Cambridge Assessment International Education

Cambridge IGCSE™

CO-ORDINATED SCIENCES **0654/21**

Paper 2 Multiple Choice (Extended) **May/June 2020**

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. A mark will not be deducted for a wrong answer.
- Any rough working should be done on this question paper.
- The Periodic Table is printed in the question paper.

This document has **16** pages. Blank pages are indicated.

1 Which characteristic of living organisms is defined as the chemical reactions that break down nutrient molecules and release energy for metabolism?

A excretion

B nutrition

C respiration

D reproduction

2 What is the net movement of molecules during diffusion?

A from a higher concentration to a lower concentration down a concentration gradient

B from a higher concentration to a lower concentration up a concentration gradient

C from a lower concentration to a higher concentration down a concentration gradient

D from a lower concentration to a higher concentration up a concentration gradient

3 A food contains reducing sugar, but no starch.

What colours will be obtained if samples of the food are tested with Benedict's solution and with iodine solution?

	Benedict's test	iodine test
A	blue	blue-black
B	blue	brown
C	red-orange	blue-black
D	red-orange	brown

4 Which statement correctly describes enzyme activity as the temperature increases up to an optimum temperature?

A The enzyme has less frequent effective collisions with the product.

B The enzyme has less frequent effective collisions with the substrate.

C The enzyme has more frequent effective collisions with the product.

D The enzyme has more frequent effective collisions with the substrate.

5 A plant which is deficient in nitrates and magnesium has yellow leaves and poor growth.

What is the importance of these two ions in plant growth?

	importance of nitrate ions	importance of magnesium ions
A	making amino acids	production of chlorophyll
B	making amino acids	production of roots
C	making fatty acids	production of chlorophyll
D	making fatty acids	production of roots

6 Why is calcium needed in the diet?

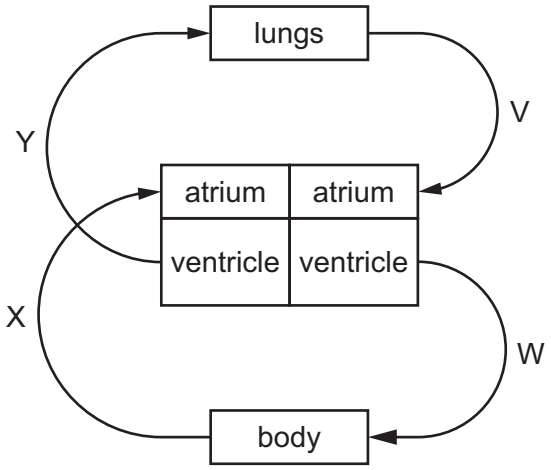
A to make carbohydrates

B to make teeth

C to make enzymes

D to make protein

7 The diagram shows the double circulatory system to the lungs and the body.



In which two blood vessels is the pressure the highest?

A V and W **B** W and Y **C** X and V **D** Y and X

8 Cigarette smoke paralyses the cilia in the gas exchange system.

What is the direct result of this?

A Mucus accumulates in the airways.

B Oxygen cannot diffuse into the blood.

C The blood cannot carry oxygen efficiently.

D The smoker develops lung cancer.

9 What happens when the body temperature falls below normal?

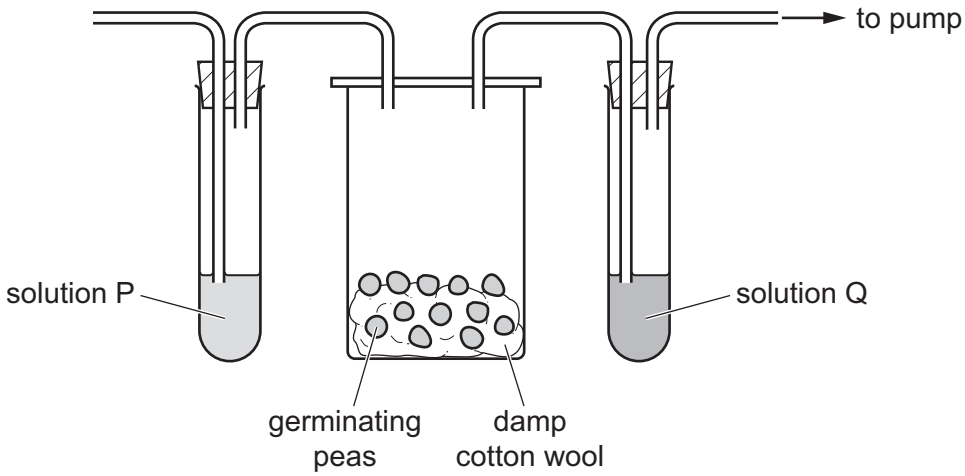
A Arterioles supplying the skin constrict.

B Arterioles supplying the skin dilate.

C Capillaries move towards the skin surface.

D Capillaries move away from the skin surface.

10 An experiment using germinating seeds is set up as shown, and left at room temperature for 12 hours.



The pump is then switched on and air is drawn through the apparatus for 2 minutes.

Which row identifies solutions P and Q and the results obtained?

	solution P	solution P results	solution Q	solution Q results
A	ethanol	remains colourless	ethanol	turns milky
B	ethanol	turns milky	limewater	remains colourless
C	limewater	remains colourless	limewater	turns milky
D	limewater	turns milky	ethanol	remains colourless

11 Chimpanzee gametes contain one more chromosome than human gametes.

What is the chromosome number in a chimpanzee diploid cell?

A 23 **B** 24 **C** 46 **D** 48

12 The flow chart shows part of a food chain.

grass → rabbit → fox

What describes the rabbit?

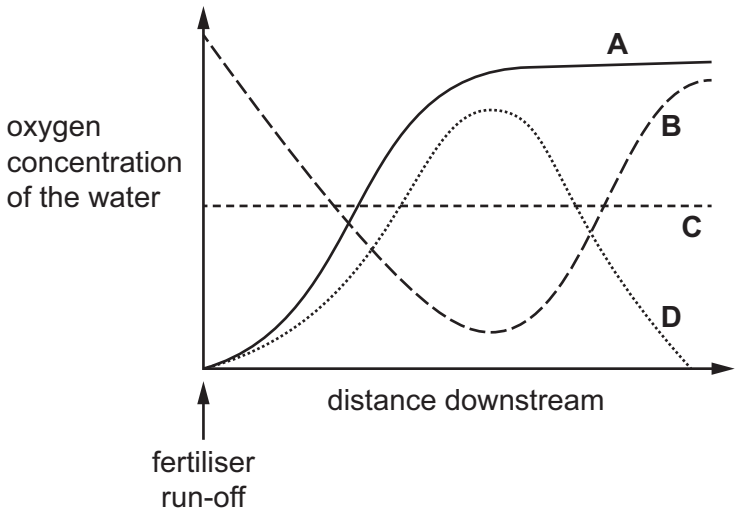
A consumer and carnivore

B consumer and herbivore

C producer and carnivore

D producer and herbivore

13 Which line shows how the oxygen concentration of the water changes after excess fertiliser has entered a stream?



14 Which statement about atoms and molecules is correct?

A All molecules are gases at room temperature and pressure.

B An atom is the smallest part of an element.

C Atoms of the same element all have the same mass.

D Molecules always contain atoms of more than one element.

15 Which compound is formed when one metal atom transfers two electrons to one non-metal atom?

A calcium chloride

B calcium oxide

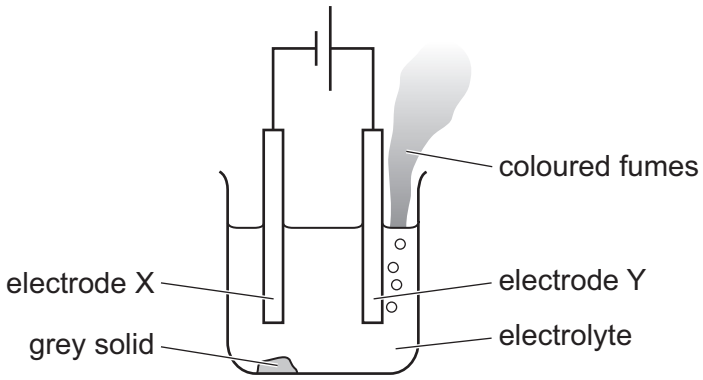
C sodium chloride

D sodium oxide

16 What is the volume of 0.35 mol of hydrogen gas at room temperature and pressure?

A 2.1 dm^3 **B** 4.2 dm^3 **C** 8.4 dm^3 **D** 16.8 dm^3

17 The diagram shows the electrolysis of lead(II) bromide using inert electrodes.



Which statement about this experiment is correct?

A Electrode X is positively charged.

B The coloured fumes are produced at the negative electrode.

C The electrolyte is lead(II) bromide.

D The grey solid is lead(II) bromide.

18 An acid reacts with solid lumps of calcium carbonate to produce a salt, water and carbon dioxide.

Which changes lead to a greater frequency of successful collisions between reacting particles?

1 Increase the temperature of the acid.

2 Use powdered lumps of calcium carbonate.

3 Use a different acid with a higher pH.

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

19 The ionic equation for the formation of chromium(III) ions is shown.

$$Cr \rightarrow Cr^{3+} + 3e^-$$

Which statement about chromium atoms is correct?

A They are oxidised by gaining electrons.

B They are oxidised by losing electrons.

C They are reduced by gaining electrons.

D They are reduced by losing electrons.

20 X is an oxide. When solid X is added to dilute hydrochloric acid, the pH of the solution increases.

When solid X is added to aqueous sodium hydroxide, the pH of the solution decreases.

Which type of oxide is X?

A acidic

B amphoteric

C basic

D neutral

21 Copper sulfate is made by adding an excess of copper carbonate to dilute sulfuric acid and stirring.

The excess solid is removed. Most of the water is then removed. The solution is left for solid copper sulfate to form.

In which order is apparatus used?

A Bunsen burner, tripod and flask → filter funnel → crystallising dish

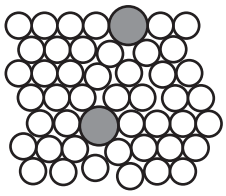
B Bunsen burner, tripod and flask → crystallising dish → filter funnel

C filter funnel → crystallising dish → Bunsen burner, tripod and flask

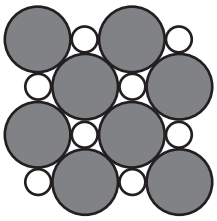
D filter funnel → Bunsen burner, tripod and flask → crystallising dish

22 Which diagram represents an alloy?

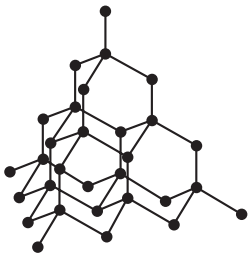
A



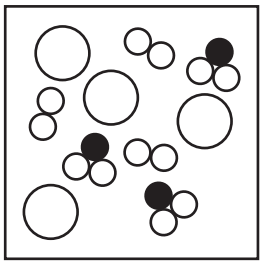
B



C



D



23 Which statement is **not** a reason why aluminium is used in aircraft manufacture?

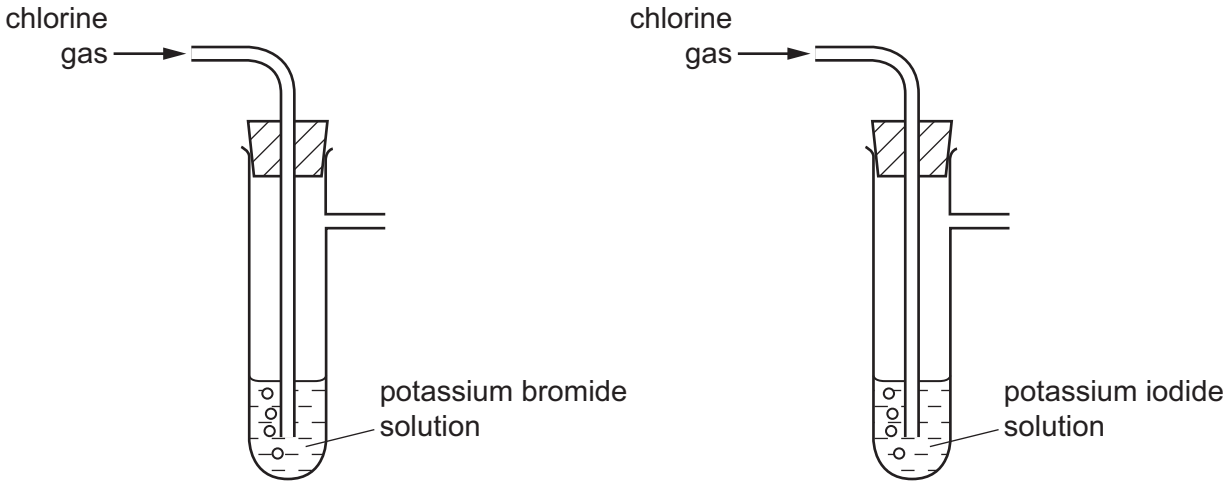
A It forms low density alloys.

B It is malleable.

C It is more reactive than iron.

D It is resistant to corrosion.

24 Chlorine gas is bubbled through two separate solutions.



What is observed in the two tubes?

	potassium bromide tube	potassium iodide tube
A	colourless solution turns orange	colourless solution turns brown
B	colourless solution turns orange	solution remains colourless
C	orange solution turns colourless	brown solution turns colourless
D	orange solution turns colourless	solution remains brown

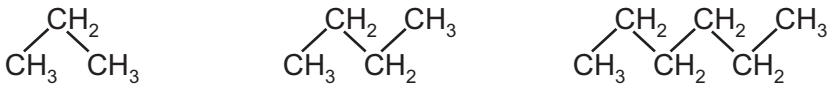
25 Limestone is converted to lime in process 1.

Limestone is used to treat industrial waste in process 2.

What are processes 1 and 2?

	process 1	process 2
A	decomposition	dissolving
B	decomposition	neutralisation
C	oxidation	dissolving
D	oxidation	neutralisation

26 The structures of three organic compounds are shown.



Which statement about these three compounds is correct?

A They are alcohols.

B They are alkenes.

C They are saturated.

D They do not burn.

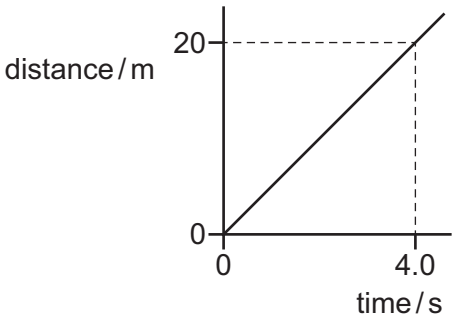
27 Which row matches the name of a polymer to the formula of the monomer from which it is made?

	polymer	monomer
A	poly(ethene)	C_2H_2
B	poly(ethene)	C_2H_6
C	poly(propene)	C_2H_4
D	poly(propene)	C_3H_6

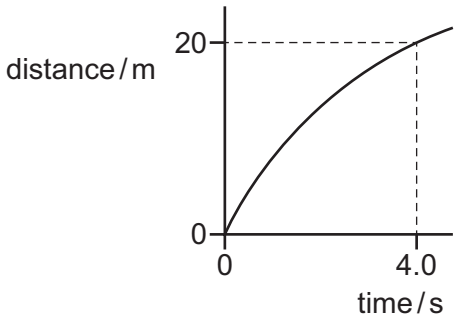
28 The diagrams show two distance–time graphs and two speed–time graphs for objects travelling in a straight line.

Which graph represents an object with a constant, positive acceleration of $5.0\,m/s^2$?

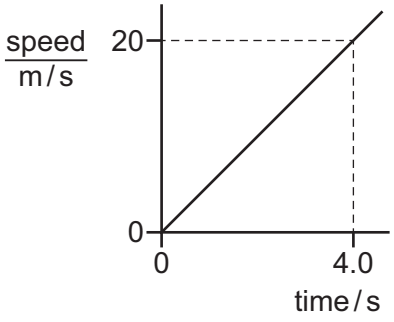
A



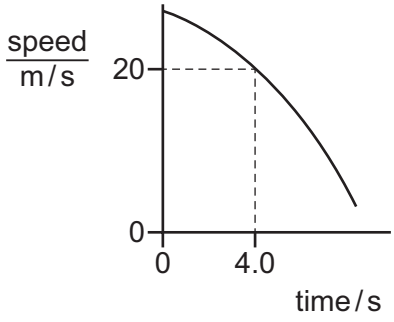
B



C



D



29 A force F acting on an area A exerts a pressure P.

What pressure is exerted by a force of $2F$ acting on an area $0.50A$?

A $0.50P$ **B** P **C** $2.0P$ **D** $4.0P$

30 An object is moving along a straight path with 200 J of kinetic energy.

A resultant force acts on the object, in the direction it is moving, for a distance of 20 m. The kinetic energy of the object increases to 1000 J.

What is the magnitude of the force?

A 10 N **B** 40 N **C** 50 N **D** 60 N

31 An object of mass m moving with speed v has kinetic energy E.

A second object, also of mass m, moves with speed $\frac{v}{2}$.

What is the kinetic energy of the second object?

A $\frac{E}{4}$ **B** $\frac{E}{2}$ **C** E **D** $2E$

32 Which statement describes the production of electricity from a renewable energy source?

A Coal is burnt to release energy to make steam that turns a generator.

B Moving air passes over blades that rotate and turn a generator.

C Nuclear fission releases energy to make steam that turns a generator.

D Oil is burnt to release energy to make steam that turns a generator.

33 A liquid-in-glass thermometer contains mercury.

The thermometer is moved from cold water into hot water.

What happens to the mercury?

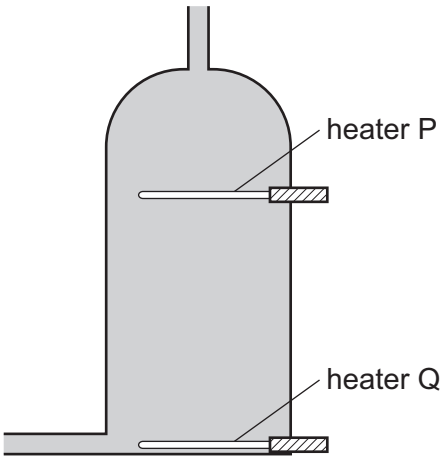
A It contracts.

B It expands.

C It freezes.

D It melts.

34 A hot water tank is fitted with two identical heaters P and Q. Heater P is fitted above heater Q as shown. The tank is full of cold water.



When only heater Q is switched on, it takes a long time to heat the tank of water to 60 °C.

What happens to the cold water when only heater P is switched on?

A All the water reaches 60 °C in less time.

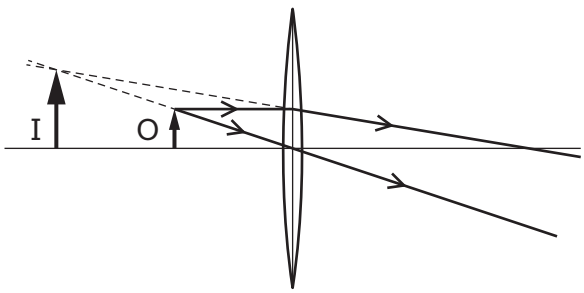
B All the water reaches 60 °C in the same time.

C The water below heater P reaches 60 °C in less time.

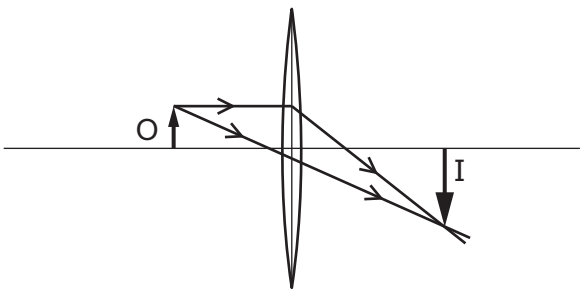
D The water above heater P reaches 60 °C in less time.

35 Which ray diagram represents the formation of a virtual image I of an object O?

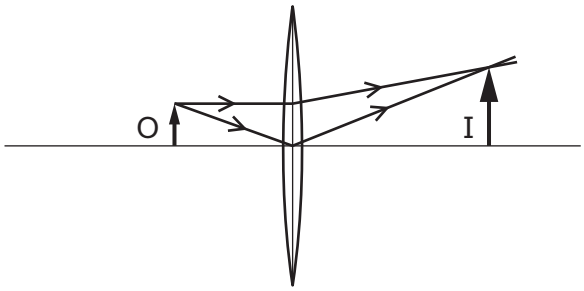
A



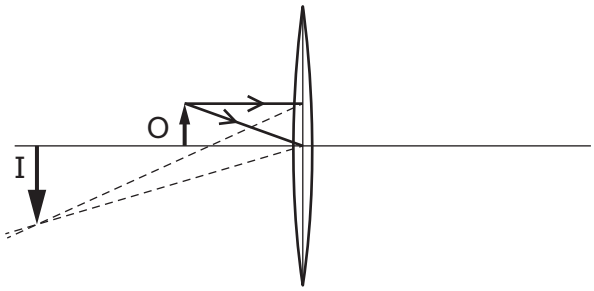
B



C



D



36 Which statement about the transmission of sound is correct?

A Sound does not need a medium.

B Sound travels faster in gases than in solids.

C The particles of the transmission medium vibrate parallel to the direction in which the sound travels.

D The regions in the transmission medium where the particles are closest together are called rarefactions.

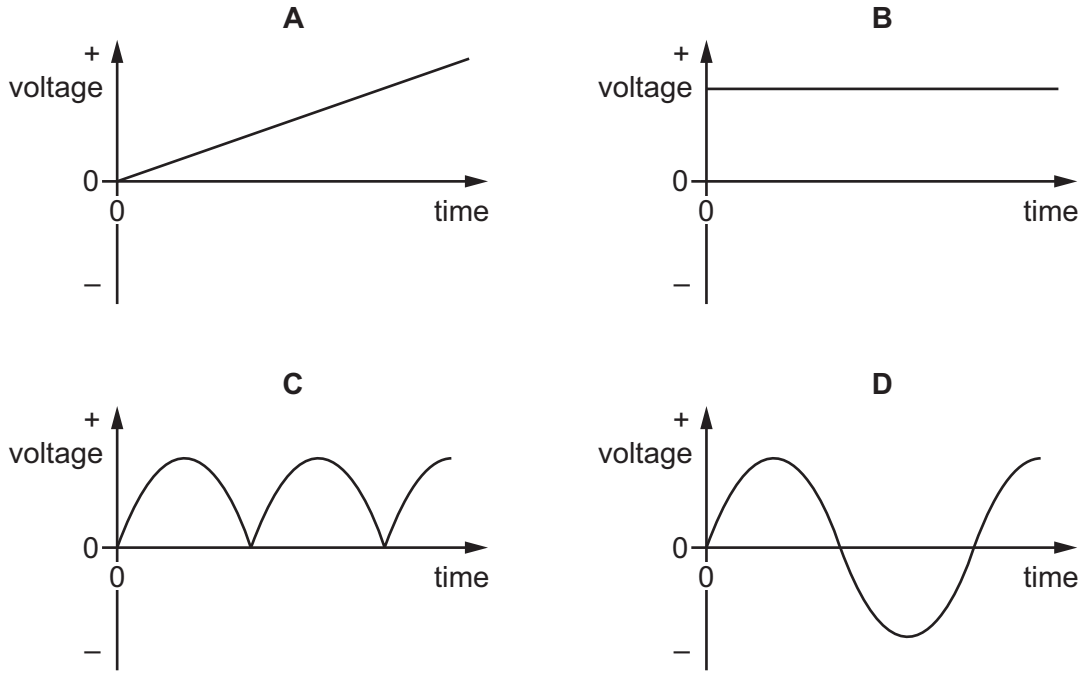
37 The diagram shows a wire with resistance *R*.

Both the length and the diameter of the wire are now doubled.

What is the new resistance of the wire after both of these changes?

A $\frac{R}{2}$ **B** R **C** $2R$ **D** $4R$

38 Which graph shows the voltage output of an alternating current (a.c.) generator?



39 A fuse is a safety device for use in an electrical circuit.

The current in the circuit becomes greater than the rated value for the fuse.

What happens?

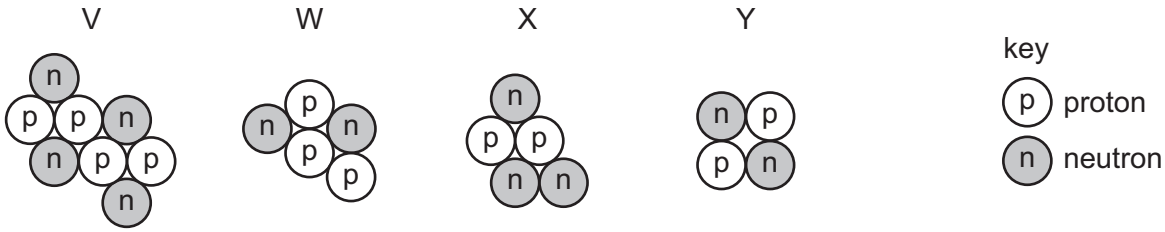
A The current decreases to zero.

B The current decreases to the rated value for the fuse.

C The thickness of the insulation around the wires increases.

D The current is sent to the outer case of the appliance.

40 The diagrams represent the nuclei of four different atoms V, W, X and Y.



Which two diagrams represent isotopes of the same element?

A V and Y **B** W and X **C** X and Y **D** Y and W

BLANK PAGE

BLANK PAGE

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.).