Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2996962047 4

CO-ORDINATED SCIENCES **0654/33**

Paper 3 (Core) **October/November 2018**

2 hours

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 or graphs.
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 28.

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.

This document consists of **27** printed pages and **1** blank page.

CAMBRIDGE International Examinations

1 Fig. 1.1 shows a forest food web.

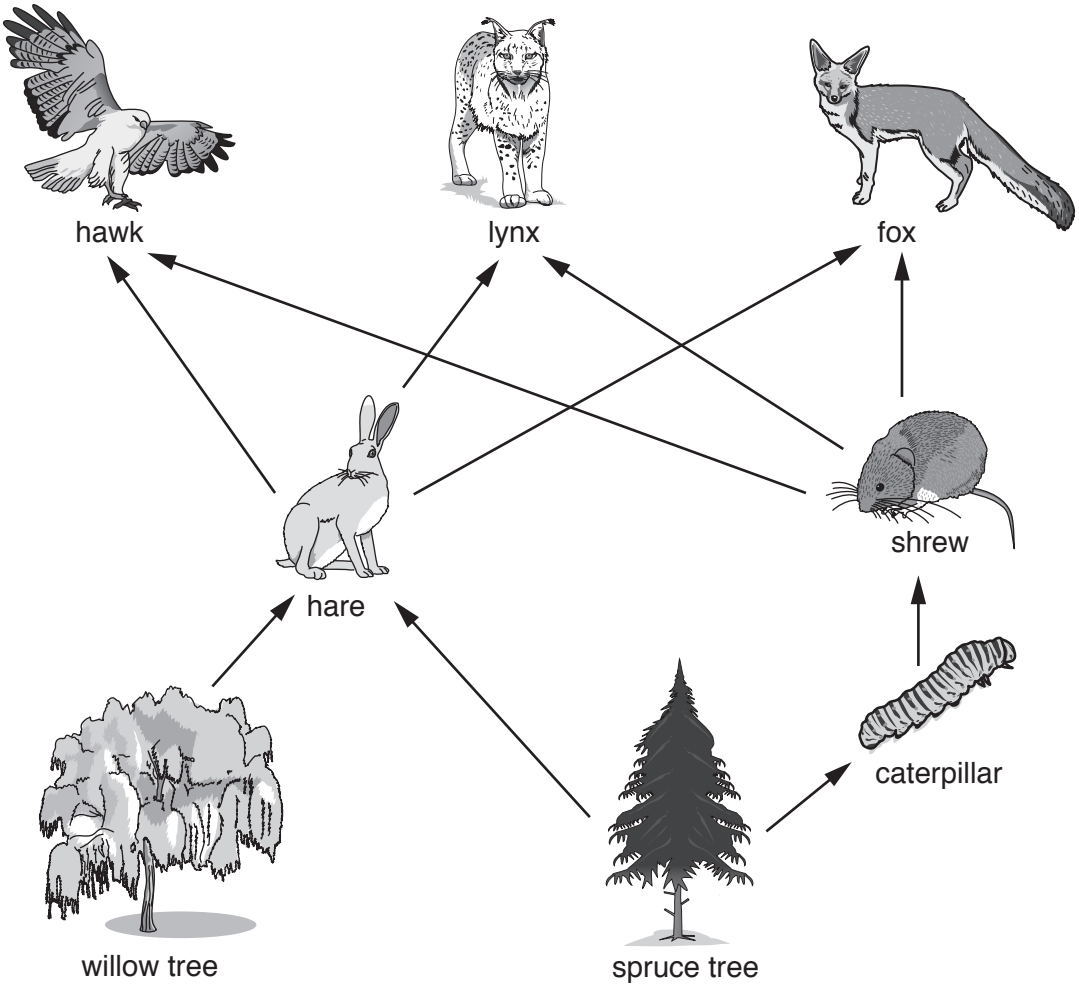

Fig. 1.1

(a) Use Fig. 1.1 to name one:

(i) producer

.....[1]

(ii) herbivore.

.....[1]

(b) A disease is introduced that kills all the foxes.

Suggest **and** explain how this affects the population of:

(i) hares

.....

.....[1]

(ii) lynx.

.....

.....

.....

.....[2]

(c) Trees are removed from the forest.

Explain why this causes animal populations in the forest to decrease.

.....

.....

.....

.....

.....[2]

2 Table 2.1 shows information about some of the elements in Group VII of the Periodic Table.

Table 2.1

element	symbol	atomic number	physical state at 20 °C
chlorine	C*l*	17	
bromine	Br	35	
iodine	I	53	

(a) (i) Complete Table 2.1 to show the physical state of each element at 20 °C.

Use only the words **solid**, **liquid** or **gas**. [2]

(ii) The atomic number of chlorine is 17.

Explain what is meant by this statement.

.....

.....[1]

(iii) Predict the number of electrons in an atom of bromine.

Explain how you used the information in Table 2.1 to make your prediction.

number of electrons .....

explanation .....

.....

[1]

(b) Sodium chloride contains sodium ions strongly attracted to chloride ions.

(i) State why sodium ions and chloride ions attract one another.

.....

.....[1]

(ii) Describe, in terms of electrons, how a sodium atom changes when it reacts with chlorine.

.....[1]

(c) The bottle in Fig. 2.1 contains sand and a solution of sodium chloride.

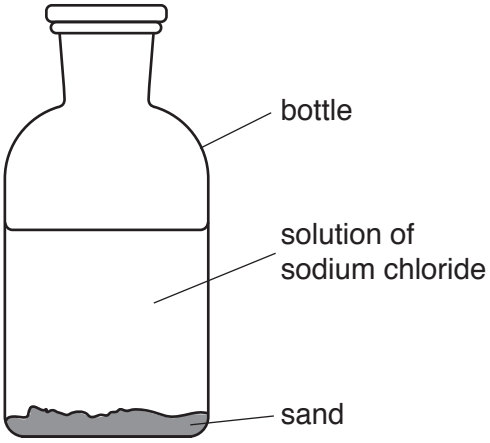

Fig. 2.1

(i) State the method used to separate the solution of sodium chloride from the sand.

.....[1]

(ii) Describe how **solid** sodium chloride can be obtained from the solution of sodium chloride.

.....

.....

.....[2]

(d) Describe what is seen when an acidified solution of silver nitrate is added to a solution of sodium chloride.

Explain your answer.

what is seen .....

explanation .....

.....
[2]

3 **(a)** An electric kettle, an electric fan and a torch (flashlight) all transform electrical energy into other forms of energy. Fig. 3.1 shows a kettle, a fan and a torch.

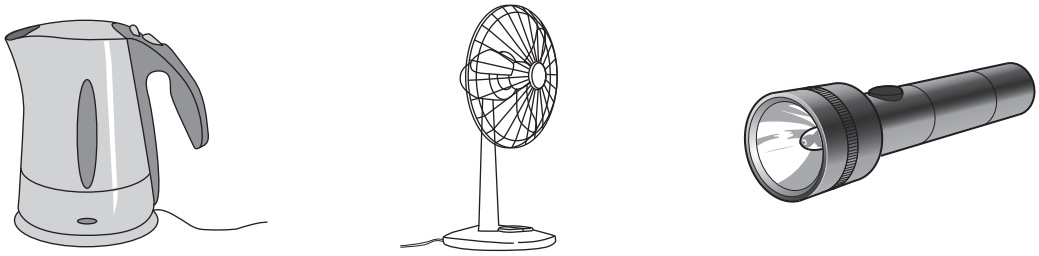

Fig. 3.1

Draw **one** line from each device to the most useful form of energy that it produces.

device	**most useful energy produced**
fan	chemical
kettle	kinetic
torch	light
	thermal

[3]

(b) A torch contains two cells, a lamp and a switch connected in series.

Draw a circuit diagram for the torch using electrical circuit symbols.

[2]

(c) The current in the lamp is 0.6 A when the potential difference across it is 3.0 V.

Calculate the resistance of the lamp.

State the formula you use and show your working.

formula

working

resistance = ... Ω [2]

(d) Fig. 3.2 shows a single ray from the torch shining on a mirror.

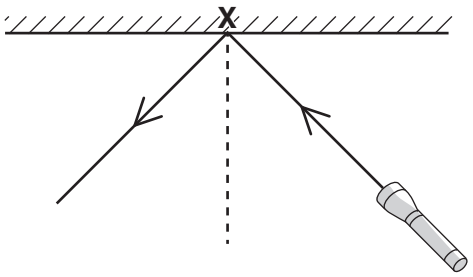

Fig. 3.2

(i) Name the effect that occurs at point **X**.

.....[1]

(ii) On Fig. 3.2, label the angle of incidence with the letter ***i***. [1]

(e) Torches sometimes use rechargeable cells. Solar energy can be used to recharge these cells. Solar energy is a renewable energy source.

(i) State **one other** renewable energy source.

.....[1]

(ii) State **one** non-renewable energy source.

.....[1]

4 **(a)** State the term used to describe the loss of water from a leaf by evaporation.

.....[1]

(b) Two similar leaves are removed from the same plant.

- Leaf **A** is kept in an environment of high humidity.
- Leaf **B** is kept in an environment of low humidity.
- All other variables are kept the same.

The mass of each leaf is measured each hour for six hours.

Table 4.1 shows the results.

Table 4.1

time / hours	mass of leaf **A** / g	mass of leaf **B** / g
0	0.90	0.90
1	0.90	0.86
2	0.90	0.83
3	0.87	0.80
4	0.87	0.78
5	0.85	0.78
6	0.85	0.75

(i) Calculate the difference in mass between leaf **A** and leaf **B** at six hours.

.....[1]

(ii) Explain the difference in mass between leaf **A** and leaf **B** at six hours.

.....

.....

.....

.....[2]

(c) Describe how plants obtain water.

.....

.....

.....[2]

(d) (i) Draw a circle around **two** substances transported by xylem in plants.

blood **carbon dioxide** **glucose** **methane**

mineral ions **oxygen** **urea** **water**

[2]

(ii) State **one other** function of xylem apart from transport.

.....[1]

5 **(a)** Calcium, copper, iron and potassium are metallic elements in the fourth period of the Periodic Table.

(i) List these four metals in order of reactivity.

..... most reactive

.....

.....

..... least reactive [1]

(ii) State which of these metals are transition elements.

.....[1]

(b) A student investigates the reaction between calcium and water.

Fig. 5.1a shows the calcium reacting with water.

Fig. 5.1b shows the test-tube after the reaction has finished.

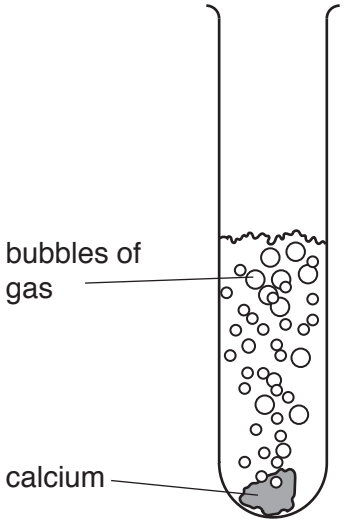

Fig. 5.1a

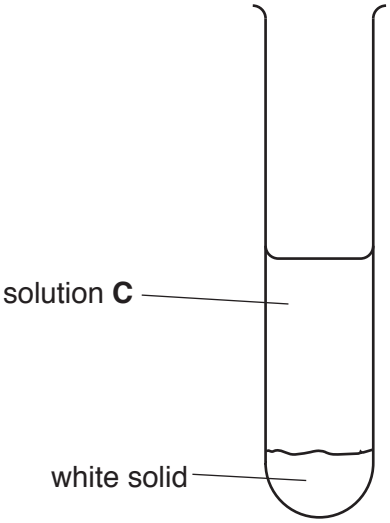

Fig. 5.1b

(i) Identify the gas released during the reaction.

.....[1]

(ii) Suggest a value for the pH of solution **C**.

Explain your answer.

pH .....

explanation .....

.....

[2]

(iii) The student tests an acidic solution and an alkaline solution using full-range indicator, to compare with solution **C**.

Describe the colour of the acidic solution and the alkaline solution when tested with full-range indicator.

colour of acidic solution .....

colour of alkaline solution .....

[2]

(iv) The reaction between calcium and water is exothermic.

Describe what is meant by the term *exothermic*.

.....

.....[1]

(c) Water must be present for iron to rust.

(i) State what else must be present for iron to rust.

.....[1]

(ii) Describe **one** method to prevent an iron object from rusting.

Explain your answer.

method .....

explanation .....

.....

[2]

[Turn over

6 **(a)** Table 6.1 shows the audible frequency range of four animals.

Table 6.1

animal	lowest frequency / Hz	highest frequency / Hz
bat	2000	110 000
dog	50	50 000
elephant	5	12 000
mouse	1000	100 000

(i) State the meaning of the term *audible frequency range*.

.....

.....

.....[1]

(ii) State the audible frequency range for a human.

lowest frequency .....Hz

highest frequency .....Hz

[2]

(iii) State which animal in Table 6.1 can hear a sound with the highest pitch.

.....[1]

(iv) State which animal in Table 6.1 has the smallest audible frequency range.

.....[1]

(b) An elephant communicates with other elephants using infrasound. This is a very low frequency sound wave.

An infrasound wave takes 2.9 seconds to travel 1.0 km from one elephant to another.

Calculate the speed of infrasound waves in m / s.

State the formula you use and show your working.

formula

working

speed = ... m / s [2]

(c) The mass of an elephant is 3000 kg. The volume of the elephant is 2.9 m^3.

Calculate the average density of the elephant.

State the formula you use, show your working and give the unit of your answer.

formula

working

density = ... unit ..... [3]

7 Fig. 7.1 shows a diagram of the female reproductive system.

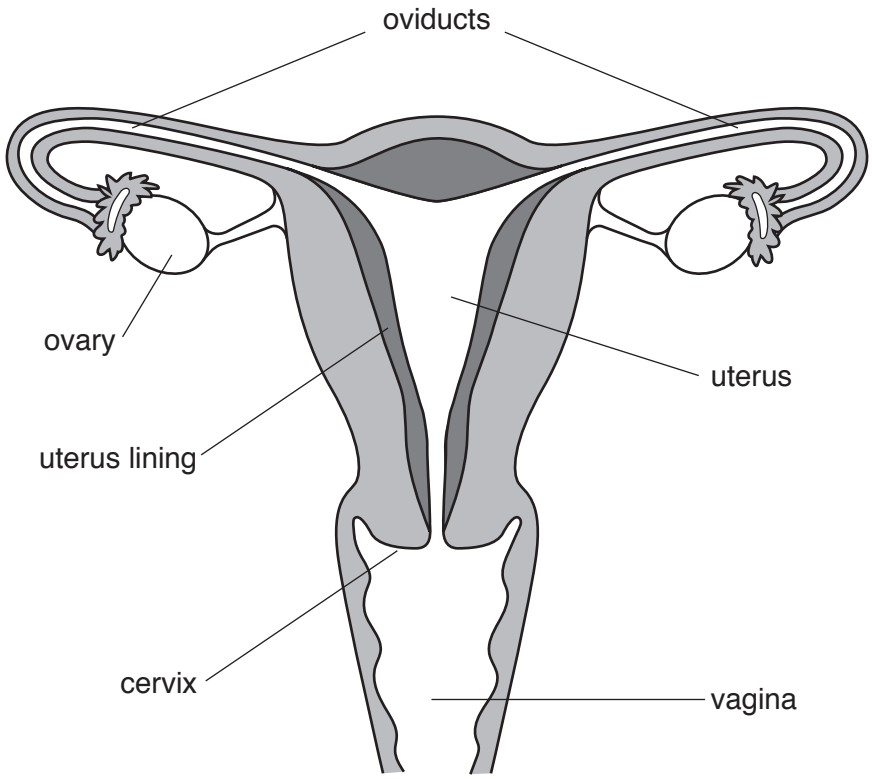

Fig. 7.1

(a) Mark an **X** on Fig. 7.1 to show where an egg is released. [1]

(b) The boxes on the left show parts of the female reproductive system.

The boxes on the right show functions of the parts of the reproductive system.

Draw four lines to link each part of the female reproductive system with its function.

part	function
cervix	keeps baby in place during pregnancy
oviduct	penis placed here during intercourse
uterus	where fertilisation occurs
vagina	where growing baby develops

[3]

(c) The menstrual cycle lasts for approximately 28 days.

Describe the main changes to the uterus lining during the menstrual cycle.

days 0–5

.....

.....

days 5–18

.....

.....

days 18–28

.....

.....

[3]

(d) When an egg is fertilised, it becomes a zygote.

Describe, in detail, the early development of the zygote immediately after fertilisation.

.....

.....

.....

.....[3]

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8 **(a)** Some volcanoes release the element sulfur.

The sulfur sometimes catches fire, which is dangerous for people who collect the sulfur.

(i) Name the element that combines with sulfur when it burns.

.....[1]

(ii) Name the gas that is formed when sulfur burns.

.....[1]

(iii) Suggest **one** harmful effect on health of the gas named in **(a)(ii)**.

.....

.....[1]

(b) Copper sulfate, $CuSO_4$, and hydrogen sulfide, H_2S, are compounds containing sulfur.

(i) Copper sulfate also contains a transition element.

State **two** general properties of compounds containing transition elements.

1 .....

2 .....
[2]

(ii) Predict the type of chemical bonding in hydrogen sulfide.

Explain your answer.

bonding .....

explanation .....

.....
[2]

(iii) Iron sulfide is formed when a mixture of iron and sulfur is heated.

Describe **one** way a student can show that a mixture of iron and sulfur is different from the compound iron sulfide.

.....

.....

.....[1]

9 **(a)** Aluminium can be easily shaped into containers to store food.

Describe one other property that makes aluminium suitable for making food containers.

.....

.....[1]

(b) The frames of bicycles are also made from aluminium.

The air in the tyres of a bicycle warms up during a journey.

(i) Describe what happens to the air molecules in the tyres as the air warms up.

.....

.....[1]

(ii) Explain, in terms of molecules, why the pressure exerted on the walls of the tyre increases as the tyre warms up.

.....

.....

.....[2]

(c) A cyclist has a mirror on his bicycle so that he can see behind him.

He sees a bus in his mirror. This is shown in Fig. 9.1.

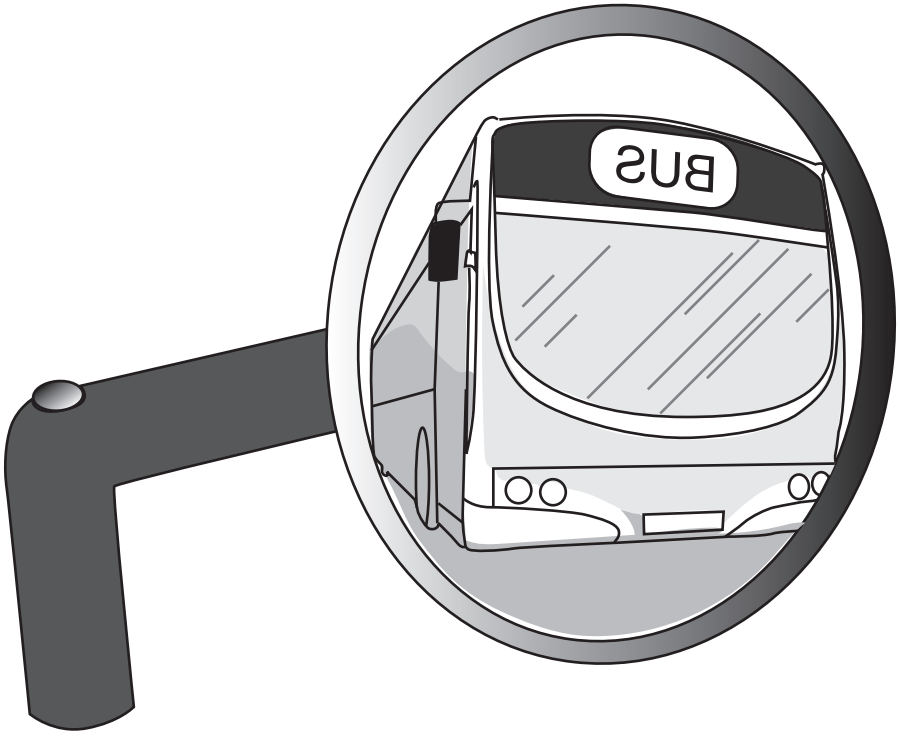


Fig. 9.1

The mirror in Fig. 9.1 is a plane mirror.
Select **three** words or phrases from the list to describe the image that he sees.

inverted **laterally inverted** **magnified**

same size **smaller** **upright**

1 .....

2 .....

3 ..... [2]

(d) The bicycle is left outside on a sunny day. Energy from the Sun heats the black saddle on the bicycle.

(i) State the method of energy transfer between the Sun and the Earth.

.....[1]

(ii) Name the part of the electromagnetic spectrum involved in thermal energy transfer from the Sun to the Earth.

.....[1]

(iii) Fig. 9.2 shows an incomplete electromagnetic spectrum.

On Fig. 9.2, write your answer to **(d)(ii)** in the correct place.

γ-rays			visible light		microwaves	

Fig. 9.2

[1]

(iv) γ-rays are part of the electromagnetic spectrum, but beta particles are not.

State **two other** differences between beta particles and γ-rays.

1 .....

2 .....
[2]

10 Albinism is an inherited condition where there is no pigment in the skin and hair. The skin is very pale and the hair is white.

(a) Use words from the list to complete the definition of the term *inheritance*.

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

diploid **father** **generation** **genetic**

mother **parent** **physical**

Inheritance is defined as the transmission of ..... information from

..... to generation. [2]

(b) Fig. 10.1 is a photograph which shows a person with albinism.

Fig. 10.1

- The allele for albinism is **a**.
- The allele for no albinism is **A**.

One allele is inherited from the mother and one from the father.

(i) State the genotype for the person in Fig. 10.1.

.....[1]

(ii) State the term that can be used to describe the genotype **Aa**.

.....[1]

(c) In a population, there is a greater number of people without albinism than with albinism.

Explain, in terms of genetics, why there are fewer people with albinism than without albinism.

.....

.....

.....[2]

11 Alkanes and alkenes are types of hydrocarbons.

Alkanes are obtained from petroleum.

Some alkanes are converted into alkenes.

(a) Ethene is an alkene.

(i) Complete the diagram in Fig. 11.1 to show the structure of a molecule of ethene.

Fig. 11.1

[2]

(ii) Name the process used to produce alkenes from alkanes.

.....[1]

(b) A student uses the apparatus shown in Fig. 11.2 to test a gas for the presence of unsaturated hydrocarbons.

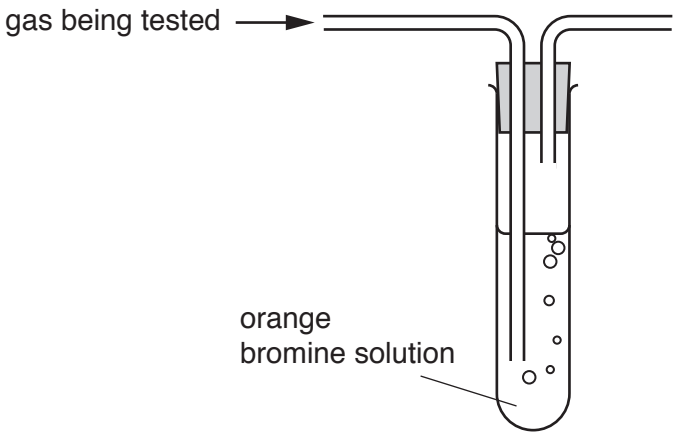


Fig. 11.2

He obtains a positive result for the presence of unsaturated hydrocarbons.

(i) State the observation that shows the presence of unsaturated hydrocarbons.

.....

.....[1]

(ii) The student thinks that the positive result shows that the gas being tested is pure ethene.

Suggest **two** reasons why he may **not** be correct.

1 .....

.....

2 .....

.....
[2]

(c) Fig. 11.3 shows the structure of a molecule of ethanol.

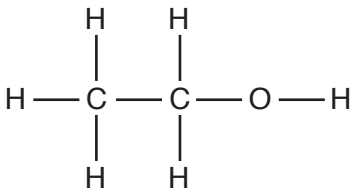


Fig. 11.3

(i) Explain why ethanol is **not** an alkane.

.....

.....[1]

(ii) State **one** use of ethanol.

.....[1]

(d) Fig. 11.4 shows apparatus a student uses to investigate the combustion of ethanol.

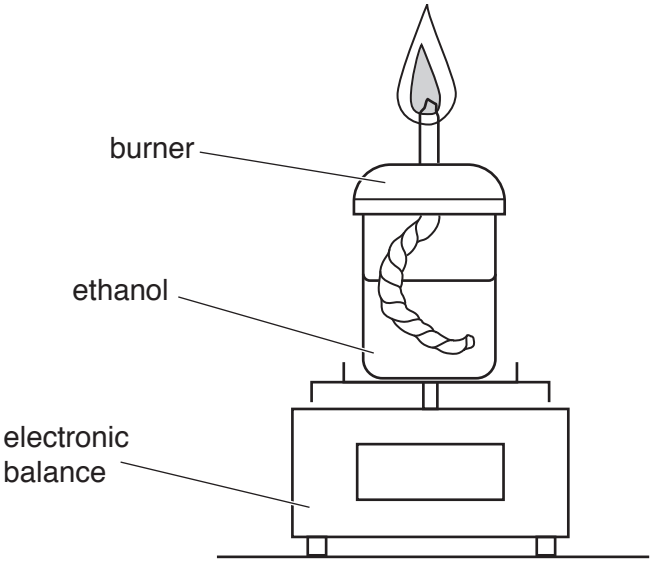


Fig. 11.4

Predict the change, if any, in the reading of the electronic balance as the ethanol burns.

Explain your prediction.

prediction .....

explanation .....

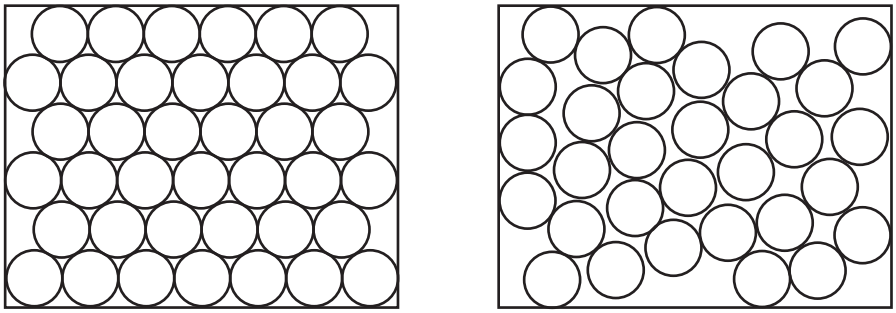
.....

.....

[2]

12 (a) Some ice has been made by freezing water.

(i) Fig. 12.1 shows the arrangement of the molecules in a solid and in a liquid.



A **B**

Fig. 12.1

Complete the statements below.

Diagram **A** shows a solid because the molecules are

1 .....

2 ..... .

Diagram **B** shows a liquid because the molecules are

1 .....

2 ..... .

[2]

(ii) Choose words or numbers from the list to complete the sentences which describe the formation of ice from water.

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

boiling **condensation** **melting** **solidification** **0** **100**

When water turns to ice, ... occurs.

This change happens at .....°C which is the ..... point of ice.

[2]

(b) Fig. 12.2 shows a refrigerator with a freezing compartment at the top.

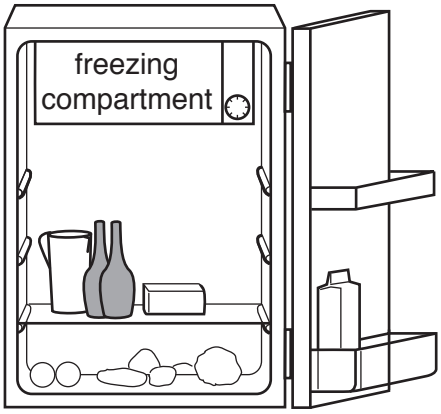


Fig. 12.2

The freezing compartment at the top cools all the air in the refrigerator.

State the main method of heat transfer used in this process.

.....[1]

(c) The refrigerator contains two lamps connected in series.

Lamp **A** has a resistance of 3000 Ω and lamp **B** has a resistance of 6000 Ω.

Calculate the combined resistance of the two lamps in series.

Show your working.

resistance = ... Ω [1]

(d) In another refrigerator, the 3000 Ω lamp and the 6000 Ω lamp are connected in parallel.

(i) Put a circle around the most likely value of the combined resistance of the lamps in this parallel circuit.

2000 Ω **3000 Ω** **4500 Ω** **6000 Ω** **9000 Ω** [1]

(ii) Give a reason for your choice in **(d)(i)**.

.....

.....[1]

13 Fig. 13.1 shows a cross-section through an artery and a vein.

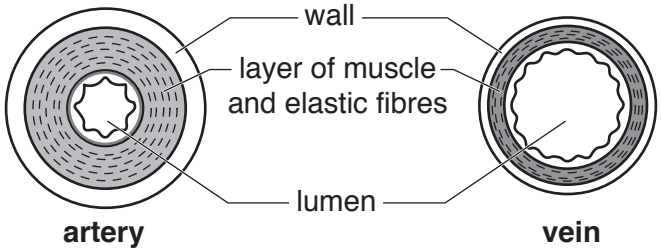


Fig. 13.1

(a) (i) Describe how the structure of the artery differs from the structure of the vein, as shown in Fig. 13.1.

.....

.....

.....

.....[3]

(ii) State **one** structure that is normally found in veins but is **not** shown in Fig. 13.1.

.....[1]

(b) Describe how oxygen is carried in the blood.

.....

.....

.....[2]

(c) State the names of the **two** veins that carry blood to the heart.

1 .....

2 .....
[2]

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.).