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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

7164700704

SCIENCE : DOUBLE AWARD **0569/03**

Paper 3 **October/November 2012**

2 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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 20.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
14	
15	
Total	

This document consists of **18** printed pages and **2** blank pages.

1 Fig. 1.1 shows a speed-time graph of a stone thrown vertically upwards.

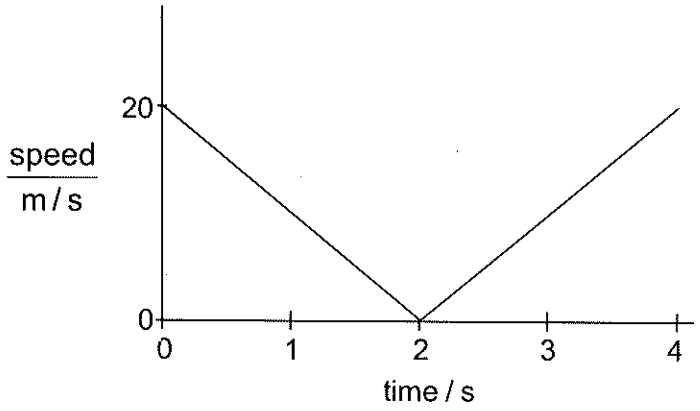


Fig. 1.1

(a) Describe the motion of the stone in the four seconds.

.....

.....

..... [3]

(b) Calculate the maximum height reached by the stone.

height = ... [2]

(c) Explain how the shape of the graph shows that air resistance was negligible.

.....

..... [1]

For Examiner's Use

2 **(a)** State the principle of moments.

.....

..... [1]

(b) Fig. 2.1 shows Neo and David on a see-saw pivoted at the centre.
Neo has a mass of 30 kg and David has a mass of 20 kg. (g = 10 N / kg).

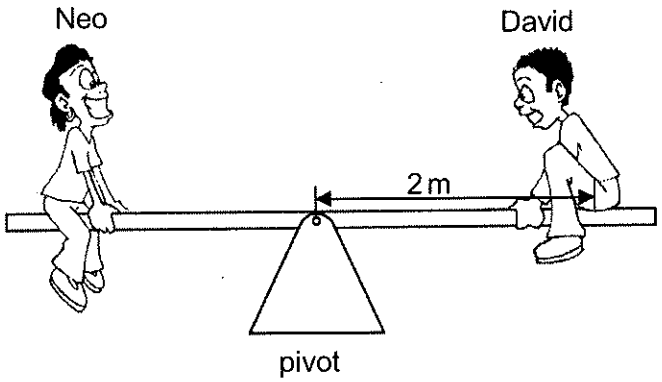


Fig. 2.1

(i) Calculate the weight of David.

weight = ... [2]

(ii) Calculate the moment of David about the pivot.

moment =..... [2]

(iii) The see-saw is in equilibrium. Calculate the distance of Neo from the pivot.

distance = ... [2]

[Turn over

For Examiner's Use

3 Fig. 3.1 shows a set-up used to determine a fixed point of a thermometer.

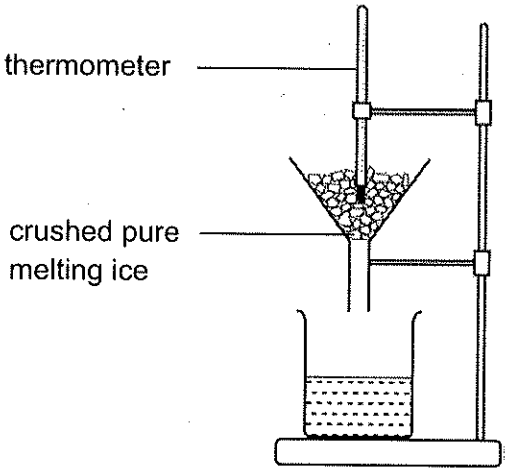


Fig. 3.1

(a) What are fixed points?

.....

..... [1]

(b) Name and state the temperature value of the fixed point to be determined in Fig. 3.1.

name .....

temperature ..... [1]

(c) Explain why

(i) ice made from tap water is not suitable for this experiment,

.....

..... [1]

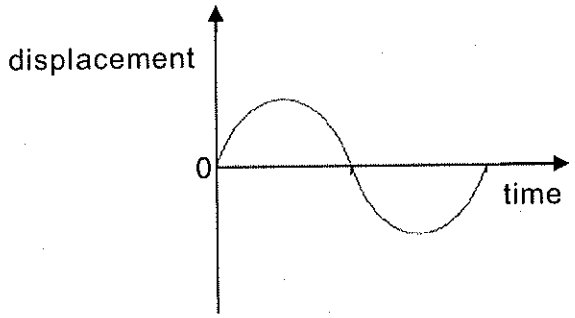
(ii) the ice should be melting.

.....

..... [1]

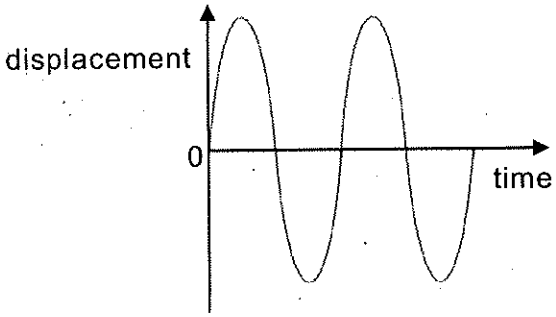
For Examiner's Use

4 Fig. 4.1 and Fig. 4.2 show the displacement/time graphs for sound waves **X** and **Y**.



sound **X**

Fig. 4.1



sound **Y**

Fig. 4.2

(a) On Fig. 4.2 show

(i) the wavelength of sound **Y**, and label it λ.

(ii) the amplitude of sound **Y** and label it A. [2]

(b) **(i)** Which sound is louder? Explain your answer.

.....

..... [1]

(ii) Which sound has the higher pitch? Explain your answer.

.....

..... [1]

(c) What type of a wave is sound?

..... [1]

[Turn over

For Examiner's Use

5 Fig. 5.1 shows a permanent magnet with a single magnetic field line drawn.

Fig. 5.1

(a) Name the pole at **X**.

..... [1]

(b) On Fig. 5.1 draw more field lines to show the magnetic field around the magnet. [2]

(c) Describe the electrical method of making magnets. You may draw a diagram as part of your answer.

.....

.....

.....

.....

..... [3]

6 **(a)** Table 6.1 shows radioactive emissions, their nature and penetration powers with some information missing. Complete the table.

Table 6.1

radiation	penetration power	nature of radiation
	highest	electromagnetic wave
alpha		helium nucleus
	moderate	

[3]

(b) Radioactive waste is often stored for a long time in structures with concrete walls. Explain why this is done.

.....

..... [1]

(c) Name an instrument used for detecting radioactive emissions.

..... [1]

For Examiner's Use

7 **(a)** In an experiment, 120 cm^3 of methane, measured at room temperature and pressure, was burnt in excess oxygen. The equation for the reaction is

$$CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O.$$

(i) Calculate the number of moles in 120 cm^3 of methane.
(1 mole of gas occupies 24 000 cm^3)

..... [2]

(ii) Use the equation and your answer to **(a)(i)** to calculate the number of moles of oxygen that reacted.

..... [1]

(iii) Calculate the volume of oxygen, measured at room temperature and pressure, that reacted with 120 cm^3 of methane.

volume = ...cm^3 [1]

(b) The burning of methane is an example of an exothermic reaction.

(i) What is an exothermic reaction?

..... [1]

(ii) Give another example of an exothermic reaction other than burning in oxygen.

..... [1]

For Examiner's Use

(c) Draw a dot and cross diagram to show bonding in a molecule of methane, CH_4.

[2]

(d) Explain why it is not safe to burn methane in a limited supply of oxygen.

.....

.....

..... [2]

[Turn over

For Examiner's Use

8 An iron ring can be electroplated with copper as shown in Fig. 8.1.

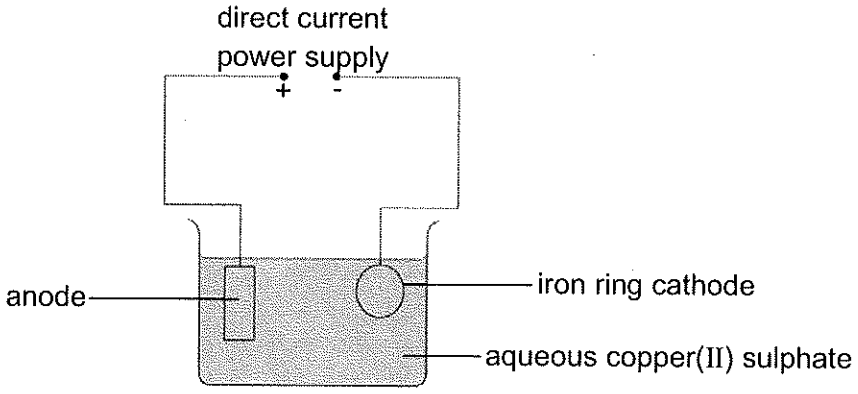


Fig. 8.1

(a) What material is the anode made of?

..... [1]

(b) What change would be seen on the iron ring?

..... [1]

(c) Write an equation for the reaction at the cathode.

..... [1]

(d) Suggest a suitable electrolyte that could be used if the iron ring was to be plated using silver.

..... [1]

(e) Give **two** other uses of copper.

1.....

2..... [2]

For Examiner's Use

9 Four powdered metals **P, Q, R** and **S** were each placed in dilute hydrochloric acid (HC*l*). Fig. 9.1 shows what was observed.

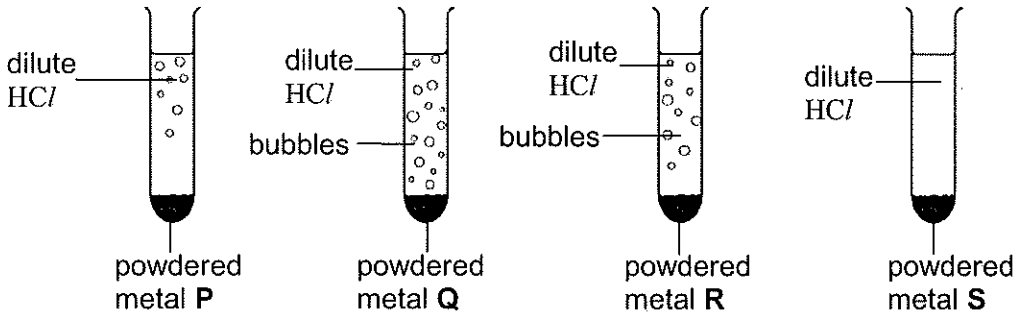


Fig. 9.1

(a) Use the information in the diagram to arrange the metals in order of increasing reactivity.

least reactive most reactive

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

(b) The gas produced in the reaction between metals and dilute hydrochloric acid is hydrogen. Describe the test for hydrogen gas.

test .....

result ..... [2]

(c) Which of the metals, **P**, **Q, R** or **S** could be copper?

.....

Explain your answer.

..... [2]

(d) Predict how the rate of reaction will compare with that shown in Fig. 9.1 when lumps of metal **Q** are used.

.....

Explain your answer.

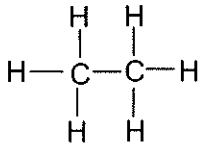
.....

..... [2]

For Examiner's Use

10 (a) Complete Table 10.1 about some organic compounds.

Table 10.1

name	molecular formulae	structural formulae
ethane		
ethene	C_2H_4	
	C_2H_5OH	

[4]

(b) Ethene polymerises to form poly(ethene).

Explain why careless disposal of poly(ethene) causes pollution problems.

..... [1]

(c) An incomplete equation for the reaction of the compound C_2H_5OH and oxygen is

$$\text{.....}C_2H_5OH\text{.....} + \text{.....}O_2\text{.....} \longrightarrow \text{.....}CO_2\text{.....} + \text{.....}H_2O\text{.....}$$

(i) Balance the equation and include state symbols. [2]

(ii) State **two** uses of the compound C_2H_5OH.

1.....

2..... [2]

For Examiner's Use

11 Fig. 11.1 shows an animal cell.

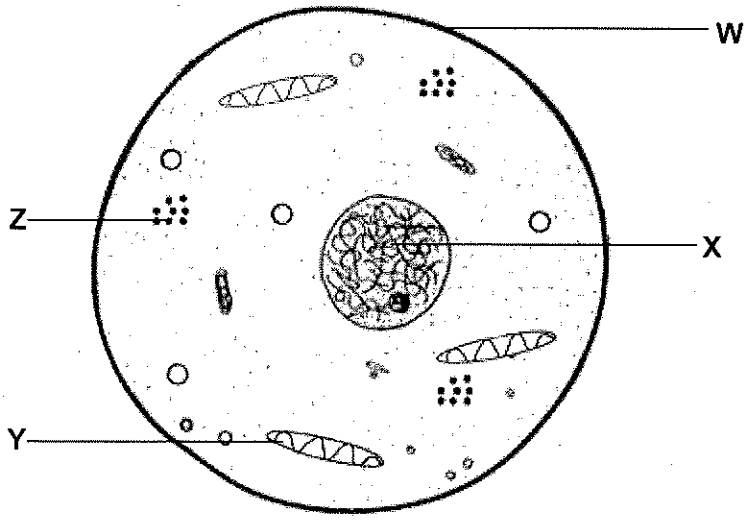


Fig. 11.1

(a) Identify structures **W** and **X.**

W.....

X..... [2]

(b) State the functions of structures **Y** and **Z.**

function of **Y** .....

function of **Z**..... [2]

(c) Define the term *tissue*.

.....

.....

..... [2]

For Examiner's Use

12 Fig. 12.1 shows the structure of a leaf.

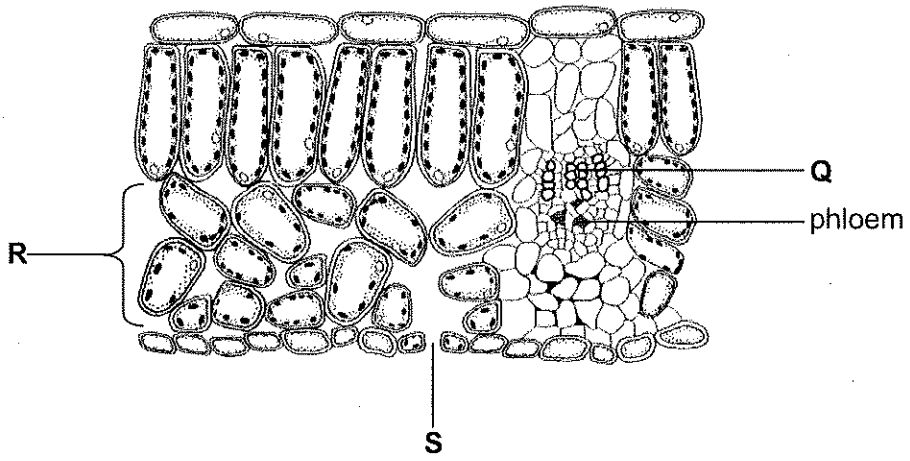


Fig. 12.1

Name the structures **Q, R** and **S.** For each structure, explain how it makes the leaf an ideal site for photosynthesis.

name of **Q** .....

explanation .....

.....

.....

name of **R** .....

explanation .....

.....

.....

name of **S** .....

explanation .....

.....

..... [6]

For Examiner's Use

13 Fig. 13.1 shows some endocrine glands in the body.

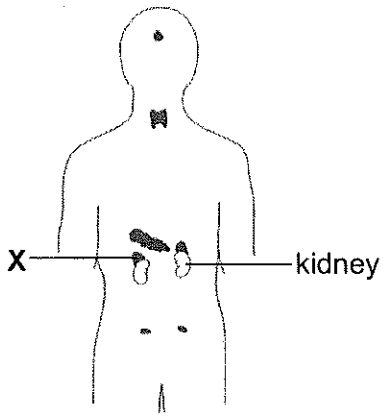


Fig. 13.1

(a) On Fig. 13.1, label:

- an ovary
- the pituitary gland [2]

(b) Explain how the hormone from gland **X** may affect blood glucose level.

.....

.....

.....

.....

..... [3]

(c) Explain how the body responds to a meal rich in carbohydrate after the digested food is absorbed into the blood.

.....

.....

.....

.....

.....

.....

..... [4]

For Examiner's Use

14 Fig. 14.1 shows a foetus in the uterus.

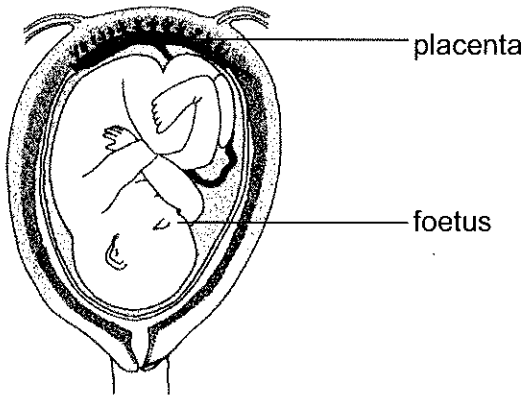


Fig. 14.1

(a) The placenta is often described as the 'lung and kidney' of the foetus.

Suggest the meaning of this description.

.....

.....

..... [2]

(b) Suggest **one** feature of the placenta that helps it to carry out its function.

..... [1]

(c) Suggest **two** ways by which the structure of the umbilical artery differs from that of umbilical vein.

1.....

2..... [2]

(d) Explain why it is important that there is no direct contact of the foetal blood and the mother's blood.

.....

.....

..... [2]

For Examiner's Use

15 Fig. 15.1 shows the different stages of development of two plants from two similar seeds. After germination plant **M** was left to grow in a dark place while plant **N** was left to grow in light.

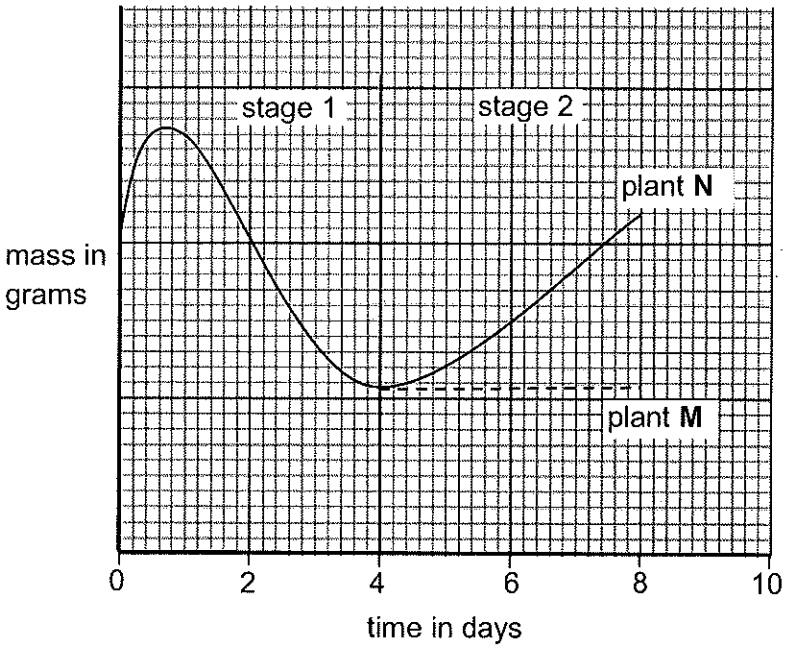


Fig. 15.1

(a) How long did it take for the seeds to germinate?

..... [1]

(b) Explain why the mass increases for the first two days.

..... [1]

(c) **(i)** Explain the change in mass for plant **N** between day 4 and day 8.

.....

.....

.....

..... [2]

(ii) Explain why the mass of plant **M** did not change between day 4 and day 8.

.....

.....

.....

..... [2]

BLANK PAGE

BLANK PAGE

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	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	186 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	Po Polonium 84	At Astatine 85	Rn Radon 86
Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	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	Pa Protactinium 91	238 U Uranium 92	Np Neptunium 93	Pu Plutonium 94	Am Americium 95	Cm Curium 96	Bk Berkelium 97	Cf Californium 98	Es Einsteinium 99	Fm Fermium 100	Md Mendelevium 101	No Nobelium 102	Lr Lawrencium 103

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

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

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).