BRI
GHT

233/3 **-CHEMISTRY-** PAPER 3

(PRACTICAL)

SEPTEMBER 2019 -2 ¼ HOURS

Name _____ Index No. _____

Candidate's sign _____ Date _____

Instructions to Candidates

- *Write **your name** and **Index number** in the spaces provided.*
- *Sign and write the date of the examination in the spaces provided*
- *Answer **all** the questions in the spaces provided.*
- *You are required to spend the first 15 minutes of the 2 ¼ hours allowed for this examination reading through the whole paper carefully before commencing your work.*
- *This paper consists of 7 printed pages.*
- *Additional pages MUST not be inserted.*
- *Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.*
- *Candidates should answer all the questions in English.*

For Examiner's Use Only:

QUESTIONS	MAXIMUM SCORE	CANDIDATES SCORE
1	19	
2	07	
3	14	

TOTAL	**40**	

1. You are provided with:

- Solution **A,** containing 9.7g per litre of salt **A**
- Aqueous sodium hydroxide, solution **B**
- Solution **C** containing 10g per litre of a dibasic acid.
- Phenolphthalein indicator.

You are required to:-

- Determine the concentration of sodium hydroxide, solution **B**
- React salt **A** with excess sodium hydroxide and then determine the relative molecular mass of salt **A**.

Procedure I

(a) Using a burette, place 25.0cm^3 of solution **A** in each of two 250ml conical flasks. Using a pipette and a pipette filler, add 25.0cm^3 of solution **B** to each of the two conical flasks. (The sodium hydroxide added is in excess).

(b) Heat the contents of the first conical flask to boiling and then let the mixture boil for five minutes. Transfer the contents into a 250ml beaker. Allow the mixture to cool.

(c) Repeat procedure **I** (b) with the second conical flask. While the mixtures are cooling, proceed with procedure II.

Procedure II

Place solution **C** in a clean burette. Using a pipette and a pipette filler, place 25.0cm^3 of solution **B** in a 250ml conical flask. Add 2 drops of phenolphthalein indicator and titrate with solution **C**. Record your results in Table 1. Repeat the titration two more times and complete the table.

Table 1

	I	II	II I
Final burette reading			
Initial burette reading			
Volume of solution **C** used (cm^3)			

(4 marks)

Calculate the:

(i) Average volume of solution C used: (½ mark)

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(ii) Concentration in moles per litre of the dibasic acid in solution C; (Relative molecular mass of A is 126) (1 mark)

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(iii) Moles of the dibasic acid used; (1 mark)

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(iv) Moles of sodium hydroxide in 25.0cm^3 of solution **B**. (1 mark)

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(v) Concentration of sodium hydroxide in moles per litre (2 marks)

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Procedure III

Transfer the contents of the 250ml beaker prepared in procedure 1 into a clean empty 250ml conical flask. Add 2 drops of phenolphthalein indicator to the contents and titrate with **solution C**. Record your results in Table 2. Repeat the procedure with the contents of the second conical flask prepared in procedure 1 above and complete the table.

Table 2

	1st Conical flask	2nd Conical Flask
Final burette reading		
Initial burette reading		
Volume of solution **C** used (cm^3)		

(3 marks)

Calculate the: -

(i) average volume of solution **C** used; (½ mark)

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(ii) Moles of the dibasic acid used; (1 mark)

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(iii) Moles of sodium hydroxide that reacted with the basic acid. (1 mark)

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(iv) Moles of sodium hydroxide that reacted with 25.0cm^3 of salt **A** in solution **A;**

(2 marks)

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(v) Given that 1 mole of **salt A** reacts with 1 mole of sodium hydroxide. Calculate the : -

I) Number of moles of salt **B** in 25.0cm^3 of solution **B;** (1 mark)

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II) Concentration in moles per litre of salt **A** in solution **A** ; (1 mark)

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III) Relative molecular mass of salt **A**; (1 mark)

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2. You are provided with solid D in the test tube

- You are required to determine the freezing point of solid M.

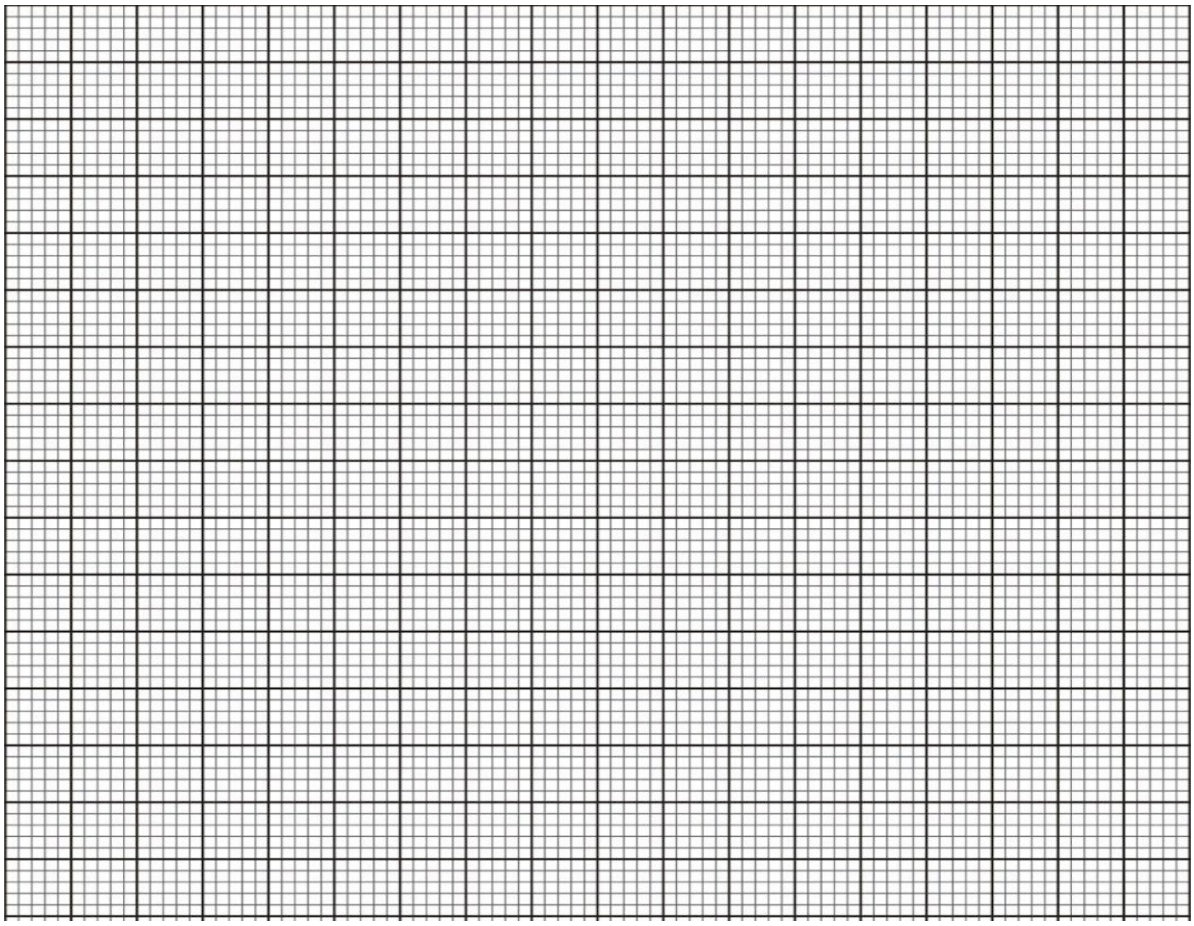
Procedure

Place 150cm^3 of tap water in a 250ml glass beaker. Heat the water to near boiling. Immerse the test tube containing solid D into the hot water (ensure that half of the test tube is immersed in water) continue heating the water until the solid starts to melt. Insert a thermometer into the liquid being formed in the test tube and note the temperature when **all** the solid has just melted. Record the temperatures in table 3. Remove the test tube from the water and **immediately** start the stopwatch clock /watch and record the temperature of the contents of the test tube after every half a minute and complete the table 3. Dip the thermometer into the hot bath to clean it then wipe it with tissue paper.

Table 3 (3 marks)

Time (Min)	0	½	1	1 ½	2	2 ½	3	3 ½
Temperature (^{0}C)								

(a) On the grid provided, plot a graph of time (Horizontal axis) against temperature.
(3 marks)



(b) From the graph determine the freezing point of solid M (1 mark)

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3. You are provided with solid E and G. Carry out the following tests and write your observations and inferences in the spaces provided.

(a) (i) Place all of the solid E in a boiling tube. Add about 10cm^3 of distilled water. Shake well. **Retain the mixture for use in (b)**

Observation	Inferences

(1 mark) (1 mark)

(ii) To the mixture obtained above, add all of solid G and stir with a thermometer. Filter the mixture. **Use the residue in (a) (iii) below. Retain the filtrate for use in (b)**

Observations	Inferences

(1 mark) (1 mark)

(iii) Place the residue in a test tube and add a $5cm^3$ the 2M Nitric (v) acid. **Retain the mixture for use in (iv)**

Observations	Inferences

(1 mark) (1 mark)

(iv) To the mixture in (a) (iii) above, add $5cm^3$ of 2 M ammonia solution.

Observations	Inferences

(1 mark) (½ mark)

(b) Divide the filtrate above into four portions.

I) To the first portion, add 2 M sodium hydroxide dropwise until in excess.

Observation	Inferences

(1 mark) (½ mark)

II) To the second portion, add the hydrogen peroxide followed by $5cm^3$ of 2M ammonia solution.

Observation	Inferences

(1 mark) (1 mark)

III) To the third portion add, lead (II) nitrate **and place the test tube in the warm water used in question 1**

Observations	Inferences

(1 mark) (1 mark)

IV) To the fourth portion, add barium nitrate followed by 5 cm^3 of Nitric (V) acid.

Observations	Inferences

(½ mark) (½ mark)