



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

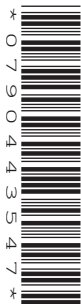
CANDIDATE
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COMBINED SCIENCE

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.

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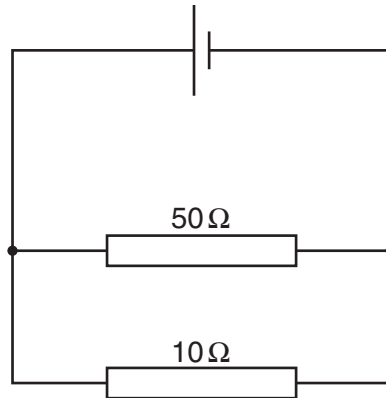


Fig. 1.1

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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Use

- (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 cm^3 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 NH_4^+ and the sulfate ion SO_4^{2-} .

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

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

..... [1]

4

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

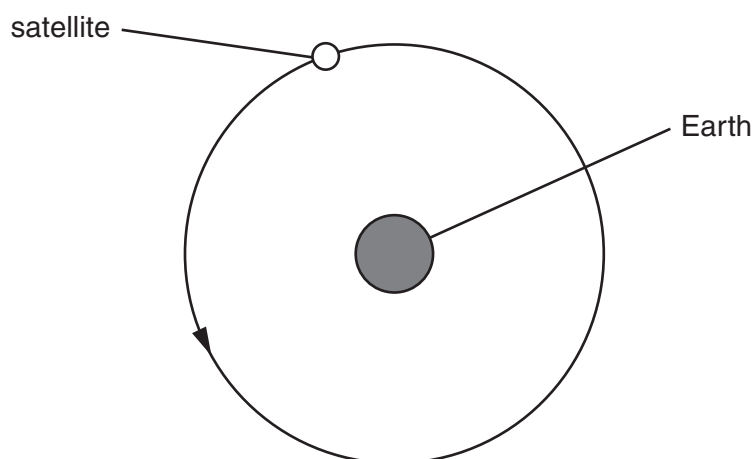


Fig. 3.1

- (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]

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

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Use

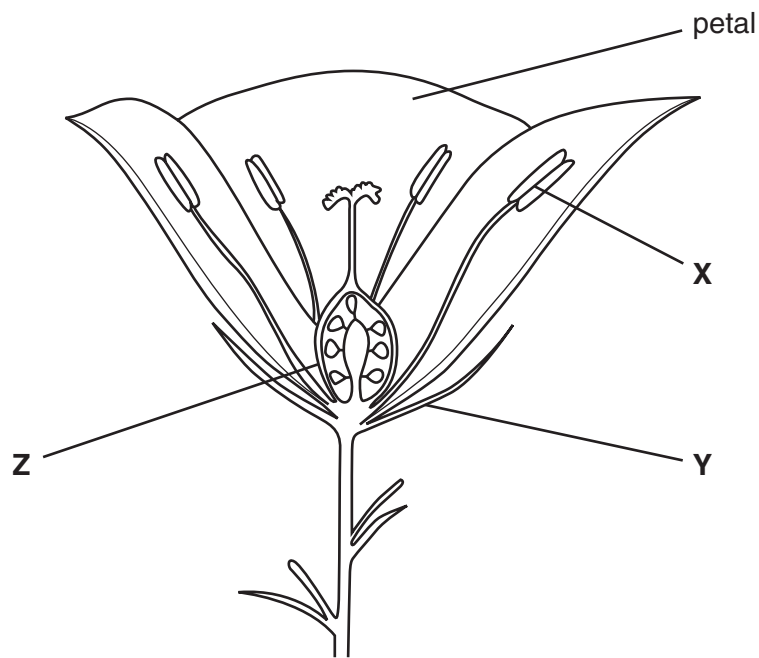


Fig. 4.1

- (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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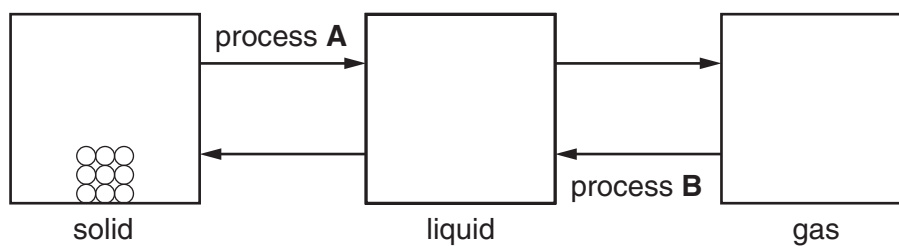


Fig. 5.1

- (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]

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Use

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

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Examiner's
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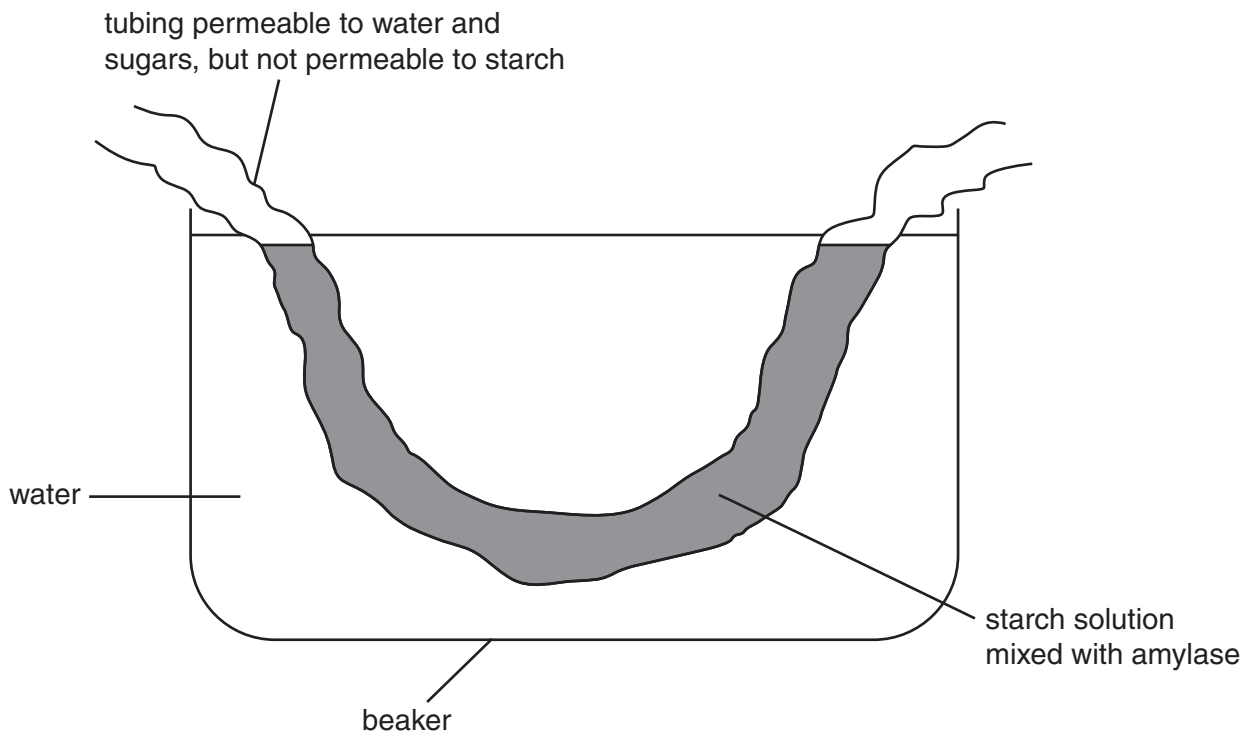


Fig. 7.1

(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.

For
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Use

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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Examiner's
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.

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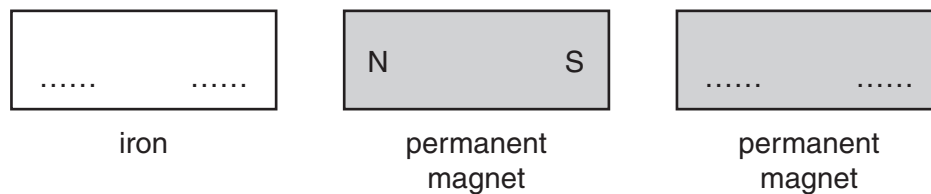


Fig. 10.1

- (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.

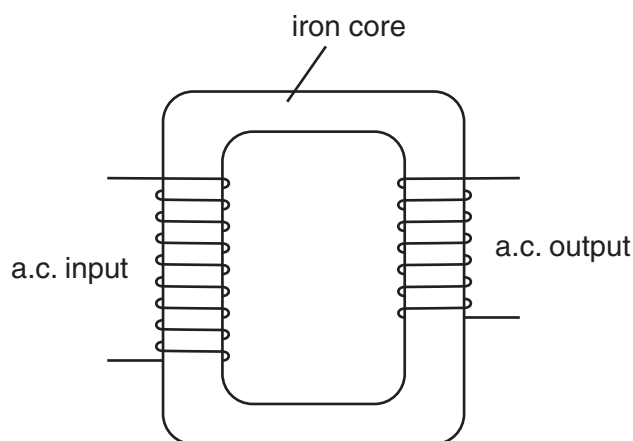


Fig. 10.2

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]

For
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Use

- 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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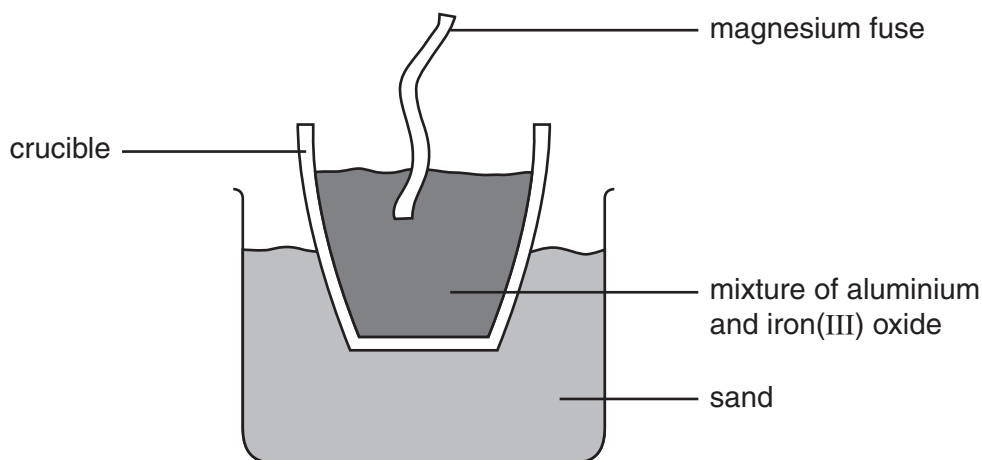


Fig. 12.1

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.

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Examiner's
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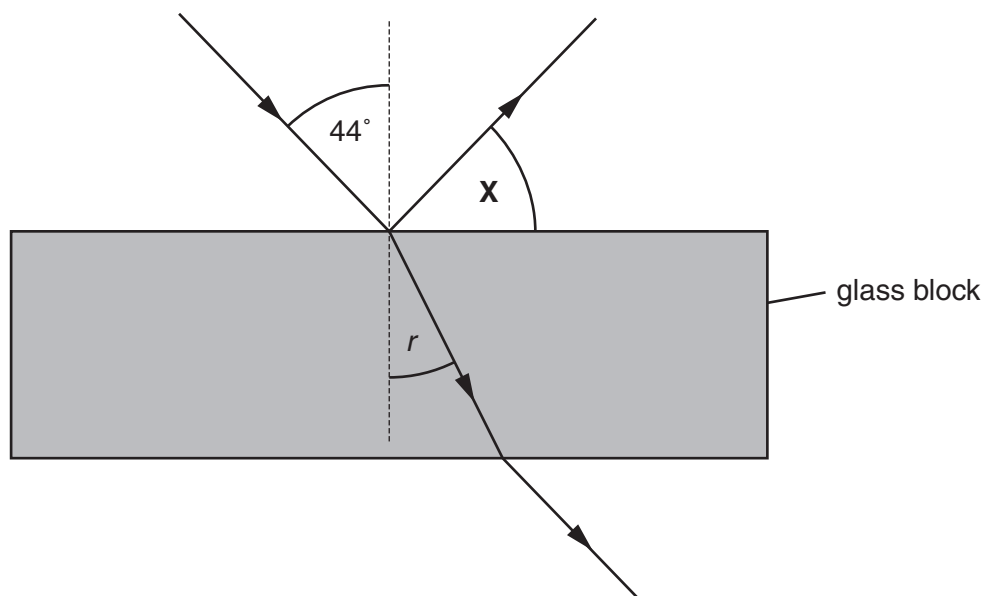


Fig. 13.1

- (a)** The angle of incidence is 44° .

Calculate angle **X**.

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

14 Study the following reaction scheme.

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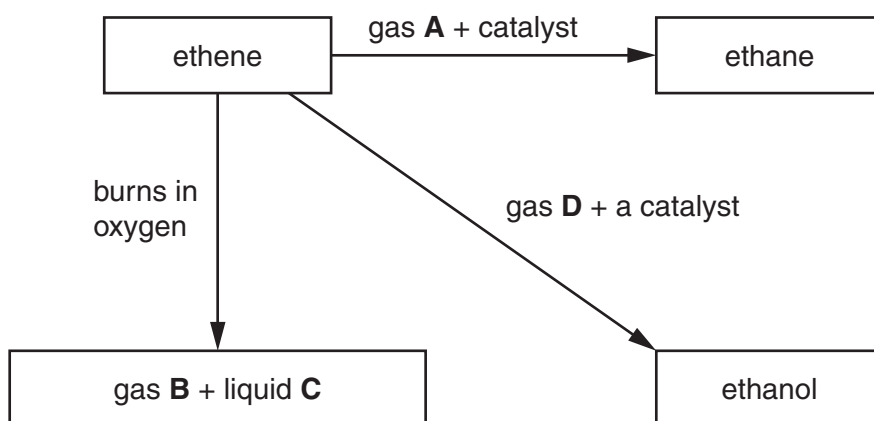


Fig. 14.1

(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.

For
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Use

.....
..... [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.

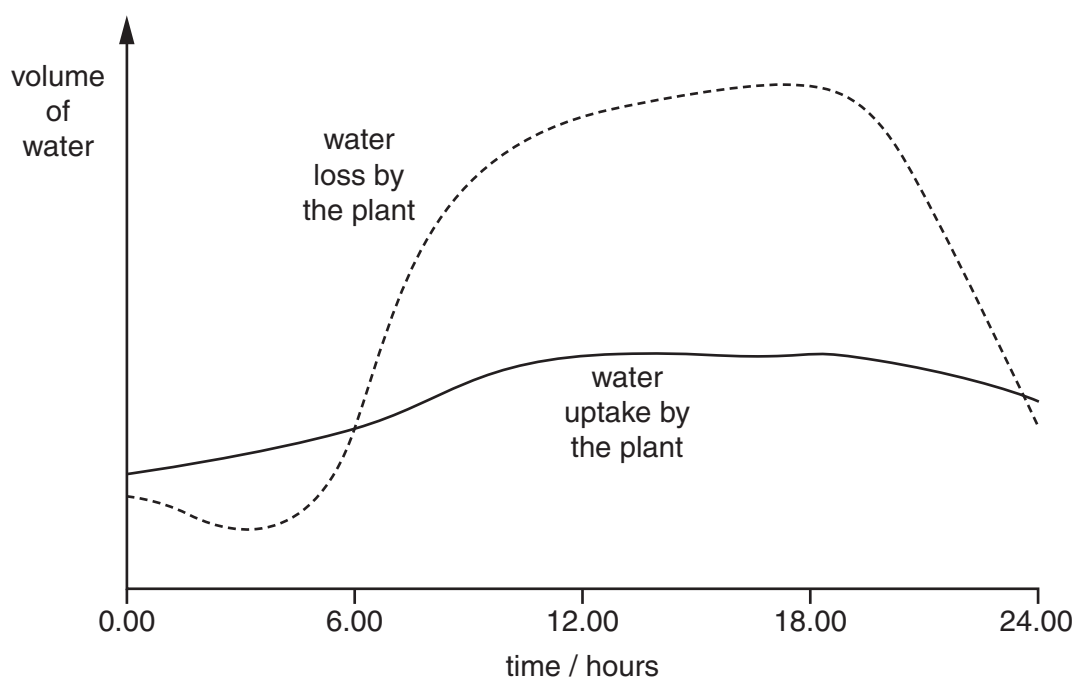


Fig. 15.1

(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.

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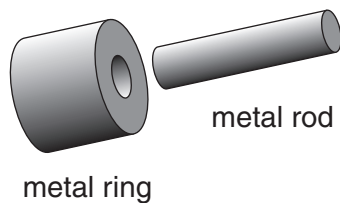


Fig. 16.1

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 $^{18}_8\text{O}$.

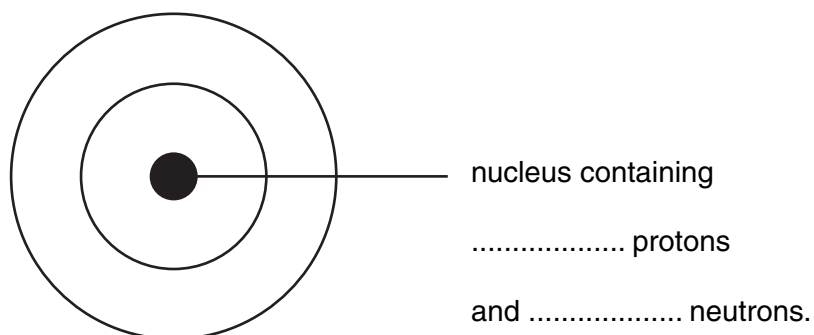


Fig. 17.1

[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]

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

blood gland kidneys liver nerves target organ

*For
Examiner's
Use*

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 cm^3 .

(a) Calculate its density.

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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.

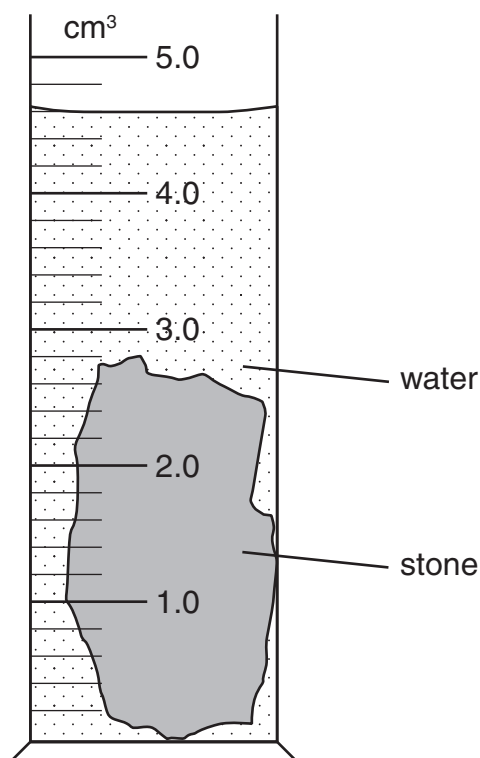


Fig. 19.1

Calculate the volume of the water in the measuring cylinder.

volume = cm^3 [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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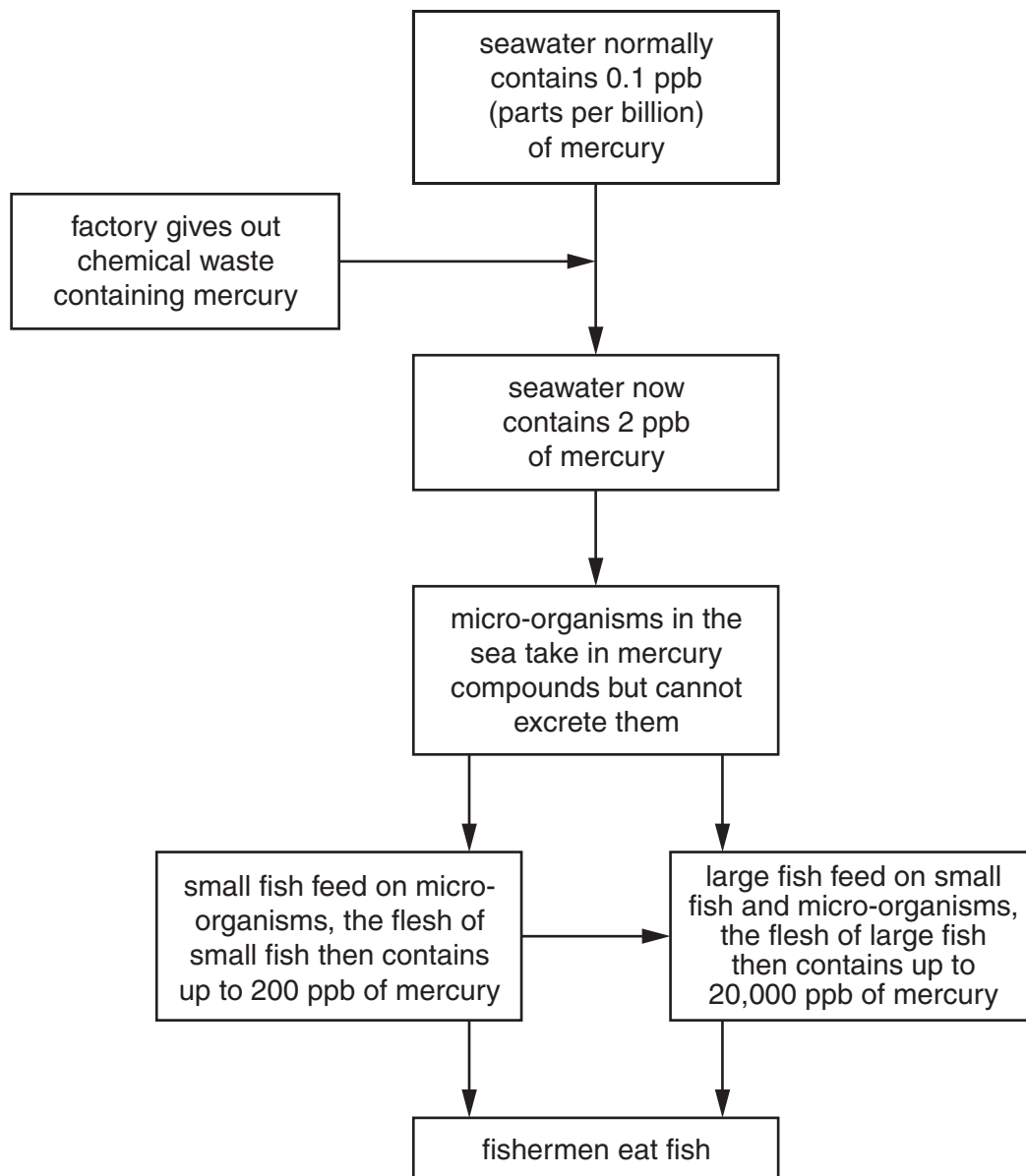


Fig. 20.1

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

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Use

..... [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																	
7 Li Lithium 3	9 Be Beryllium 4																
23 Na Sodium 11	24 Mg Magnesium 12																
39 K Potassium 19	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	84 Kr Krypton 36	
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	98 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	131 Xe Xenon 54	
133 Cs Caesium 55	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	210 Bi Bismuth 83	210 Po Polonium 84	222 Rn Radon 86	
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89															
* 58–71 Lanthanoid series † 90–103 Actinoid series																	
aXb a = relative atomic mass X = atomic symbol b = atomic (proton) number																	
Key																	
140Ce58 141Pr59 144Nd60 147Pm61 152Eu63 157Gd64 159Tb65 162Dy66 167Er68 169Tm70 175Lu71 90Th90 91Pa91 92U92 93Np93 94Pu94 95Am95 96Cm96 97Bk97 98Cf98 99Es99 100Fm100 101Md101 102No102 103Lr103 232Th90 231Pa91 238U92 237Np93 244Pu94 243Am95 247Cm96 247Bk97 251Cf98 252Es99 257Fm100 258Md101 259No102 260Lr103																	

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