

Candidate Name _____

Centre Number

Candidate
Number

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CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level
COMBINED SCIENCE
PAPER 2

5129/2

OCTOBER/NOVEMBER SESSION 2002

2 hours 15 minutes

Candidates answer on the question paper.
No additional materials are required.

TIME 2 hours 15 minutes

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [] at the end of each question or part question.

A copy of the Periodic Table is printed on page 20.

FOR EXAMINER'S USE

TOTAL	
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This question paper consists of 19 printed pages and 1 blank page.



- 1 (a) Fig. 1.1 shows an extension-load graph for a spring.

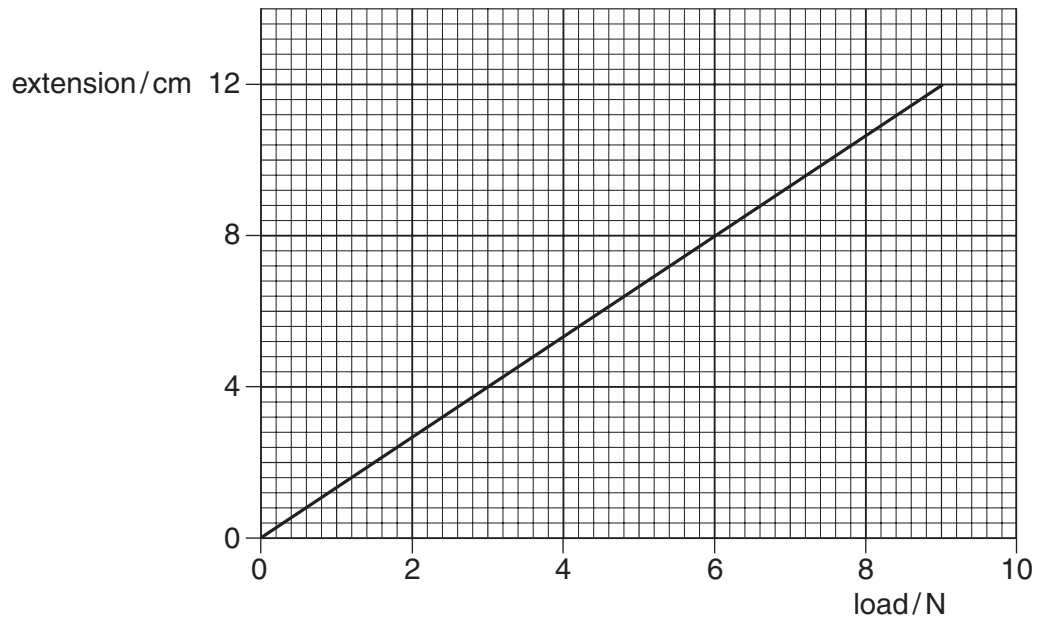


Fig. 1.1

With no force on the spring, it has a length of 10.0 cm.

What force is acting on the spring when its length is 18.0 cm?

[2]

- (b) Fig. 1.2 shows the same spring being used in a device for weighing objects. The spring pulls down on one side of a wooden strip with a force of 8.0 N. The wooden strip is horizontal.

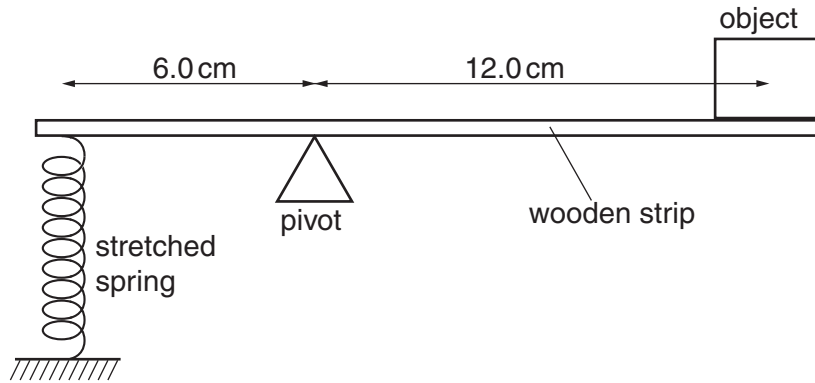


Fig. 1.2

- (i) Calculate the anticlockwise moment, about the pivot, of the force in the spring.

[2]

- (ii) State the clockwise moment of the weight of the object. The weight of the wooden strip can be ignored.

.....[1]

- (iii) Calculate the weight of the object.

[1]

- (c) Identical apparatus is used to weigh the same object on the Moon. The wooden strip is horizontal but the pivot is not in the same position as it is on Earth.

Explain why.

.....

[2]

- 2 When sodium burns in chlorine, sodium chloride is produced. The structure of sodium chloride is illustrated in Fig. 2.1.

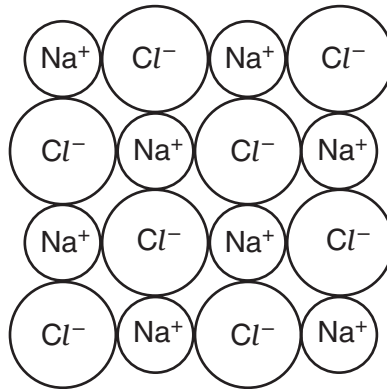


Fig. 2.1

- (a) What type of bonding is present in sodium chloride?

.....[1]

- (b) State the formula of sodium chloride.

.....[1]

- (c) Explain why solid sodium chloride does not conduct electricity.

.....
[1]

- (d) Suggest the names of an acid and an alkali that react together to form sodium chloride.

.....
[2]

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**PLEASE TURN OVER
FOR QUESTION 3**

- 3 Fig. 3.1 shows the apparatus used to investigate how the rate of photosynthesis varies with light intensity.

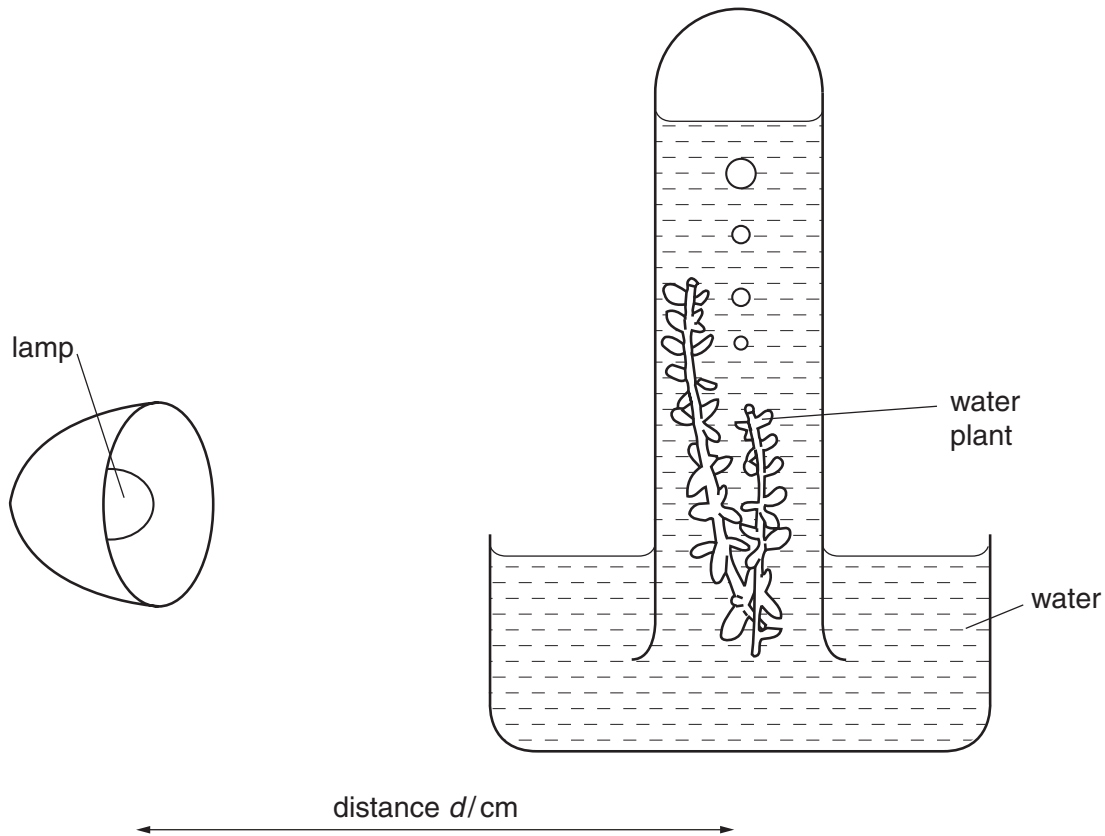


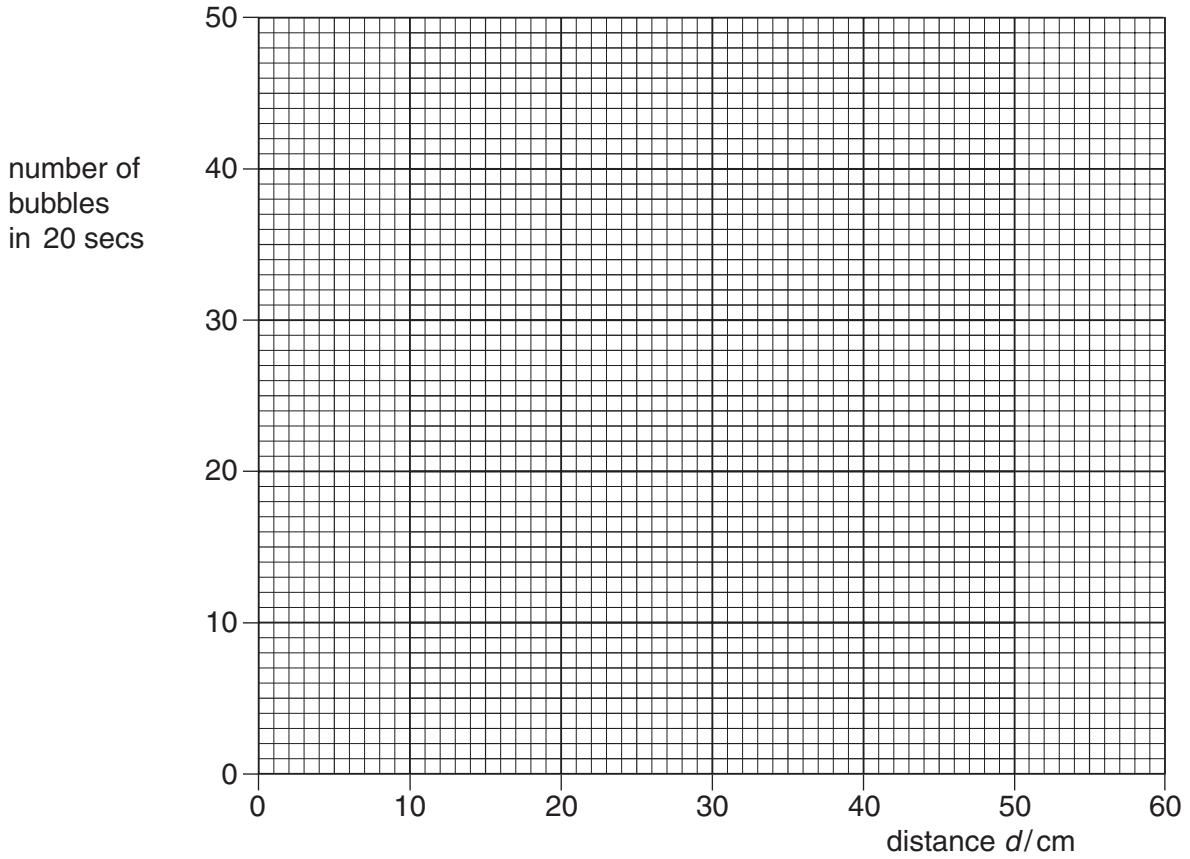
Fig. 3.1

Bubbles of gas are given off as the plant photosynthesises.
The number of bubbles given off in a time of 20 seconds is counted.
The distance d , between the lamp and the plant, is changed and the experiment is repeated.

Fig. 3.2 shows the results of the investigation.

distance d/cm	number of bubbles in 20 seconds
5	40
10	25
15	20
20	15
25	10
30	8
35	5
40	2
50	1

Fig. 3.2



- (a) Name the gas in the bubbles.
.....[1]
- (b) Plot the data in Fig. 3.2 on the grid above. [3]
- (c) How does the rate of photosynthesis vary with increasing distance of the lamp?
.....
.....[1]
- (d) Suggest why, in a lake, very few water plants grow at depths greater than 20 m.
.....[1]

- 4 Fig. 4.1 shows water droplets from a nozzle falling on a plant. The nozzle gives each droplet a positive charge.

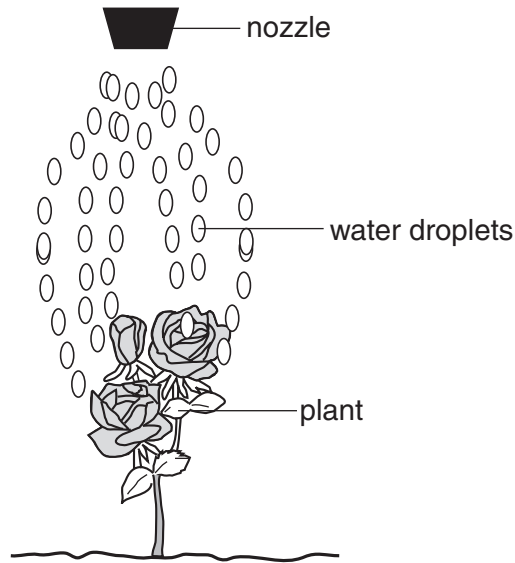


Fig. 4.1

- (a) Explain why the droplets spread out as they leave the nozzle.

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

- (b) The plant gains a negative charge. Explain why this makes the water droplets move towards the plant.

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

- (c) Every 20 seconds, 5.0×10^7 water droplets come out of the nozzle. Each droplet carries a charge of 1.8×10^{-11} C.

Calculate

- (i) the charge carried away by the droplets in 20 s,

[1]

- (ii) the charge carried away by the droplets in 1.0 s,

[1]

- (iii) the electric current from the nozzle.

[1]

- 5 Fig. 5.1 shows the apparatus used to investigate the composition of air.

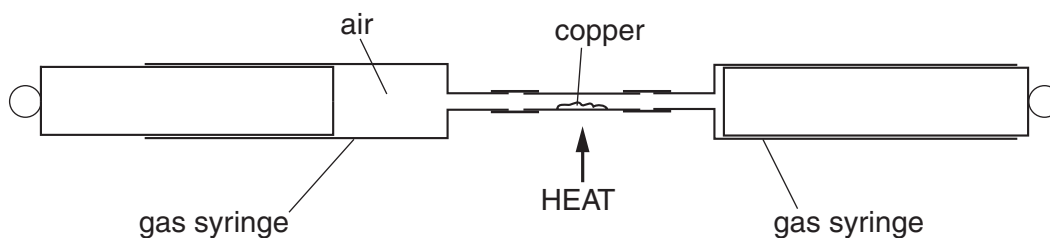


Fig. 5.1

Air is passed over hot copper from one syringe to the other. One of the gases of the air, **X**, reacts with the copper, which changes colour from brown to black.

The results obtained from the experiment are as follows:

initial volume of air in the syringe = 75.0 cm^3

final volume of gas in the syringe = 60.0 cm^3

- (a) Name the gas **X**.

.....[1]

- (b) (i) What is the volume of gas **X** in the sample of air?

..... cm^3 [1]

- (ii) Calculate the percentage by volume of gas **X** in the air.

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

- (c) Air contains about 1% of argon.

- (i) In which group of the Periodic Table is argon?

.....

- (ii) Suggest why argon does not react with the copper.

.....[2]

6 (a) State the function of red blood cells.

.....[1]

(b) (i) State two structural adaptations of human red blood cells that help them to carry out their function.

1

2[2]

(ii) Explain how **one** of the adaptations you stated in (b)(i) helps the cell to function.

.....

.....[1]

(c) Fig. 6.1 below shows a blood smear seen under a microscope.

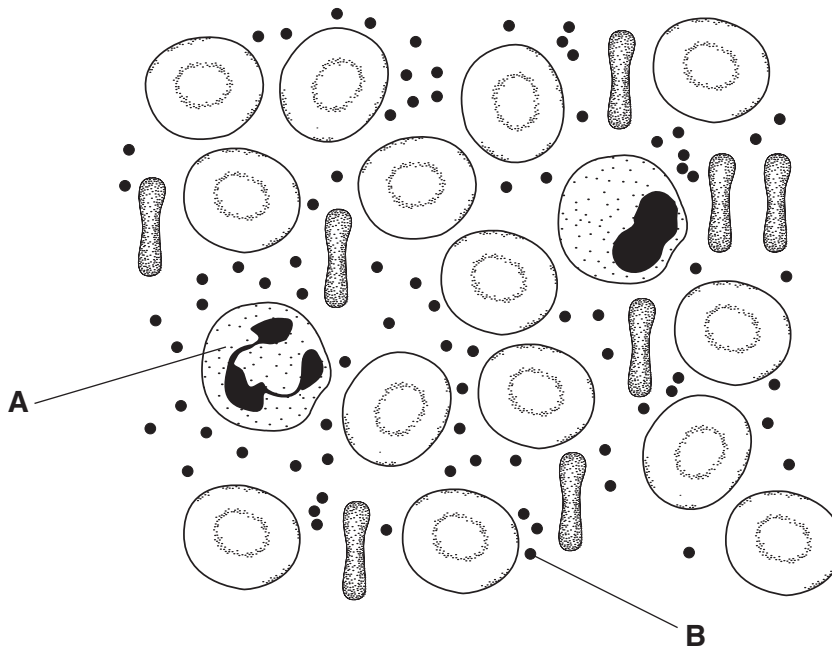


Fig. 6.1

(i) Name **A** and **B**.

A

B[2]

(ii) State the functions of **A** and **B**.

A

B[2]

- 7 (a) Complete the following sentences about energy changes in a hydroelectric power station.

In a hydroelectric power station, water flows downhill. As it falls, the energy of the water is changed into energy. In the generators, energy is changed into energy. Friction causes some energy to be wasted as [3]

- (b) One generator produces 72 000 000 J of energy in 12 minutes.

- (i) State an equation for calculating power.

.....[1]

- (ii) Calculate the power of the generator.

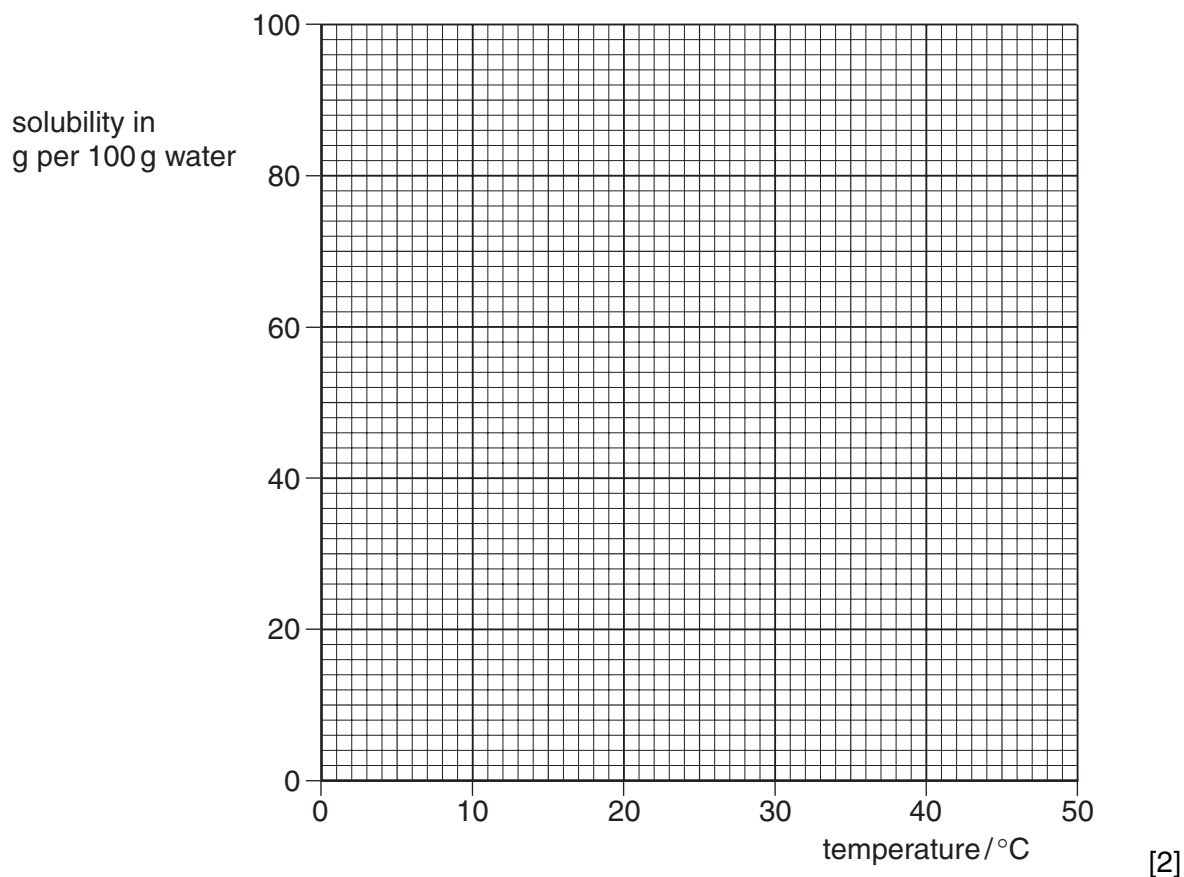
[2]

- 8 Fig. 8.1 shows the solubility of ammonia in water at different temperatures.

temperature / °C	0	10	20	30	40	50
<u>solubility of ammonia</u> g per 100 g water	90	69	53	41	31	24

Fig. 8.1

(a) On the grid below, plot a graph of solubility against temperature.



(b) Use the graph to find the solubility of ammonia at 25 °C.

..... g per 100 g water. [1]

(c) When ammonia solution is heated, ammonia gas is given off.

(i) What is the maximum mass of ammonia that can be dissolved in 100 g of water at 20 °C?

..... g [1]

(ii) If this solution is heated to 40 °C, what mass of ammonia gas will be given off?

..... g [1]

(iii) If 17 g of ammonia has a volume of 24 dm³, what is the volume of the gas given off in (c)(ii)?

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

9 (a) Explain what is meant by *excretion*.

.....

[2]

(b) (i) Name the organ through which carbon dioxide is excreted.

.....[1]

(ii) Name the process that produces this carbon dioxide.

.....[1]

(iii) Where in the body does the process in (b)(ii) take place?

.....[1]

(c) Fig. 9.1 is a diagram of a kidney and its blood vessels.

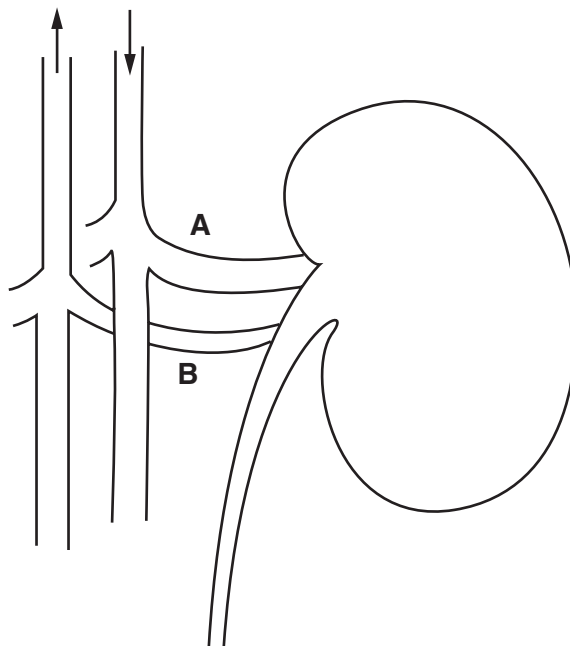


Fig. 9.1

Suggest three differences between the blood in artery **A** and the blood in vein **B**.

- 1
.....
- 2
.....
- 3
.....[3]

- 10 Fig. 10.1 shows a ray of light, **A**, passing through a glass block and a ray **B** arriving at point **X**.

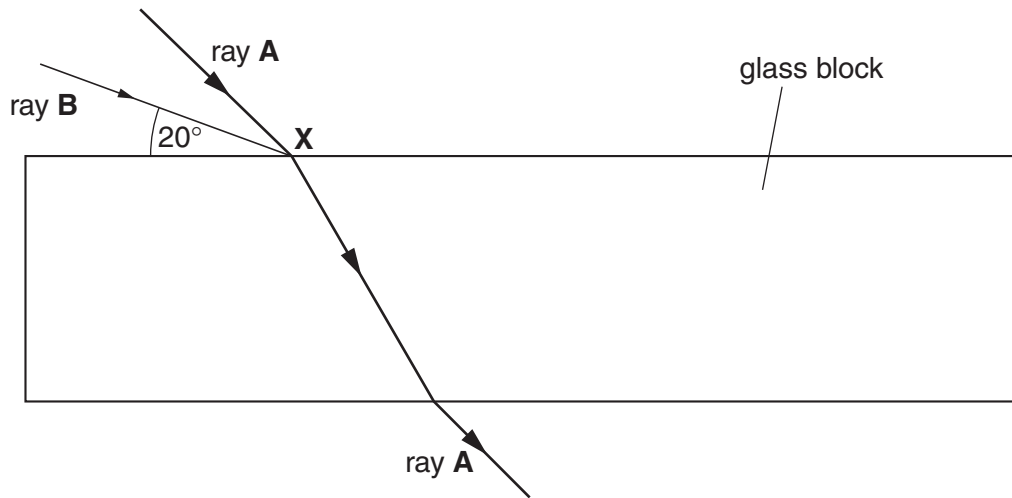


Fig. 10.1

- (a) On Fig. 10.1, draw ray **B** passing through and out of the block. [3]

- (b) What is the angle of incidence of ray **B** at point **X**?

.....[1]

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

.....[1]

- (ii) When the angle of incidence is 54° , the angle of refraction is 35° .

Calculate the refractive index of the glass.

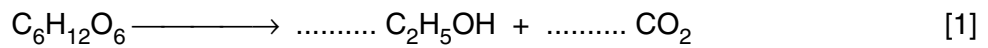
[2]

11 Ethanol is made by the fermentation of glucose.

(a) Describe the essential conditions for the fermentation of glucose to form ethanol.

.....
.....
.....
.....[4]

(b) Balance the equation for the fermentation of glucose.



(c) State **one** industrial use of ethanol.

.....[1]

12 Breathing in smoke from burning coal, oil, wood or cigarettes can damage the lungs.

Name two air pollutants, other than carbon monoxide, that are harmful to the lungs.

For each one, explain the way in which the lungs are affected.

1 pollutant[1]

effect

.....[1]

2 pollutant[1]

effect

.....[1]

13 Wires in a mains cable are different colours.

(a) State the colour or colours of

(i) the live wire,

(ii) the neutral wire,

(iii) the earth wire.

[3]

(b) Which wire should be connected to the fuse?[1]

(c) A plug is connected to a kettle. The element of the kettle is rated at 2.0 kW, 230 V

(i) Calculate the current in the element of the kettle.

[2]

(ii) Three fuse ratings are available. These are 5 A, 10 A and 15 A.

State which fuse rating is most suitable for the plug of the kettle.

.....[1]

14 Butane is a fuel obtained from petroleum (crude oil). It is used as a fuel because it burns in air giving a large amount of energy.

(a) Name the process used to obtain butane from petroleum.

.....[1]

(b) Butane belongs to a homologous series of hydrocarbons.

(i) Name this homologous series.[1]

(ii) State **two** characteristics of a homologous series.

.....

.....

.....[2]

(c) What type of bonding is present in a molecule of butane?

.....[1]

15 (a) A woman starts to menstruate on November 1st.

(i) On which day does she expect to ovulate?

.....[1]

(ii) She does not become pregnant.

On which day does she expect to begin menstruation again?

.....[1]

(iii) The days of the following month, December, are listed

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31

.....

write the word *fertile* under the days when an egg is most likely to be fertilised. [1]

(b) Complete the following sentence by choosing words from the list below.

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

fetus ovary sperm uterus zygote

An egg fuses with a to form a which develops into a ball of cells that implants in the wall of the , where it grows into a [4]

16 The following is a list of substances.

ammonium sulphate calcium carbonate chlorine
copper nitric acid sulphur dioxide

Use the list to answer the questions. Each substance may be used **once**, **more than once** or **not at all**.

Name the substance that

(a) reacts with ammonia to produce a fertiliser,[1]

(b) reacts with dilute sulphuric acid to produce a colourless gas,[1]

(c) is used to control the acidity of soil,[1]

(d) forms a covalent compound when reacted with hydrogen,[1]

(e) forms an alloy when mixed with zinc.[1]

DATA SHEET
The Periodic Table of the Elements

20

		Group									
I	II	III	IV	V	VI	VII	0				
1	2						3	4			
H Hydrogen 1	He Helium 2						Li Lithium 3	Be Beryllium 4			
5	6	7	8	9	10	11	12				
B Boron 5	C Carbon 6	N Nitrogen 7	O Oxygen 8	F Fluorine 9	Ne Neon 10	Na Sodium 11	Mg Magnesium 12				
13	14	15	16	17	18	19	20				
Al Aluminium 13	Si Silicon 14	P Phosphorus 15	S Sulphur 16	Cl Chlorine 17	Ar Argon 18	K Potassium 19	Ca Calcium 20				
21	22	23	24	25	26	27	28				
Sc Scandium 21	Ti Titanium 22	V Vanadium 23	Cr Chromium 24	Mn Manganese 25	Fe Iron 26	Co Cobalt 27	Ni Nickel 28				
29	30	31	32	33	34	35	36				
Cu Copper 29	Zn Zinc 30	Ga Gallium 31	Ge Germanium 32	As Arsenic 33	Se Selenium 34	Br Bromine 35	Kr Krypton 36				
37	38	39	40	41	42	43	44				
Rb Rubidium 37	Sr Strontium 38	Y Yttrium 39	Zr Zirconium 40	Nb Niobium 41	Ru Ruthenium 44	Rh Rhodium 45	Pd Palladium 46				
45	46	47	48	49	50	51	52				
La Lanthanum 57	Ce Cerium 58	Pr Praseodymium 59	Nd Neodymium 60	Pm Promethium 61	Sm Samarium 62	Eu Europium 63	Gd Gadolinium 64				
53	54	55	56	57	58	59	60				
In Indium 49	Sn Tin 50	Sb Antimony 51	Te Tellurium 52	I Iodine 53	Xe Xenon 54	Ba Barium 56	Ra Radium 88				
61	62	63	64	65	66	67	68				
Tl Thallium 81	Pb Lead 82	Bi Bismuth 83	Po Polonium 84	At Astatine 85	Rn Radon 86	Fr Francium 87	Ra Radium 88				
69	70	71	72	73	74	75	76				
Er Erbium 68	Tm Thulium 69	Yb Ytterbium 70	Lu Lutetium 71	No Nobelium 102	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101				
77	78	79	80	81	82	83	84				
Ir Iridium 77	Pt Platinum 78	Au Gold 79	Hg Mercury 80	Tl Thallium 81	Pb Lead 82	Bi Bismuth 83	Po Polonium 84				
85	86	87	88	89	90	91	92				
Pt Platinum 78	Au Gold 79	Hg Mercury 80	Tl Thallium 81	Pb Lead 82	Bi Bismuth 83	Po Polonium 84	At Astatine 85				
89	90	91	92	93	94	95	96				
Ac Actinium 89	Ra Radium 88	Th Thorium 90	Pa Protactinium 91	U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Cm Curium 96				
97	98	99	100	101	102	103	104				
Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103					
105	106	107	108	109	110	111	112				
Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103						

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

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

Key

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