



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE
NAME

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COMBINED SCIENCE

5129/02

Paper 2

October/November 2009

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

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This document consists of **19** printed pages and **1** blank page.



- 1 Fuel (gasoline) is mixed with air and burned in the engine of a car. The waste gases are passed out of the exhaust of the car. This is shown in Fig. 1.1.

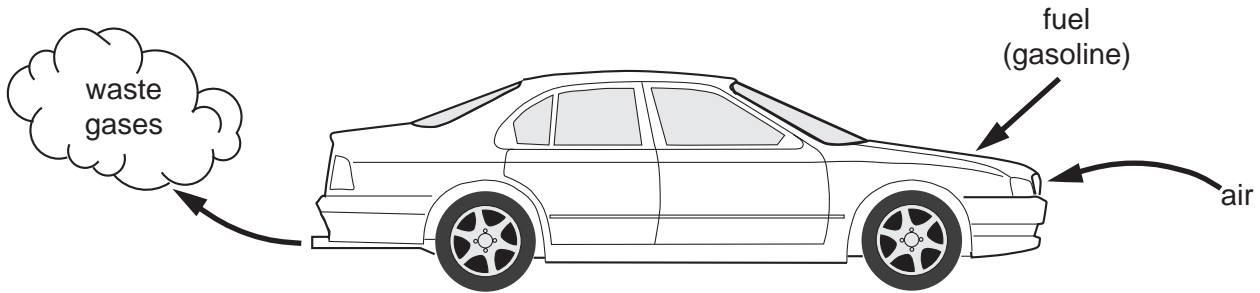


Fig. 1.1

- (a) Gasoline is a mixture of hydrocarbons, mainly alkanes, obtained from petroleum.

Explain the meaning of the term *hydrocarbon*.

.....
 [2]

- (b) Name the gas in the air used when the fuel is burned.

..... [1]

- (c) (i) Name the gases produced by the **complete** combustion of the fuel used in this car.

..... and [2]

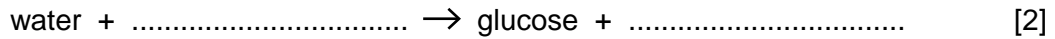
- (ii) Name a gas that is produced during the **incomplete** combustion of this fuel.

..... [1]

- (iii) State **one** other pollutant in the waste gases.

..... [1]

2 (a) Complete the word equation for photosynthesis.



(b) An experiment is carried out to investigate the effect of changing light intensity on the rate of photosynthesis. The apparatus is shown in Fig. 2.1.

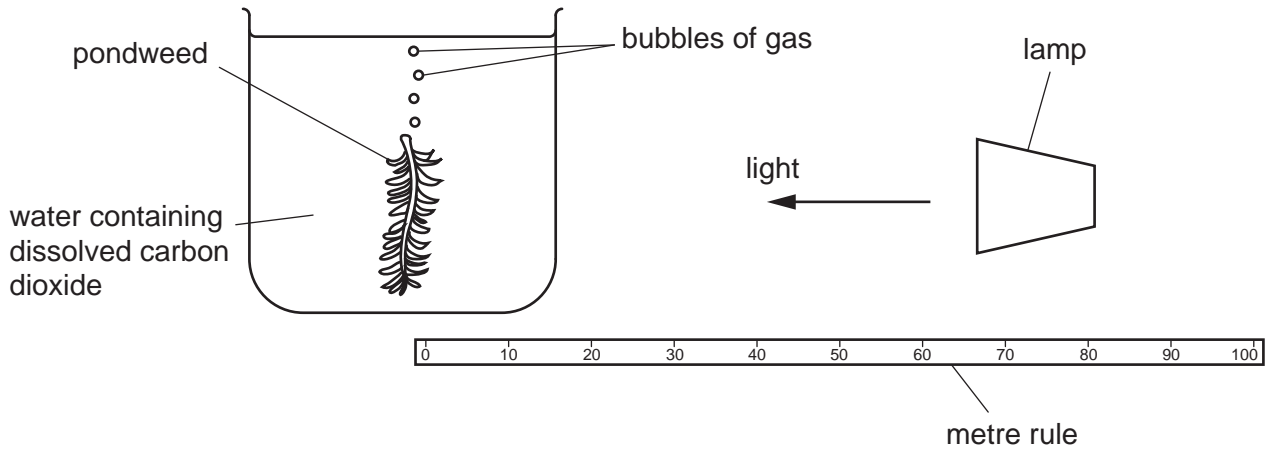


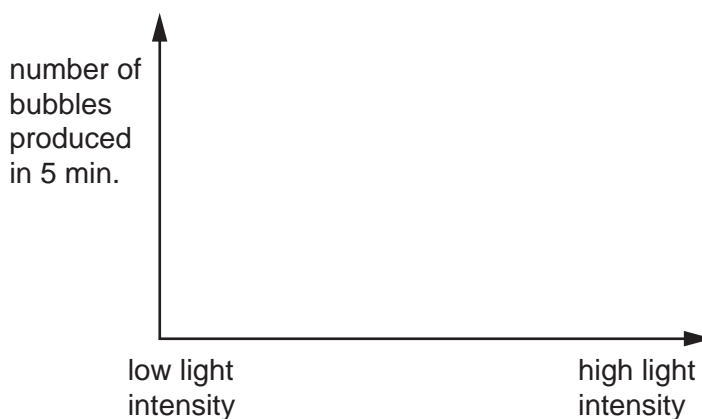
Fig. 2.1

The light intensity at the plant is changed by changing the distance between the lamp and the plant. The rate of photosynthesis is measured by counting the number of bubbles produced by the pondweed in five minutes.

(i) Suggest **one** condition that should be kept constant in this experiment.

..... [1]

(ii) On the axes below, sketch a curve to show the results expected from this experiment.



[2]

(c) Explain why **animals** depend on photosynthesis.

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

- 3 A car maintains a constant speed of 30 m/s for 20 s.
During the next 20 s, the car accelerates at a constant rate, reaching a speed of 50 m/s.

(a) (i) On Fig. 3.1, plot a speed-time graph for the car. [2]

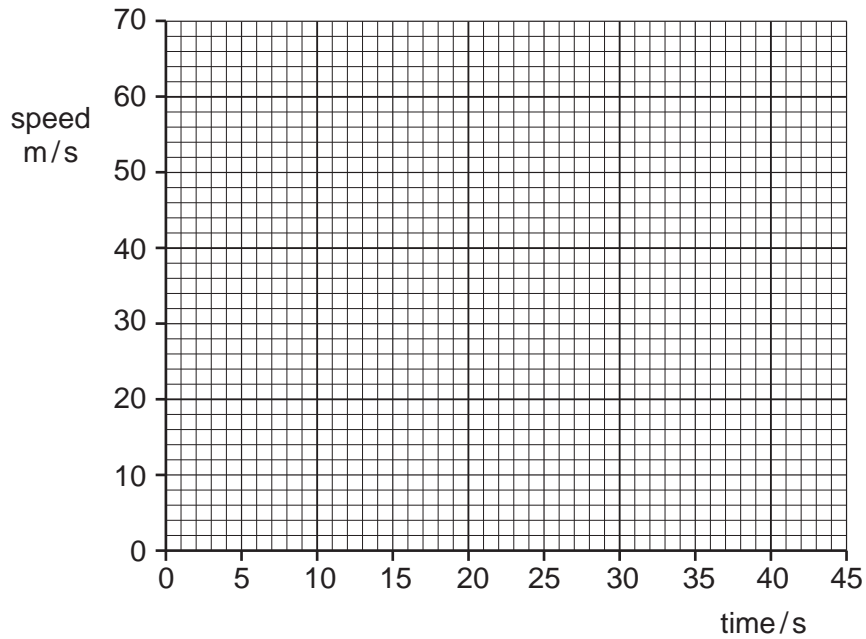


Fig. 3.1

(ii) Although the car has a constant speed for 20 s, its velocity may not be constant.

Explain the difference between velocity and speed.

.....
 [2]

(b) A second car has a mass of 1 500 kg.

Calculate the acceleration of the car when the accelerating force acting on it is 5 100 N.

acceleration = unit [3]

4 Some properties of five substances are shown in Fig. 4.1.

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substance	conducts electricity when solid	conducts electricity when melted	melting point /°C	soluble in water
A	yes	yes	1539	no
B	no	no	-75	yes
C	yes	yes	98	reacts with water
D	no	no	119	no
E	no	yes	772	yes

Fig. 4.1

(a) Give the letter, **A**, **B**, **C**, **D** or **E**, of the substance that is **not** a solid at room temperature.

..... [1]

(b) (i) Give the letter, **A**, **B**, **C**, **D** or **E**, of one Group I metal.

..... [1]

(ii) Give a reason for your choice.

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

(c) Give the letter, **A**, **B**, **C**, **D** or **E**, of one ionic compound.

Explain the reasons for your choice.

compound

reasons

.....

..... [3]

5 Plant reproduction involves the production of fruits and seeds.

(a) What is a *pericarp*?

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

(b) A section through a broad bean seed is shown in Fig. 5.1.

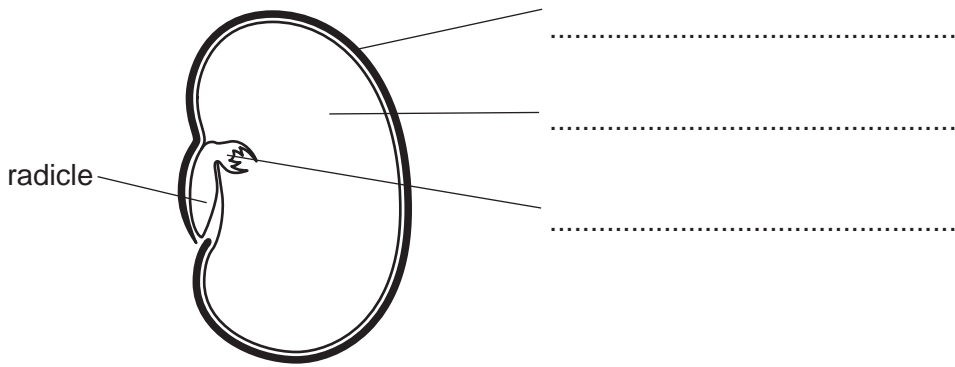


Fig. 5.1

Complete the labels on Fig. 5.1. [3]

(c) Explain the importance of seed dispersal for plants.

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

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

- chemical geothermal hydroelectric kinetic**
nuclear potential solar

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

There are several ways of generating electricity. In schemes, water falls from a high level to a lower level.

As the water falls it loses energy. When coal burns, energy is converted into thermal energy.

..... cells use the energy from sunlight to produce electricity. [4]

7 Chlorine, bromine and iodine are elements in Group VII of the Periodic Table.

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(a) State the name given to the elements in Group VII.

..... [1]

(b) Describe the change of state of the Group VII elements as the group is descended from fluorine to astatine.

..... [1]

(c) When bromine is added to potassium iodide, a brown solution is produced.

Name the products of this reaction.

..... and [2]

(d) State why chlorine is used in the purification of water supplies.

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

8 A human heart is shown in Fig. 8.1.

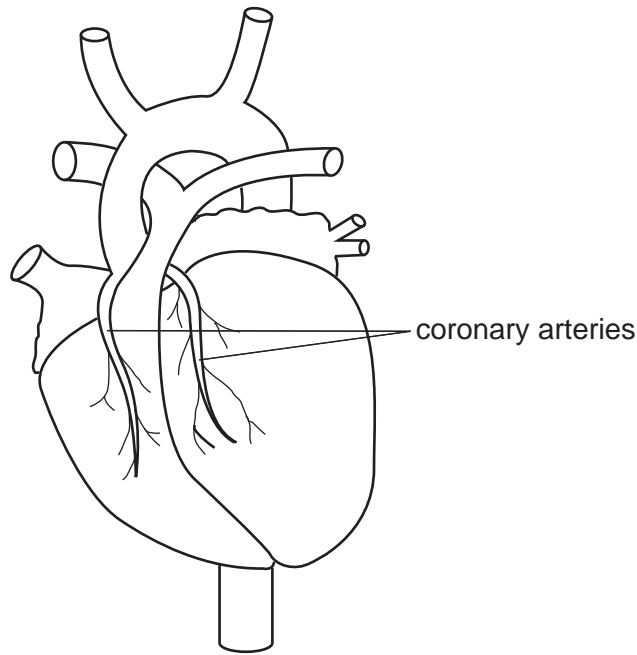


Fig. 8.1

Blood is carried to the heart muscle in the coronary arteries and away from the heart muscle in the coronary veins.

(a) State **two** differences between the blood carried in the coronary arteries and the blood carried in the coronary veins.

- 1.
-
- 2.
- [2]

(b) State **two** ways in which the structure of the coronary arteries differs from that of the coronary veins.

- 1.
-
- 2.
- [2]

(c) A coronary artery may become blocked. This may cause a heart attack. A heart attack is more likely to happen if a person is a smoker. State **two** other features of a person's lifestyle that may make a heart attack more likely.

- 1.
- 2. [2]

- 9 A wire is moved downwards between the North and South poles of two magnets, as shown in Fig. 9.1.

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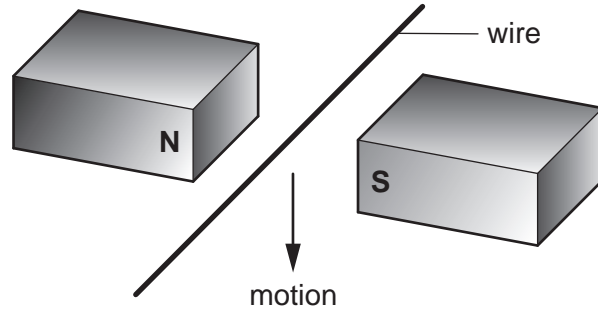


Fig. 9.1

The variation of the induced e.m.f. with time is shown in Fig. 9.2.

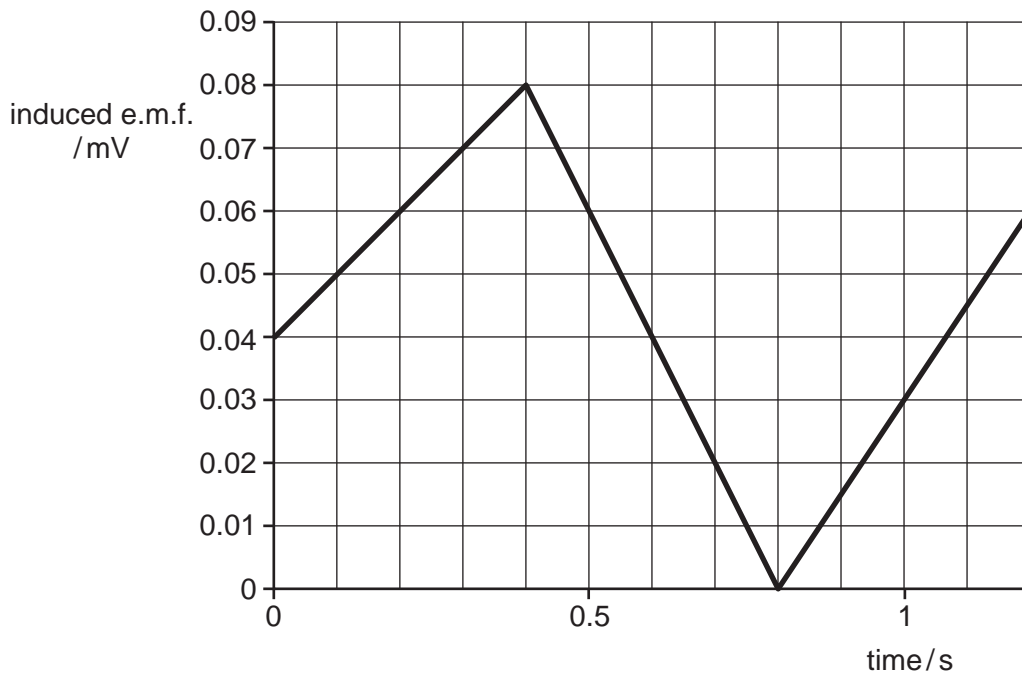
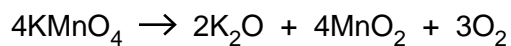


Fig. 9.2

- (a) Use Fig. 9.2 to state at which time
- (i) the induced e.m.f. is at maximum, s
 - (ii) the wire is not moving. s [2]
- (b) Name **two** factors affecting the magnitude of the induced e.m.f.
- 1..... [2]
 - 2..... [2]

- 10 When potassium manganate(VII) is heated, it decomposes according to the following equation.



Four students each weigh a test-tube containing some potassium manganate(VII). Each student heats the test-tube, collects the oxygen given off in a gas syringe and then weighs the test-tube again.

The mass and the volume of oxygen given off from each tube are shown in Fig. 10.1.

mass of oxygen / g	volume of oxygen / cm ³
0.80	600
0.60	450
0.40	300
0.20	150

Fig. 10.1

- (a) On Fig. 10.2, plot a graph of these results.

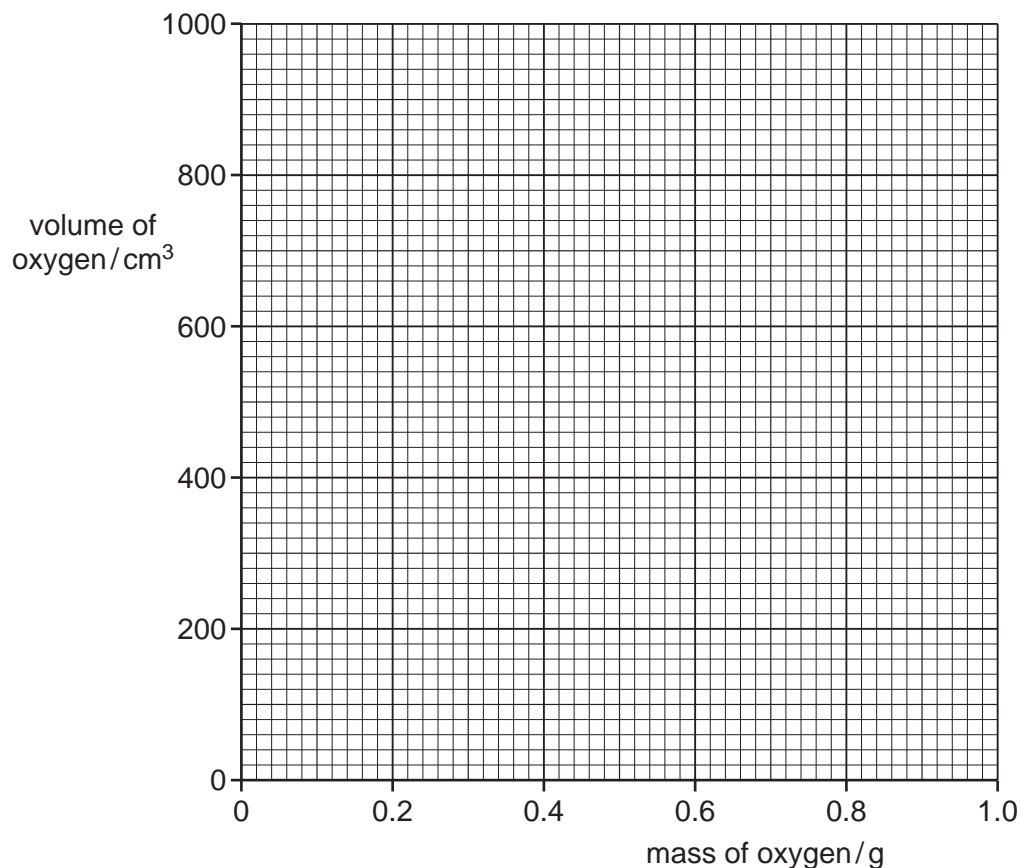


Fig. 10.2

[3]

- (b) (i) Use the graph to find the volume of 1.0 g of oxygen [1]
- (ii) The relative molecular mass, M_r , of oxygen is 32.
Using your answer to (b)(i), calculate the volume of 32 g of oxygen.

volume of oxygen = cm^3 [1]

- (c) State a test to show that the gas given off is oxygen.

test

result [2]

- 11 (a) Use the words from the following list to complete the sentences below.

alveoli carbon dioxide chest
diffusion osmosis oxygen

The words may be used once, more than once, or not at all.

In the lungs, moves into the blood across the walls of the
.....

This occurs by

At the same time, moves from the blood into the air. [4]

- (b) State **three** ways in which expired air differs from inspired air.

1.
2.
3. [3]

12 The following questions are about the transfer of thermal energy.

(a) The handle of a saucepan must not get hot.

Name a suitable material for the handle.

.....

[1]

(b) Explain fully how thermal energy from a radiator travels round a room by convection.

.....
.....
.....
.....
.....
.....

[3]

(c) Infra-red radiation is incident on two similar objects. The temperature of both rises. One is painted black and the other is white.

State why the temperature of the black object rises more quickly.

.....[1]

- 13 A student wants to find which coloured dyes have been mixed together to make dye X. She separates a sample of dye X and samples of coloured dyes using paper chromatography. Her results are shown in Fig. 13.1.

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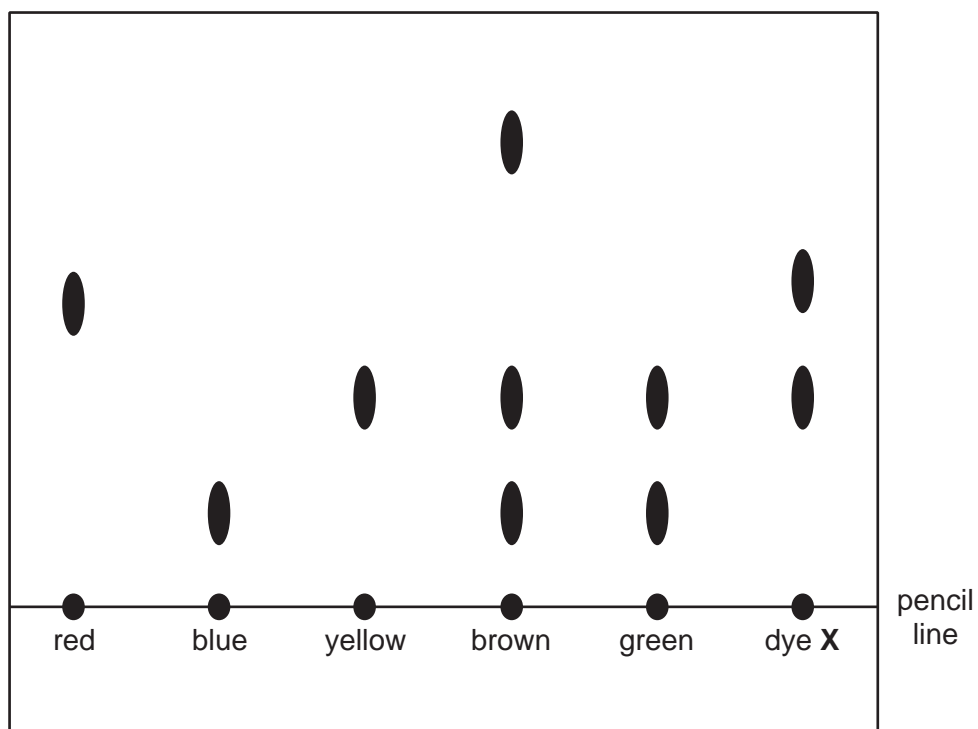


Fig. 13.1

- (a) Explain why the line is drawn in pencil and not in ink.

.....[1]

- (b) Which colours are present in dye X?

.....[2]

- (c) Which coloured dye contains a substance **not** present in any of the other coloured dyes?

.....[1]

- 14 To investigate the action of amylase, four test-tubes are set up as shown in Fig. 14.1. Each test-tube contains starch solution and amylase.

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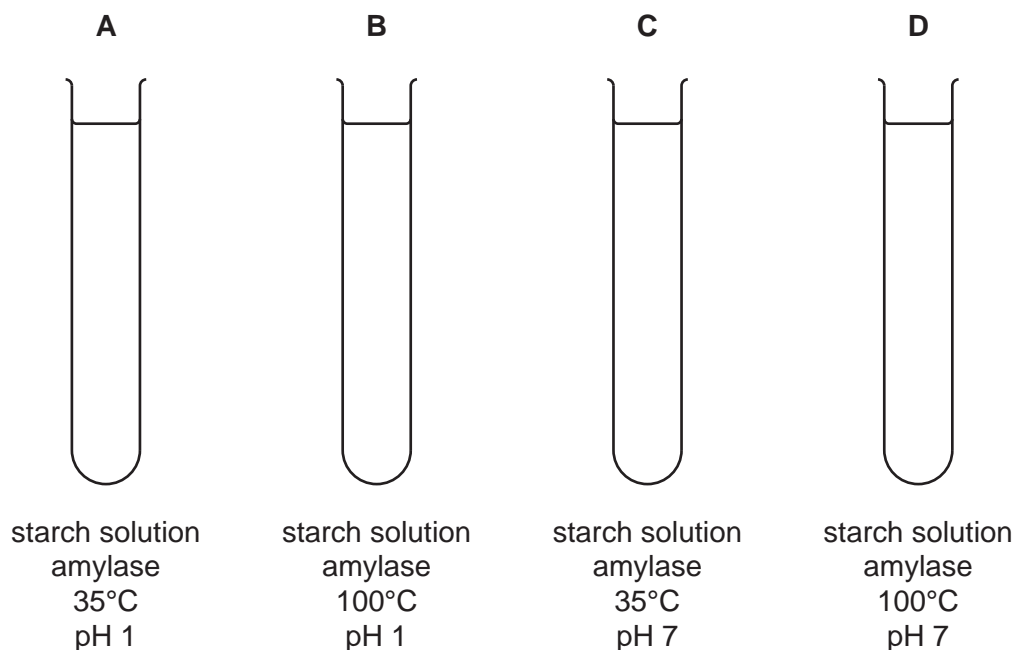


Fig. 14.1

- (a) At one-minute intervals, a sample from each tube is tested for sugar.

State and explain in which tube you would expect sugar to be produced most quickly.

.....

.....

.....

..... [2]

- (b) For this reaction, name

(i) the enzyme,

.....

(ii) the substrate,

.....

(iii) the product.

.....

[3]

15 Parallel rays of light are incident on a thin convex lens as shown in Fig. 15.1.

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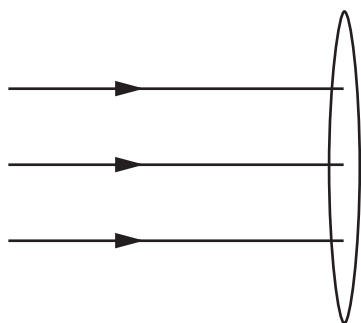


Fig. 15.1

(a) Complete Fig. 15.1 to show what happens to the rays after they pass through the lens. [2]

(b) A ray of light is incident on a glass block as shown in Fig. 15.2.

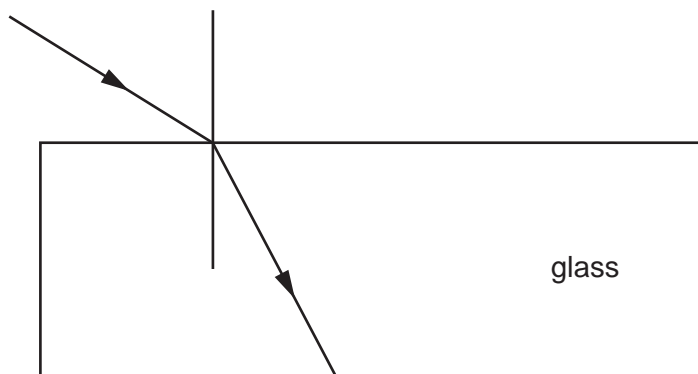


Fig. 15.2

(i) On Fig. 15.2, mark the angle of incidence with the letter *i* and the angle of refraction with the letter *r*. [2]

(ii) The angle of incidence *i* and the angle of refraction *r* are related by the equation

$$\frac{\sin i}{\sin r} = n.$$

State the name given to the constant *n*.

..... [1]

(c) Visible light and infra-red light are both components of the electromagnetic spectrum.

Name **two** other components of the electromagnetic spectrum.

..... and [2]

16 (a) Use the words from the following list to complete the sentences below.

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

electrons **element** **gained** **ions**
isotopes **lost** **neutrons** **protons**

The nuclei of atoms are made up of and

When atoms form positive ions, are

Atoms of the same but with different numbers of neutrons are called

In a neutral atom, there are the same number of and [4]

(b) An atom of radon is represented by ${}_{86}^{222}\text{Rn}$.

Calculate the number of neutrons in this atom of radon.

number of neutrons = [1]

For
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Use

17 The female reproductive system is shown in Fig. 17.1.

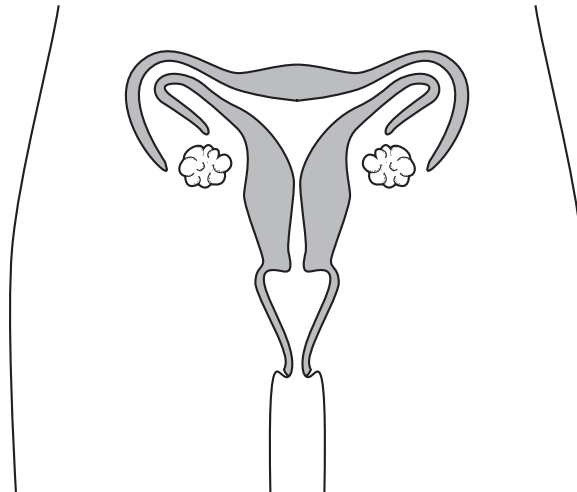


Fig. 17.1

(a) On Fig. 17.1, mark the cervix with the letter X. [1]

(b) In which part of the reproductive system does each of these processes occur?

(i) ovulation

.....

(ii) fertilisation

.....

(iii) implantation

.....

[3]

(c) Explain what is meant by *fertilisation*.

.....

.....

.....

[1]

- 18 A metre rule rests on a table. A book is placed on one end of the metre rule and a student pushes down on the other end, as shown in Fig. 18.1

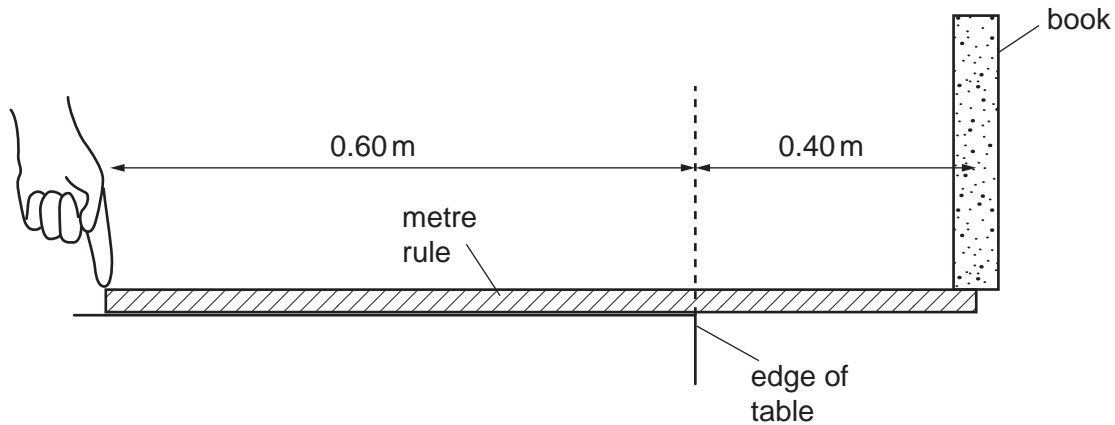


Fig. 18.1

The weight of the metre rule can be ignored.

- (a) On Fig. 18.1, draw an arrow to show the direction of the gravitational force acting on the book. [1]
- (b) The book weighs 6.0 N.

Calculate the moment of the weight of the book about the edge of the table.

moment = unit [2]

- (c) The boy just manages to stop the metre rule tipping clockwise.

Calculate the minimum force with which the student pushes on the metre rule.

force = N [2]

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DATA SHEET
The Periodic Table of the Elements

		Group																																	
		I	II	III	IV	V	VI	VII	O																										
		<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%; text-align: right;">1</td> <td style="width: 10%; text-align: center;">H Hydrogen 1</td> <td colspan="8"></td> <td style="width: 10%; text-align: right;">4</td> <td style="width: 10%; text-align: center;">He Helium 2</td> </tr> </table>										1	H Hydrogen 1									4	He Helium 2												
1	H Hydrogen 1									4	He Helium 2																								
7	Li Lithium 3	9	Be Beryllium 4	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	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																														

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

Key

a	X
b	b

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

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