



BOTSWANA EXAMINATIONS COUNCIL
 in collaboration with
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE
 Botswana General Certificate of Secondary Education

CANDIDATE
NAME

CENTRE
NUMBER

--	--	--	--

CANDIDATE
NUMBER

--	--	--	--

* 3 4 6 7 2 9 4 0 7 5 *

SCIENCE : DOUBLE AWARD

0569/04

Paper 4

October/November 2012

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: 300 mm ruler.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided at the top of this page.
 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.
 Write your answers in the spaces provided on the question paper.
 The number of marks is given in brackets [] at the end of each question or part question.
 You may use a calculator.
 A copy of the Periodic Table is printed on page 16.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
Total	

This document consists of **16** printed pages.



- 1 A student performed an experiment to determine the power of a small electric motor. The student determined the power by measuring the height of the table, h , the mass of the load, m , and the time, t , taken by the load to reach the height of the table. Fig. 1.1 shows the set-up that was used by the student.

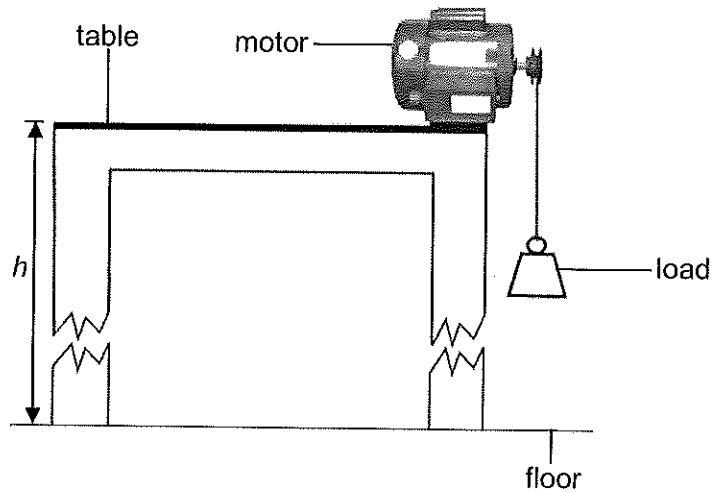


Fig. 1.1

Fig. 1.2 shows the results obtained when measuring the height, h , using a metre rule with a zero mark at the floor level.

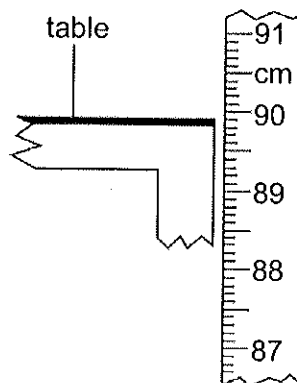


Fig. 1.2

- (a) Record the height of the table, h .

$h = \dots\dots\dots$ [1]

(b) Fig. 1.3 shows the results obtained when measuring the mass, m .

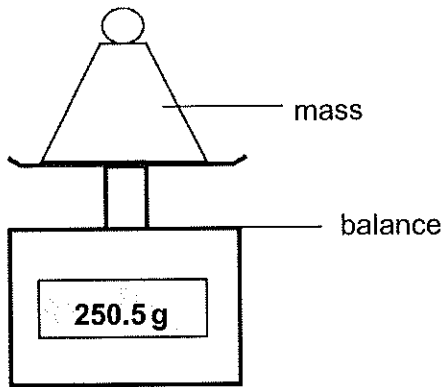


Fig. 1.3

Record the mass of the load, m , in kilograms.

$m = \dots\dots\dots$ [1]

(c) Fig. 1.4 shows the time recorded on a stopwatch for the load to move from the floor to the top of the table, t .

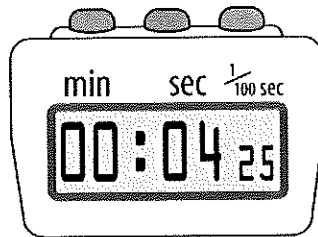


Fig. 1.4

Record the time taken by the load to reach the top of the table, t .

$t = \dots\dots\dots$ [1]

(d) Find the power of the motor. Use the equation

$$\text{power} = \frac{m \times h}{10 \times t}$$

where h is in centimetres.

power = $\dots\dots\dots$ [2]



- (e) The student repeated the experiment using a load which has a mass of 502.0 g. Fig. 1.5 shows the time the student recorded.

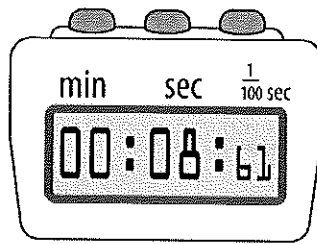


Fig. 1.5

Record the time taken by the second load to reach the motor t_2 .

$t_2 = \dots\dots\dots$ [1]

- (f) Why is it important to repeat the experiment using the same mass?

.....
 [1]

- 2 An experiment was performed to compare the resistance of two wires of different thickness, **P** and **Q**. Each wire is connected in turn between points **X** and **Y**. Fig. 2.1 shows the set-up that was used.

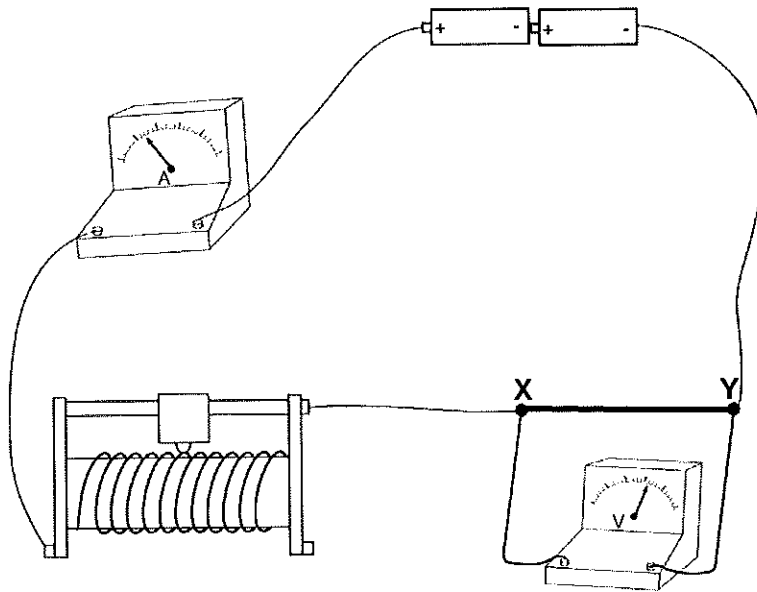


Fig. 2.1

- (a) Use circuit symbols to draw the circuit shown in Fig. 2.1.
Use the symbol of a resistor for the wire connected between **X** and **Y**.

[3]

- (b) Fig. 2.2 shows the wires placed next to each other.



Fig. 2.2

Measure and record the length of wires **P** and **Q**.

- (i) length of **P** =
- (ii) length of **Q** = [2]



- (c) Fig. 2.3(a) and Fig 2.3(b) shows the micrometer scale readings obtained when measuring the thickness of the two wires.

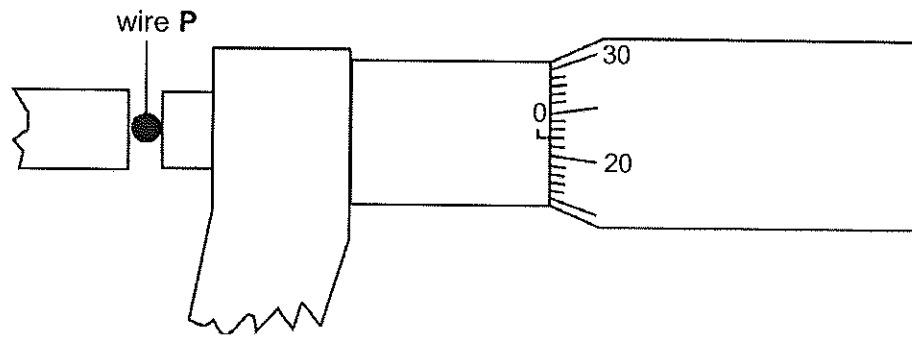


Fig. 2.3(a)

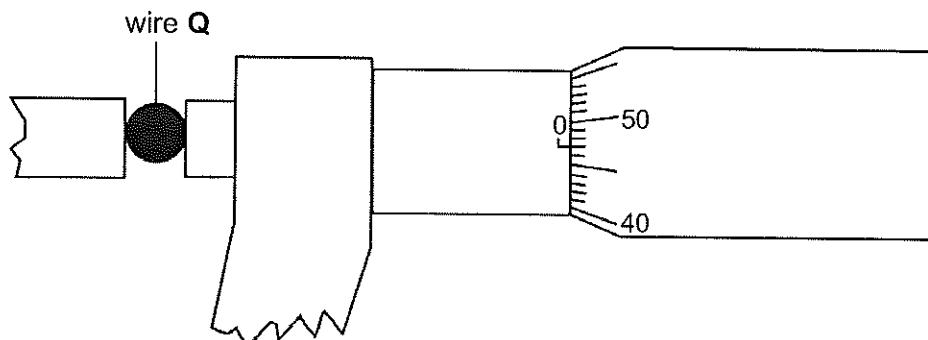


Fig. 2.3(b)

Record the diameters of wire P and wire Q.

- (i) diameter of wire P =
- (ii) diameter of wire Q = [2]
- (d) Fig. 2.4 shows the readings obtained from the ammeter and the voltmeter when wire Q was connected between X and Y.

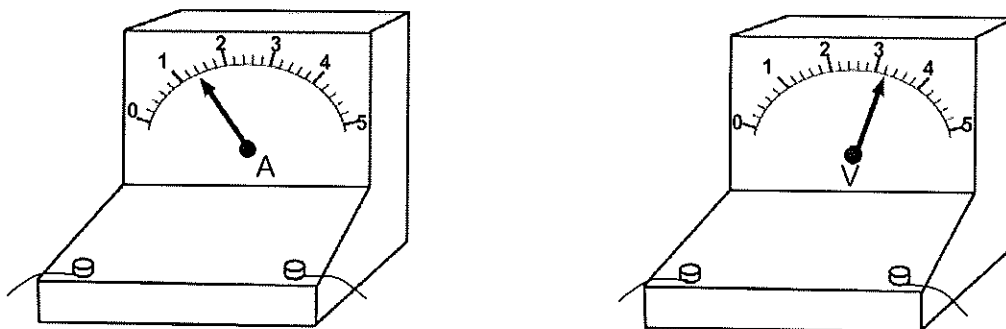


Fig. 2.4

Record the ammeter reading and the voltmeter reading.

- (i) ammeter reading =
- (ii) voltmeter reading = [2]

(e) Given that $R = \frac{V}{I}$, find the resistance of wire Q.

R = [1]

(f) Wire P and Q are made from the same material.
Will the value of R for wire P be **less than**, **greater than** or **equal** to that of Q.
Explain your answer.

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

(g) Name one other variable that must be kept the same for both wires to make a valid conclusion about the effect of thickness.

..... [1]

3 Fig. 3.1 shows some apparatus used in the laboratory.

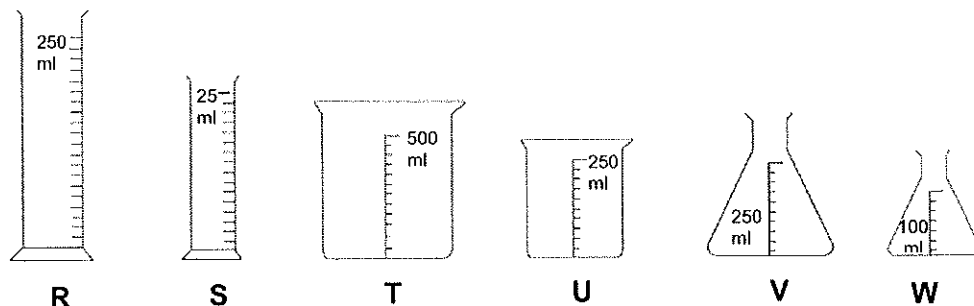


Fig. 3.1

(a) Which piece(s) of apparatus

(i) are beakers,

(ii) is capable of measuring accurately 250 cm³ of water,

(iii) is safe for use in boiling 250 cm³ of water? [3]

(b) Give **two** precautions taken to obtain an accurate reading when using apparatus R.

1

2



- 4 Fig. 4.1 shows the apparatus used to investigate the rate of reaction between magnesium and excess dilute hydrochloric acid at 30 °C.

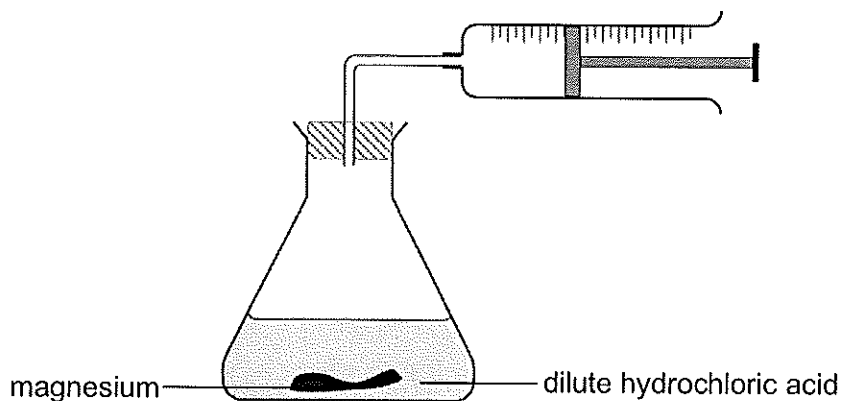
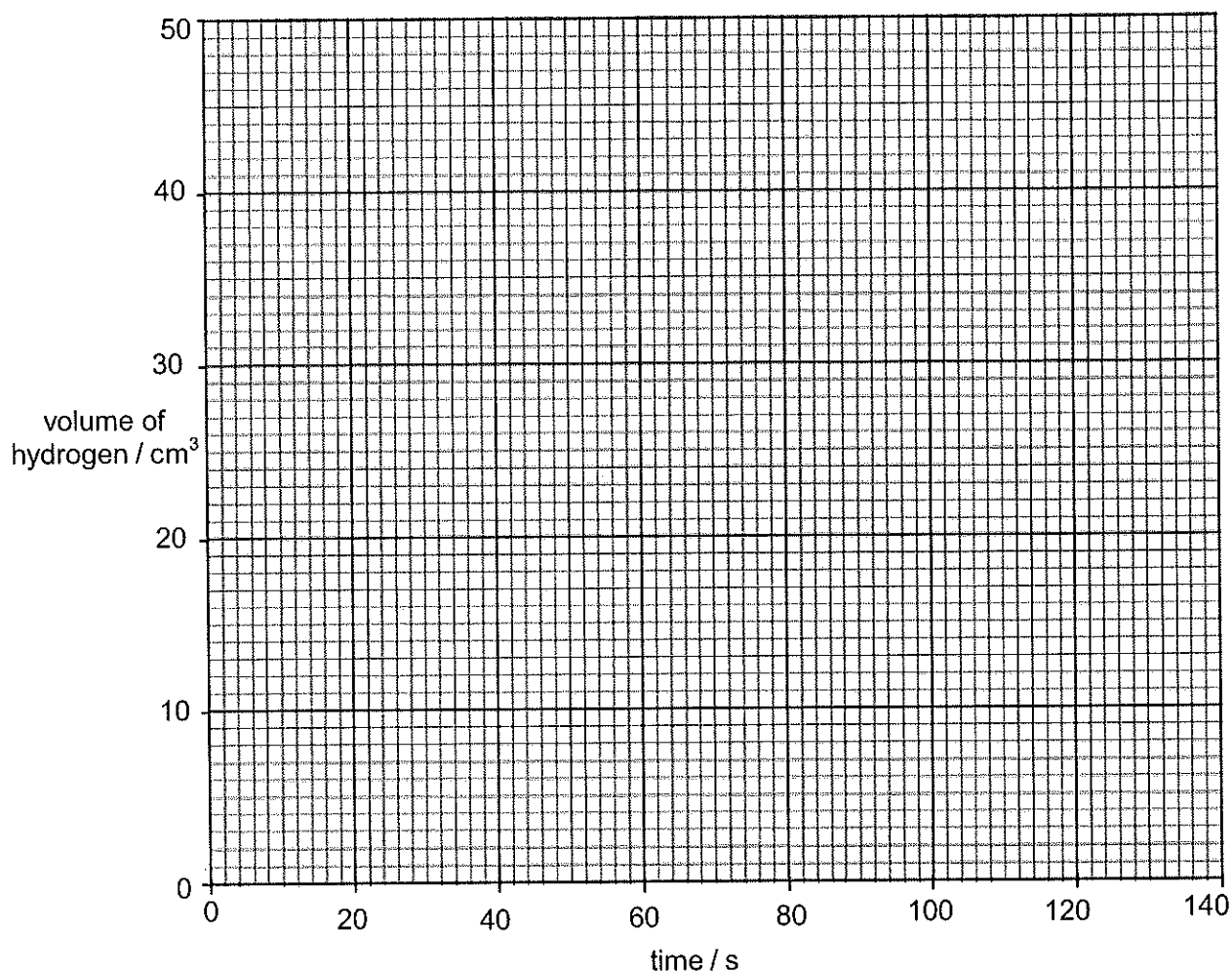


Fig. 4.1

The volume of hydrogen gas produced was measured and recorded in Table 4.1.

Table 4.1

time / s	volume of hydrogen / cm ³
0	0
20	19
40	32
60	33
80	43
100	46
120	46
140	46



- (a) Plot the graph of the results on the grid. [2]
- (b) Use your graph to determine
- (i) the time taken to produce 30 cm^3 of hydrogen gas,
 [1]
- (ii) the anomalous reading which should be checked.
 [1]
- (c) On the same axis, sketch a graph you would get if the same experiment was carried out at 20°C . Label this graph X. [2]



5 Tests were carried out on a solution of salt **R**.

Table 5.1 shows tests, observations and conclusions drawn. Complete the table.

Table 5.1

	tests	observations	conclusions
(a)	(i) a little aqueous ammonia was added to a portion of solution R [2]	Cu^{2+} ions present
	(ii) excess aqueous ammonia was added [2]	Cu^{2+} ions present
(b) [2] [1]	sulphate ions present

(c) State the name and formula of salt **R**.

name

formula [2]

- 6 Fig. 6.1 shows set-ups used to investigate germination in bean seeds. The set-ups were prepared at the same time and left for 5 days. The diagrams show the apparatus at the start of the experiment. The conditions for set-up **S** were kept the same for 5 days.

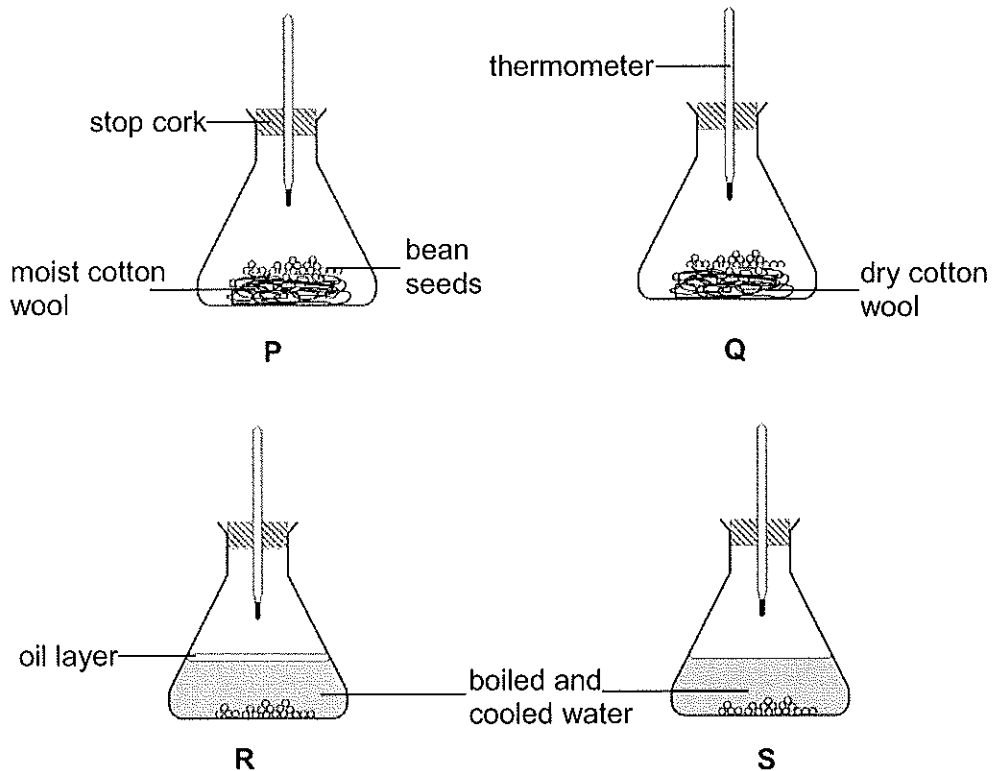


Fig. 6.1

The readings of the thermometers from set-ups **P**, **Q**, **R** and **S** at the beginning of the experiment are shown in Table 6.1.

Table 6.1

set-up	temperature / °C
P	26
Q	26
R	26
S	0



(a) Fig. 6.2 shows the thermometer readings of P, Q, R and S after 5 days.

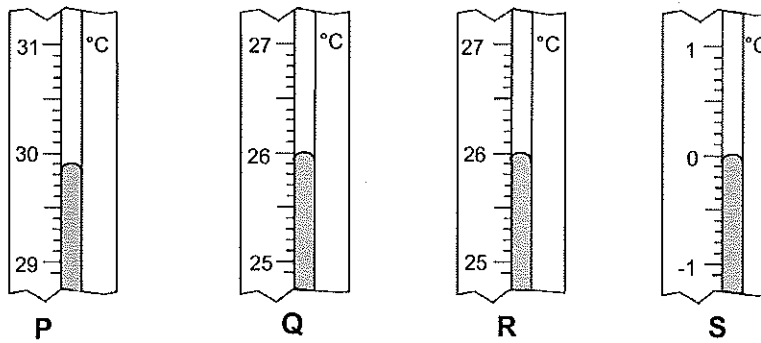


Fig. 6.2

Record the temperatures for P, Q, R and S.

P

Q

R

S

[2]

(b) (i) Use the results shown in Fig. 6.2 to determine in which of the set-ups, P, Q, R or S, the seeds germinated.

..... [1]

(ii) Explain how you worked out your answer to (i).

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

(iii) Explain why the seeds germinated in this set-up but not in the others.

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

(c) State **one** way in which the experiment can be improved.

..... [1]

- 7 Four potato chips of the same length were cut. Fig. 7.1(a) shows the length of one potato chip. Fig 7.1(b) shows the scale on a balance that was used to measure the mass of the potato chip.

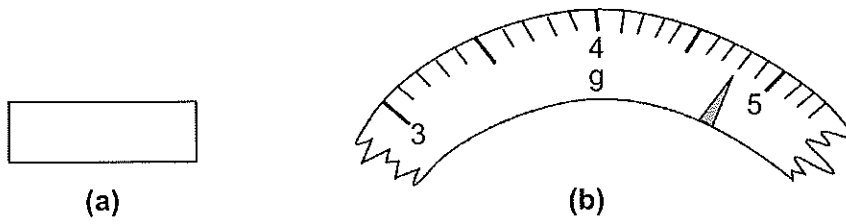


Fig. 7.1

- (a) (i) Measure and record the length of the potato chip in Fig. 7.1(a).

.....[1]

- (ii) Record the mass of the potato chip.

.....[1]

Each potato chip was then placed in a different liquid as shown in Fig. 7.2.

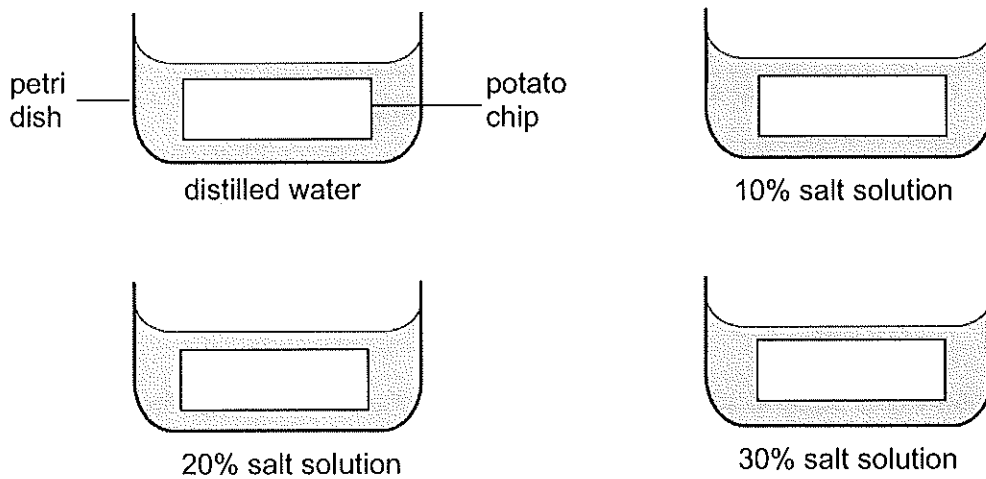


Fig. 7.2



- (b) Fig. 7.3 shows the potato chips after they were left in the solutions for 30 minutes. Measure and record the length of the chips in the 10% salt solution and in the 30% salt solutions. The lengths of the potato chips in distilled water and the 20% salt solution have already been measured and recorded.

distilled water	10% salt solution
<input type="text"/>	<input type="text"/>
length = 3.0 cm	length =
20% salt solution	30% salt solution
<input type="text"/>	<input type="text"/>
length = 2.3 cm	length =

[2]

Fig. 7.3

- (c) The mass of the potato chips that were in 10%, 20% and 30% salt solutions have been recorded in Table 7.1.

Table 7.1

concentration of salt solution	mass of potato chip / g
10%	5.1
20%	4.6
30%	4.3

Fig. 7.4 shows the scale reading for the mass of the potato chip in distilled water.

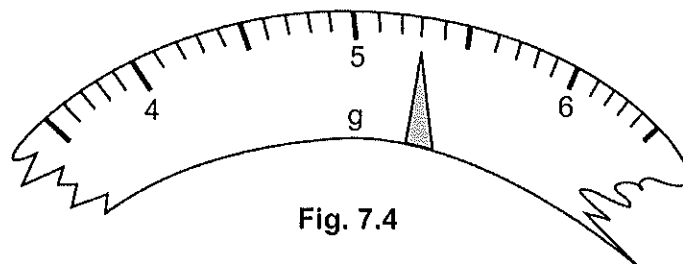


Fig. 7.4

Record the mass of the potato chip in distilled water.

.....[1]

- (d) Use the results in (b) and (c) to suggest the concentration of the cell sap in the potato chips.

.....[1]

(e) Explain the change in the mass of the potato chip in distilled water.

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

8 Fig. 8.1 shows a fruit of a plant.

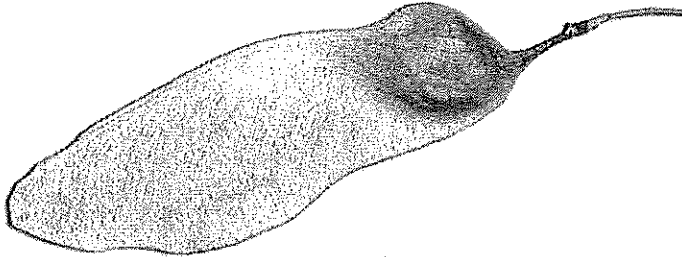


Fig. 8.1

Make a large drawing of the fruit in Fig. 8.1. Labels are not required.

[4]

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (BEC) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest



DATA SHEET
The Periodic Table of the Elements

		Group																
I	II	III	IV	V	VI	VII	0											
		1 H Hydrogen 1					4 He Helium 2											
7 Li Lithium 3	9 Be Beryllium 4		11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10										
23 Na Sodium 11	24 Mg Magnesium 12		27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulphur 16	35.5 Cl Chlorine 17	40 Ar Argon 18										
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	80 Br Bromine 35	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	101 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	127 I Iodine 53	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	188 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	209 Bi Bismuth 83	210 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
226 Fr Francium 87	226 Ra Radium 88		227 Ac Actinium 89															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	162 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71	
232 Th Thorium 90	238 U Uranium 92	238 Pa Protactinium 91	94 Pu Plutonium 94	95 Am Americium 95	96 Cm Curium 96	97 Bk Berkelium 97	98 Cf Californium 98	99 Es Einsteinium 99	100 Fm Fermium 100	101 Md Mendelevium 101	102 No Nobelium 102	103 Lr Lawrencium 103

*58-71 Lanthanoid series
190-103 Actinoid series

Key

a	X
---	----------

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

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