



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE
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COMBINED SCIENCE

5129/02

Paper 2

October/November 2010

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 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.

For Examiner's Use

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This document consists of **23** printed pages and **1** blank page.



- 1 Two resistors of resistance $10\ \Omega$ and $50\ \Omega$ are connected in parallel. A cell is connected across the resistors as shown in Fig. 1.1.

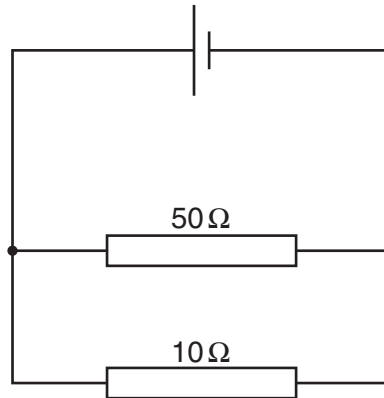


Fig. 1.1

The current in the $10\ \Omega$ resistor is $0.15\ \text{A}$. The current in the $50\ \Omega$ resistor is $0.03\ \text{A}$.

Calculate

- (a) the current through the cell,

current = A [1]

- (b) the potential difference across the $50\ \Omega$ resistor,

potential difference = V [2]

- (c) the charge passing through the $10\ \Omega$ resistor in 5 minutes.

charge = unit [3]

2 When ammonia is dissolved in water, an alkaline solution is produced.

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- (a) (i) State the colour of Universal Indicator paper after it has been dipped into the solution.

..... [1]

- (ii) Which ion in the solution causes it to be alkaline?

..... [1]

- (b) When sulfuric acid is added to ammonia solution in a titration experiment, ammonium sulfate is produced.

Complete the following sentences.

Exactly 25.0 cm³ of ammonia solution is added to a conical flask using a

.....

A few drops of indicator solution are added to the conical flask and sulfuric acid is added slowly from a until the indicator shows that the solution is [3]

- (c) Ammonium sulfate contains the ammonium ion NH₄⁺ and the sulfate ion SO₄²⁻.

(i) Deduce the formula of ammonium sulfate. [1]

- (ii) State a large-scale use of ammonium sulfate.

..... [1]

- 3 A satellite orbits the Earth as shown in Fig. 3.1.

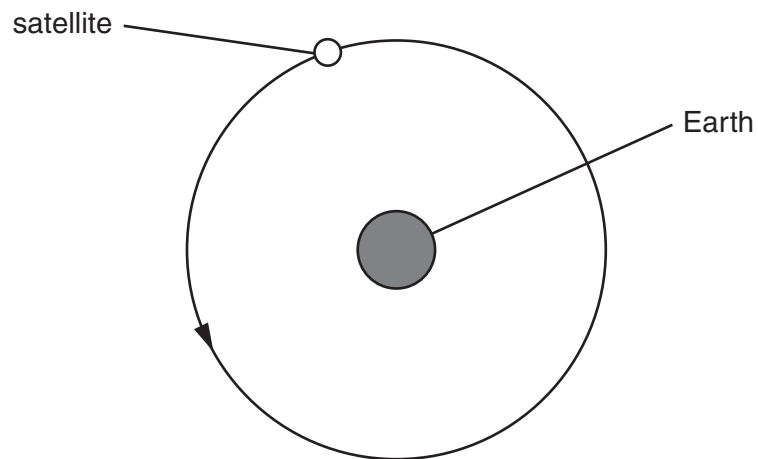


Fig. 3.1

- (a) In every 24 hours the satellite travels a distance of 2.7×10^8 m at constant speed.

Calculate the speed in m/s of the satellite.

speed = m/s [2]

- (b) The satellite has a mass of 200 kg and the force on it is 45 N.

Calculate the acceleration of the satellite.

acceleration = m/s^2 [2]

4 A flower that has been cut in half is shown in Fig. 4.1.

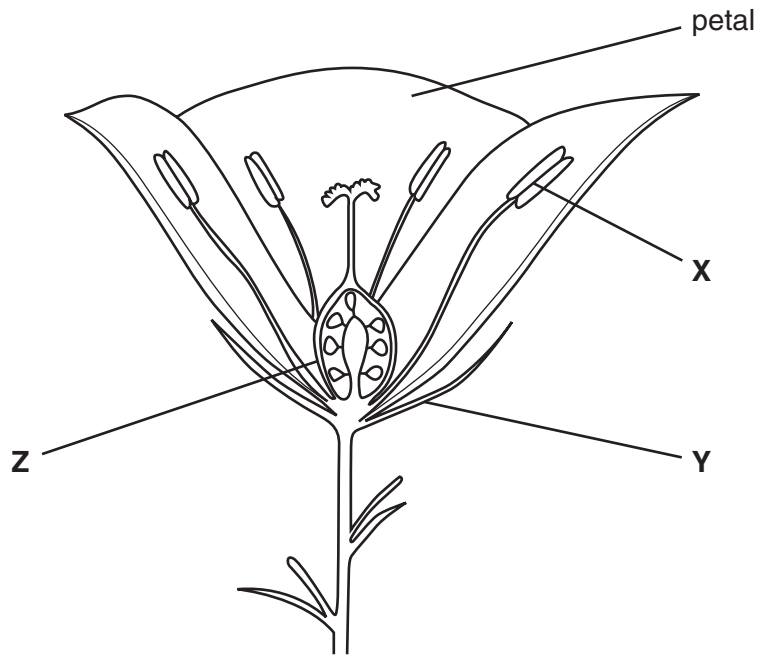


Fig. 4.1

(a) Name the structures labelled X, Y and Z.

X

Y

Z

[3]

(b) State and explain the main function of the petals of the flower.

.....

 [2]

(c) In which part of the flower is pollen produced?

..... [1]

- 5 The three states of matter are solid, liquid and gas.
Fig. 5.1 shows the arrangement of the particles in a solid.

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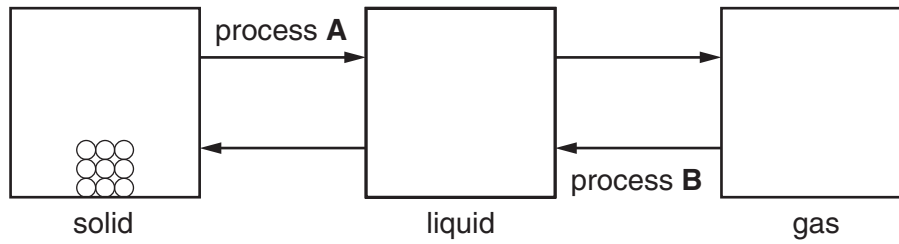


Fig. 5.1

- (a) Complete Fig. 5.1 to show the arrangement of the particles in a liquid and in a gas. [2]
- (b) State the names of each of the processes **A** and **B**.

process **A**

process **B**

[2]

- 6 (a) A physical property that changes with temperature can be used to measure temperature.

Name **two** suitable physical properties.

..... and [2]

- (b) State **two** differences between laboratory and clinical liquid-in-glass thermometers.

1.

.....

2.

..... [2]

- (c) Some liquid-in-glass thermometers contain either mercury or alcohol.
Some information about these liquids is shown in Fig. 6.1.

liquid	melting point/°C	boiling point/°C
alcohol	-120	78
mercury	-39	370

Fig. 6.1

A liquid-in-glass thermometer is used to measure a temperature of -56°C .

Explain why the thermometer should contain alcohol, not mercury.

.....

..... [1]

7 Fig. 7.1 shows a model of digestion and absorption in the alimentary canal.

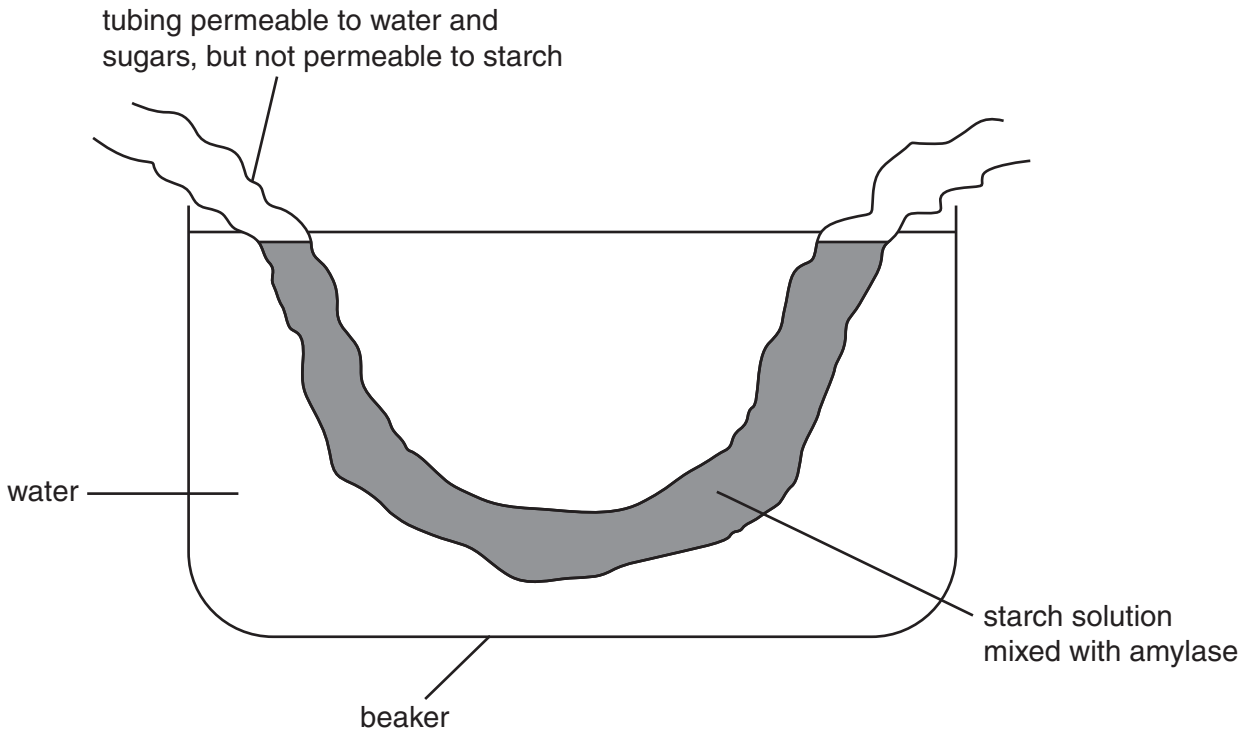


Fig. 7.1

(a) In this model, what represents,

(i) the small intestine,

..... [1]

(ii) the blood,

..... [1]

(iii) the food?

..... [1]

(b) After 20 minutes, the sugar maltose is present in the water in the beaker.

Explain why.

.....

 [3]

8 An electric iron has a power rating of 1800W.

(a) Calculate the energy converted into heat by the iron in 2 minutes.

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energy = unit [3]

(b) The electric iron has a plug containing three wires.
One of the wires is the **live** wire.

Name the other two wires.

..... and [2]

9 The following is a list of gases.

argon carbon dioxide carbon monoxide
hydrogen nitrogen oxygen sulfur dioxide

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Use

Complete the following sentences using gases from the list.
Each gas may be used once, more than once or not at all.

- (a) The gas that relights a glowing splint is [1]
- (b) The gas that produces **only** water when it is burned is [1]
- (c) A gas that is **not** present in polluted air is [1]
- (d) The gas that is produced during the incomplete combustion, but not during
complete combustion, of hydrocarbons is [1]
- (e) The gas that is used in light bulbs is [1]

- 10 Two permanent magnets and a piece of iron are placed end-to-end on a bench as shown in Fig. 10.1.
The poles of one magnet are shown.

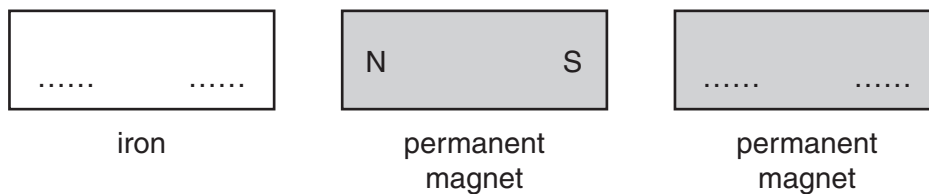


Fig. 10.1

- (a) (i) The iron becomes magnetised and is attracted to the nearest permanent magnet.
On Fig. 10.1, mark the north pole and the south pole on the iron. [1]
- (ii) The two permanent magnets are repelling each other.
On Fig. 10.1, mark the north pole and the south pole on the second permanent magnet. [1]
- (b) Fig. 10.2 shows an iron-cored transformer.

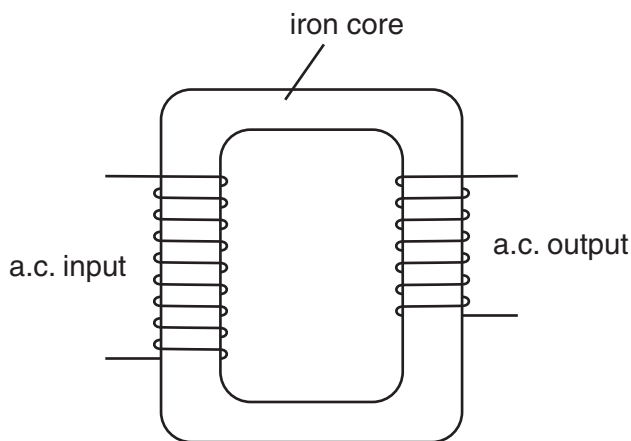


Fig. 10.2

The input is changed from alternating current to direct current.

Explain why the transformer has no output.

.....

.....

.....

..... [2]

11 (a) State **two** ways in which sexual reproduction is different from asexual reproduction.

1.

2. [2]

(b) In the list below, draw lines to match the structures in the human male reproductive system to their different functions. One has been done for you.

structure	function
penis	carries sperm and also urine
prostate gland	carries sperm but not urine
sperm duct	allows sperm to be released in the vagina
testis	produces sperm cells
urethra	secretes seminal fluid

[4]

- 12 A mixture of aluminium and iron(III) oxide is placed in a crucible as shown in Fig. 12.1. The reaction is started using a magnesium fuse.

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Use

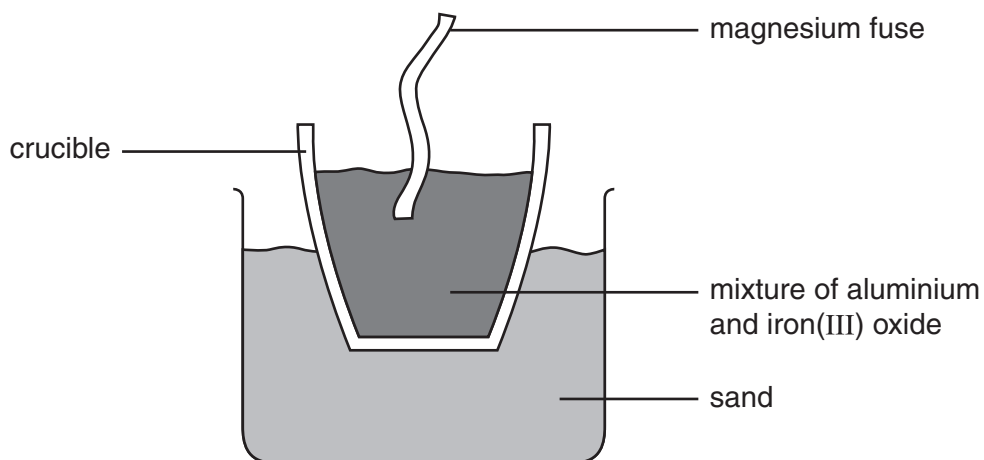


Fig. 12.1

The equation for the reaction is



The relative molecular mass of iron(III) oxide is 160.

[A_r: Al, 27; Fe, 56].

- (a) Complete the following sentences.

160 g of iron(III) oxide reacts with g of aluminium and produces g of iron.

16 g of iron(III) oxide reacts with g of aluminium and produces g of iron.

8 g of iron(III) oxide produces g of iron. [4]

- (b) State the type of reaction that the aluminium undergoes.

..... [1]

- 13 Light passes through a glass block as shown in Fig. 13.1.
Some of the light is reflected from the surface of the glass block.

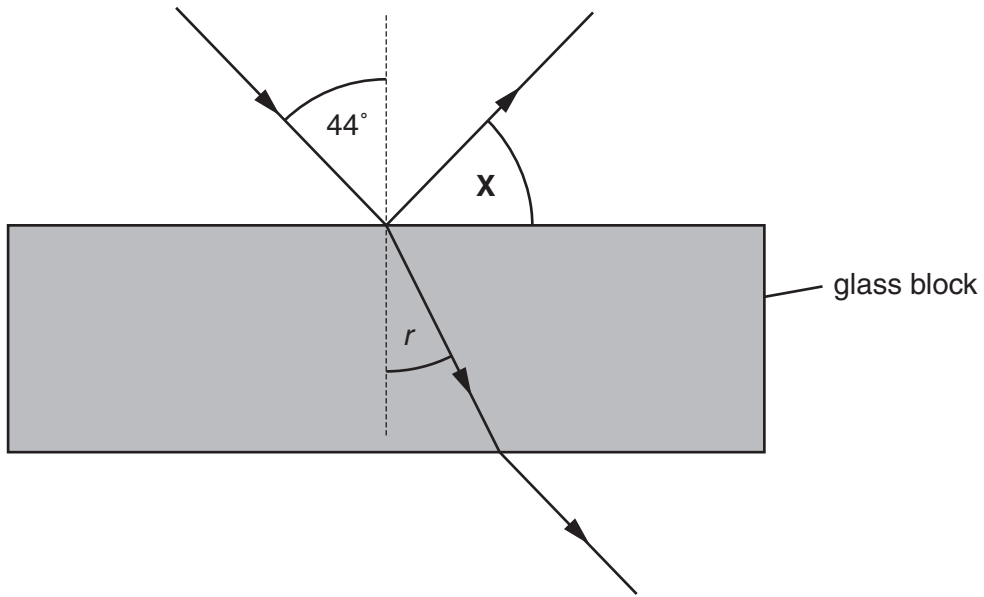


Fig. 13.1

- (a) The angle of incidence is 44° .

Calculate angle X .

$X = \dots\dots\dots^\circ$ [1]

- (b) (i) State an equation for calculating refractive index.

[1]

- (ii) The refractive index of the glass is 1.48.

Calculate the angle of refraction r .

$r = \dots\dots\dots^\circ$ [1]

14 Study the following reaction scheme.

For
Examiner's
Use

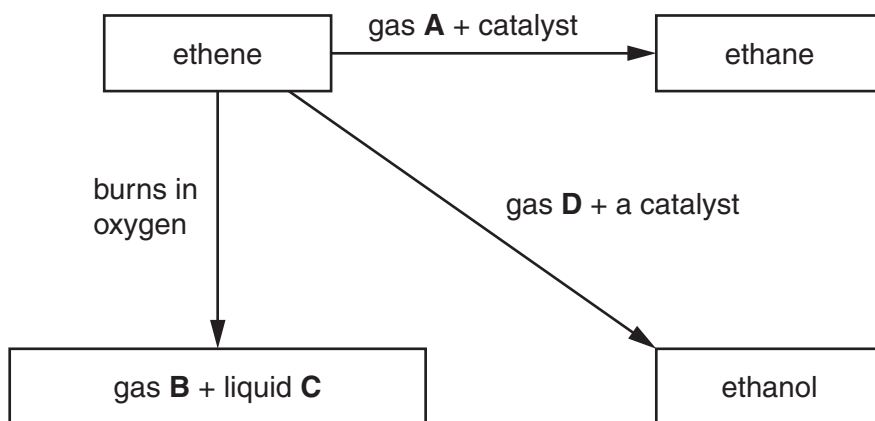


Fig. 14.1

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

gas **A**

gas **B**

liquid **C**

gas **D**

[4]

(b) In what way does the structure of ethene differ from that of ethane?

.....

.....[1]

(c) Two of the reactions in the scheme use a catalyst.

Suggest why a catalyst is used in these reactions.

.....

.....[1]

15 (a) (i) Define transpiration.

.....
..... [1]

(ii) Where does most transpiration occur in a plant?

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

(b) An experiment is carried out to investigate water uptake and water loss in a potted plant. The results are shown in Fig. 15.1.

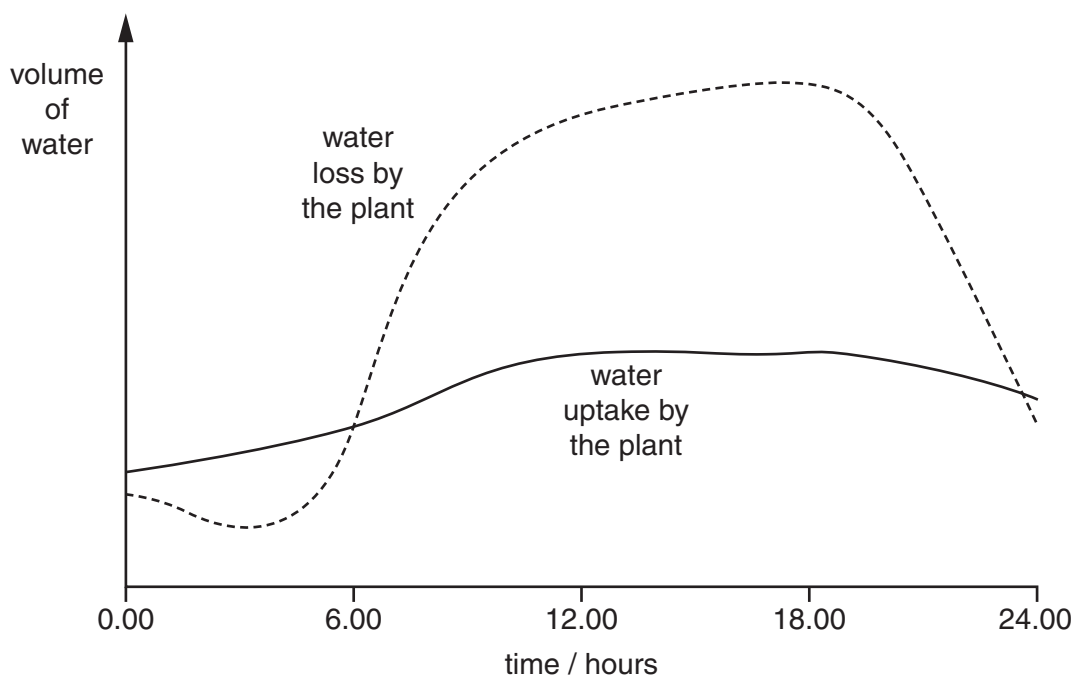


Fig. 15.1

(i) At which times is water uptake equal to water loss?

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

(ii) A similar pattern of water uptake and water loss occurs over a period of several days.

State the effect this pattern has on the plant.

.....
..... [1]

- 16** A metal rod and a metal ring are shown in Fig. 16.1.
At room temperature, the hole in the ring is only just large enough for the rod to be pushed through it.

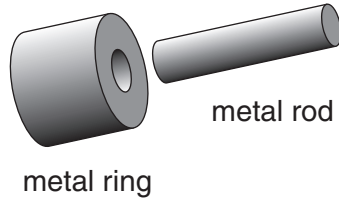


Fig. 16.1

One end of the metal rod is heated strongly. The entire rod becomes hot.

State

- (a)** the method by which thermal energy is transferred through the rod,

.....[1]

- (b)** why the heated rod will no longer pass through the metal ring.

.....
.....[1]

17 $^{18}_8\text{O}$ and $^{16}_8\text{O}$ are two isotopes of oxygen.

For
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Use

- (a) (i) Complete Fig. 17.1 to show the number of protons and the number of neutrons in the nucleus of an atom of $^{18}_8\text{O}$.

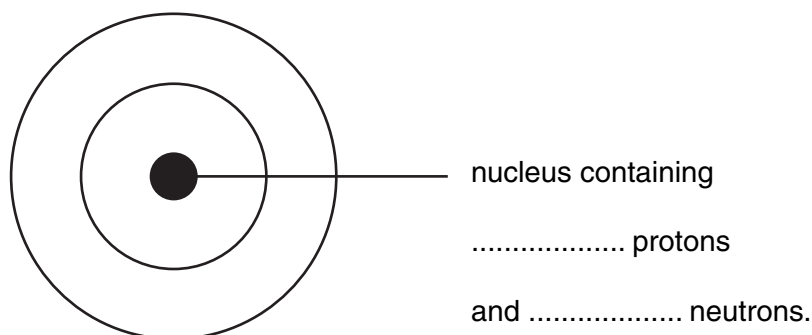


Fig. 17.1 [2]

- (ii) Complete Fig. 17.1 to show the electronic structure of an atom of $^{18}_8\text{O}$. [1]

(b) Define the term *isotope*.

.....

 [2]

(c) State **two** uses of oxygen.

1. [2]
 2. [2]

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

blood gland kidneys liver nerves target organ

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

Hormones are carried in the from the
that produces them to the where they have their effect.

Most hormones are removed by being destroyed by the [4]

19 A stone has a mass of 5.4 g and a volume of 1.8 cm³.

(a) Calculate its density.

density = unit [3]

(b) Some water is placed in a measuring cylinder. The stone is then added to the water. Fig. 19.1 shows the measuring cylinder containing the stone and the water.

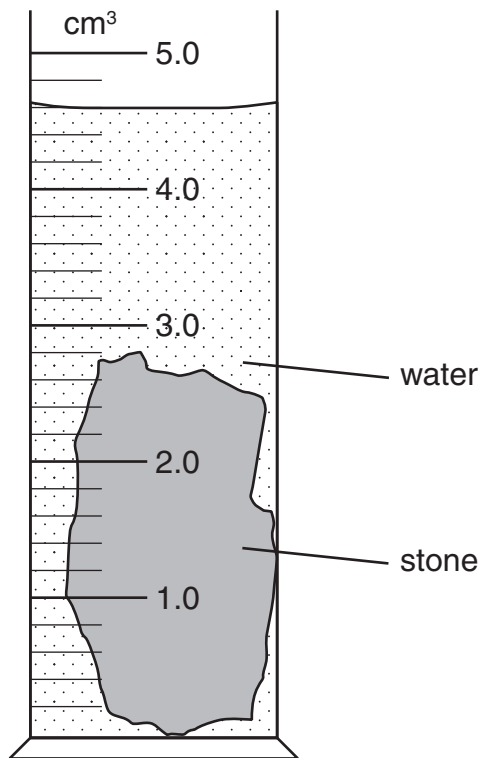


Fig. 19.1

Calculate the volume of the water in the measuring cylinder.

volume = cm³ [1]

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TURN OVER FOR QUESTION 20

20 The effect of mercury pollution from a chemical factory is described in Fig. 20.1.

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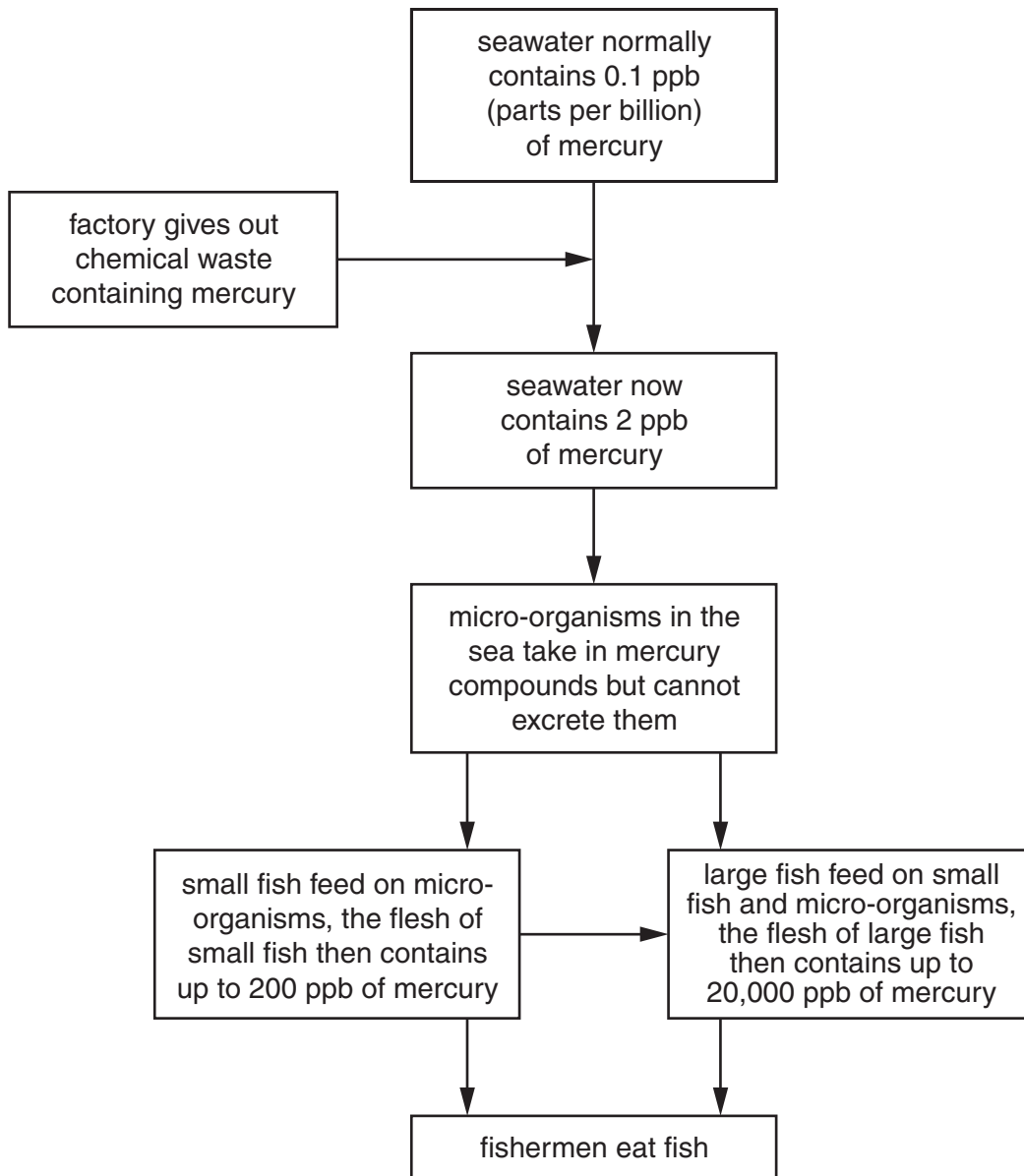


Fig. 20.1

(a) Which of the organisms described in Fig. 20.1 contains the highest concentration of mercury?

..... [1]

(b) Use Fig. 20.1 to describe how mercury gets from the factory into the small fish.

.....
.....
.....
..... [3]

(c) The fishermen are in danger of mercury poisoning.

Explain why.

.....
..... [1]

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DATA SHEET
The Periodic Table of the Elements

		Group																				
I	II	III	IV	V	VI	VII	0															
1 H Hydrogen 1											2 He Helium 2											
3 Li Lithium 3	4 Be Beryllium 4	5 B Boron 5	6 C Carbon 6	7 N Nitrogen 7	8 O Oxygen 8	9 F Fluorine 9	10 Ne Neon 10					11 B Boron 11										
11 Na Sodium 11	12 Mg Magnesium 12	13 Al Aluminium 13	14 Si Silicon 14	15 P Phosphorus 15	16 S Sulfur 16	17 Cl Chlorine 17	18 Ar Argon 18					19 F Fluorine 19										
19 K Potassium 19	20 Ca Calcium 20	21 Sc Scandium 21	22 Ti Titanium 22	23 V Vanadium 23	24 Cr Chromium 24	25 Mn Manganese 25	26 Fe Iron 26	27 Co Cobalt 27	28 Ni Nickel 28	29 Cu Copper 29	30 Zn Zinc 30	31 Ga Gallium 31	32 Ge Germanium 32	33 As Arsenic 33	34 Se Selenium 34	35 Br Bromine 35	36 Kr Krypton 36					
37 Rb Rubidium 37	38 Sr Strontium 38	39 Y Yttrium 39	40 Zr Zirconium 40	41 Nb Niobium 41	42 Mo Molybdenum 42	43 Tc Technetium 43	44 Ru Ruthenium 44	45 Rh Rhodium 45	46 Pd Palladium 46	47 Ag Silver 47	48 Cd Cadmium 48	49 In Indium 49	50 Sn Tin 50	51 Sb Antimony 51	52 Te Tellurium 52	53 I Iodine 53	54 Xe Xenon 54					
55 Cs Caesium 55	56 Ba Barium 56	57 La Lanthanum 57	72 Hf Hafnium 72	73 Ta Tantalum 73	74 W Tungsten 74	75 Re Rhenium 75	76 Os Osmium 76	77 Ir Iridium 77	78 Pt Platinum 78	79 Au Gold 79	80 Hg Mercury 80	81 Tl Thallium 81	82 Pb Lead 82	83 Bi Bismuth 83	84 Po Polonium 84	85 At Astatine 85	86 Rn Radon 86					
87 Fr Francium 87	88 Ra Radium 88	89 Ac Actinium 89											173 Yb Ytterbium 173	174 Lu Lutetium 174	175 Lu Lutetium 175							
																				169 Tm Thulium 169	170 Yb Ytterbium 170	171 Lu Lutetium 171
																				167 Er Erbium 167	168 Tm Thulium 168	169 Yb Ytterbium 169
																				165 Ho Holmium 165	166 Er Erbium 166	167 Tm Thulium 167
																				162 Dy Dysprosium 162	163 Ho Holmium 163	164 Er Erbium 164
																				159 Tb Terbium 159	160 Dy Dysprosium 160	161 Er Erbium 161
																				157 Gd Gadolinium 157	158 Tb Terbium 158	159 Dy Dysprosium 159
																				152 Eu Europium 152	153 Gd Gadolinium 153	154 Tb Terbium 154
																				150 Sm Samarium 150	151 Eu Europium 151	152 Gd Gadolinium 152
																				147 Pm Promethium 147	148 Sm Samarium 148	149 Eu Europium 149
																				144 Nd Neodymium 144	145 Pm Promethium 145	146 Sm Samarium 146
																				141 Pr Praseodymium 141	142 Nd Neodymium 142	143 Pm Promethium 143
																				139 La Lanthanum 139	140 Pr Praseodymium 140	141 Nd Neodymium 141
																				137 Ba Barium 137	138 La Lanthanum 138	139 Ce Cerium 139
																				133 Cs Caesium 133	134 Ba Barium 134	135 La Lanthanum 135
																				127 I Iodine 127	128 Xe Xenon 128	129 Lu Lutetium 129
																				122 Sb Antimony 122	123 Te Tellurium 123	124 I Iodine 124
																				119 Sn Tin 119	120 Sb Antimony 120	121 Te Tellurium 121
																				115 In Indium 115	116 Sn Tin 116	117 Sb Antimony 117
																				108 Ag Silver 108	109 Cd Cadmium 109	110 In Indium 110
																				106 Pd Palladium 106	107 Ag Silver 107	108 Cd Cadmium 108
																				103 Rh Rhodium 103	104 Pd Palladium 104	105 Ag Silver 105
																				101 Ru Ruthenium 101	102 Rh Rhodium 102	103 Pd Palladium 103
																				99 Ir Iridium 99	100 Pt Platinum 100	101 Au Gold 101
																				97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99
																				96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98
																				95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97
																				94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96
																				93 Np Neptunium 93	94 Pu Plutonium 94	95 Am Americium 95
																				92 U Uranium 92	93 Np Neptunium 93	94 Pu Plutonium 94
																				91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93
																				90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92

* 58–71 Lanthanoid series
† 90–103 Actinoid series

Key

a	X
b	X

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

The volume of one mole of any gas is 24 dm³ at room temperature and pressure (r.t.p.).