Cambridge
O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

COMBINED SCIENCE **5129/22**

Paper 2 **May/June 2018**

2 hours 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
A copy of the Periodic Table is printed on page 24.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

1 Flowers are the reproductive organs of plants.

Fig. 1.1 shows a section through a flower.

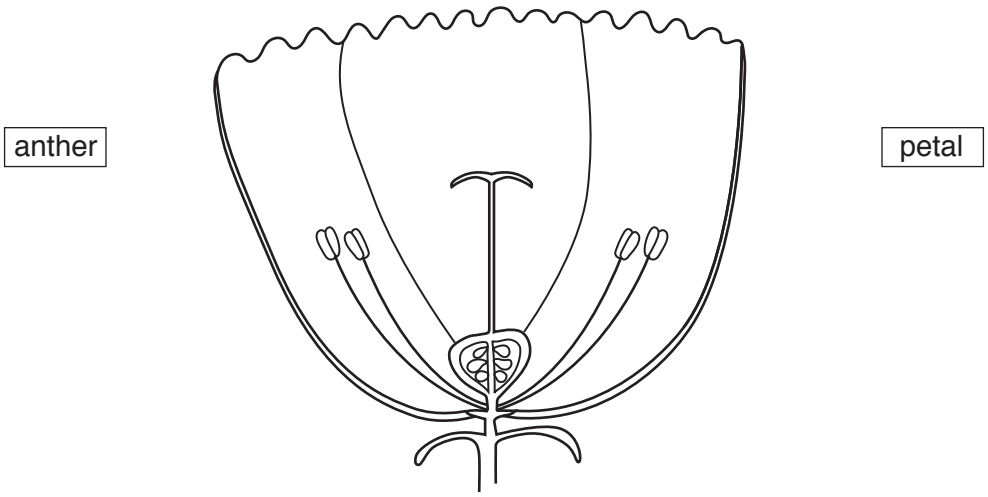


Fig. 1.1

(a) (i) On Fig. 1.1, draw a line from each box to show the position of an anther and a petal. [2]

(ii) State **one** function of an anther and **one** of a petal.

anther .....

.....

petal .....

.....
[2]

(b) Flowers produce seeds.

Seeds need a suitable temperature to germinate.

State **two** other conditions that affect germination.

..... and ..... [2]

(c) Reproduction can be *asexual* or *sexual*.

Describe an investigation and the result of the investigation that shows that seeds are produced by sexual reproduction.

.....

.....

.....

.....

.....[2]

2 Sodium reacts with oxygen to produce sodium oxide.

The equation for the reaction is

$$4Na + O_2 \longrightarrow 2Na_2O$$

[A_r: O, 16; Na, 23]

(a) (i) Calculate the relative molecular mass of sodium oxide.

relative molecular mass = ...[1]

(ii) Complete the following sentences.

92 g of sodium reacts with ..... g of oxygen and produces ..... g of sodium oxide.

4.6 g of sodium produces ..... g of sodium oxide. [3]

(b) Sodium oxide dissolves in water.

A solution of sodium oxide turns Universal Indicator purple.

Suggest the pH of the solution. .....[1]

(c) State the type of bonding in sodium oxide and give a reason for your answer.

type of bonding .....

reason .....

.....

[2]

3 A partly completed circuit containing a lamp is shown in Fig. 3.1.

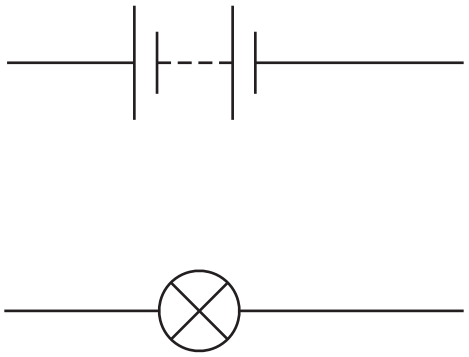


Fig. 3.1

(a) Complete the circuit in Fig. 3.1 to show the symbol for an ammeter and the symbol for a voltmeter, connected so that the resistance of the lamp may be calculated. [2]

(b) **(i)** State the current and the potential difference shown on the meters in Fig. 3.2.

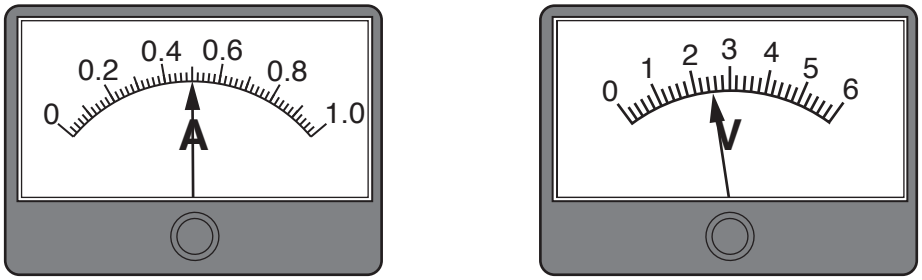


Fig. 3.2

current = ...

potential difference = ...
[2]

(ii) Use your answers to **(b)(i)** to calculate the resistance of the lamp.
State the unit.

resistance = ... unit ..... [3]

4 Specialised cells carry out different processes in living organisms.

On Fig. 4.1, draw a straight line from each process to the cell where the process takes place.

processes	specialised cells
removal of urea from the blood	kidney cell
production of glycogen	liver cell
breakdown of alcohol	mesophyll cell
light energy transferred to chemical energy	root hair cell
absorption of ions	
removal of excess water	

Fig. 4.1

[6]

5 W, X, Y and Z are elements in the Periodic Table.

The atomic structures of an isotope of each of these elements are shown in Table 5.1.

The letters are **not** the chemical symbols of the elements.

Table 5.1

	number of protons	number of neutrons	electronic structure
^{24}W	12		2,8,2
^{28}X	14	14	
^{34}Y		18	2,8,6
^{37}Z	17	20	

(a) Complete Table 5.1. [4]

(b) Choose letters from Table 5.1 to complete the statements below.

Each letter may be used once, more than once or not at all.

(i) The element that is a metal is ..... . [1]

(ii) The element that forms an ion with a –1 charge is ..... . [1]

(iii) The element that forms a covalent bond when one atom of the element combines with two atoms of fluorine is ..... . [1]

6 Methane and ethane are the first two members of a homologous series.

(a) (i) State the name of the homologous series to which they belong.

.....[1]

(ii) State the general formula of this homologous series.

.....[1]

(iii) State how the melting point of this homologous series changes as the relative molecular mass increases.

.....[1]

(b) Methane burns in excess oxygen to release energy.

(i) State the name given to reactions that release energy.

.....[1]

(ii) Name the products of the reaction when methane burns in excess oxygen.

..... and ..... [2]

[Turn over

7 Vernier calipers are used to measure lengths.

Calipers are used to measure the external diameter of the boiling tube as shown in Fig. 7.1.

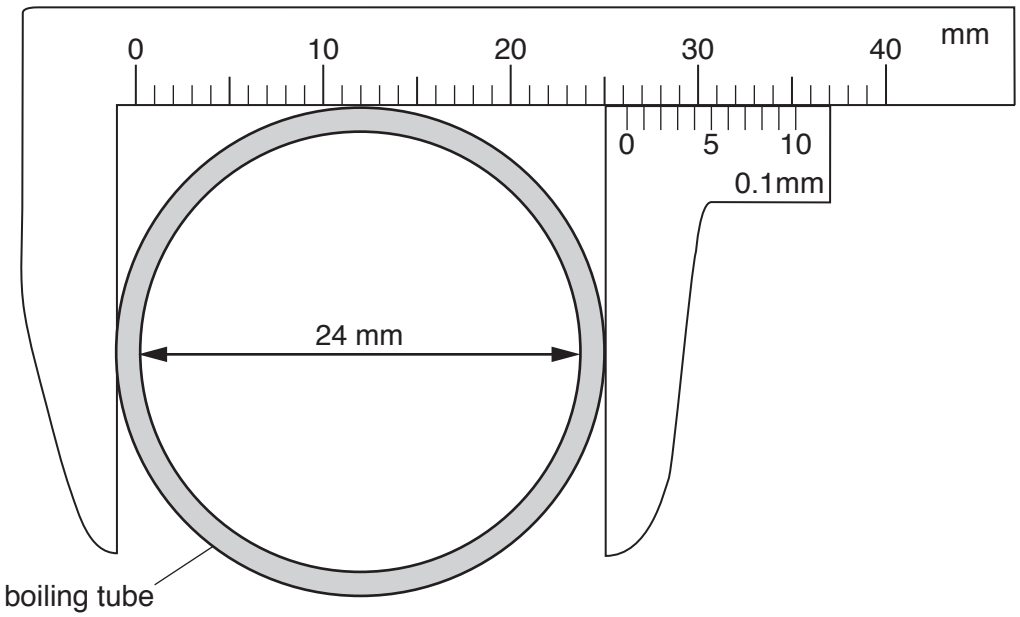


Fig. 7.1

(a) The glass boiling tube has an internal diameter of 24 mm.

(i) Determine the external diameter *d* of the boiling tube.

d = ...mm [1]

(ii) Calculate the thickness *t* of the glass wall of the boiling tube.

t = ...mm [2]

(b) A measuring cylinder contains water as shown in Fig. 7.2. The boiling tube is then placed in the measuring cylinder as shown in Fig. 7.3.

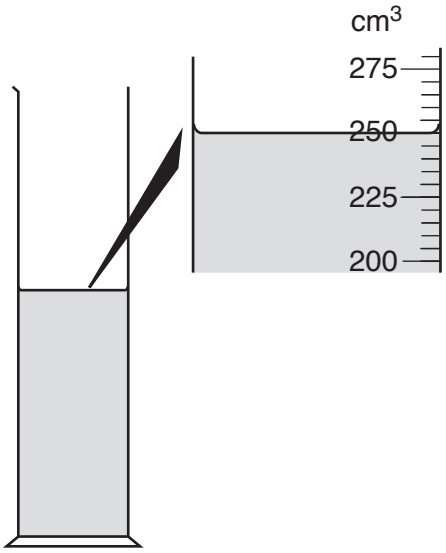


Fig. 7.2

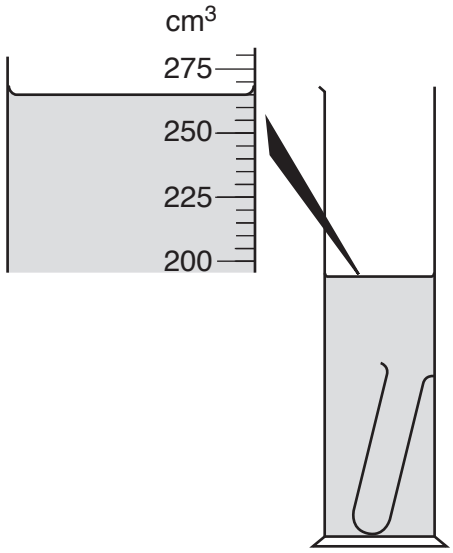


Fig. 7.3

(i) Determine the volume V of glass used to make the boiling tube.

V = ... cm^3 [1]

(ii) The mass of the boiling tube is 33.5 g.

Calculate the density D of the glass used to make the boiling tube.

D = ... g/cm^3 [2]

[Turn over

8 **(a)** All cells in the body carry out aerobic respiration.

Write the word equation for aerobic respiration.

..... + ... ⟶ ..... + ... [2]

(b) Respiration releases energy.

Fig. 8.1 shows the daily average energy requirements of different age groups of males and females.

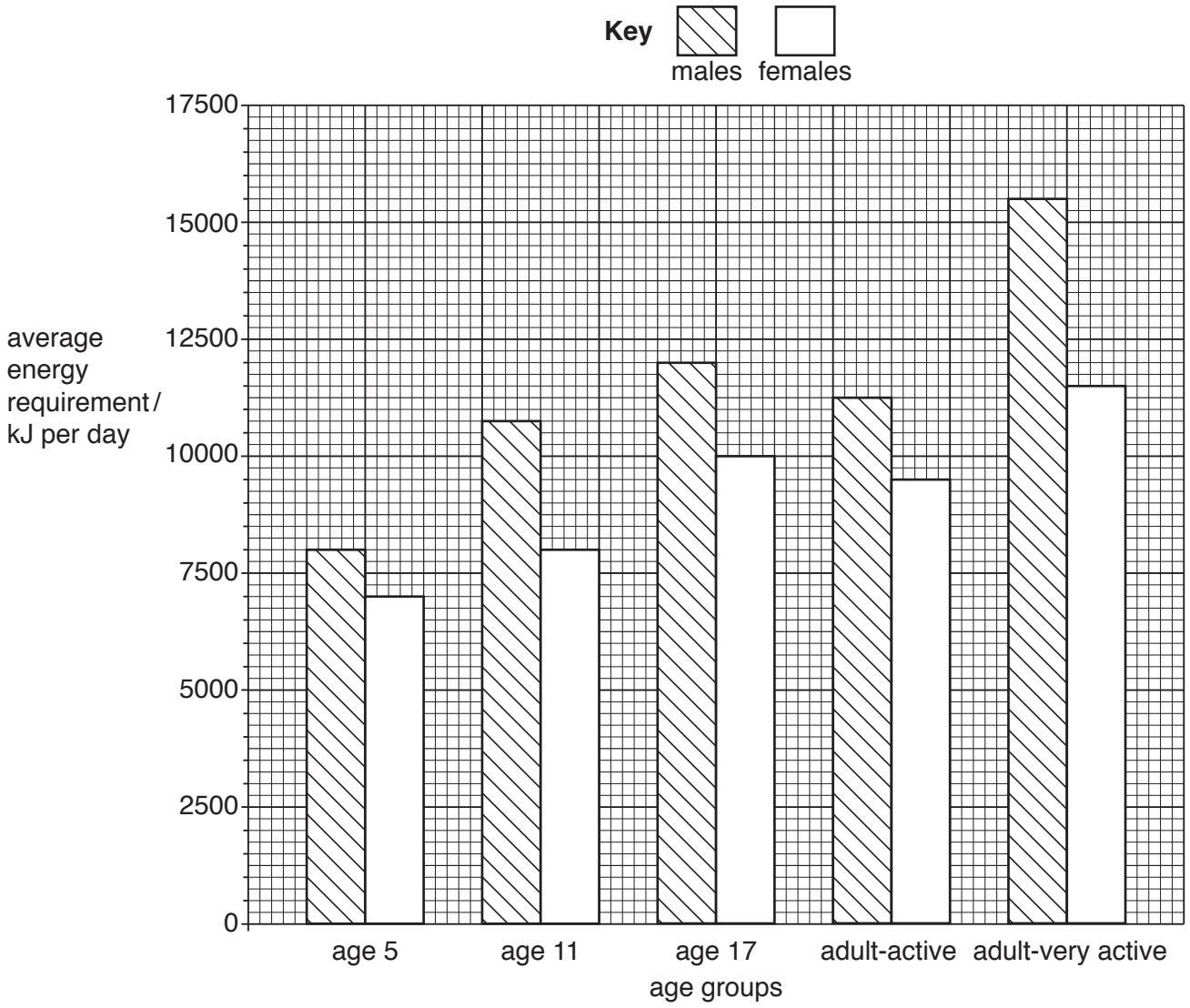


Fig. 8.1

(i) State the average energy requirement of a 5 year old female.

..... kJ per day [1]

(ii) Identify the type of person who has an average daily energy requirement of 12 000 kJ per day.

.....[1]

(iii) Calculate the difference between the daily energy requirements of an 11 year old female and a 17 year old female.

..... kJ per day [1]

(iv) State **two** conclusions that can be drawn from the information given in Fig. 8.1.

1 .....

.....

2 .....

.....

[2]

9 The inside of an electrical plug is shown in Fig. 9.1.

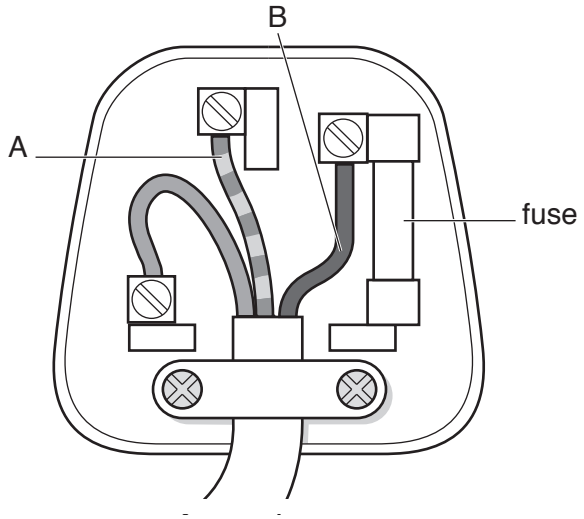


Fig. 9.1

(a) State the name of lead A.

.....[1]

(b) B is the live lead.

Explain the function of the live lead.

.....

.....[2]

(c) **(i)** When plugged into a socket, the plug supplies mains electricity at 230 V to a hairdryer.

The power produced in the hairdryer is 700 W.

Calculate the current I in the fuse.

I = ... A [2]

(ii) Draw a circle around the value of a suitable fuse rating for the fuse in **(c)(i)**.

3 A **5 A** **3 V** **5 V** **3 Ω** **5 Ω**

[1]

10 State **three** problems caused by the excessive consumption of alcohol over a period of several years.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

11 Iron is extracted from iron ore in a blast furnace.

(a) State the name of an ore of iron. ..... [1]

(b) Iron ore, limestone (calcium carbonate) and carbon are added at the top of the blast furnace and hot air is passed in at the bottom.

Complete the sentences about the reactions that take place in the blast furnace.

At the bottom of the blast furnace the carbon is ..... to form

carbon dioxide.

Carbon dioxide reacts with more carbon to form a gas called ..... .

This gas ..... the iron ore to iron.

The calcium carbonate decomposes to form calcium oxide, which reacts with the

..... impurities in the ore to form ..... .

[5]

[Turn over

12 Fig. 12.1 shows a plane mirror **A**, a lens **B** and a glass block **C**.

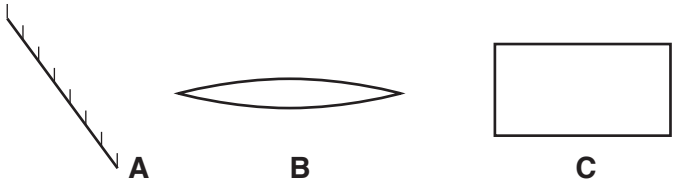
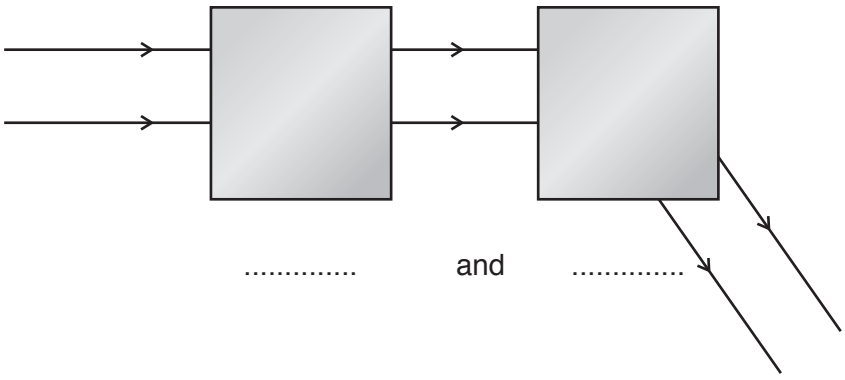


Fig. 12.1

Some of the objects in Fig. 12.1 are placed in the path of parallel rays of light.

The objects are hidden behind screens. Each screen covers one object only.

State the letters of the hidden objects **A**, **B** or **C**, that give rise to the ray diagrams shown in Fig. 12.2.



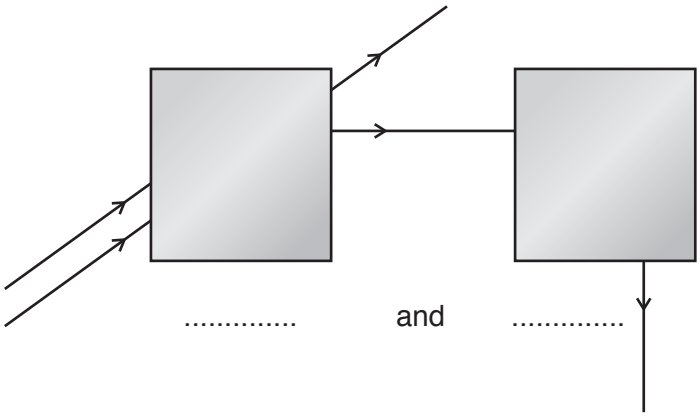


Fig. 12.2

[4]

13 Fig. 13.1 shows a section through the heart.

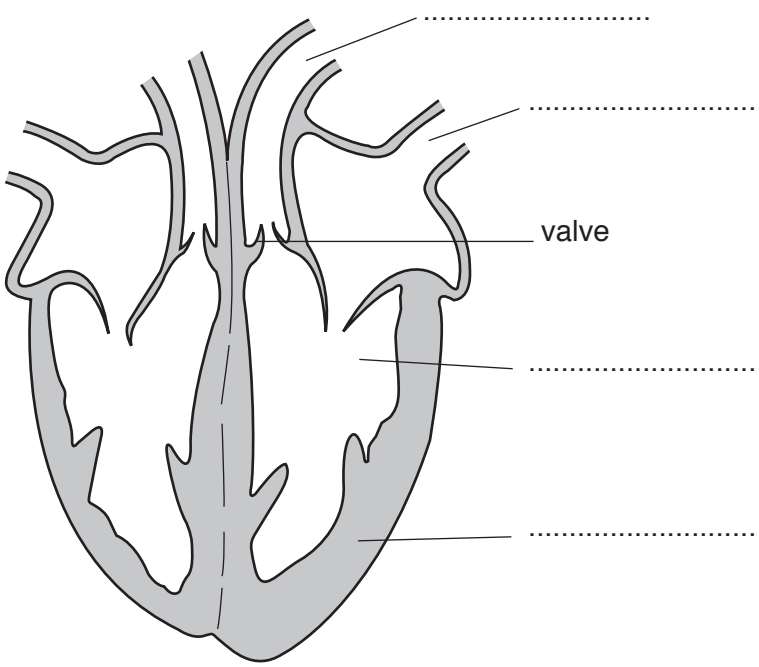


Fig. 13.1

(a) Complete the labels on Fig. 13.1 by using words from the following list.

aorta **atrium** **capillary** **muscular wall**

pulmonary artery **pulmonary vein** **vena cava** **ventricle**

[4]

(b) Describe and explain what happens to the valve labelled in Fig. 13.1 when the heart muscle relaxes.

.....

.....

.....

.....[2]

[Turn over

14 Hydrogen and chlorine react together to form hydrogen chloride, a covalent compound.

(a) Complete Fig. 14.1 to show the outer electrons in a molecule of hydrogen chloride.

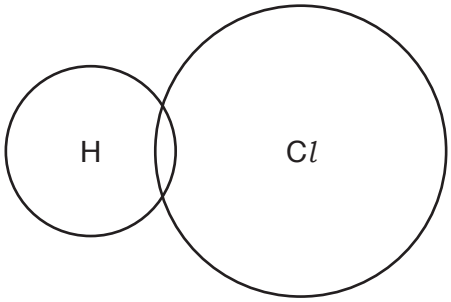


Fig. 14.1

[2]

(b) Hydrogen chloride dissolves in water to produce hydrochloric acid.

Hydrochloric acid reacts with copper oxide.

Complete the equation for this reaction.

$$CuO + \text{.....} HCl \longrightarrow \text{.....} + H_2O$$

[1]

(c) Explain why hydrochloric acid does not react with copper metal.

.....

.....[1]

Question 15 begins over the page.

15 A stopwatch measures the time taken by a piece of modelling clay to fall through oil as shown in Fig. 15.1.

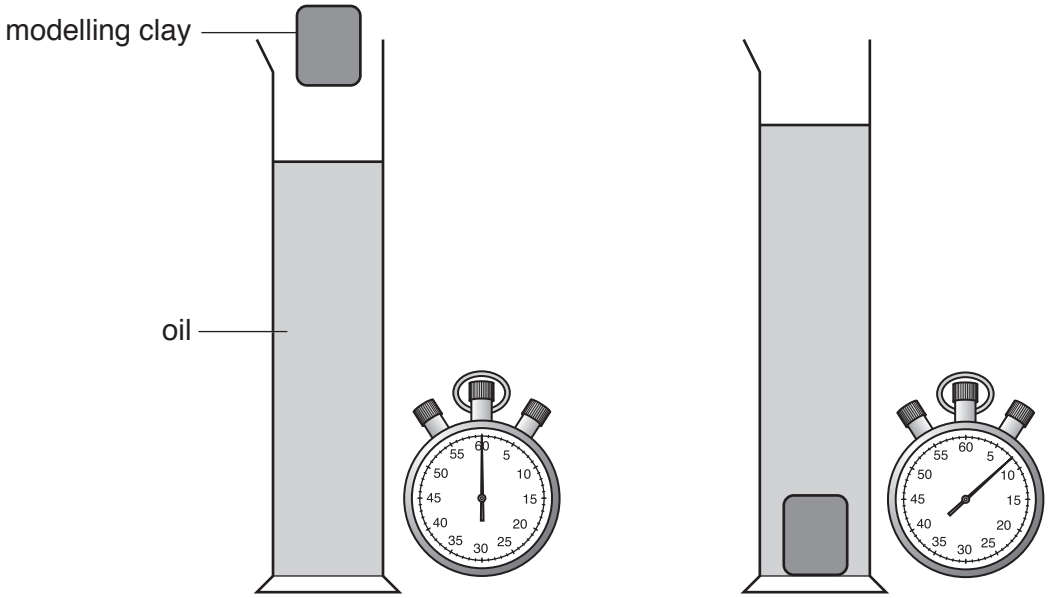


Fig. 15.1

(a) The experiment is repeated using the same oil at a higher temperature.

State a physical property of oil that varies with temperature.

.....[1]

(b) The freezing point of the oil is –11 °C.

As the temperature increases, the time taken for the modelling clay to fall through oil decreases.

On Fig. 15.2, sketch a graph to show the relationship between the temperature of the oil and the time taken for the clay to fall through the oil.

Label the axes on the graph.

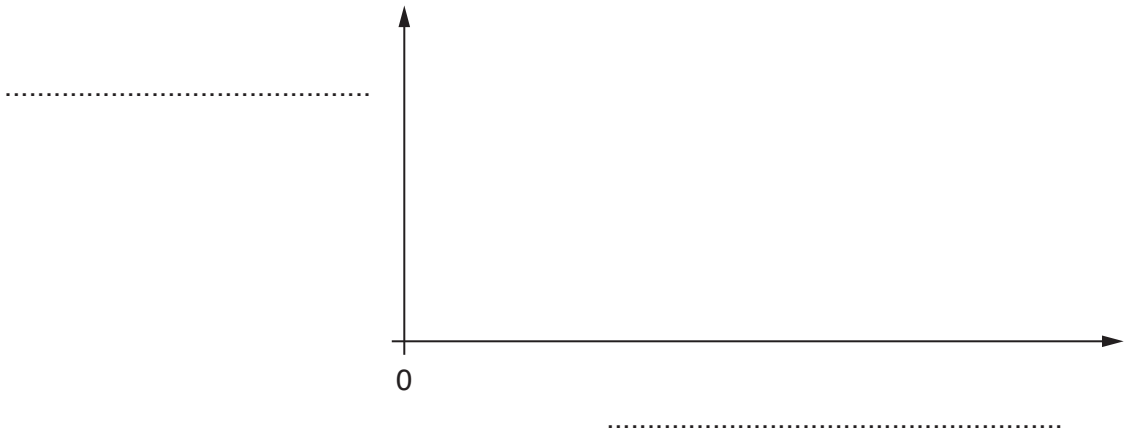


Fig. 15.2

[3]

(c) In one experiment, modelling clay of weight 0.6 N falls a distance of 0.4 m through the oil in a time of 8.0 s.

Calculate the work done by gravity *W* as the modelling clay falls this distance.

W = ... J [2]

16 Fig. 16.1 shows a healthy plant and the same plant a few days later. The plant has wilted.

healthy plant wilted plant

Fig. 16.1

(a) Suggest **one** environmental cause of this wilting.

.....[1]

(b) Describe the process of wilting.

.....

.....

.....

.....[2]

17 Fig. 17.1 shows representations of elements, compounds and mixtures.

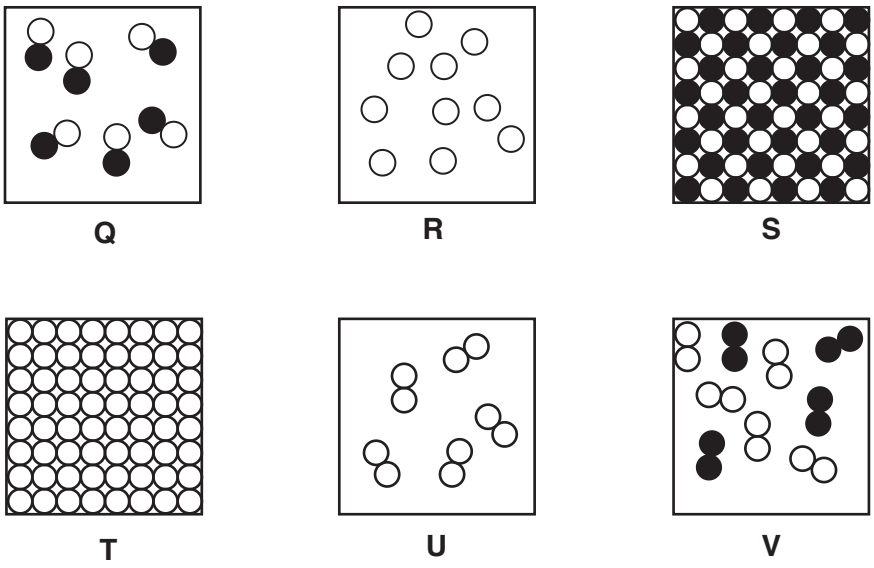


Fig. 17.1

State the letter that represents

an element in Group VII of the Periodic Table, ...

an ionic compound, ...

a metallic element, ...

a mixture of two elements. ..... [4]

18 An electric field exerts a force of 4.7×10^{-14} N on a stationary alpha-particle.

The alpha-particle accelerates with an initial acceleration of 7.08×10^{12} m/s^2.

(a) Calculate the mass m of the alpha-particle.

m = ... kg [2]

(b) **(i)** An alpha-particle has a positive charge of 3.2×10^{-19} C.

Calculate the charge on one proton.

charge = ... C [1]

(ii) Determine the charge on a beta-particle.

charge = ... C [1]

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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.).