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 2019**

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 17.
You may lose marks if you do not show your working or if you do not use appropriate units.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
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11	
Total	

This document consists of **17** printed pages and **3** blank pages.

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1 Fig. 1.1 shows a liquid-in-glass thermometer being calibrated against water for reading temperature in Celsius.

Only the lower and upper fixed points are labelled.

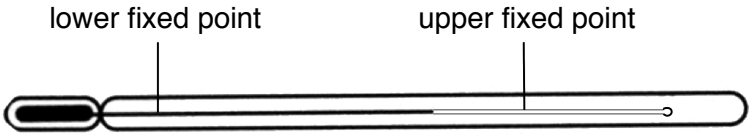

Fig. 1.1

(a) State the value of the

(i) lower fixed point ..... [1]

(ii) upper fixed point ..... [1]

(b) Describe how the thermometer can be calibrated using the lower and upper fixed points.

.....

..... [2]

(c) The liquid-in-glass thermometer in Fig. 1.1 is placed in warm water.

A similar thermometer with a larger bulb is placed in the same warm water.

(i) Describe how the larger bulb affects sensitivity of the thermometer.

..... [1]

(ii) Suggest how the increase in the size of the bulb affects the scale of the thermometer.

..... [1]

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2 Aluminium is extracted from its ore by electrolysis.

Fig. 2.1 shows the electrolytic cell used in the extraction of aluminium.

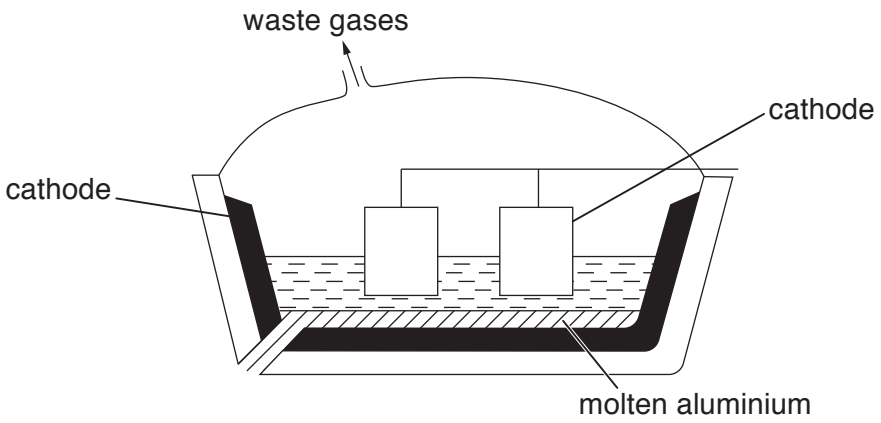

Fig. 2.1

(a) Name the main ore of aluminium.

..... [1]

(b) Label with the letter **A**, on Fig. 2.1, the electrode where oxygen gas is produced. [1]

(c) Explain why aluminium cannot be extracted by reduction with carbon.

.....

.....

..... [2]

(d) State **two** properties of aluminium that make it suitable for the construction of aircraft bodies.

1 .....

2 ..... [2]

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[Turn over

3 Cell phones transmit information through radio waves.

Radio waves are part of the electromagnetic spectrum.

(a) State the speed of the radio waves in a vacuum.

..... [1]

(b) Jabu, who is in Eswatini, receives a call on her cell phone from her friend in Australia.

Calculate the frequency of the radio waves if the wavelength is 0.2 km

..... Hz [3]

(c) Explain why x-rays are more harmful than radio waves.

.....

.....

..... [2]

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4 Table 4.1 shows the number of sub-atomic particles of atoms **X**, **Y** and **Z**.

Table 4.1

atom	number of protons	number of electrons	number of neutrons
X	8	8	8
Y	11	11	12
Z	8	8	9

(a) (i) Identify **X** using the Periodic Table on page 17.

..... [1]

(ii) Explain why **Z** is an isotope of **X**.

.....

.....

..... [2]

(b) Hydrogen reacts with **X** to form a covalent compound with the formula, H_2**X**.

Draw a 'dot-and-cross' diagram for the covalent compound, H_2**X**.

[2]

(c) **Y** is an atom of sodium, Na.

X reacts with sodium to form the ionic compound, Na_2**X**.

Explain the difference in the melting points of the ionic compound, Na_2**X**, and the covalent compound, H_2**X**.

.....

.....

..... [2]

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[Turn over

(d) Sodium is a Group I element while copper is a transition element.

Complete Table 4.2 by stating the colour and oxidation state of sodium and copper compounds.

Table 4.2

compound	colour	oxidation state
sodium compounds	white	
copper compounds		

[3]

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5 Fig. 5.1 shows a boy juggling with two marbles, **B** and **C**, of different diameters.

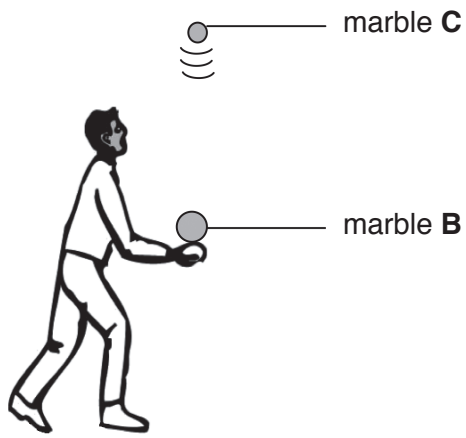

Fig. 5.1

Marble **B** is bigger than marble **C**.

(a) Marble **B**, of mass 200 g, leaves the hand at a speed of 3 m/s.

(i) Calculate the maximum kinetic energy that marble **B** gains during its motion.

..... [2]

(ii) Calculate the maximum height reached by marble **B**.

..... [2]

(iii) State **one** assumption made when calculating maximum height in **(a) (ii)**.

.....

..... [1]

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(b) Marble **C**, mass of 110 g, leaves the hand of the boy with the same speed of 3 m/s.

Compare the height reached by marble **C** to the height reached by marble **B**.

Give a reason for your answer.

comparison .....

reason .....

..... [2]

6 Fig. 6.1 is a flow diagram.

It shows methods for preparing two salts, copper(II) sulfate and barium sulfate.

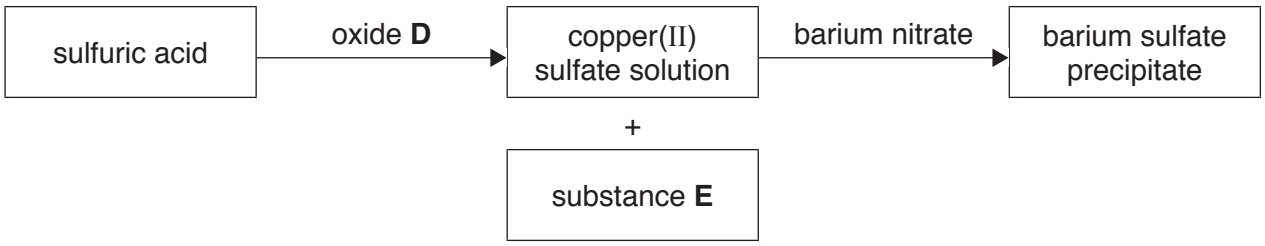

Fig. 6.1

(a) Identify oxide **D** ..... [1]

(b) Name the method used to prepare barium sulfate in Fig. 6.1.

..... [1]

(c) Identify substance **E**.

..... [1]

(d) Sulfur dioxide is another oxide.

Classify the type of oxide for sulfur dioxide.

Give a reason for your answer.

classification .....

reason .....

..... [2]

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7 Fig. 7.1 shows a circuit consisting of 3 resistors, 3 ammeters and 2 cells.

Resistor 1 (R_1) is 2 Ω

Resistor 2 (R_2) is 3 Ω

Resistor 3 (R_3) is 6 Ω

Ammeter A_3 reading is 1.7 A.

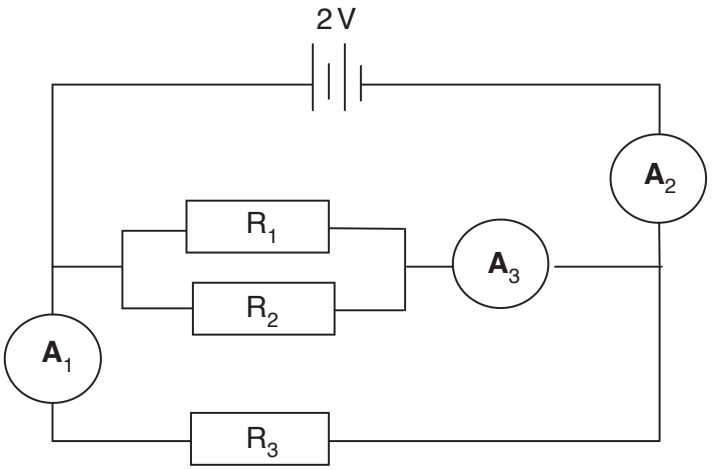

Fig. 7.1

(a) State the potential difference across R_3.

..... V [1]

(b) Calculate

(i) the current through ammeter A_1,

..... A [2]

(ii) the charge passing through R_3 in 10 seconds,

..... C [2]

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(iii) the combined resistance of R_1 and R_2,

..... Ω [2]

(iv) the reading of ammeter A_2,

..... A [1]

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8 **(a)** Calcium carbonate, $CaCO_3$, breaks down to form calcium oxide and carbon dioxide when heated.

Name the type of reaction involved when calcium carbonate is heated.

..... [1]

(b) 20 g of calcium carbonate is heated in a kiln to form calcium oxide and carbon dioxide.

The equation for the reaction is

$$CaCO_3 \longrightarrow CaO + CO_2$$

(i) Calculate the relative formula mass, RFM, of calcium carbonate, $CaCO_3$.

[A_r: Ca: 40; C: 12; O: 16]

..... [2]

(ii) Calculate the number of moles of calcium oxide that are produced when the 20 g calcium carbonate, $CaCO_3$ is heated in the kiln.

..... moles [3]

(iii) Find the number of moles of carbon dioxide gas produced when 20 g of calcium carbonate is heated in the kiln.

..... moles [1]

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(iv) The volume of carbon dioxide produced when 20 g of calcium carbonate is heated in the kiln is measured.

Calculate the volume of this gas at room temperature and pressure.

[Use the molar gas volume as 24 dm^3 at r.t.p.]

..... dm^3 [2]

(c) Describe the use of calcium carbonate in

(i) the manufacture of glass,

..... [1]

(ii) the extraction of iron.

.....

..... [2]

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9 A power station generates 21 MW, 25 000 V of electricity.

The electricity is transmitted to a transformer in a nearby sub-station.

Fig. 9.1 shows the transformer at the sub-station.

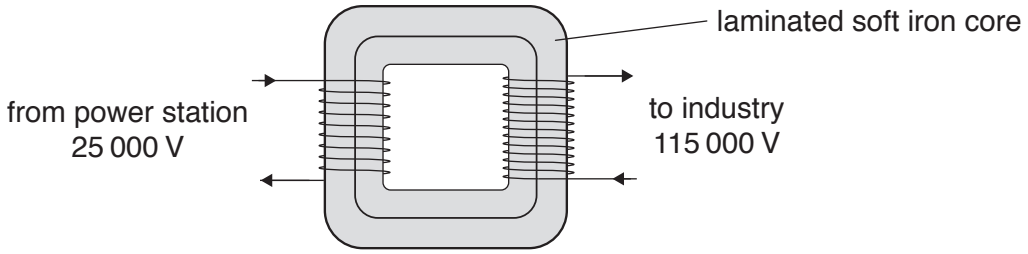

Fig. 9.1

(a) State the type of transformer shown in Fig. 9.1.

..... [1]

(b) State the purpose of the high voltage transmission of electricity.

..... [1]

(c) Describe how the transformer converts one input value of voltage to a different output value.

.....

.....

.....

..... [3]

(d) Calculate the output current in the transformer in Fig. 9.1.

..... [2]

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10 Fig. 10.1 shows processes used to manufacture ethanol.

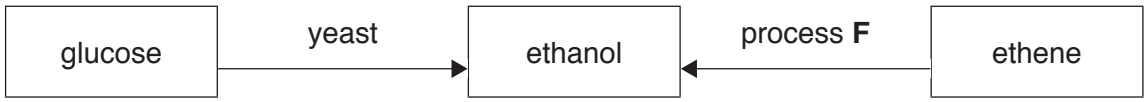

Fig. 10.1

(a) Name the constituent in yeast that will convert glucose to ethanol.

..... [1]

(b) In process **F**, steam is added to ethene.

Name process **F**.

..... [1]

(c) Ethanol is the second member of the alcohol homologous series.

Draw the structure of the fourth member of the alcohol homologous series.

[2]

(d) Describe the formation of ethanoic acid using atmospheric oxygen.

.....

.....

..... [2]

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[Turn over

11 The nuclide radon-222 is found to emit **β** particles to form a new nuclide.

(a) Complete the equation to show the new nuclide after the radon-222 has undergone **β** decay. Write the new nuclide in the boxes.

(You may use the Periodic Table on page 17).

$$^{222}_{86}Rn \rightarrow \square\!\!\square + {}^{0}_{-1}\beta$$

[2]

(b) Explain why **β** particles are deflected when they pass through a magnetic field.

.....

.....

..... [2]

(c) State **one** method of storing the radon-222 nuclide safely.

..... [1]

(d) Radon has a half-life of 4 days.

A 30 g sample of radon is left to decay for 16 days.

Calculate the amount of the sample remaining after the 16 days.

..... [2]

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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 Radius 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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