EXAMINATIONS COUNCIL OF ESWATINI
Eswatini General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

PHYSICAL SCIENCE **6888/03**

Paper 3 Practical Test **October/November 2020**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on the spaces provided.
Write in dark blue or black pen.
You may use an 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.
You may lose marks if you do not show your working or if you do not use appropriate units.
Chemistry practical notes for this paper are printed on page 9.

The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
Total	

This document consists of **9** printed pages and **3** blank pages.

1 (a) You are provided with two solutions: magnesium chloride and sodium carbonate.

(i) Pour about 2 cm^3 of magnesium chloride solution into test-tube **A**.

Measure the temperature of the magnesium chloride solution using the thermometer.

Record this temperature as T_0.

T_0 ..... °C.

Note: *always rinse the thermometer and the measuring cylinder before using them again.*

(ii) Pour about 2 cm^3 of sodium carbonate solution into test-tube **B**.

Measure the temperature of the sodium carbonate solution.

Record this temperature also as T_0.

T_0 ..... °C. [1]

(iii) Pour the contents of test-tube **A** into test-tube **B** to mix the two solutions.

Insert the thermometer and immediately start the stop-watch.

Record the temperature, T_1 of the mixture after 30 seconds in Table 1.1.

Continue recording the temperatures T_2, T_3 and T_4 at 30 second intervals.

Table 1.1

time/s	temperature/° C
30	T_1 = ...
60	T_2 = ...
90	T_3 = ...
120	T_4 = ...

[2]

(iv) Describe the relationship between the time and the temperature in Table 1.1 as the reaction progresses.

.....

..... [1]

(v) State the type of reaction that is taking place between magnesium chloride and sodium carbonate solutions.

Give a reason for your answer in terms of energy changes.

type of reaction .....

reason .....

..... [2]

(vi) Describe an observation that shows that the reaction of magnesium chloride with sodium carbonate is an example of a chemical change.

..... [1]

(vii) State **one** precaution you should take to ensure that an accurate reading is taken using a thermometer.

..... [1]

(b) Dilute sulfuric acid is reacted with excess sodium hydroxide solution.

The temperature of the solution formed is measured at 30 second intervals.

Table 1.2 shows the results of this reaction.

Table 1.2

time/s	temperature/° C
0	25
30	28
60	30
90	31.5
120	32.5
150	33
180	33

(i) Plot these results in Fig. 1.1.

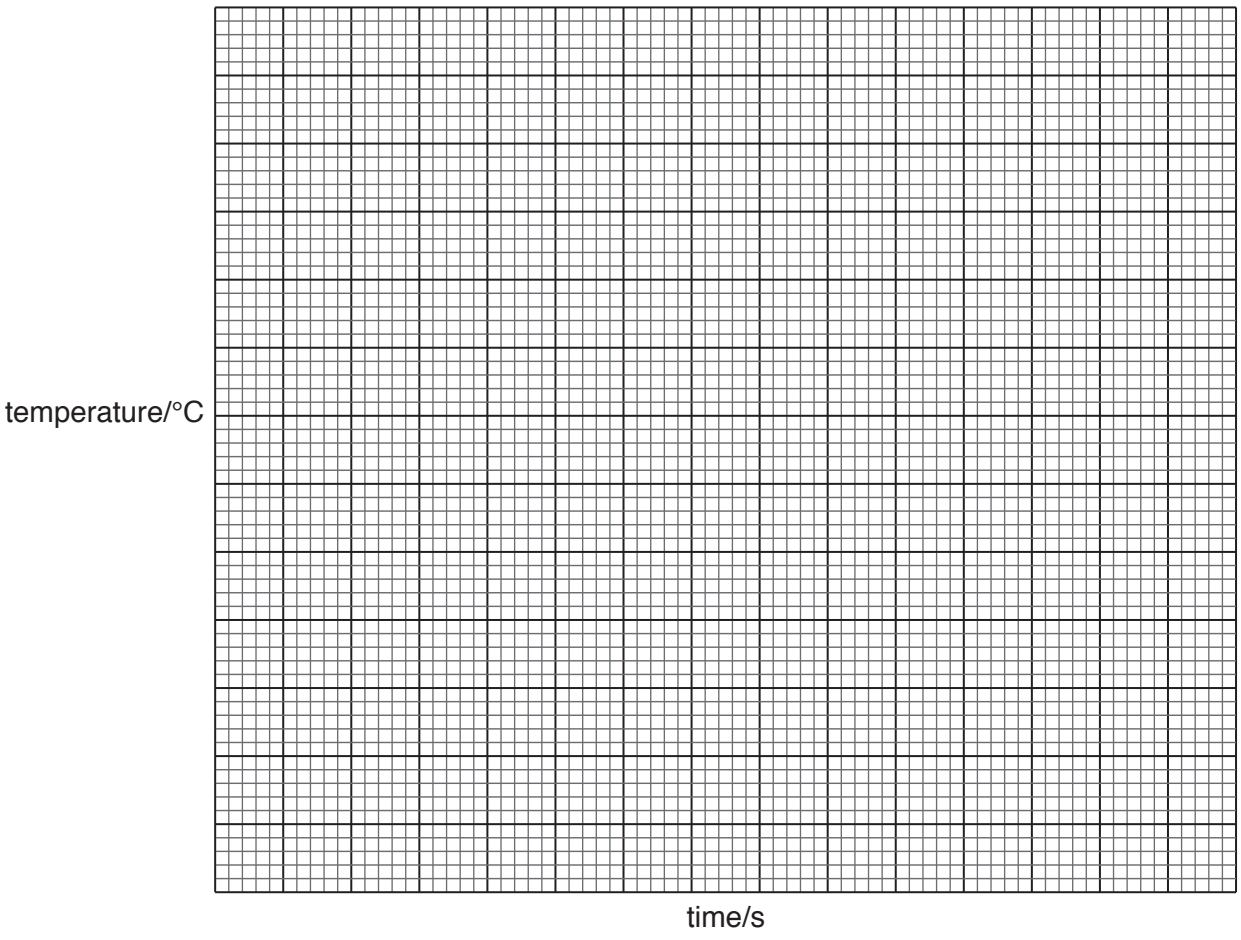

Fig. 1.1

[3]

(ii) Name the substance that limits the rate of this chemical reaction.

..... [1]

(iii) Suggest the value of the temperature after four minutes (240 seconds).

..... °C [1]

(c) Place about 2 cm^3 of sodium carbonate solution in test-tube **C**.

Add about 2 cm^3 of dilute sulfuric acid into the test-tube and close with a stopper fitted with a delivery tube.

Immerse the delivery tube in solution **D** as shown in Fig. 1.2.

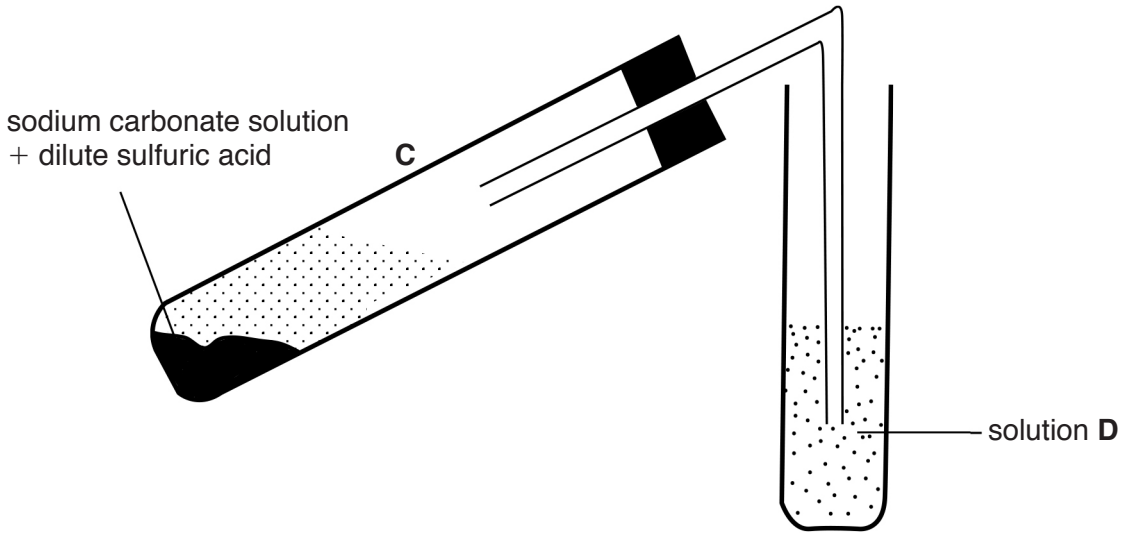

Fig. 1.2

(i) Record your observations in test-tube **C** and solution **D**.

test-tube **C** .....

solution **D** ..... [2]

(ii) Identify solution **D**.

..... [1]

(iii) Suggest how the rate of this reaction can be increased.

..... [1]

[Turn over

(d) Place about 5 cm^3 of magnesium chloride solution into a test-tube.

Add about 2 cm^3 of aqueous silver nitrate into the test-tube.

Describe how you can obtain a pure salt of the precipitate from the mixture.

.....

.....

.....

..... [3]

2 You are to carry out an experiment to determine an approximate volume of the material making a small glass beaker.

(a) Use the two blocks of wood and the ruler to measure the external diameter, *d*, of the small glass beaker.

d = ... cm [1]

(b) Draw a simple labelled diagram to show how you used the blocks of wood and the ruler to find, as accurately as possible, a value for the diameter.

[2]

(c) Calculate the external radius, *r*, of the bottom of the beaker.

$\left(r = \frac{d}{2} \right)$

r = ... [1]

(d) Measure and record the height, *h*, of the beaker.

h = …..…… [1]

(e) Calculate the external volume, V_1, of the beaker using the equation $V_1 = \pi r^2 h$.

Show your working.

V_1 = …..…… cm^3 [2]

(f) **(i)** Now you are to measure the internal volume of the beaker.

- Place the beaker on a flat surface.
- Pour water into the measuring cylinder to a volume of your choice.
- Note the volume in the measuring cylinder.
- Pour the water in the measuring cylinder into the beaker.
- Repeat steps 1 to 3 until beaker is filled with water.
- Record the total volume of water in the beaker.

V_2 = …..…… cm^3 [1]

(ii) State **one** precaution that you have taken when reading the volume of the water in the measuring cylinder.

..... [1]

(g) Calculate the approximate volume, *V*, of the glass material used to make the beaker.

Show your working.

V = …..…… cm^3 [2]

[Turn over

(h) Use the displacement can, measuring cylinder and water to find again the volume of the material used to make the beaker.

(i) Describe how you measured the volume of the material used to make the beaker.

.....

.....

..... [2]

(ii) Record the volume of the material used to make the beaker.

V = ... cm^3 [1]

(i) Explain why the volume of the material used to make the beaker in **(g)** is different from the volume in **(h)(ii)**.

.....

..... [1]

(j) Calculate the mean of your two values for *V* in **(g)** and **(h)(ii)**.

Show your working.

mean volume = ... cm^3 [2]

(k) Describe how you would measure the mass of the water in the beaker in **(f)(i)**.

.....

.....

.....

..... [3]

CHEMISTRY PRACTICAL NOTES

Test for anions

anion	*test*	*test result*
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminum foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify, then add aqueous barium chloride or aqueous barium nitrate	white ppt

Test for aqueous cations

cation	*effect of aqueous sodium hydroxide*	*Effect of aqueous ammonia*
ammonium (NH_4^+)	ammonia produced on warming	–
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess giving a colorless solution	white ppt., soluble in excess, giving a colourless solution

Test for gases

gas	*test and test results*
ammonia (NH_3)	turns damp litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	'pops' with a lighted splint
oxygen (O_2)	relights a glowing splint

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