EXAMINATIONS COUNCIL OF ESWATINI
Eswatini General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			

PHYSICAL SCIENCE **6888/02**

Paper 2 Structured Questions **October/November 2020**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and candidate name on the spaces provided.
Write in dark blue or black pen.
You may use a HB pencil for any diagrams, graphs, tables or rough working.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.
Do **not** write on the barcode.

Answer **all** questions.

You may use an electronic calculator.

A copy of the Periodic Table is printed on page 15.
You may lose marks if you do not show your working or if you do not use the appropriate units.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total	

This document consists of **15** printed pages and **1** blank page.

1 A 1000 kg bag of mealie-meal is dropped at a height of 100 m above the ground from a helicopter.

[Take g = 10 N/kg]

(a) Calculate the weight of the bag.

weight = ... [3]

(b) Calculate the gravitational potential energy of the bag the moment it is released.

gravitational potential energy = ... [2]

(c) Explain why the potential energy at the top is not equal to the kinetic energy when the bag hits the ground.

.....

.....

..... [2]

2 The equation below shows a redox reaction.

$Zn(s) + Cu^{2+}(aq) \longrightarrow Zn^{2+}(aq) + Cu(s)$

(a) Define oxidation in terms of electron transfer.

..... [1]

(b) State and explain which substance has been reduced in the above equation.

.....

.....

..... [2]

(c) Copper combines with zinc to form an alloy known as brass.

(i) State **two** reasons why brass is used in the manufacture of door handles while copper is not.

1 .....

.....

2 .....

..... [2]

(ii) Explain, using metallic bonding, why copper is malleable.

.....

.....

..... [2]

[Turn over

3 Fig. 3.1 shows a thermos flask filled with hot tea.

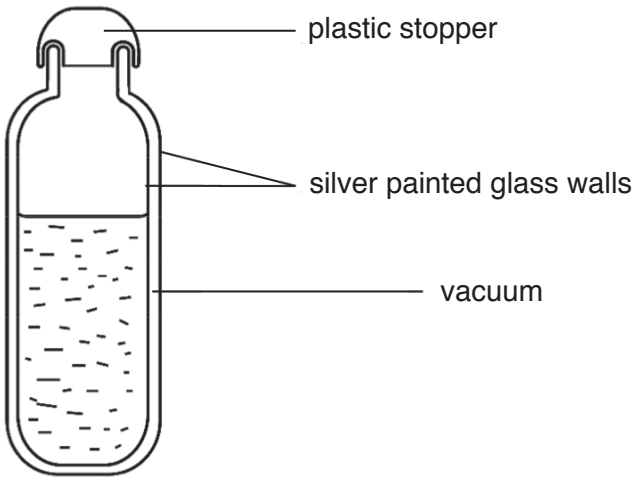

Fig. 3.1

(a) Explain how the thermos flask reduces heat loss by conduction.

.....

..... [2]

(b) The hot tea will eventually reach the temperature of the environment when the flask is left open.

Describe how the hot tea eventually reaches the temperature of the environment.

.....

.....

.....

..... [3]

(c) Suggest what would happen to the hot tea if the silver painted glass walls are replaced with black painted glass walls.

.....

.....

.....

..... [3]

4 Vapours from solutions **A** and **B** react to form ammonium chloride as shown in Fig. 4.1.

These solutions are hydrochloric acid and ammonia.

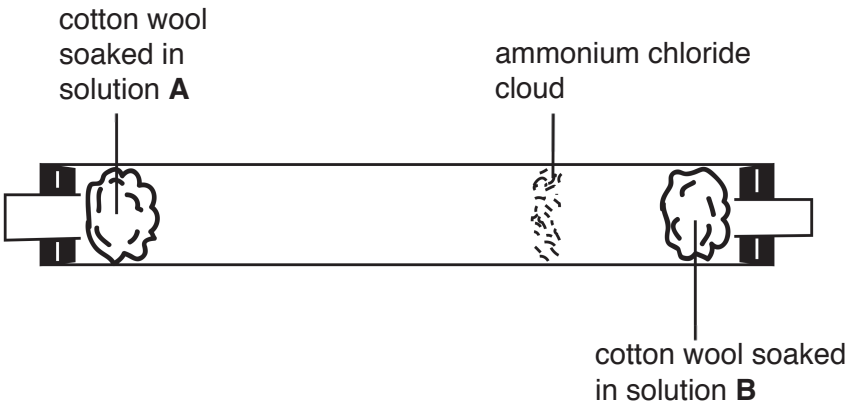

Fig. 4.1

(a) Explain why ammonium chloride is formed closer to solution **B**.

.....

.....

.....

..... [3]

(b) Ammonium chloride can be used as a fertiliser.

Ammonium nitrate is also a fertiliser and can be prepared by reacting ammonia with nitric acid.

Explain why ammonium nitrate is preferred as a fertiliser to ammonium chloride.

.....

.....

..... [2]

(c) Lime, CaO, is accidentally added to soil with ammonium nitrate fertiliser.

Ammonia, calcium nitrate and water are produced.

Write a balanced chemical equation for the reaction of the lime with the ammonium nitrate.

..... [2]

[Turn over

(d) State how lime will reduce the acidity of the soil.

.....

..... [1]

(e) The formula of ammonia is NH_3.

Calculate the percentage by mass of hydrogen in ammonia.

[2]

5 Fig. 5.1 shows a fish in a pond and a bird flying above.

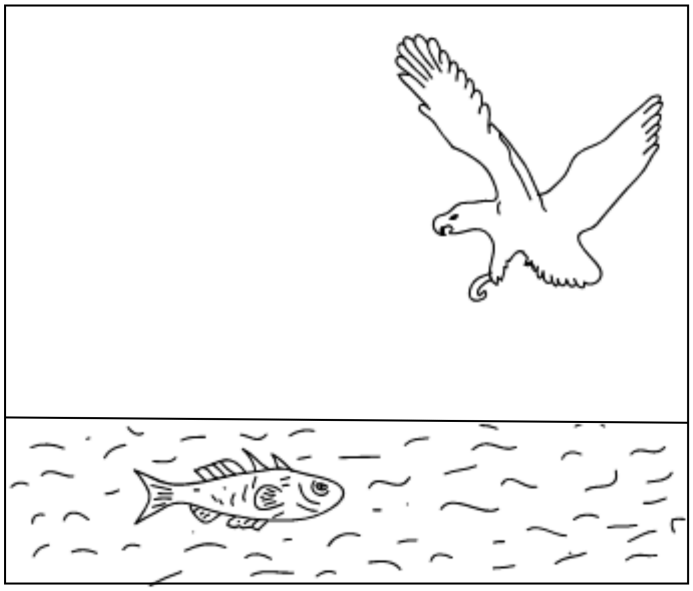

Fig. 5.1

(a) On Fig. 5.1, draw light rays to show the position of the bird as seen by the fish.

Mark the position of the bird with a cross. [4]

(b) Calculate the angle of refraction when the angle of incidence is 60°.

The refractive index of air is 1.3.

r = ... [3]

[Turn over

6 A student sets up the apparatus to carry out the electrolysis of concentrated sodium chloride solution using carbon electrodes as shown in Fig. 6.1.

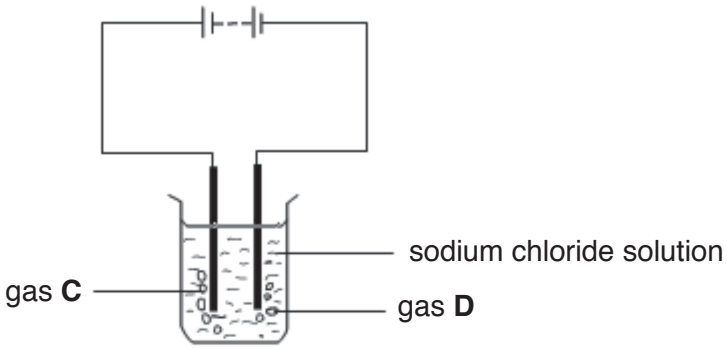

Fig. 6.1

(a) Name all the positive ions present in aqueous sodium chloride.

..... [1]

(b) Name gases **C** and **D**.

C .....

D ..... [2]

(c) Explain why the solution formed is alkaline.

.....

.....

..... [2]

7 Fig. 7.1 shows an electric circuit consisting of a battery, two resistors and an ammeter.

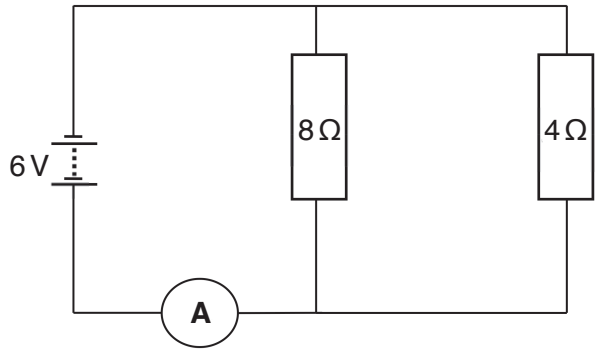

Fig. 7.1

(a) Calculate the total resistance of the circuit.

resistance = ...Ω [2]

(b) Calculate the current through ammeter, **A**.

current = ... A [2]

(c) State the potential difference across the 4 Ω resistor.

potential difference = ... V [1]

(d) Calculate the power dissipated by the 8 Ω resistor.

power = ... [3]

(e) Explain why the 4 Ω resistor feels warmer than the 8 Ω resistor after several minutes.

.....

.....

..... [2]

[Turn over

8 Fig. 8.1 shows the drilling and processing of crude oil.

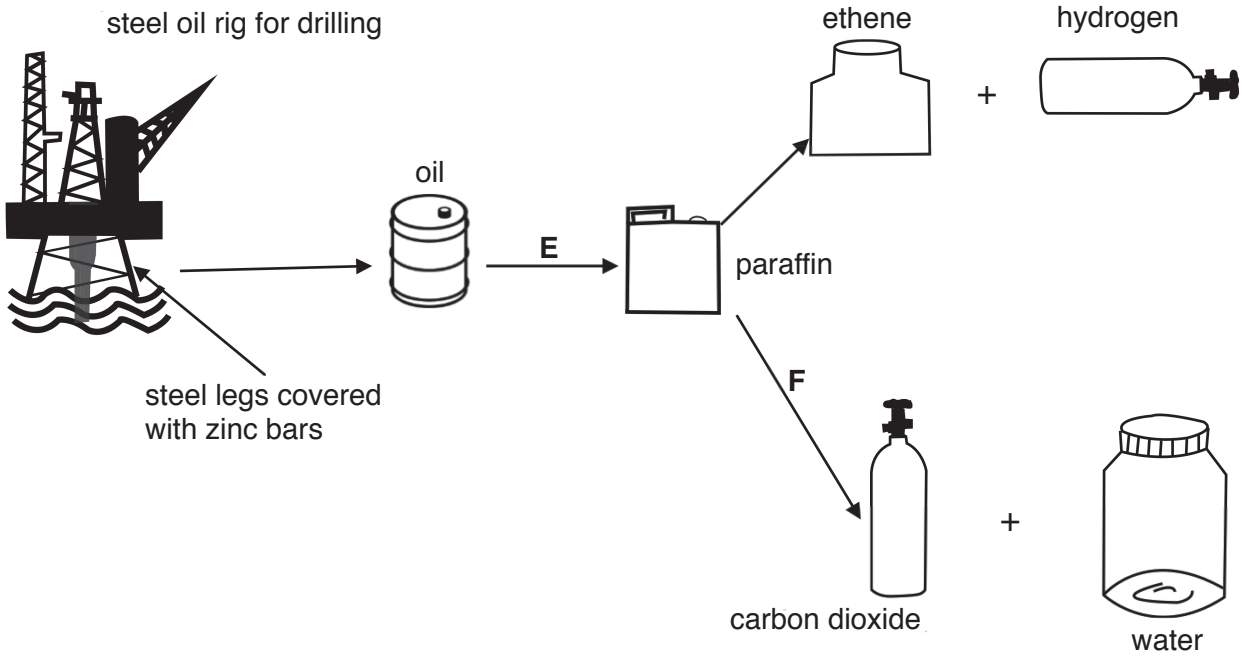

Fig. 8.1

(a) Name the processes **E** and **F**.

E .....

F ..... [2]

(b) Explain why the steel legs that are in the water are covered with zinc bars.

.....

.....

..... [2]

(c) Name the homologous series to which ethene belongs.

..... [1]

(d) Draw a 'dot-and-cross' diagram of ethene.

[2]

(e) Nylon is a synthetic organic polymer.

Fig. 8.2 shows part of the structure of nylon.

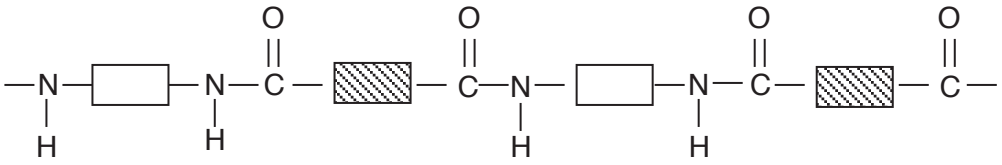

Fig. 8.2

(i) Name the linkage present in nylon.

..... [1]

(ii) Name another polymer with the same linkage as nylon.

..... [1]

[Turn over

9 An 80 W radio, which contains a transformer, is connected to a 240 V socket.

The transformer has 30 000 turns in the primary coil and 600 turns in the secondary coil.

(a) Name this type of transformer.

..... [1]

(b) Calculate the output voltage of the transformer.

output voltage ..... [2]

(c) Calculate:

(i) the current, I_s, in the secondary coil.

I_s = ... [2]

(ii) the current, I_p, in the primary coil.

I_p = ... [2]

(iii) State the assumption that has been made about the transformer when calculating the current in the primary coil.

.....

..... [1]

10 Fig. 10.1 shows a graph of volume of hydrogen gas produced when 10 cm^3 of 1.0 mol/dm^3 of hydrochloric acid solution reacts with 3 g of magnesium ribbon.

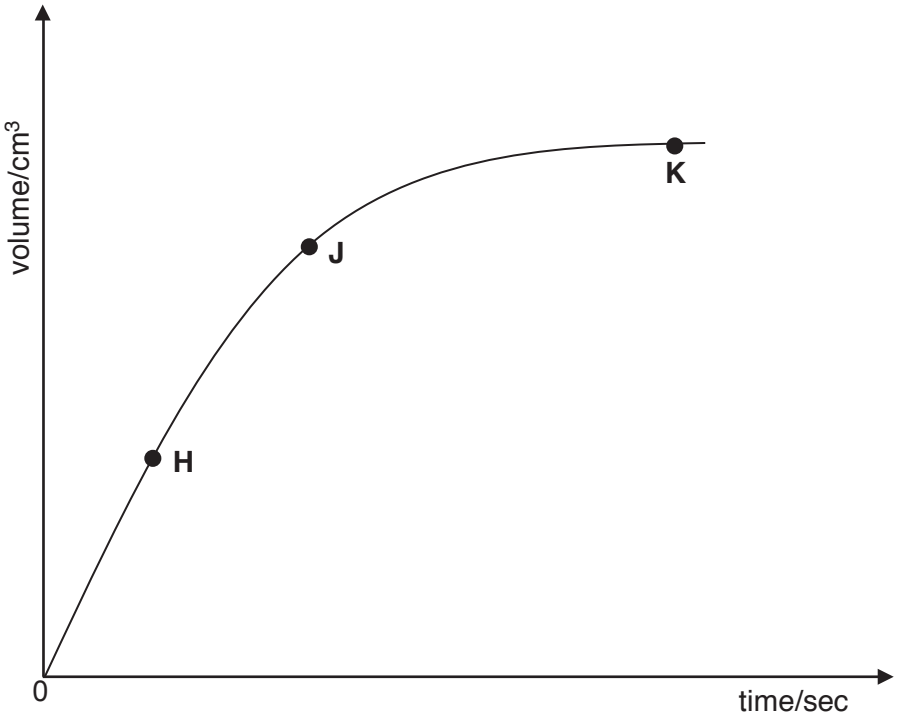

Fig. 10.1

(a) Identify the point **H**, **J** or **K** where the reaction is fastest.

..... [1]

(b) On the same diagram, sketch a graph that can be obtained if 1.0 mol/dm^3 of hydrochloric acid solution reacts with 3 g of magnesium powder. [2]

(c) The equation for the reaction of magnesium and dilute hydrochloric acid is given below.

$$Mg + 2\,HCl \longrightarrow MgCl_2 + H_2$$

(i) Calculate the number of moles in 3 g of magnesium,

..... moles [2]

[Turn over

(ii) Calculate the number of moles in 10 cm^3 of 1.0 mol/dm^3 of hydrochloric acid solution,

..... moles [2]

(iii) Hence show that magnesium is in excess in this reaction.

.....

..... [2]

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 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 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	163 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	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	244 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	247 Bk Berkelium 97	251 Cf Californium 98	252 Es Einsteinium 99	257 Fm Fermium 100	258 Md Mendelevium 101	259 No Nobelium 102	260 Lr Lawrencium 103

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

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

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

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