



EXAMINATIONS COUNCIL OF LESOTHO
Lesotho General Certificate of Secondary Education

CANDIDATE
NAME

--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

CENTRE
NUMBER

--	--	--	--	--

CANDIDATE
NUMBER

--	--	--	--	--	--	--	--	--	--

PHYSICAL SCIENCE

Paper 4 Alternative to Practical

0181/04

October/November 2018

1 hour

Marks: 40

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your name, centre number and candidate number on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

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.

A copy of the Periodic Table is printed on page 12.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **12** printed pages.



- 1 A student carries out an experiment to compare the rate of thermal energy (heat) loss from two cans made from the same metal. The cans are of identical shape and size, and are fitted with lids carrying thermometers to measure the temperature inside the cans as shown in Fig. 1.1.

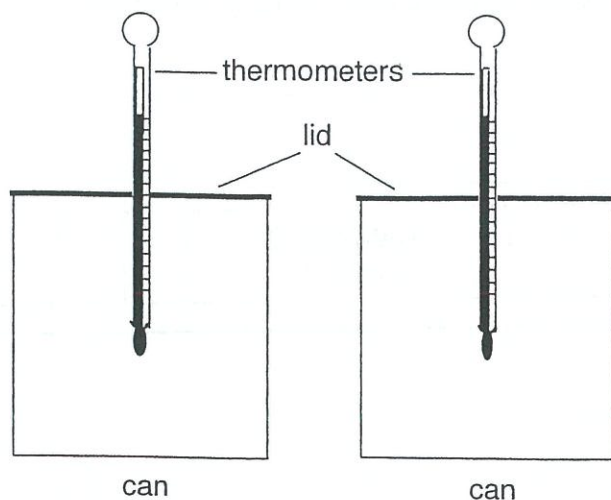


Fig. 1.1

The temperature in the laboratory is 24°C

- The student pours equal volumes of boiling water into each can.
- He measures and records the initial temperature of the water.
- He measures and records the temperature of the water in each can after every 5 minutes for 30 minutes.

Table 1.1 shows his results.

Table 1.1

time/minutes	temperature in cans/ $^{\circ}\text{C}$	
	A	B
0	95	95
5	87	85
10	82	79
15	78	74
20		
25	81	66
30	68	63



- (a) Fig. 1.2 shows the temperature readings on the thermometers after 20 minutes in each can.

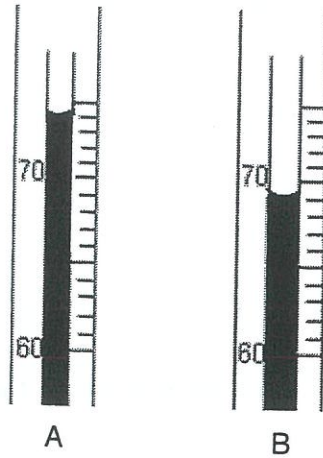


Fig. 1.2

- (i) Record the readings in Table 1.1. [1]
- (ii) Identify the temperature reading in Table 1.1 which seems unreliable and should be repeated.

can temperature °C [1]

- (b) State the temperature at which both thermometers will again show the same temperature.

Give a reason for your answer.

reason temperature °C

..... [1]

- (c) The cans lost thermal energy by the processes of conduction, convection and radiation.

- (i) State which can lost thermal energy more rapidly in this experiment.

Give a reason for your answer.

can

explanation

..... [1]

- (ii) The two cans are made of the same metal, and identical in size and shape.

Suggest with a reason which process is most likely to be responsible for the different rates of thermal energy loss.

process:

reason

.....

..... [2]

- (d) State the type of material that would be suitable to make the lids. Explain your answer.

material:

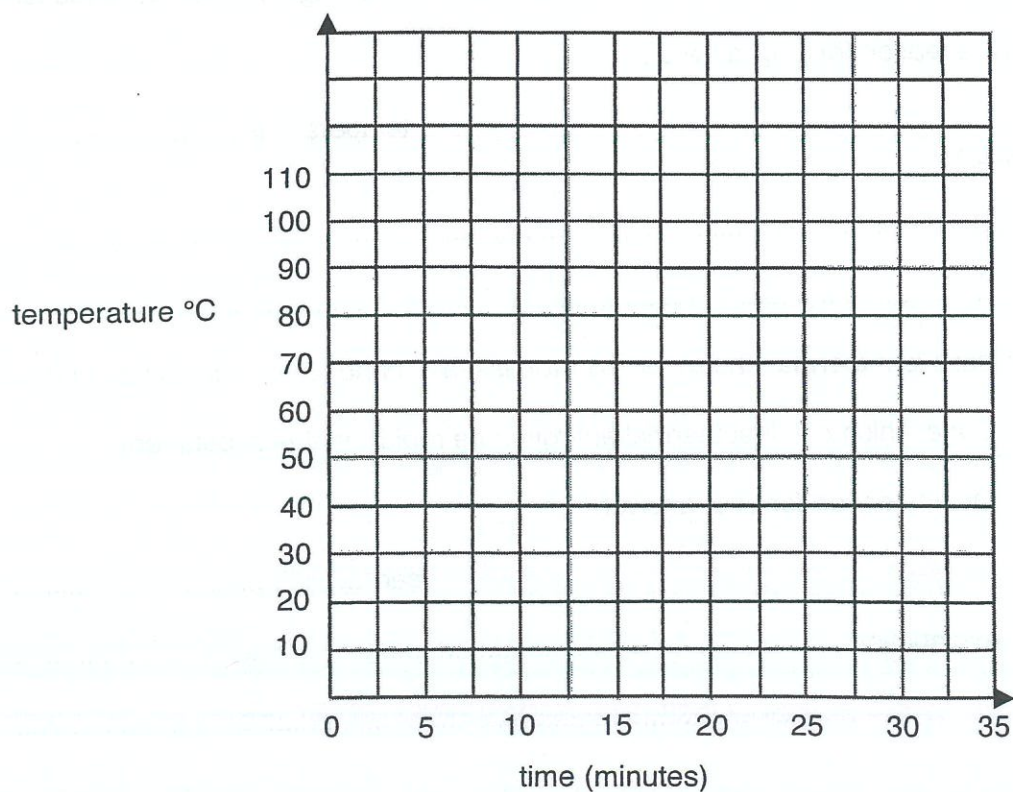
.....

explanation

.....

..... [2]

- (e) Sketch and label the temperature-time graphs for the values in Table 1.1, in the provided grid.



[2]



- 2 A student wants to investigate whether the density of a material depends on the size of the object made from the material. He used four objects labelled **A**, **B**, **C** and **D**.

The student used the balance to find the mass of each object.

- (a) Fig. 2.1 shows the readings for the masses, **A** and **B**.

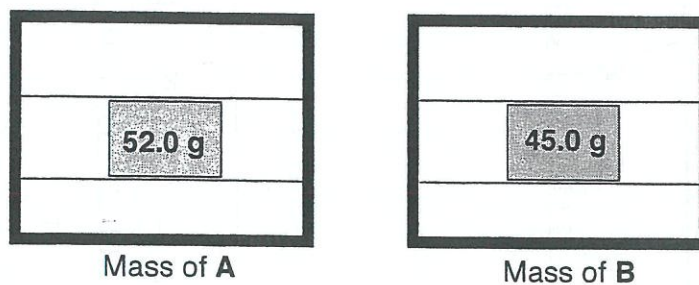


Fig. 2.1

Record the masses shown by the balances in Table 2.1.

[2]

Table 2.1

object	mass/g	volume/cm ³	density in g/cm ³
A			
B			
C	33	13.1	
D	25	10.1	

- (b) The student measured the volume of objects using a displacement can and a measuring cylinder.

Fig. 2.2 shows the volumes of objects A and B.

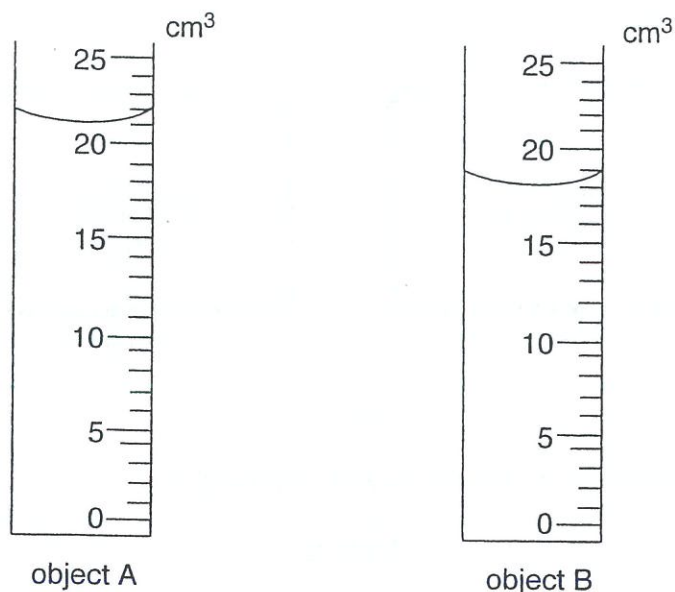


Fig. 2.2

Record the volumes in Table 2.1.

[2]

- (c) (i) Calculate the densities of the objects in Table 2.1 to **2 decimal places**.
Use the formula:

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

[2]

- (ii) Use the results in Table 2.1 to suggest whether the density of objects depends on size.

Give a reason for your answer.

.....
.....

[1]



- (d) Table 2.2 shows the standard densities of some solid materials.

Table 2.2

material	density in kg/m ³
aluminium	2700
concrete	2500
iron	7850
wood	750

Identify with a reason, the type of material used to make the object B.
(1 g/cm³ = 1000 kg/m³)

material

.....

reason

.....

..... [2]

- (e) State whether the object would sink or float in the water in the displacement can.

Give a reason for your answer.

.....

..... [1]

- 3 Fig. 3.1 shows **some** of the apparatus and materials a student used to burn magnesium ribbon in oxygen in apparatus **X**.



Fig. 3.1

- (a) Name apparatus **X**.

..... [1]

- (b) Describe a test the student would perform to show that the gas is oxygen.

test

.....

positive result

..... [2]

- (c) Outline the steps the student would have to follow in order to burn the ribbon.

.....

 [3]



(d) The student observes that the ribbon burns with a white blinding flame and produces a white ash.

- (i) Suggest the difference in observation the student would make during burning of the ribbon outside and inside the gas jar.

.....
 [1]

- (ii) Describe how the student would measure the mass of the ash, clearly stating the most appropriate instrument.

description

.....

 [3]

[Total: 10]

- 4 A constant current was passed through aqueous copper(II) sulphate using inert electrodes as shown in Fig. 4.1.

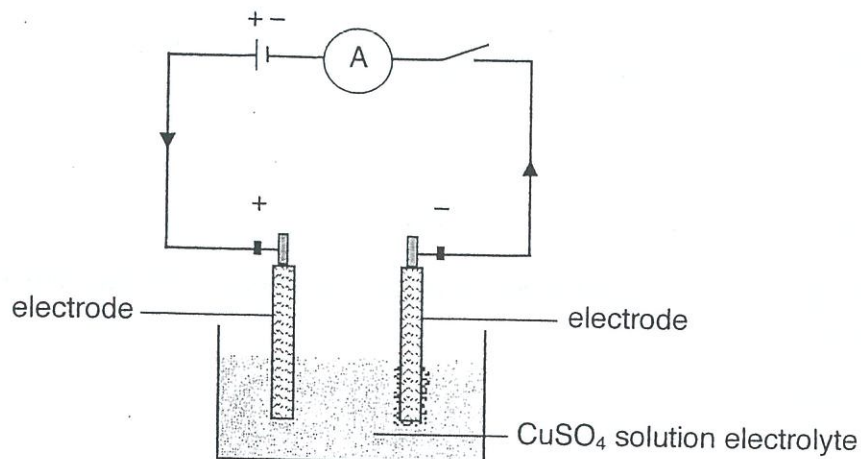


Fig. 4.1

- (a) Name a suitable chemical element for making the electrodes.

..... [1]

- (b) Describe **one** chemical observation made when the current flows.

.....
 [1]

- (c) The cathode was removed at intervals, carefully washed, dried and weighed.

The results are shown in Table 4.1.

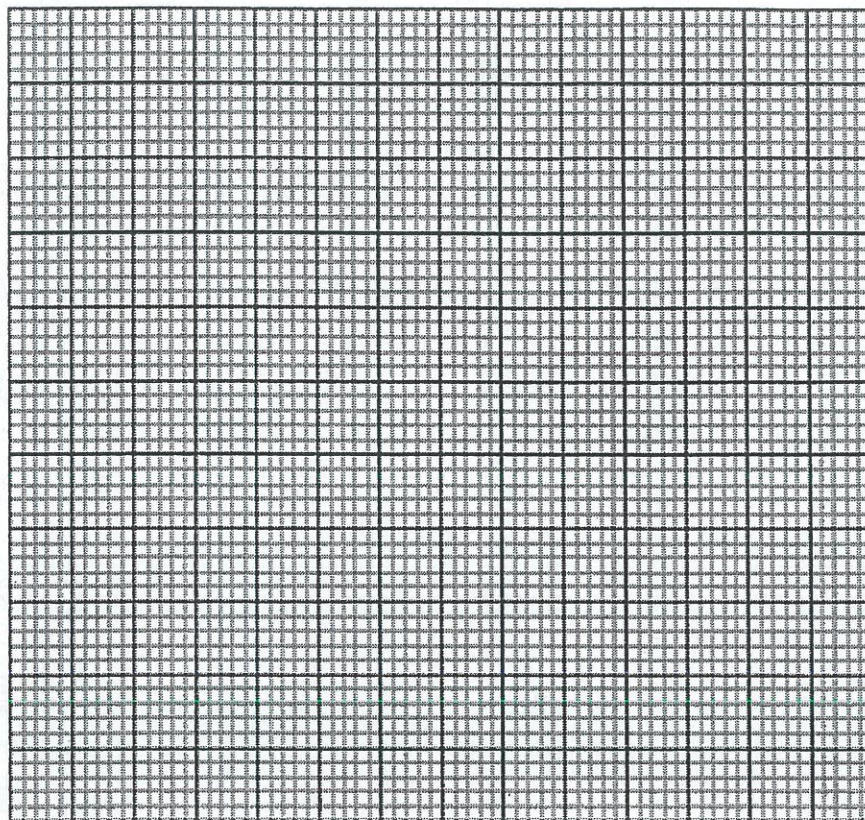
Complete the table by calculating the **total** increase in mass at each 10 minute interval.

time in minutes	mass of cathode/g	total increase in mass/g
0	11.60	0.00
10	12.05	
20	12.50	
30	12.95	
40	13.40	
50	13.60	
60	13.60	

[2]



- (d) (i) Plot a graph of total increase in mass against time on the grid provided.



[4]

- (ii) Draw the line which best fits these results.

[1]

- (iii) Use the graph to determine the time taken for 1.00 g of product to be deposited.

..... [1]

[Total: 10]

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																		19 F Fluorine 9	20 Ne Neon 10	
23 Na Sodium 11	24 Mg Magnesium 12																		32 S Sulfur 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	209 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86				
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89																			
* 58–71 Lanthanoid series † 90–103 Actinoid series																					
a X 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.).

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

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 (ECoL) 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 possible opportunity.