



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE
NAME

CENTRE
NUMBER

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CANDIDATE
NUMBER

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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.

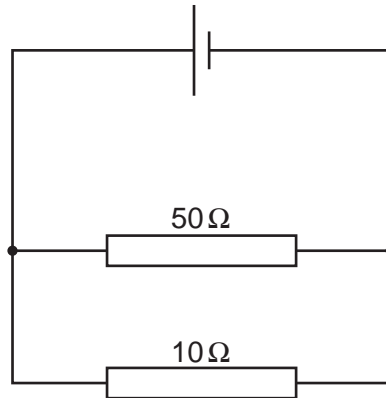


Fig. 1.1

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.

- (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]

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

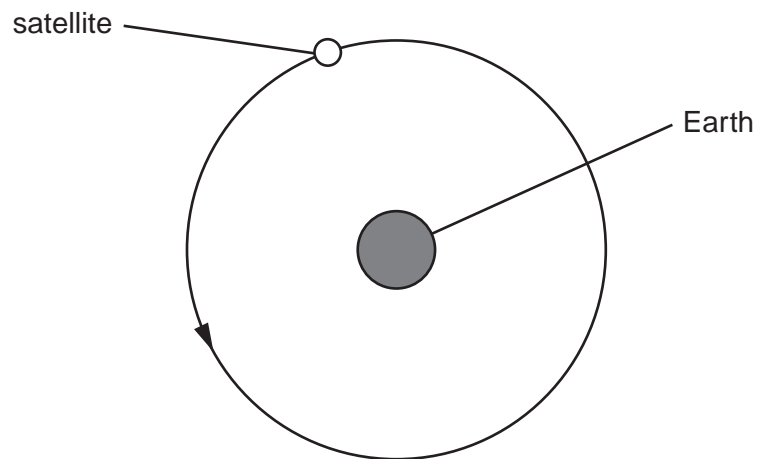


Fig. 3.1

- (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.

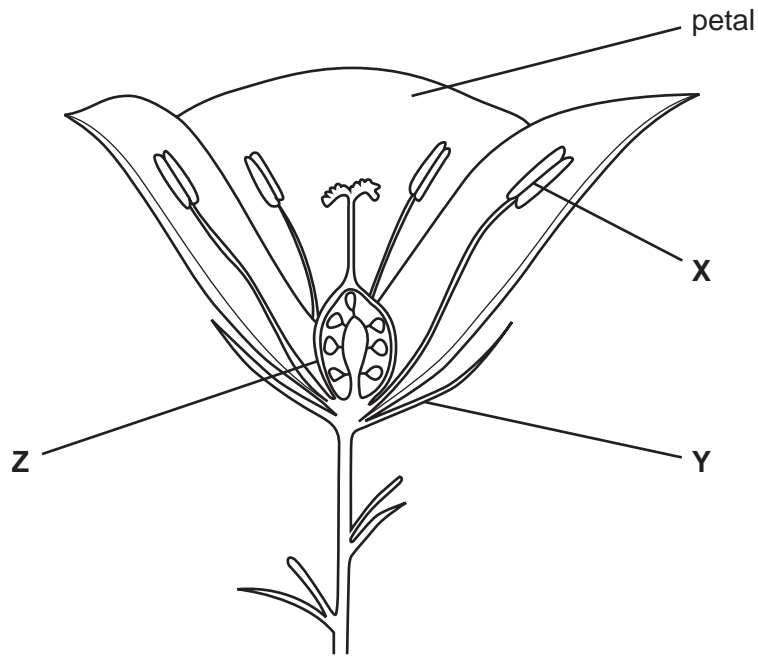


Fig. 4.1

(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.

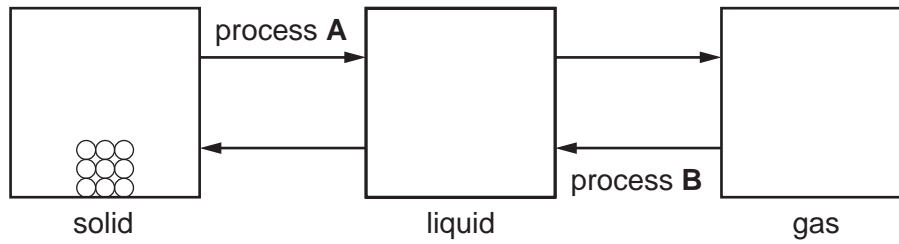


Fig. 5.1

- (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.

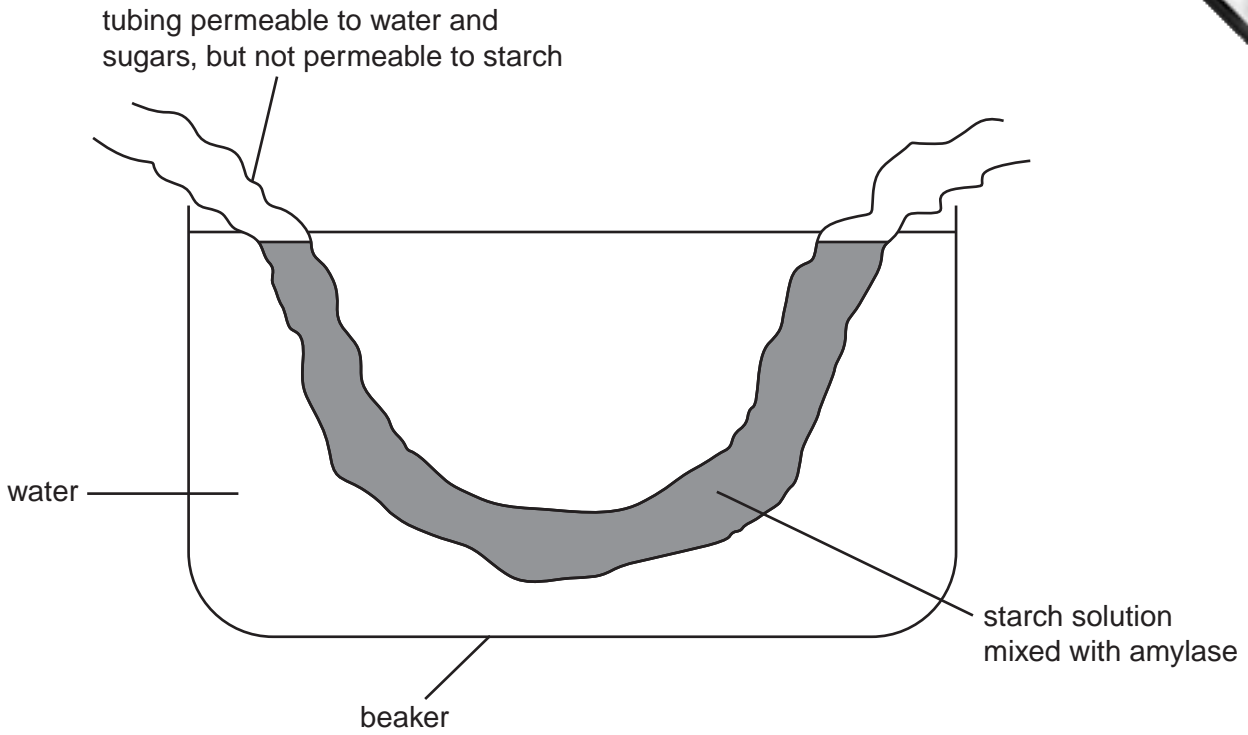


Fig. 7.1

(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.

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

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.

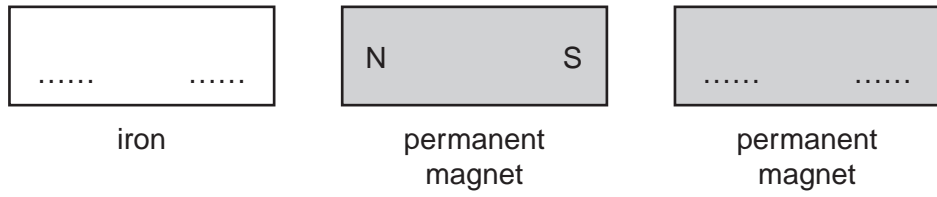


Fig. 10.1

- (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.

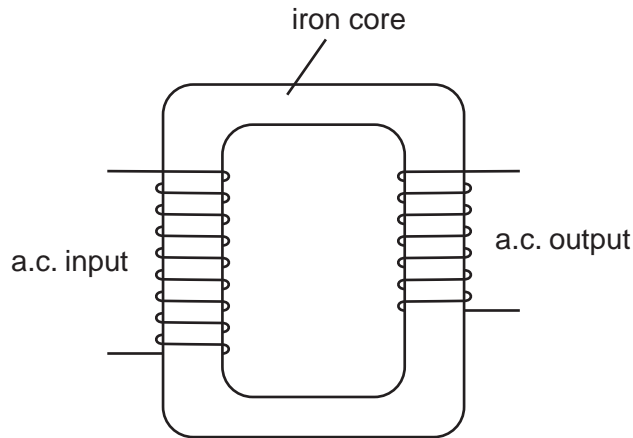


Fig. 10.2

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.

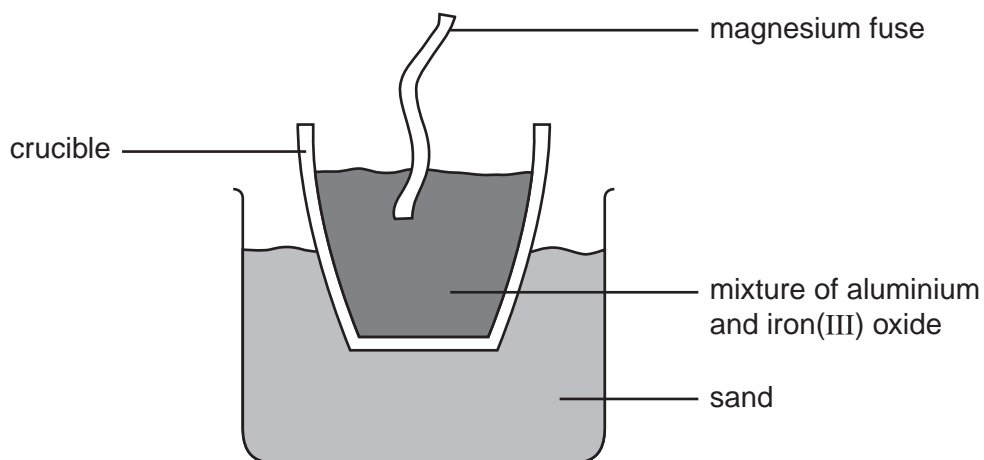


Fig. 12.1

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.

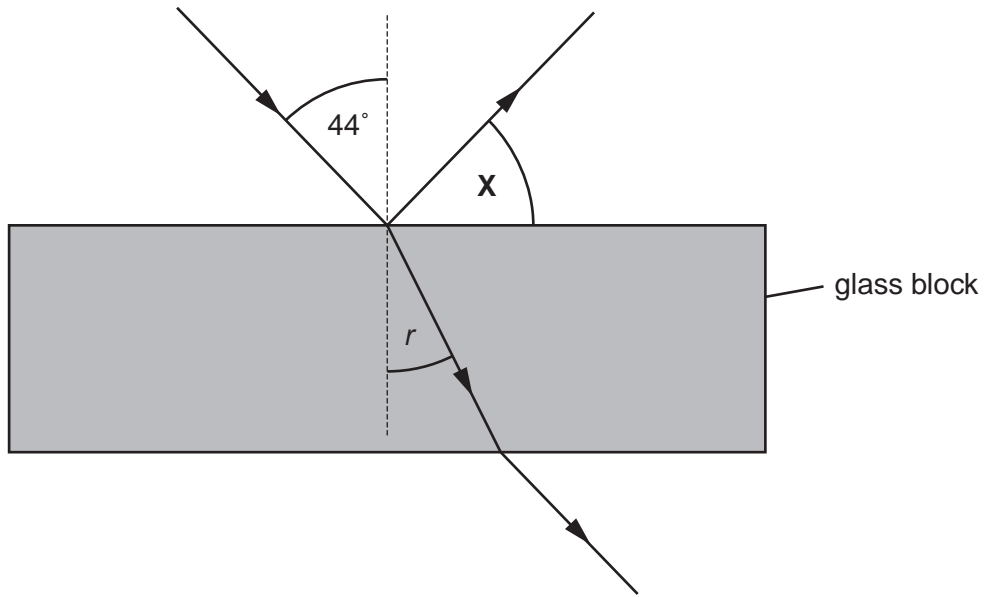


Fig. 13.1

- (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.

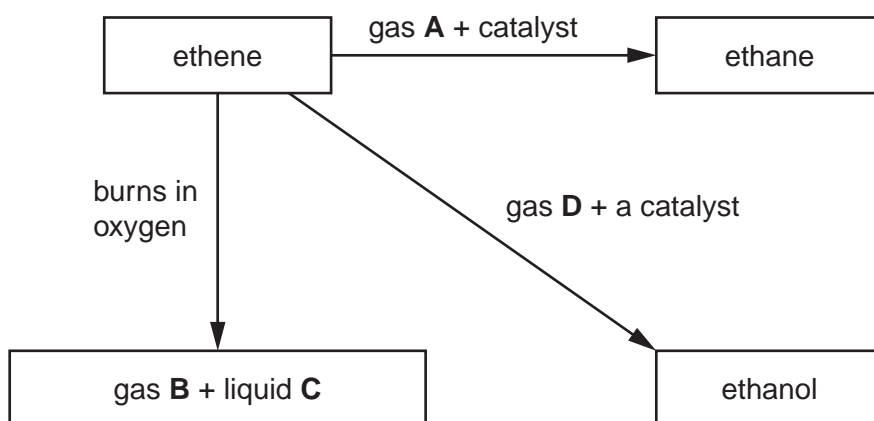


Fig. 14.1

(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.

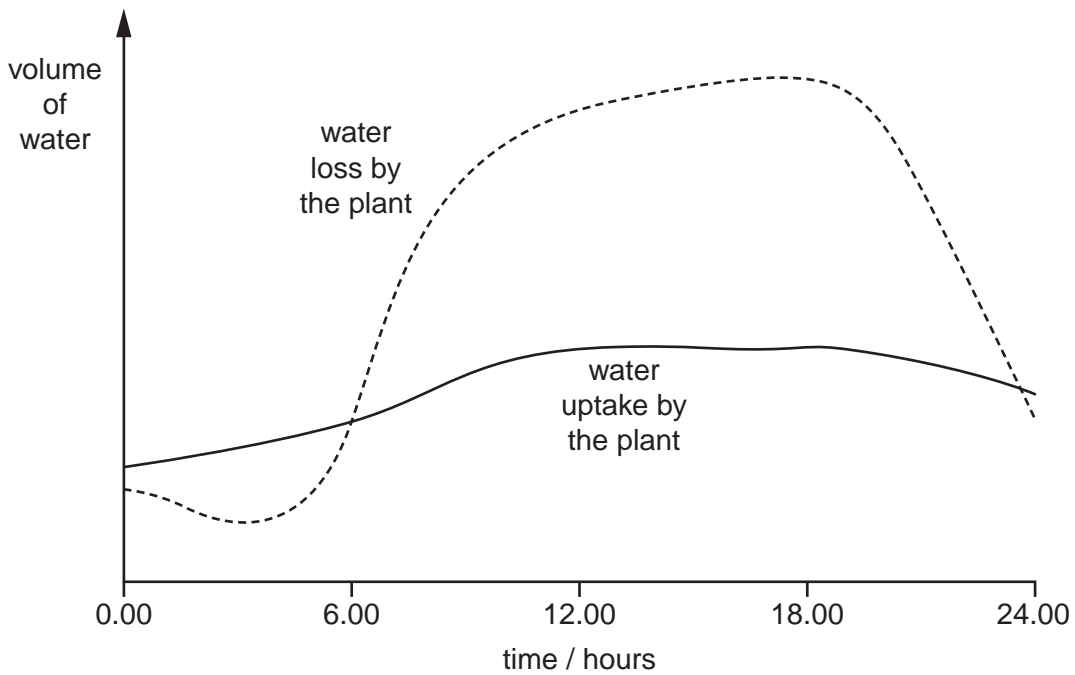


Fig. 15.1

(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.

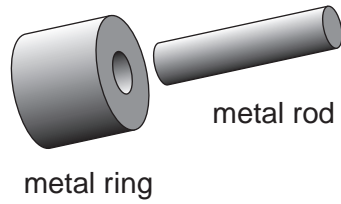


Fig. 16.1

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.

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

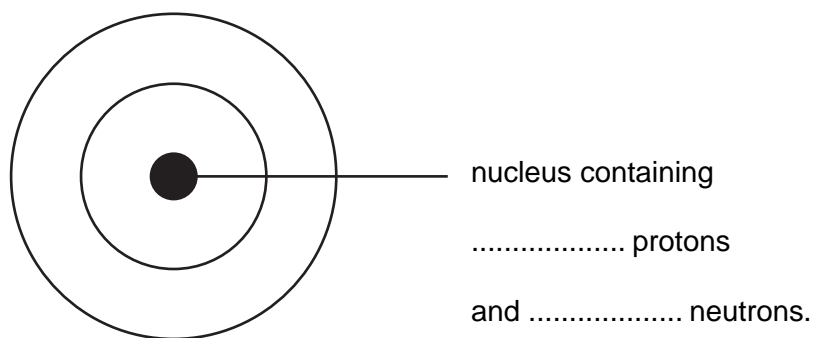


Fig. 17.1 [2]

(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 cm^3 .

(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.

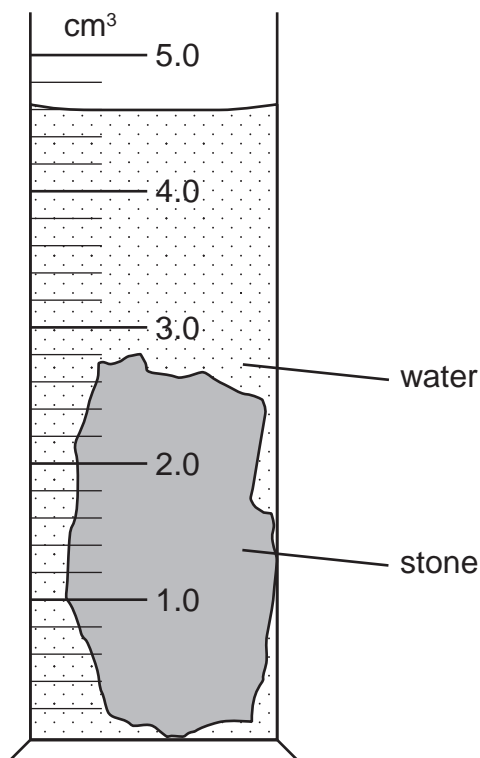


Fig. 19.1

Calculate the volume of the water in the measuring cylinder.

volume = cm^3 [1]

TURN OVER FOR QUESTION 20

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

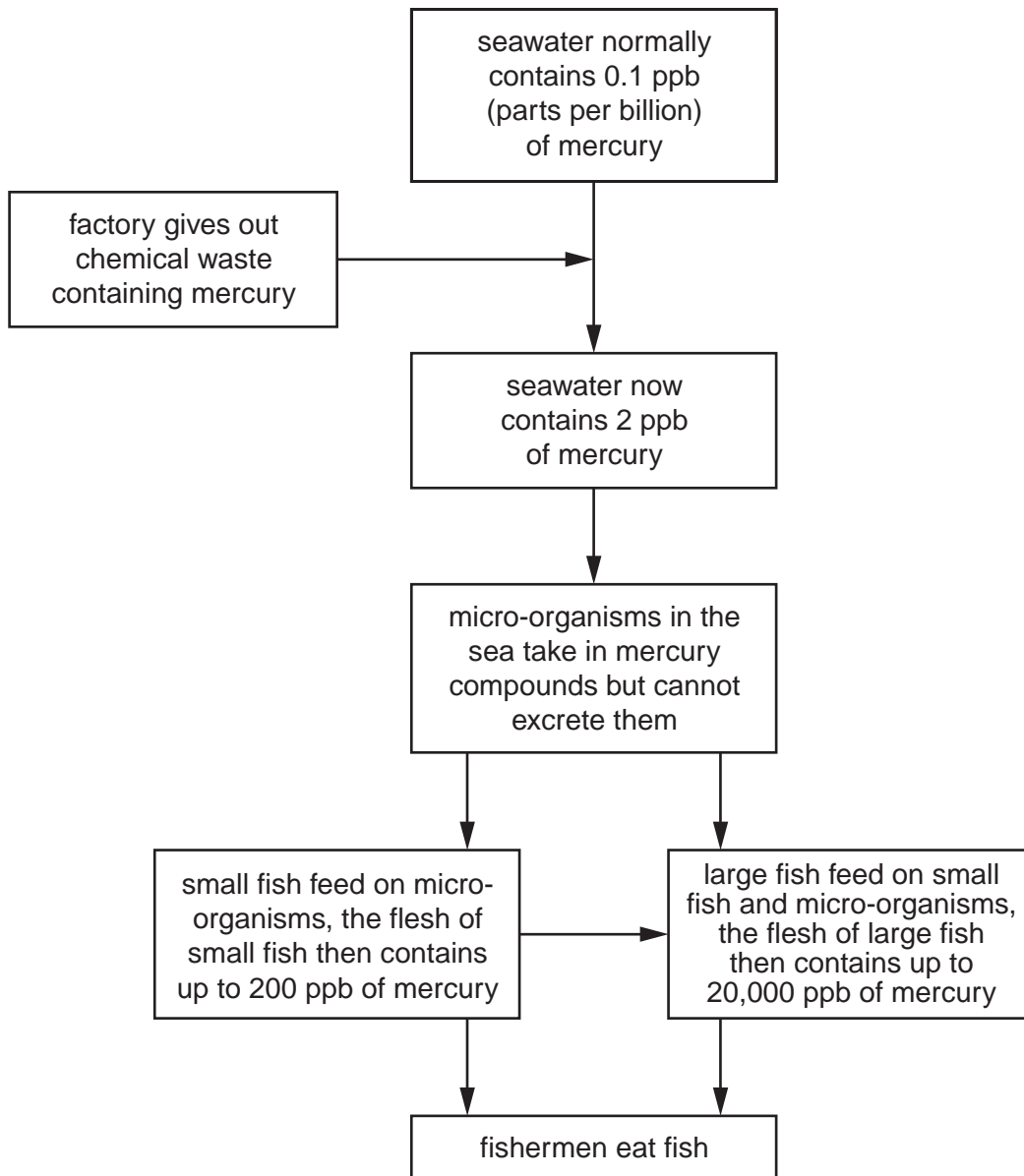


Fig. 20.1



(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]

DATA SHEET
The Periodic Table of the Elements

		Group															
I	II	III	IV	V	VI	VII	0					0					
1 H Hydrogen											2 He Helium						
3 Li Lithium	4 Be Beryllium	5 B Boron	6 C Carbon	7 N Nitrogen	8 O Oxygen	9 F Fluorine	10 Ne Neon	11 B Boron	12 C Carbon	13 Al Aluminium	14 Si Silicon	15 P Phosphorus	16 S Sulfur	17 Cl Chlorine	18 Ar Argon		
19 K Potassium	20 Ca Calcium	21 Sc Scandium	22 Ti Titanium	23 V Vanadium	24 Cr Chromium	25 Mn Manganese	26 Fe Iron	27 Co Cobalt	28 Ni Nickel	29 Cu Copper	30 Zn Zinc	31 Ga Gallium	32 Ge Germanium	33 As Arsenic	34 Se Selenium	35 Br Bromine	36 Kr Krypton
37 Rb Rubidium	38 Sr Strontium	39 Y Yttrium	40 Zr Zirconium	41 Nb Niobium	42 Mo Molybdenum	43 Tc Technetium	44 Ru Ruthenium	45 Rh Rhodium	46 Pd Palladium	47 Ag Silver	48 Cd Cadmium	49 In Indium	50 Sn Tin	51 Sb Antimony	52 Te Tellurium	53 I Iodine	54 Xe Xenon
55 Cs Caesium	56 Ba Barium	57 La Lanthanum	58 Ce Cerium	59 Pr Praseodymium	60 Nd Neodymium	61 Pm Promethium	62 Sm Samarium	63 Eu Europium	64 Gd Gadolinium	65 Tb Terbium	66 Dy Dysprosium	67 Ho Holmium	68 Er Erbium	69 Tm Thulium	70 Yb Ytterbium	71 Lu Lutetium	
87 Fr Francium	88 Ra Radium	89 Ac Actinium	90 Th Thorium	91 Pa Protactinium	92 U Uranium	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	
101 Fr Francium	102 Ra Radium	103 Ac Actinium	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	113 Nh Nihonium	114 Fl Flerovium	115 Mc Moscovium	116 Lv Livermorium	117 Ts Tennessine	118 Og Oganesson

119 Uu Ununennium	120 Uu Unbinilium	121 Uu Untrium	122 Uu Unquadrum	123 Uu Unquadium	124 Uu Unpentium	125 Uu Unsextium	126 Uu Unseptium	127 Uu Unoctium	128 Uu Unnonium	129 Uu Undecium	130 Uu Undecium	131 Uu Untrium	132 Uu Unquadrum	133 Uu Unquadium	134 Uu Unpentium	135 Uu Unsextium	136 Uu Unseptium	137 Uu Unoctium	138 Uu Unnonium	139 Uu Undecium	140 Uu Undecium
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58–71 Lanthanoid series
90–103 Actinoid series

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.).