D adding dilute acid forming a gas that produces a white precipitate when bubbled through limewater

20 Which row about the trends in the elements going down Group I of the Periodic Table is correct?

	reactivity	melting point
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

[Turn over

21 An airship containing an unreactive gas floats in air, as shown.



Which gas is used to fill the airship?

A carbon dioxide

B helium

C hydrogen

D nitrogen

22 Duralumin and magnalium are alloys used in the manufacture of aircraft.

They both contain aluminium and another metallic element.

The alloys are made up of ……1…… of each element.

They are used because they are ……2…… than the pure metals.

Which words complete gaps 1 and 2?

	1	2
A	atoms	harder
B	atoms	softer
C	molecules	harder
D	molecules	softer

23 Iron is extracted in the blast furnace.

Which reactions are involved in removing acidic impurities as slag?

1 $C + O_2 \rightarrow CO_2$

2 $C + CO_2 \rightarrow 2CO$

3 $Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$

4 $CaCO_3 \rightarrow CaO + CO_2$

5 $CaO + SiO_2 \rightarrow CaSiO_3$

A 1 and 2 only **B** 1, 2 and 3 **C** 3, 4 and 5 **D** 4 and 5 only

24 Which statements about the reactions in a catalytic converter are correct?

1 The catalyst needs to be hot for the reactions to work.

2 Carbon dioxide is converted to carbon monoxide.

3 It converts pollutant gases into gases present in clean air.

4 Nitrogen and oxygen combine to form nitrogen monoxide.

A 1 and 2 **B** 1 and 3 **C** 2 and 4 **D** 3 and 4

25 Which substances neutralise acids?

1 lime

2 limestone

3 calcium hydroxide

A 1 and 2 only **B** 1 and 3 only **C** 2 and 3 only **D** 1, 2 and 3

26 Which statements about ethene and but-1-ene are correct?

1 Only ethene reacts with bromine water.

2 They are both formed by cracking alkanes.

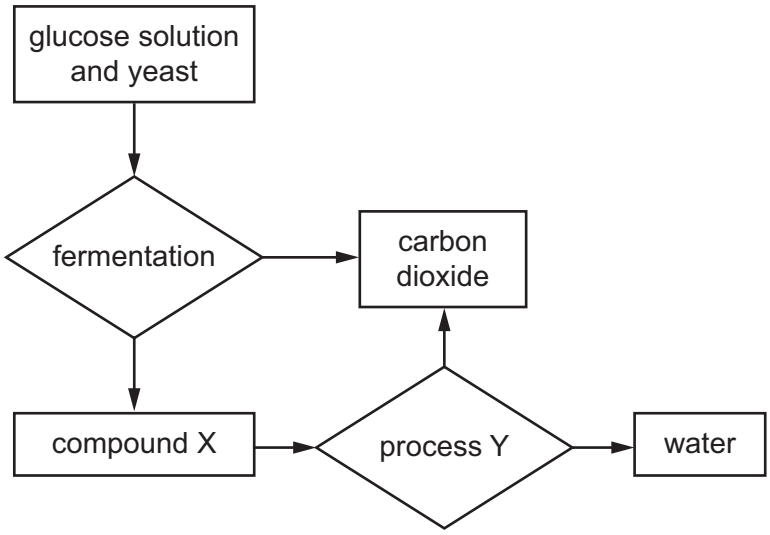
3 They both react with steam to form alcohols.

4 They have different general formulae.

A 1 and 2 **B** 1 and 4 **C** 2 and 3 **D** 3 and 4

[Turn over

27 The flow chart shows some chemical substances and processes.

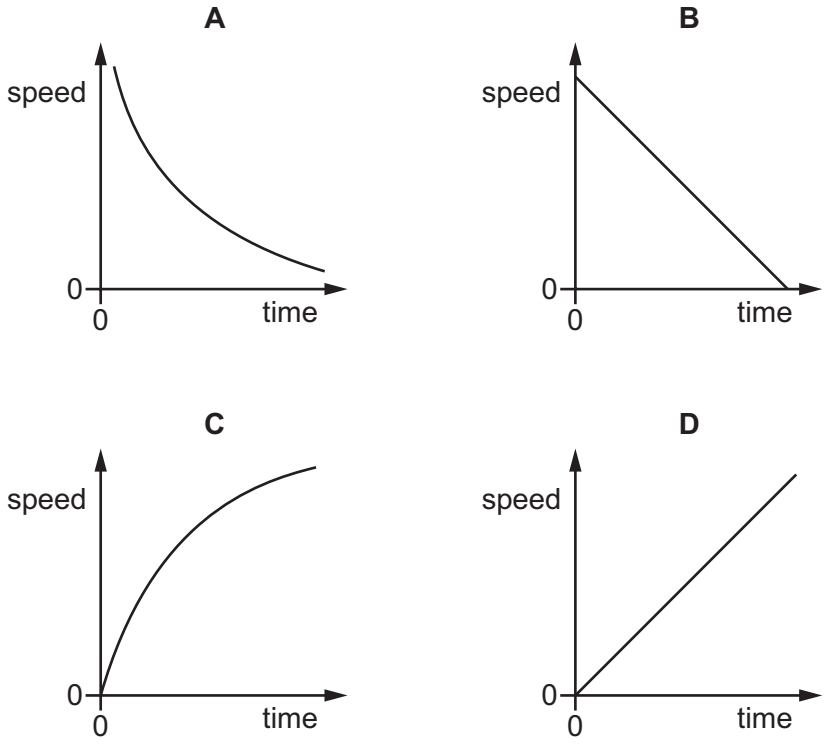


Which row identifies compound X and process Y?

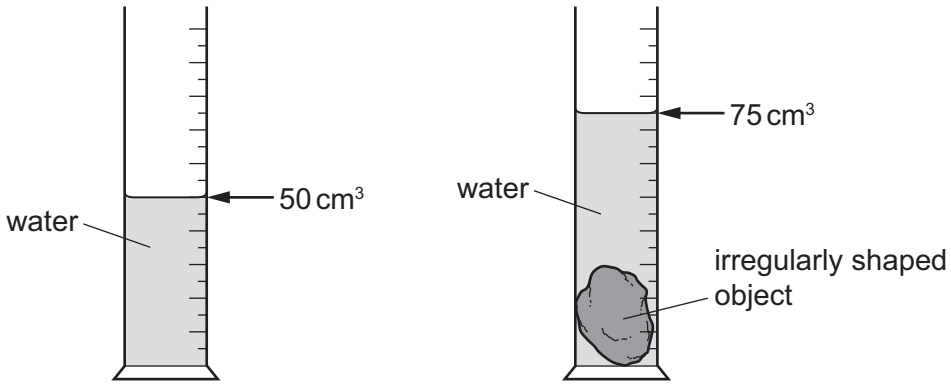
	compound X	process Y
A	ethanol	combustion
B	ethanol	cracking
C	ethene	combustion
D	ethene	cracking

28 An object falls freely in a vacuum.

Which speed–time graph represents the motion of the object?



29 An irregularly shaped object is lowered into a measuring cylinder of water.



As the object is lowered into the water, the water level rises from 50 cm^3 to 75 cm^3. The object has a mass of 50 g.

What is the density of the object?

A 0.50 g/cm^3 **B** 0.67 g/cm^3 **C** 1.5 g/cm^3 **D** 2.0 g/cm^3

[Turn over

30 Which source of energy is non-renewable?

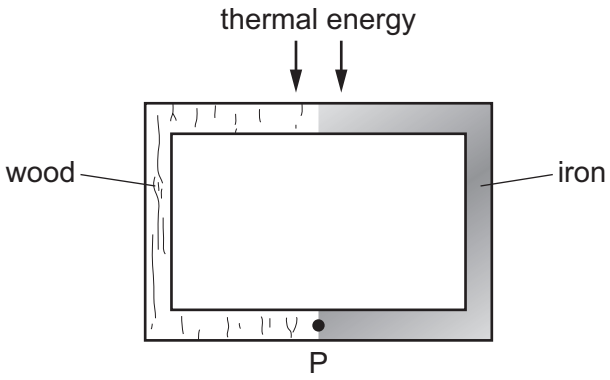
A hydroelectric

B nuclear fission

C tides

D waves

31 The diagram shows an object made partly of wood and partly of iron. Thermal energy is supplied in the position shown. Point P is marked at the bottom of the object.



How does most thermal energy reach point P?

A by conduction through the iron

B by conduction through the wood

C by convection through the iron

D by convection through the wood

32 Light undergoes total internal reflection in an optical fibre.

Which statement explains why this reflection occurs?

A The angle of incidence is equal to the angle of refraction.

B The angle of incidence is greater than the angle of reflection.

C The angle of incidence is greater than the critical angle.

D The angle of incidence is less than the critical angle.

33 Which statement about sound waves is **not** correct?

A They are caused by vibrations.

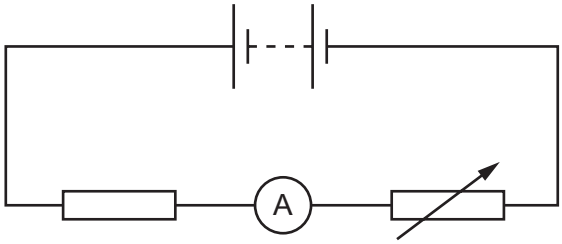
B They are longitudinal.

C They transfer energy.

D They travel in a vacuum.

34 A circuit contains a battery, a fixed resistor, an ammeter and a variable resistor.

The reading on the ammeter is 1.8 mA.

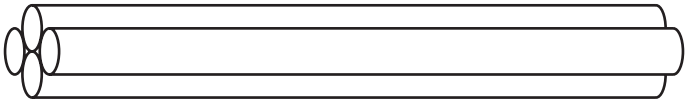


How much charge flows through the variable resistor in 30 s?

A 0.054 C **B** 17 C **C** 54 C **D** 17 000 C

35 A copper wire has a resistance of 8.0 Ω.

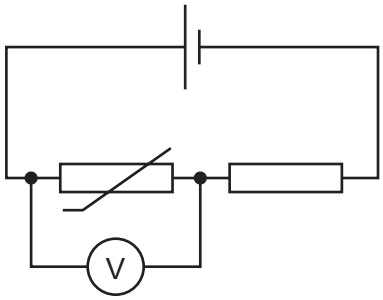
Four of these wires are arranged side by side to form a cable, as shown.



What is the resistance of this cable?

A 0.50 Ω **B** 2.0 Ω **C** 32 Ω **D** 128 Ω

36 The diagram shows a circuit containing a resistor and an NTC thermistor.

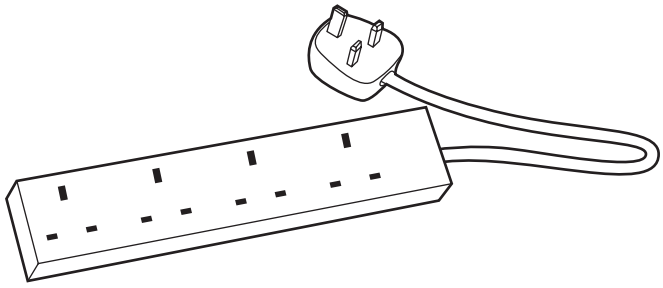


The temperature of the thermistor increases.

What happens to the resistance of the thermistor and what happens to the reading on the voltmeter?

	resistance of thermistor	reading on voltmeter
A	decreases	decreases
B	decreases	increases
C	increases	decreases
D	increases	increases

37 An electrical extension block has four sockets, a cable which can safely take a current of 6 A and a plug. It is protected by a fuse rated at 5 A.



The extension block is used with four appliances and the 5 A fuse blows. The owner replaces the 5 A fuse with a 13 A fuse.

Why is the extension block now dangerous?

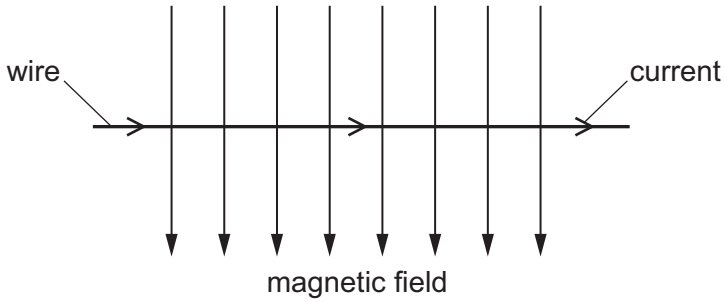
A The appliances may not receive enough current.

B The cable may overheat before the fuse blows.

C The sockets may burn out before the fuse blows.

D The 13 A fuse may blow too soon.

38 The diagram shows a wire in a magnetic field. There is a current in the wire in the direction shown. The direction of the magnetic field is also shown.



The magnetic field causes a force on the wire.

In which direction does this force act?

A into the page

B out of the page

C towards the bottom of the page

D towards the top of the page

39 How do the ionising effect and the penetrating ability of alpha-emissions compare with those of beta-emissions?

	ionising effect	penetrating ability
A	alpha more ionising than beta	alpha more penetrating than beta
B	alpha more ionising than beta	alpha less penetrating than beta
C	alpha less ionising than beta	alpha more penetrating than beta
D	alpha less ionising than beta	alpha less penetrating than beta

40 A radioactive isotope has a half-life of 18 years. A sample contains 80 million atoms of this isotope.

How long does it take for the number of atoms of this isotope in the sample to decrease to 10 million?

A 2.25 years

B 6.0 years

C 54 years

D 180 years

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The Periodic Table of Elements

Group																	
I	II											III	IV	V	VI	VII	VIII
							1 H hydrogen 1										2 He helium 4
3 Li lithium 7	4 Be beryllium 9											5 B boron 11	6 C carbon 12	7 N nitrogen 14	8 O oxygen 16	9 F fluorine 19	10 Ne neon 20
11 Na sodium 23	12 Mg magnesium 24											13 Al aluminium 27	14 Si silicon 28	15 P phosphorus 31	16 S sulfur 32	17 Cl chlorine 35.5	18 Ar argon 40
19 K potassium 39	20 Ca calcium 40	21 Sc scandium 45	22 Ti titanium 48	23 V vanadium 51	24 Cr chromium 52	25 Mn manganese 55	26 Fe iron 56	27 Co cobalt 59	28 Ni nickel 59	29 Cu copper 64	30 Zn zinc 65	31 Ga gallium 70	32 Ge germanium 73	33 As arsenic 75	34 Se selenium 79	35 Br bromine 80	36 Kr krypton 84
37 Rb rubidium 85	38 Sr strontium 88	39 Y yttrium 89	40 Zr zirconium 91	41 Nb niobium 93	42 Mo molybdenum 96	43 Tc technetium –	44 Ru ruthenium 101	45 Rh rhodium 103	46 Pd palladium 106	47 Ag silver 108	48 Cd cadmium 112	49 In indium 115	50 Sn tin 119	51 Sb antimony 122	52 Te tellurium 128	53 I iodine 127	54 Xe xenon 131
55 Cs caesium 133	56 Ba barium 137	57–71 lanthanoids	72 Hf hafnium 178	73 Ta tantalum 181	74 W tungsten 184	75 Re rhenium 186	76 Os osmium 190	77 Ir iridium 192	78 Pt platinum 195	79 Au gold 197	80 Hg mercury 201	81 Tl thallium 204	82 Pb lead 207	83 Bi bismuth 209	84 Po polonium –	85 At astatine –	86 Rn radon –
87 Fr francium –	88 Ra radium –	89–103 actinoids	104 Rf rutherfordium –	105 Db dubnium –	106 Sg seaborgium –	107 Bh bohrium –	108 Hs hassium –	109 Mt meitnerium –	110 Ds darmstadtium –	111 Rg roentgenium –	112 Cn copernicium –		114 Fl flerovium –		116 Lv livermorium –		

Key

atomic number
atomic symbol
name
relative atomic mass

lanthanoids	57 La lanthanum 139	58 Ce cerium 140	59 Pr praseodymium 141	60 Nd neodymium 144	61 Pm promethium –	62 Sm samarium 150	63 Eu europium 152	64 Gd gadolinium 157	65 Tb terbium 159	66 Dy dysprosium 163	67 Ho holmium 165	68 Er erbium 167	69 Tm thulium 169	70 Yb ytterbium 173	71 Lu lutetium 175
actinoids	89 Ac actinium –	90 Th thorium 232	91 Pa protactinium 231	92 U uranium 238	93 Np neptunium –	94 Pu plutonium –	95 Am americium –	96 Cm curium –	97 Bk berkelium –	98 Cf californium –	99 Es einsteinium –	100 Fm fermium –	101 Md mendelevium –	102 No nobelium –	103 Lr lawrencium –

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).