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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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COMBINED SCIENCE **5129/02**

Paper 2 **May/June 2011**

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 a soft pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
A copy of the Periodic Table is printed on page 20.

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.

For Examiner's Use

This document consists of **20** printed pages.

UNIVERSITY of CAMBRIDGE International Examinations

[Turn over

1 Fig. 1.1 shows a mains plug.

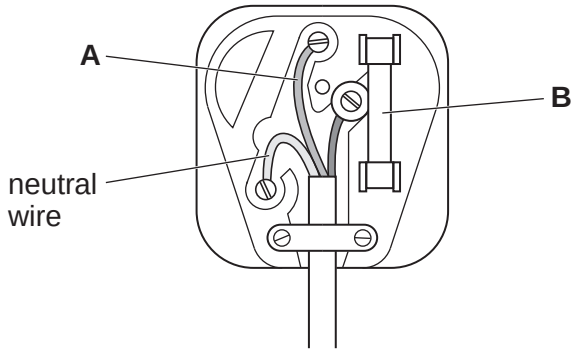

Fig. 1.1

(a) Name

(i) the wire labelled **A**, ...[1]

(ii) the component labelled **B**. .....[1]

(b) State the colour of the neutral wire. .....[1]

2 Fig. 2.1 shows a root hair cell.

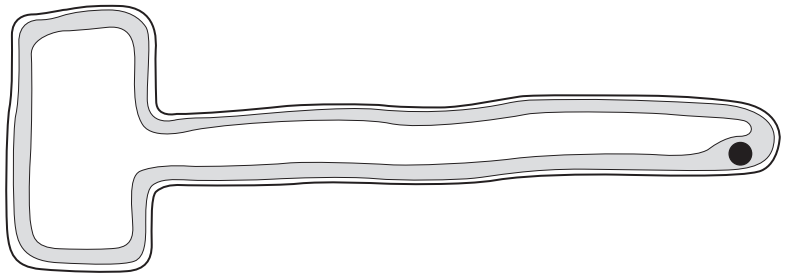

Fig. 2.1

(a) Name **two** substances that are absorbed by root hair cells from the soil.

1. .....

2. .....
[2]

(b) Explain how the structure of a root hair cell helps it to absorb these substances efficiently. Make reference to

(i) the shape of the cell,

.....

.....

(ii) the cell wall.

.....

.....
[2]

(c) Which part of the cell controls the movement of substances in and out of the cytoplasm?

.....[1]

3 **(a)** Fig. 3.1 shows the outline of part of the Periodic Table.

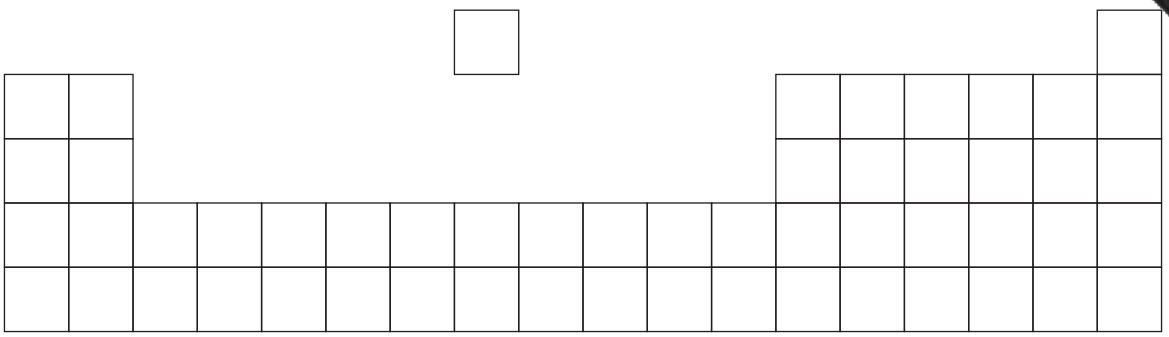

Fig. 3.1

The following statements describe some properties of four elements **W**, **X**, **Y** and **Z**.

The letters are not the chemical symbols of the elements.

- **W** is a halogen and is a gas. **W** displaces bromine from potassium bromide solution.
- **X** is a soft metal which has the lowest melting point in its group. It reacts violently with water producing an alkaline solution.
- An atom of **Y** contains 13 protons and has 3 electrons in its outermost shell.
- **Z** is a gaseous non metal. It forms the Z^{2-} ion, when it reacts with metal **X**.

Use the letters **W**, **X**, **Y** and **Z** to place each element in an appropriate position on Fig. 3.1. [4]

(b) Element **X** and element **W** form a compound **XW**.

Suggest the type of bonding present in compound **XW**.

..... [1]

4 **(a)** Nuclei of the isotope of plutonium $^{236}_{94}Pu$ emit alpha particles. The half-life of this is is 2.9 years. A sample of this plutonium emits 4,000 alpha particles per second.

Calculate how long it takes for the rate to fall to 1,000 alpha particles per second.

time = ... years [2]

(b) For a nucleus of $^{236}_{94}Pu$, what is the number of

(i) protons, ...[1]

(ii) neutrons? .....[1]

(c) State the nature of an alpha particle.

.....[1]

(d) When an alpha particle approaches the nucleus of any atom, it is repelled.
Explain why.

.....

.....[1]

5 **(a)** Magnesium oxide reacts with hydrochloric acid to produce magnesium chloride and water.

The equation for the reaction is

$$MgO + 2HCl \longrightarrow MgCl_2 + H_2O$$

The relative molecular mass, M_r, of magnesium chloride is 95.
[A_r: Mg, 24; O, 16; H, 1]

Complete the following sentences.

..... g of magnesium oxide produces 95 g of magnesium chloride and ..... g of water.

..... g of magnesium oxide produces 4.75 g of magnesium chloride. [3]

(b) Suggest the names of two other substances which react with hydrochloric acid to produce magnesium chloride.

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

6 Two groups of wheat seeds are treated in different ways.

Group A – soaked in water for 24 hours.

Group B – left unsoaked.

Each group of seeds is then scattered onto a different starch-agar plate, as shown in Fig. 6.1, and kept at 25 °C.

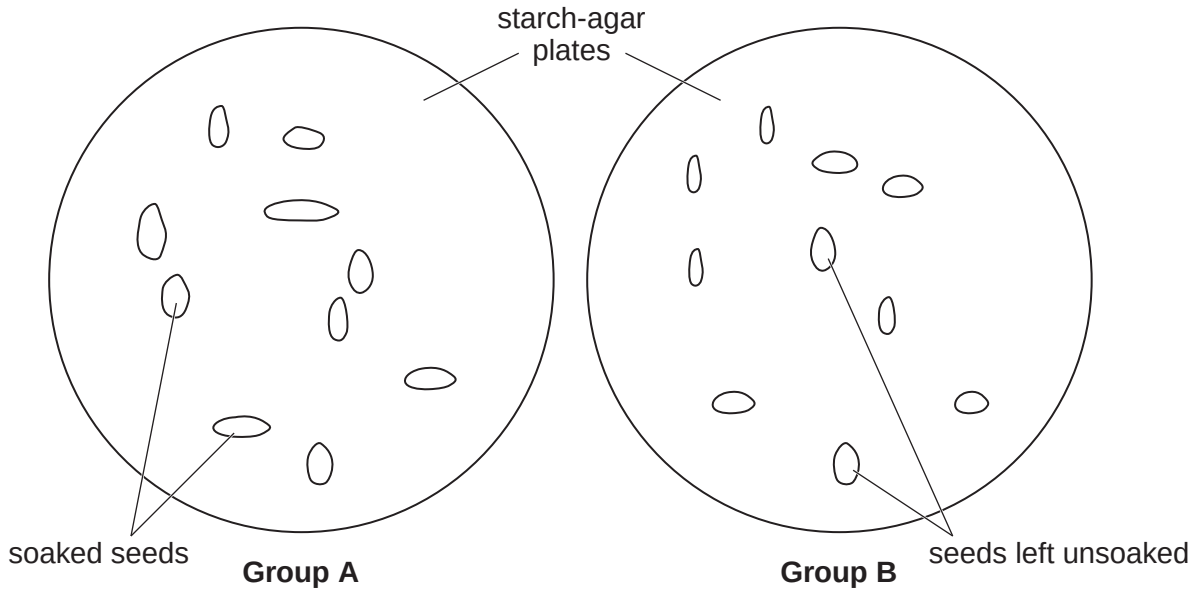

Fig. 6.1

After three days, the seeds are removed from each starch-agar plate and the plates are tested for starch by adding iodine solution.

Iodine solution is brown but turns blue-black in the presence of starch.

The results are shown in Fig. 6.2.

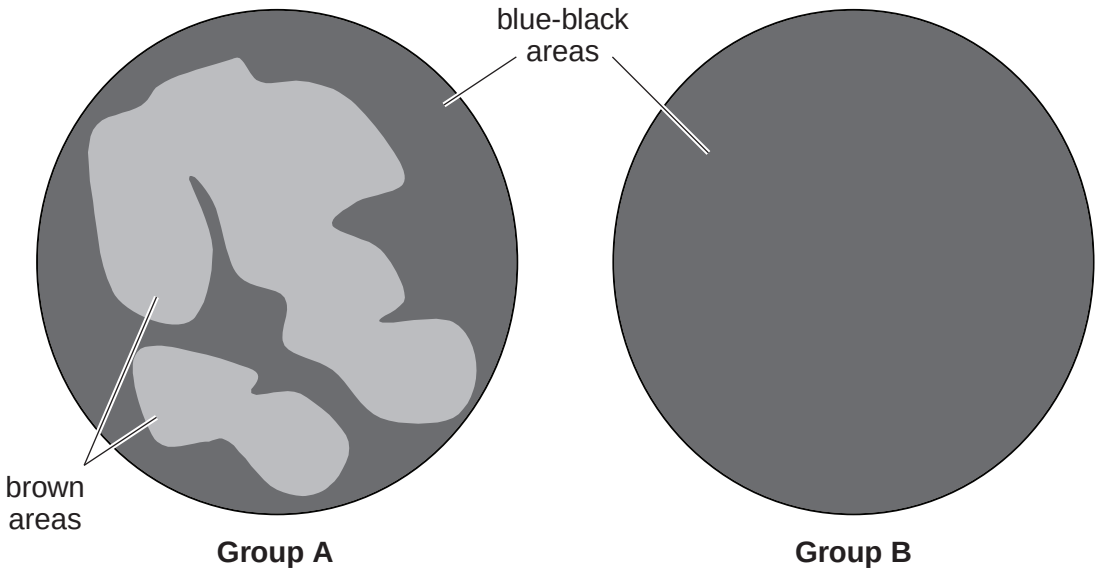

Fig. 6.2

(a) Describe the difference between the starch content of the plate for Group A a... plate for Group B at the end of the experiment.

.....

..... [2]

(b) Name the enzyme, produced by seeds, which causes the difference between the two plates.

..... [1]

(c) Explain the function of this enzyme in a germinating seed by stating

(i) what substance it produces,

..... [1]

(ii) why this substance is needed by the seed.

.....

..... [1]

7 Use the words from the list to complete the sentences below.

arteries	**glucose**	**heart**	**hormones**
plasma	**urea**	**valves**	**veins**

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

Blood is pumped round the circulatory system by the muscular contractions of the ..... .

The blood is kept flowing in the correct direction by ..... in the heart and in the ..... .

The circulatory system is a transport system, which carries soluble food substances such as ..... and waste products such as ..... .

[5]

8 Fig. 8.1 shows how the potential difference across a lamp varies with the current p... through it.

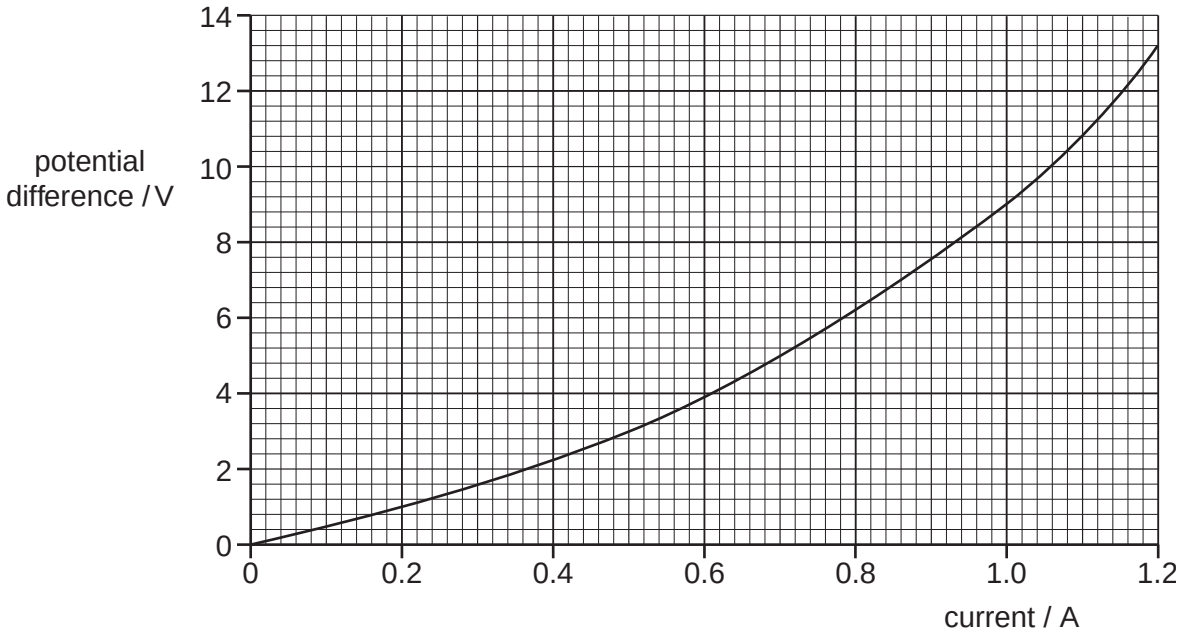

Fig. 8.1

(a) Use Fig. 8.1 to find

(i) the potential difference across the lamp for a current of 0.5 A,

potential difference = ... V

(ii) the current for a potential difference of 9 V.

current = ... A
[2]

(b) The current in the lamp is 0.5 A.
Calculate the resistance of the lamp.

resistance = ... unit ..... [2]

9 Fig. 9.1 shows some reactions of ethene.

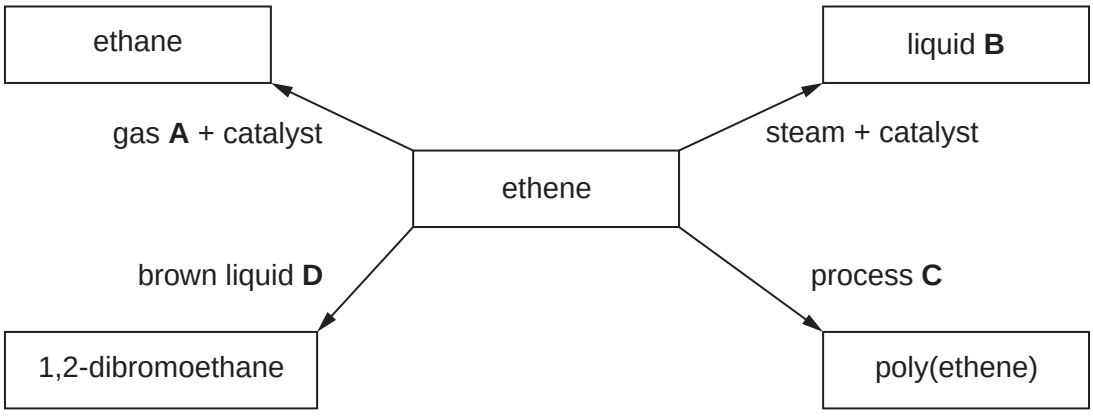

Fig. 9.1

(a) Identify **A**, **B**, **C** and **D**.

gas **A** .....

liquid **B** .....

process **C** .....

brown liquid **D** .....

[4]

(b) Ethene burns in a plentiful supply of oxygen, producing carbon dioxide and water.

Balance the equation for the reaction.

C_2H_4 + ... O_2 ⟶ ..... CO_2 + ... H_2O [1]

(c) State one use of poly(ethene).

..... [1]

10 The percentages of the population with HIV infection in five different towns are sh... Fig. 10.1.

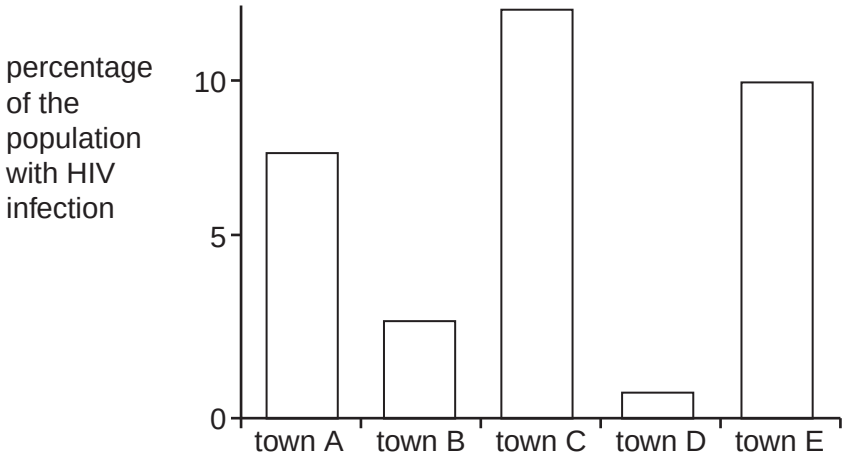

Fig. 10.1

The percentages of the population who are heroin users in the same five towns are shown in Fig. 10.2.

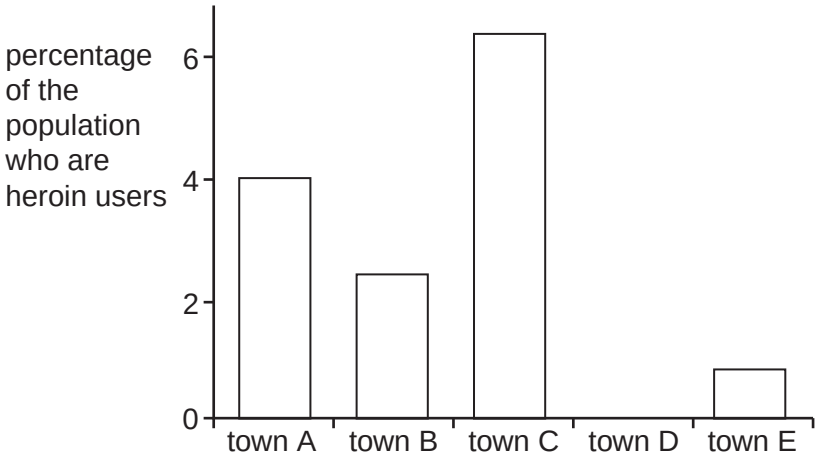

Fig. 10.2

(a) It is suggested that the differences in HIV infection are linked to differences in drug use.

Use Fig. 10.1 and Fig. 10.2 to give

(i) one piece of evidence that supports this idea,

.....

..... [1]

(ii) one piece of evidence that does **not** support this idea.

.....

..... [1]

(b) Explain why heroin users are likely to be infected by HIV.

.....

.....

..... [2]

(c) State one other problem, apart from increased risk of infection, that is associated with heroin abuse.

..... [1]

11 A hydroelectric power station uses water flowing from a high level to a lower level.

Complete the following sentences.

As the water falls it loses ..... energy.

The turbine and generator convert ..... into electrical energy.

Some energy is wasted as ..... energy.

[3]

12 Fig. 12.1 shows a spanner being used.
A moment of 30 N m is needed to tighten the nut.

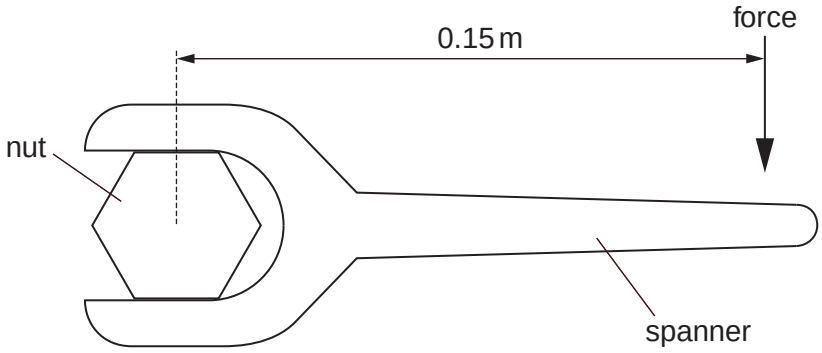

Fig. 12.1

Calculate the force applied to the spanner.

force = ...N [2]

13 Two isotopes of nitrogen are represented by the following symbols.

$$^{14}_{7}N \qquad\qquad ^{15}_{7}N$$

(a) What are *isotopes*?

.....

..... [2]

(b) Complete the following table.

isotope	number of protons	number of neutrons	number of electrons
$^{14}_{7}N$			7
$^{15}_{7}N$	7	8	

[3]

(c) Oxides of nitrogen are produced when a fuel is burned in a car engine.

State why oxides of nitrogen cause the corrosion of buildings.

..... [1]

14 The transformer shown in Fig. 14.1 is used to reduce mains voltage to 12V.
The transformer has two coils and a core.

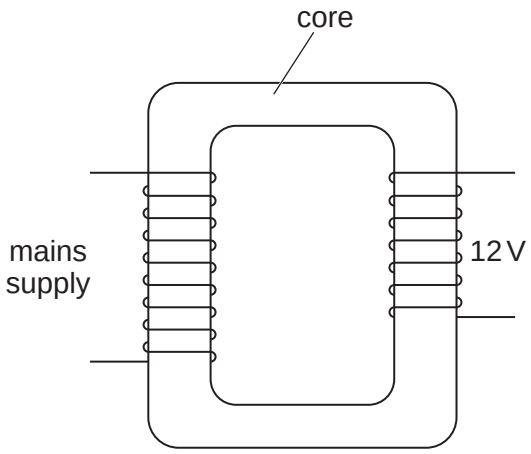

Fig. 14.1

(a) State the name of the coil connected to the mains supply.

..... [1]

(b) Name a suitable material for the core.

..... [1]

(c) Explain, in detail, the operation of a transformer.

.....

.....

.....

.....

..... [3]

15 **(a)** Give a word equation for anaerobic respiration in humans.

.....[2]

(b) Explain why anaerobic respiration sometimes takes place in the human body.

.....

.....

.....[2]

(c) State **three** ways in which aerobic respiration differs from anaerobic respiration.

1. .....

2. .....

3. .....

[3]

16 A glass bottle containing sodium chloride is dropped and it breaks.
The broken bottle and the sodium chloride are swept up and put into a beaker.
Water is added to the mixture in the beaker.
Solid sodium chloride is recovered from this mixture.

Use words from the list below to complete the following sentences.

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

evaporation **distillation** **filtration** **insoluble**

soluble **solution** **solute** **solvent**

The glass does not dissolve in the water because it is ..... .

Sodium chloride dissolves in the water to form a solution, because water is a ..... for sodium chloride.

The glass is separated from the mixture by ..... .

Solid sodium chloride is obtained from the solution by ..... of the water.

[4]

17 Fig. 17.1 shows a food web.

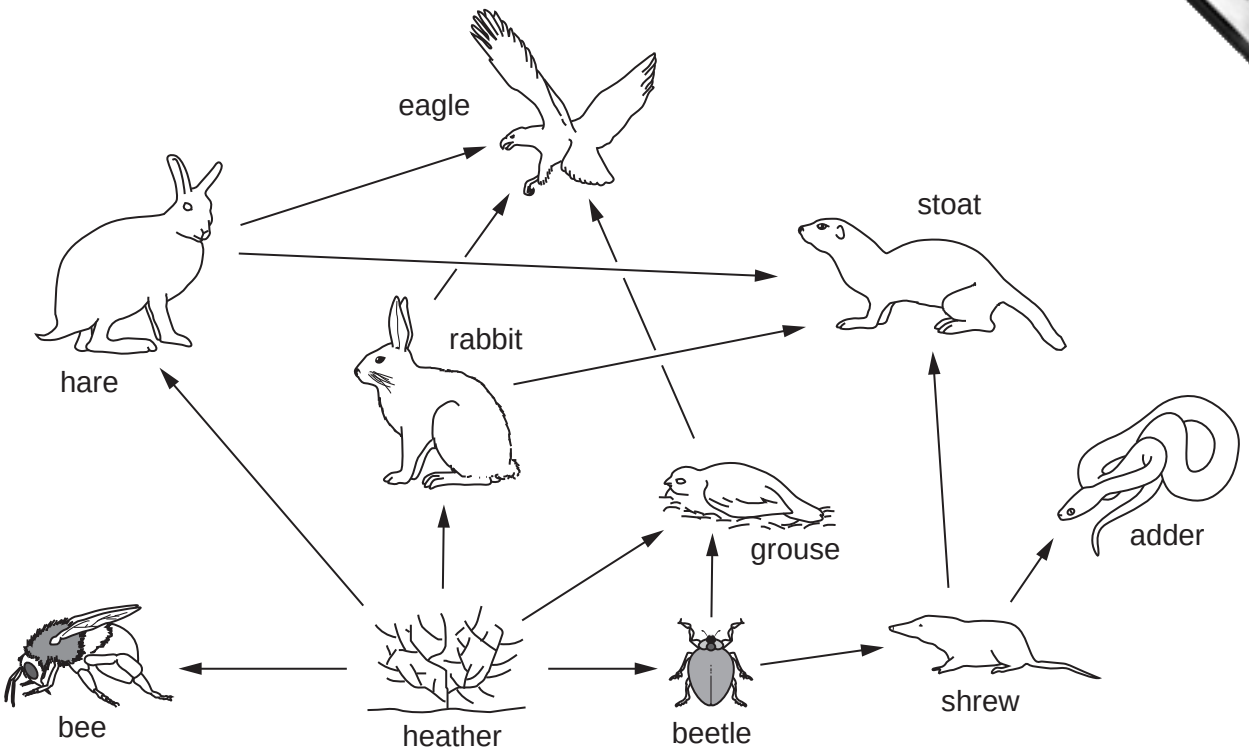

Fig. 17.1

(a) Use the food web in Fig. 17.1 to complete this food chain.

..... → beetle → ..... → eagle [2]

(b) From the food web in Fig. 17.1 name

(i) one producer,

.....[1]

(ii) one carnivore.

.....[1]

(c) What is the source of energy for this food web?

.....[1]

(d) Energy flow in food webs is non-cyclical.

Explain the meaning of the term *non-cyclical*.

.....

.....

.....[1]

18 Temperature may be measured with a laboratory thermometer or a clinical thermome

(a) State **two** differences between a laboratory thermometer and a clinical thermometer.

1. .....

.....

2. .....

.....

[2]

(b) The temperature reading of a liquid-in-glass thermometer increases as the liquid inside the thermometer changes.

State the change, if any, in

(i) the volume of the liquid,

.....[1]

(ii) the density of the liquid.

.....[1]

19 A car has an acceleration of $2.5\,m/s^2$. The force accelerating the car is 3750 N.

(a) State what is meant by *acceleration*.

.....

.....[1]

(b) Calculate the mass of the car.

mass = ... kg [2]

20 Fig. 20.1 shows elements in the reactivity series.

element	Cu H Fe C Zn Ca Na K
	increasing reactivity →

Fig. 20.1

(a) (i) Name an ore of iron. .....[1]

(ii) Explain, using the reactivity series, why iron can be extracted from an ore by heating with carbon.

.....

.....[1]

(iii) Iron rusts but stainless steel does not.
In what way does stainless steel differ from the element iron?

.....

.....[1]

(b) From the list of elements in Fig. 20.1, state the name of one metal that does not react with hydrochloric acid.

.....[1]

21 Fig. 21.1 shows a ray of light incident on one side of a glass block in air.

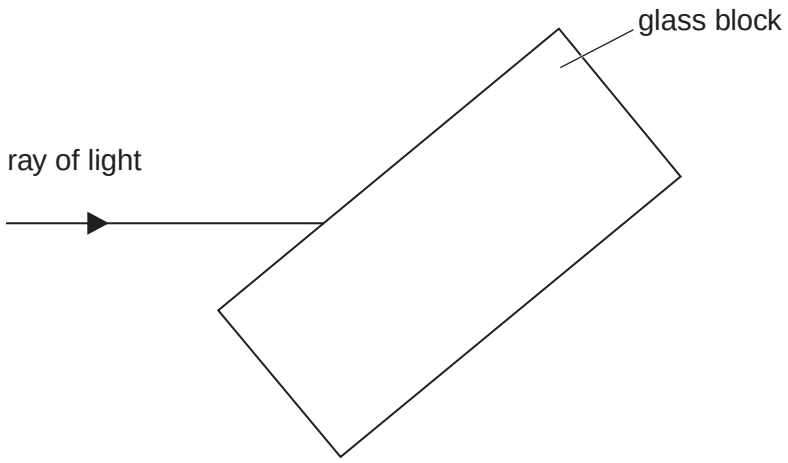

Fig. 21.1

(a) On Fig. 21.1, draw a normal to the glass block where the ray is incident on the block. [1]

(b) On Fig. 21.1, draw the ray passing

(i) through the block, [1]

(ii) into the air. [1]

22 In Fig. 22.1, the boxes on the left give the names of some elements and the boxes on the right list some uses of these elements.

Draw a line from each element to link the element to its correct use.

oxygen	water purification
chlorine	making steel
hydrogen	filling lamps
argon	making margarine

Fig. 22.1

[4]

DATA SHEET
The Periodic Table of the Elements

Group																	
I	II											III	IV	V	VI	VII	0
							1 H Hydrogen 1										4 He Helium 2
7 Li Lithium	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	209 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
223 Fr Francium	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	244 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	247 Bk Berkelium 97	251 Cf Californium 98	252 Es Einsteinium 99	257 Fm Fermium 100	258 Md Mendelevium 101	259 No Nobelium 102	260 Lr Lawrencium 103

58–71 Lanthanoid series
90–103 Actinoid series

ey

a
X
b

a = relative atomic mass
X = atomic symbol
b = atomic (proton) number

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