



BOTSWANA EXAMINATIONS COUNCIL
JUNIOR CERTIFICATE EXAMINATION

SCIENCE

14/2

Paper 2

October/November 2019

Marks: 80

Time: 2 Hours

Candidate
Full Names:

Centre Number:

J	C				
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Candidate Number:

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INSTRUCTIONS

1. Write your full names and examination number in the spaces provided above.
2. Answer **ALL** questions.
3. All answers must be written in the spaces provided.
4. Show **ALL** the necessary working.
5. Calculators may be used in this paper.
6. A copy of the Periodic Table is printed on page 20.

FOR EXAMINER'S USE ONLY

Section	Marks Scored
A	
B	
Total Marks	

This question paper contains 17 printed pages.

DO NOT TURN THE PAGE UNTIL YOU ARE TOLD TO DO SO.

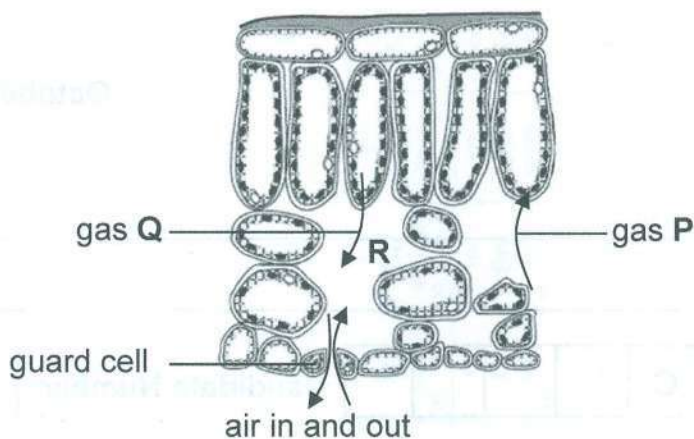


SECTION A

(60 Marks)

For
Examiner's
Use

The diagram below shows a section of a leaf taken from a plant at 12 noon on a day with clear skies. Use it to answer question 1.



1. (a) Name the structure that allows movement of air in and out of the leaf.
 (1)
- (b) Name gases P and Q.
 P
 Q (2)
- (c) (i) How does the concentration of gases P and Q compare at point R in the leaf?
 (1)
- (ii) Give a reason for the answer to (c) (i).
 (1)

831

A022



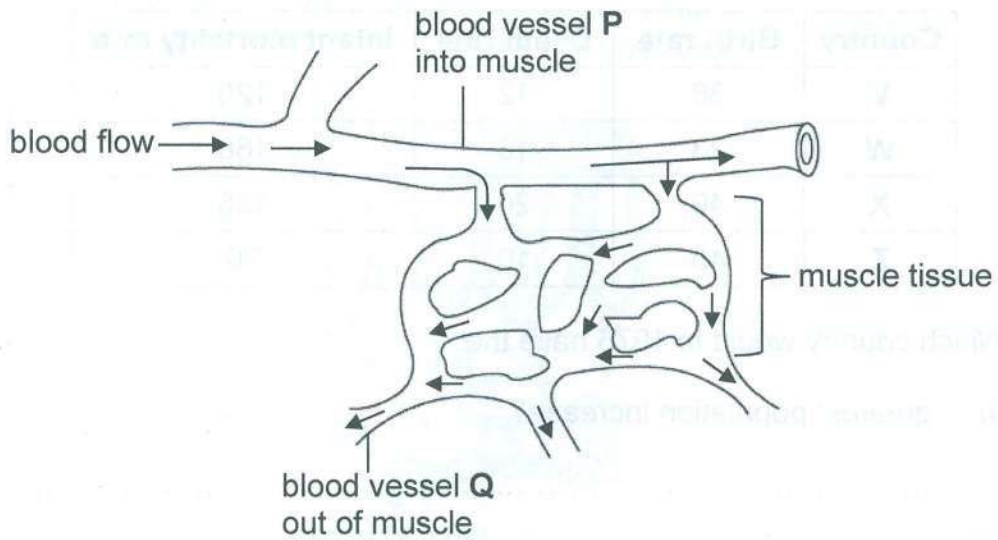
The table below shows birth rate, death rate and infant mortality rate for countries V, W, X and Z in the year of 1975. Use it to answer question 2.

Country	Birth rate	Death rate	Infant mortality rate
V	36	12	120
W	23	16	168
X	40	20	155
Z	43	10	70

2. (a) Which country would in 1976 have the
- (i) greatest population increase?
 (1)
- (ii) smallest population increase?
 (1)
- (b) State **two** factors in a society which could contribute to a reduction in the birth rate.

 (2)

The diagram below shows some blood vessels in a muscle tissue.
Use it to answer question 3.



831

3. (a) Name **two** substances which are at a higher concentration in the blood vessel P than in the blood vessel Q.

.....
..... (2)

- (b) When the muscle is more active the blood flow will be faster.

How does this benefit the muscle?

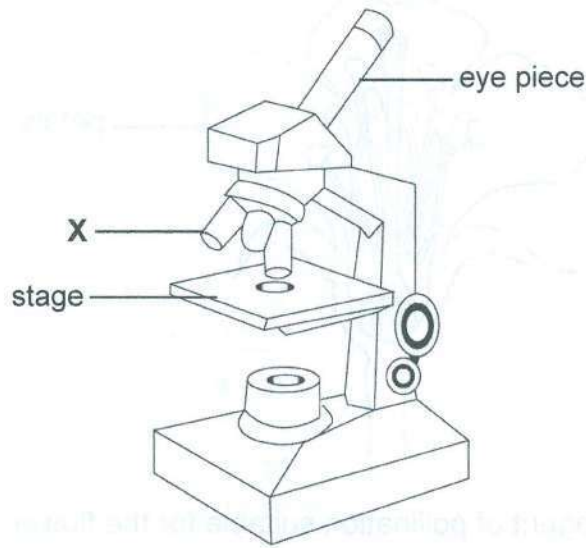
.....
..... (2)

- (c) What type of blood vessel is P?

..... (1)

A022

The diagram below shows an instrument used in a laboratory.
Use it to answer question 4.



4. (a) Name the instrument.

..... (1)

(b) State any use of the instrument.

..... (1)

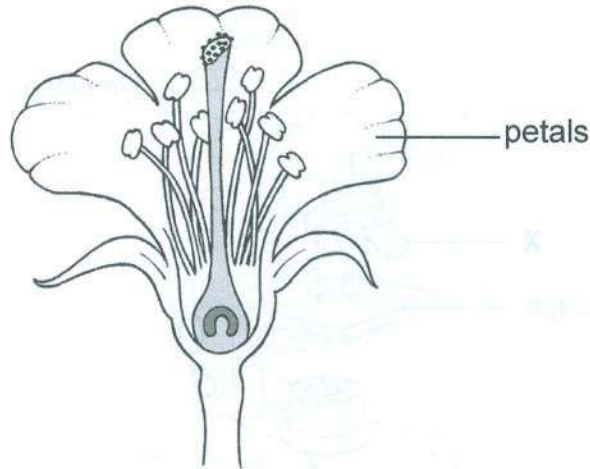
(c) What is the function of the part labelled X?

..... (1)

(d) Suggest **one** precaution to be observed when using the instrument.

.....
..... (1)

The diagram below shows a section through a flower.
Use it to answer question 5.



5. (a) (i) Name an agent of pollination suitable for the flower.
..... (1)
- (ii) Give **one** reason to the answer in (a) (i).
..... (1)
- (b) On the diagram, label with an **F**, the part that will develop into a fruit after fertilization. (1)
- (c) Why is it important for seeds to be dispersed as widely as possible?
.....
..... (2)

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A022



6. (a) Below is a list of descriptions of solutions and some pH values.

Draw a line to link each of the described solutions to an appropriate pH value.

One has been done for you.

Solution **pH value**

Strong acid	7
Weak acid	9
Strong alkali	2
Weak alkali	14
	5

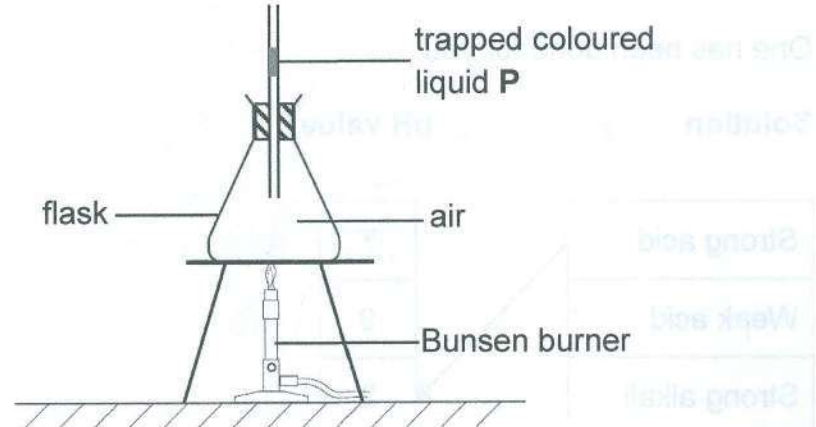
(3)

(b) Explain why toothpaste contains a weak alkali.

.....

..... (1)

The diagram below shows a set-up that was used to investigate a property of gases. Use it to answer question 7.



7. (a) State and explain what will be observed when the flask is heated.
- Observation
- (1)
- Explanation
- (1)
- (b) Suggest why liquid P in the set-up is coloured.
- (1)
- (c) Which property of gases is being investigated?
- (1)
- (d) Give **one** property of gases other than the one being investigated.
- (1)

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A022



The diagram below shows a brick of weight 15 N being released to fall to the ground. Use it to answer question 8.



8. (a) (i) On the diagram, draw an arrow to show the force that opposes the motion of the brick. (1)

(ii) Name the force you have drawn on the diagram.
..... (1)

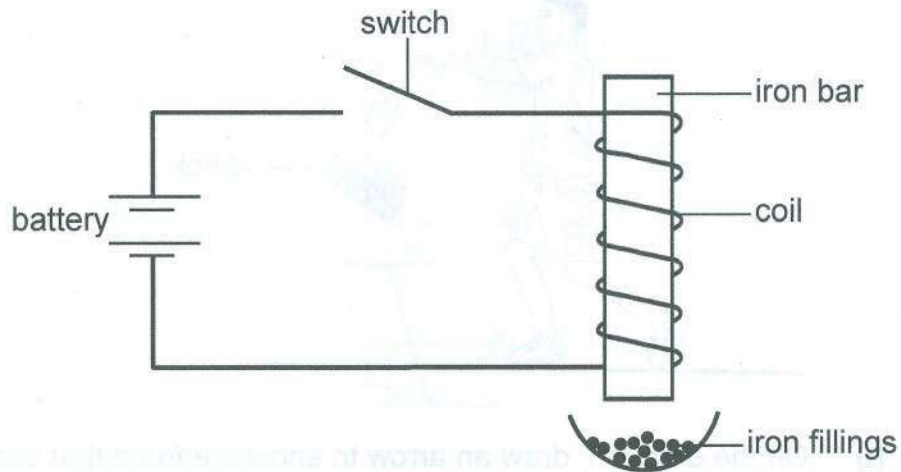
(b) What form of energy does the brick lose as it falls?
..... (1)

(c) Calculate the mass of the 15 N brick. ($g = 10 \text{ N/kg}$).

Mass = (2)

(d) What happens to the acceleration of the brick as it falls?
..... (1)

The diagram below shows a method of magnetising an iron bar.
Use it to answer question 9.



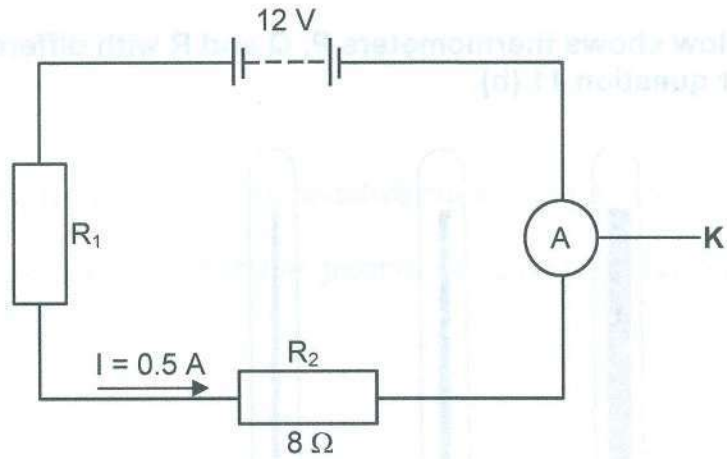
9. (a) Name the method of magnetisation shown on the diagram.
..... (1)
- (b) What observation will be made when the switch is closed and then opened?
Switch closed
.....
..... (1)
- Switch opened
.....
..... (1)
- (c) The iron bar is replaced with a steel bar.
What observation will be made when the switch is closed and then opened?
Switch closed
.....
..... (1)
- Switch opened
.....
..... (1)

831

A022



The diagram below shows an electric circuit. One of the components is labelled K. Use it to answer question 10.



10. (a) Name the component labelled K.

..... (1)

(b) Name the type of connection between resistors R_1 and R_2 .

..... (1)

(c) Calculate

(i) the total resistance of the circuit.

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Resistance = (2)

(ii) the voltage across R_2 .

Voltage = V (2)

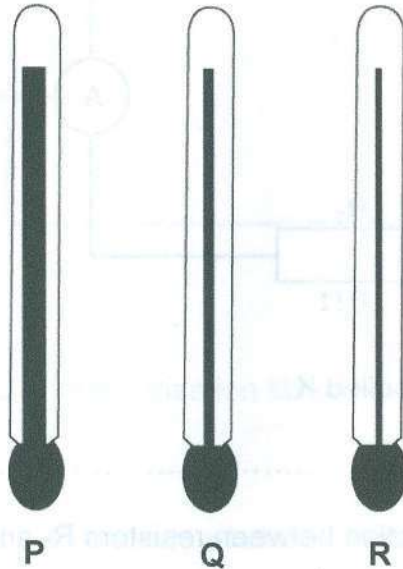
(iii) the voltage across R_1 .

Voltage = V (1)

11. (a) Define temperature.

..... (1)

The diagram below shows thermometers P, Q and R with different features. Use it to answer question 11 (b).



(b) (i) Using letters P, Q and R, arrange the thermometers according to their increasing order of sensitivity in the boxes below.

Least	Most

(2)

(ii) Identify the thermometer that would have a **widest** range.

..... (1)

(c) If the reading in thermometer P is 95 °F, what will be the reading in °C?

$T_f = (T_c \times \frac{9}{5}) + 32$ where T_f is temperature in Fahrenheit and T_c is temperature in degrees Celsius.

Reading = °C (2)



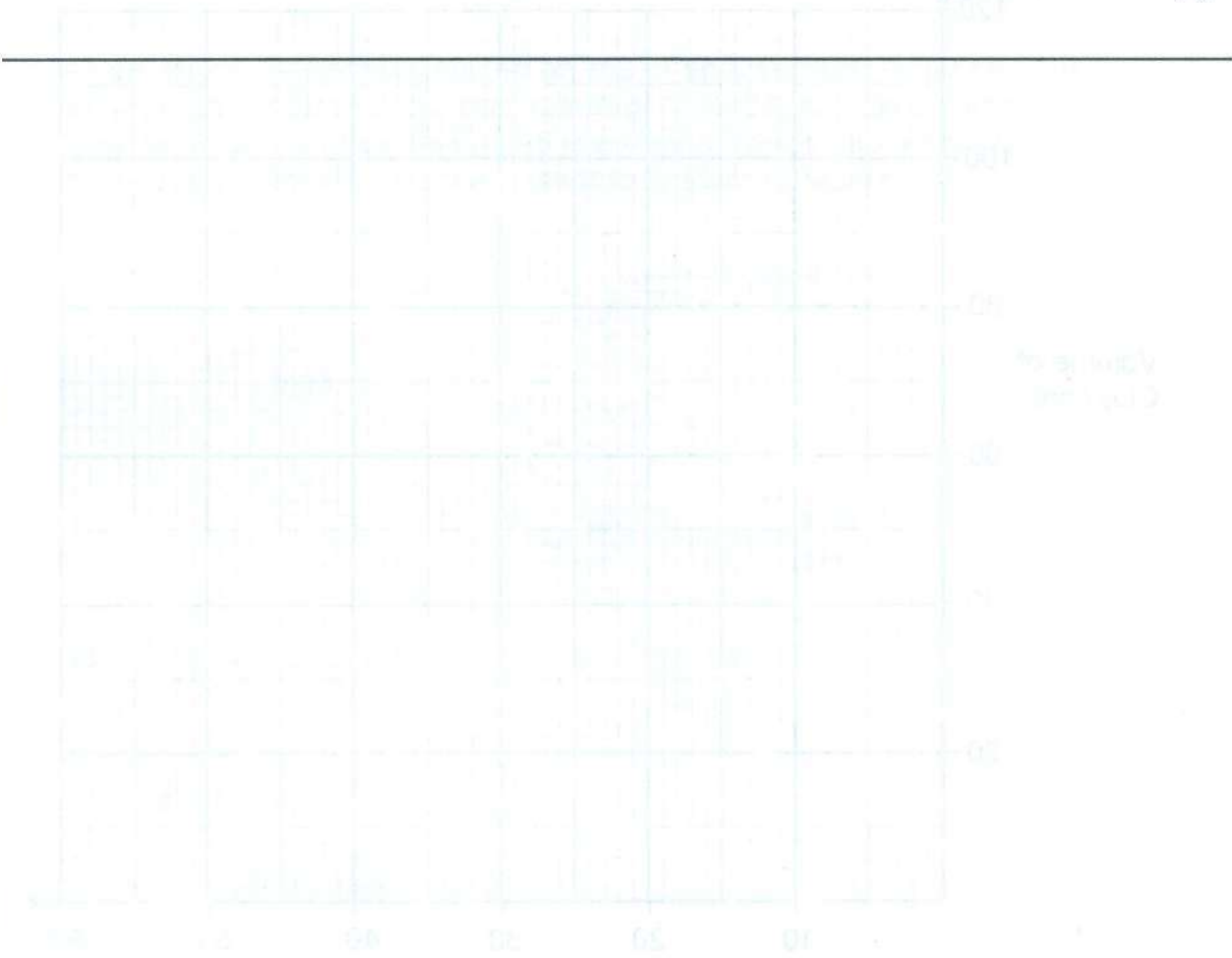
12. (a) Describe how fossil fuels were formed.

.....
.....
..... (2)

(b) Greenhouse gases have a negative impact to the environment.

State **two** ways in which the greenhouse gases impact negatively on the environment.

.....
..... (2)



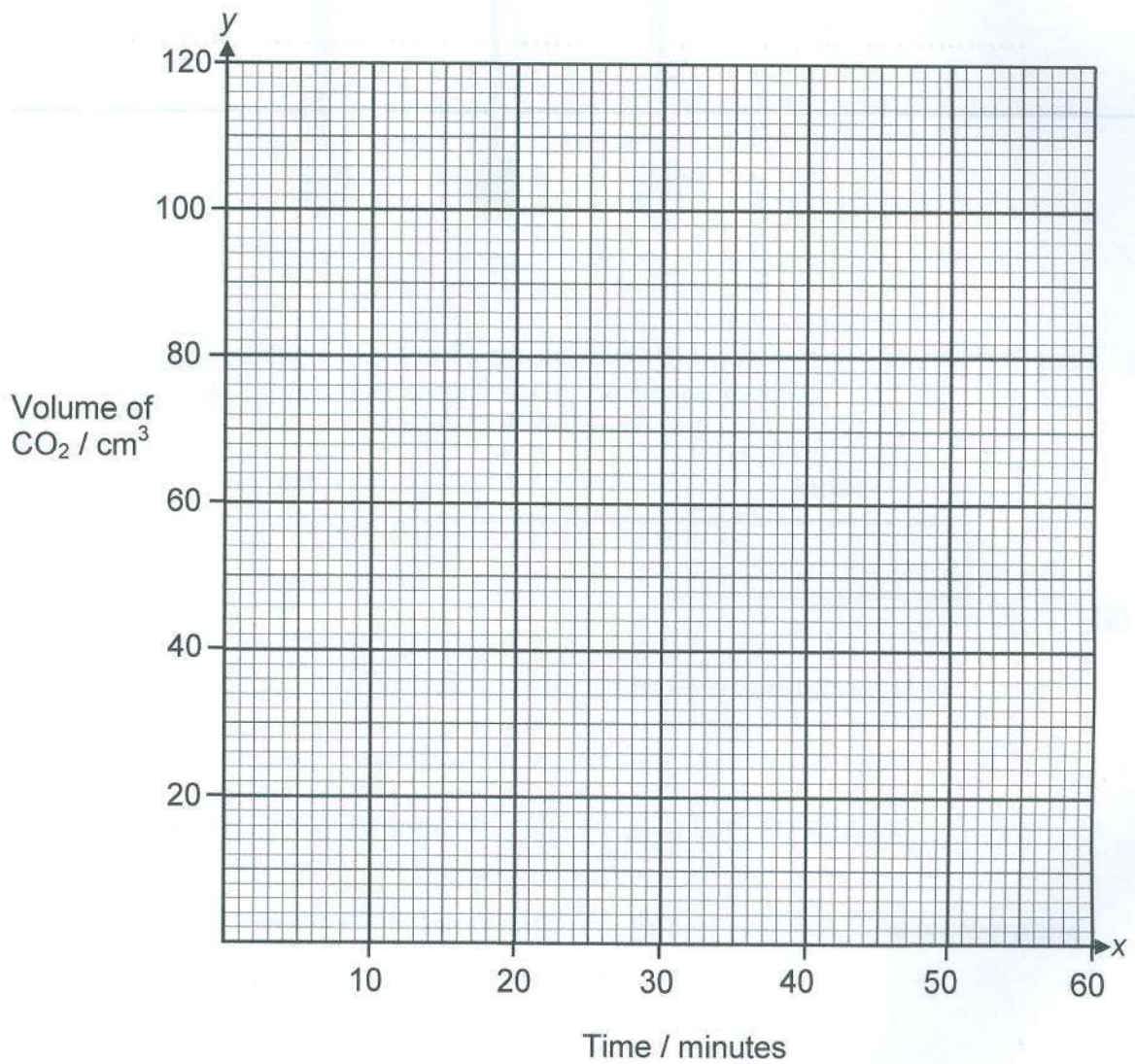
SECTION B (20 Marks)

For Examiner's Use

A student measured the volume of carbon dioxide gas produced over some time when a few large pieces of calcium carbonate reacted with excess dilute hydrochloric acid. The results are given in the table. Use it to answer question 13.

Time / minutes	0	10	20	30	40	50	60
Volume of carbon dioxide / cm ³	0	27	54	66	100	110	110

13. (a) Plot a graph of the volume of carbon dioxide produced against time on the axes below. Label the graph Q.



(4)

- (b) Using your graph, determine the volume of carbon dioxide produced at 15 minutes. Show your working on the graph.

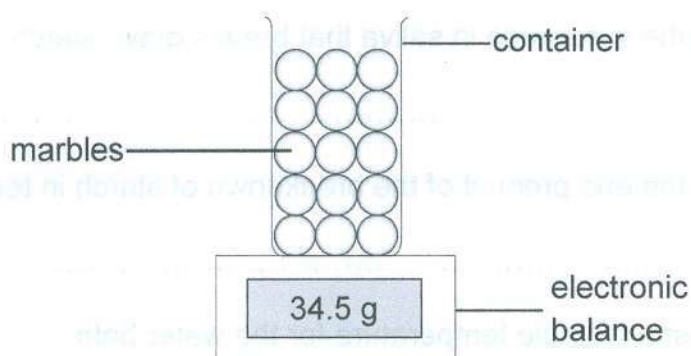
Volume =cm³ (2)



- (c) Explain why **no more** carbon dioxide is given off after 50 minutes.

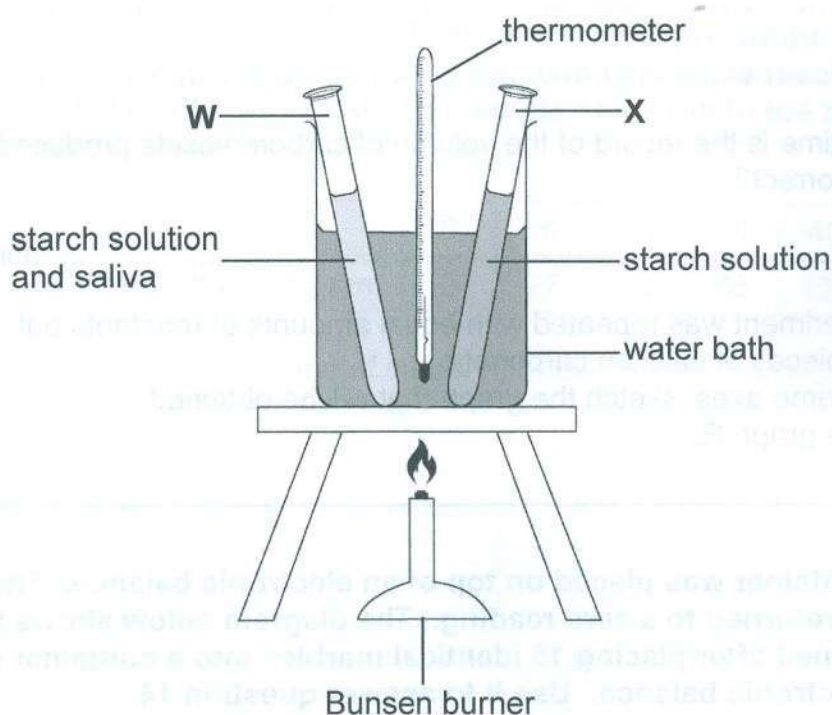
 (1)
- (d) At what time is the record of the volume of carbon dioxide produced likely to be incorrect?
 minutes (1)
- (e) The experiment was repeated with equal amounts of reactants but smaller pieces of calcium carbonate.
 On the same axes, sketch the graph that will be obtained.
 Label the graph **R**. (2)

An empty container was placed on top of an electronic balance. The balance was returned to a zero reading. The diagram below shows the reading obtained after placing 15 identical marbles into a container on top of the electronic balance. Use it to answer question 14.



14. (a) Give **one** possible source of error in the reading.
 (1)
- (b) Calculate the
- (i) mass of each marble.
 Mass = g (2)
- (ii) density of each marble if the volume of one marble is 2.0 cm^3 .
 Density = (2)

The diagram below shows a set-up used to demonstrate the breakdown of starch. Use it to answer question 15.



15. (a) (i) Name the substance in saliva that breaks down starch in test tube **W**.
 (1)
- (ii) Name the end product of the breakdown of starch in test tube **W**.
 (1)
- (b) (i) Suggest a suitable temperature for the water bath.
 (1)
- (ii) Explain your answer at (b) (i).
 (1)
- (c) State the purpose of test tube **X** in the demonstration.
 (1)



DATA SHEET
The Periodic Table of the Elements

		Group																																																																																																												
I	II	III	IV	V	VI	VII	0																																																																																																							
7 Li Lithium 3	9 Be Beryllium 4	1 H Hydrogen 1	11 B Boron 5	12 C Carbon 6	13 Al Aluminium 13	14 N Nitrogen 7	15 O Oxygen 8	16 F Fluorine 9	17 Ne Neon 10	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	58 Ce Cerium 58	59 Pr Praseodymium 59	60 Nd Neodymium 60	61 Pm Promethium 61	62 Sm Samarium 62	63 Eu Europium 63	64 Gd Gadolinium 64	65 Tb Terbium 65	66 Dy Dysprosium 66	67 Ho Holmium 67	68 Er Erbium 68	69 Tm Thulium 69	70 Yb Ytterbium 70	71 Lu Lutetium 71	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	90 Th Thorium 90	91 Pa Protactinium 91	92 U Uranium 92	93 Np Neptunium 93	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	104 Rf Rutherfordium 104	105 Db Dubnium 105	106 Sg Seaborgium 106	107 Bh Bohrium 107	108 Hs Hassium 108	109 Mt Meitnerium 109	110 Ds Darmstadtium 110	111 Rg Roentgenium 111	112 Cn Copernicium 112	113 Nh Nihonium 113	114 Fl Flerovium 114	115 Mc Moscovium 115	116 Lv Livermorium 116	117 Ts Tennessine 117	118 Og Oganesson 118

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

Key

a	X
b	

 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.).