NANDI NORTH AND NANDI CENTRAL JOINT EXAMINATIONS 2016

233/3
CHEMISTRY
PAPER 3
PRACTICAL
JULY / AUGUST 2016
TIME: 2 ¼ HOURS

1. You are provided with:-
   - Solution Q, a 2M solution of Hydrochloric acid.
   - Solution R, a 2M solution of Sodium hydroxide.
   - Solid S, 2g piece of chalk (impure calcium carbonate)

   You are required to determine:
   (i) How the rate of reaction between carbonate varies with concentration of hydrochloric acid.
   (ii) Determine the percentage purity of the carbonate.

Procedure I

(a) Measure 10cm^3 of solution R into a 100cm^3 measuring cylinder. Add distilled water to make 100cm^3 of solution. Transfer the solution into a 250ml conical flask. Label it solution T. Fill the burette with solution T.
(b) Label 5 test tubes 1, 2, 3, 4 and 5.
(c) Using a dropper and a 10ml measuring cylinder, measure 1cm^3 of solution Q into test tube 1.
(d) Measure 100cm^3 of solution Q into a 250ml conical flask. Transfer solid S into the conical flask and **immediately start a stop watch.**
(e) Swirl the remaining mixture for a further 1 minute. Using a dropper and 10ml measuring cylinder draw out 1cm^3 of the mixture into test tube 2.
(f) Swirl the remaining mixture for a further 1 minute, draw 1cm^3 of mixture into test tube 3.
(g) Repeat procedure (f) above and place the mixture in test tubes 4 and 5.
(h) To each of the test tubes 1-5, add 10cm3 of distilled water. transfer contents of test tube 1 into a conical flask. Add 2-3 drops of phenolphthalein indicator. Titrate this solution against solution T in the burette by adding T dropwise till a permanent pink colour just appear. Record the volume of T in the table 1, repeat the procedure with contents of test tubes 2, 3, 4 and 5. Complete the table 1 below.

(RETAIN THE REACTING MIXTURE FOR USE IN PROCEDURE II)

TABLE I

Test Tube Number	**1**	**2**	**3**	**4**	**5**
Time (minutes)	0	1	2	3	4
Final burette reading (cm^3)					
Initial burette reading (cm^3)					
Volume of solution T used (cm^3)					

(6mks)

(a) On the grid provided, plot a graph of volume of solution T(y-axis) against time. (3mks)
(b) (i) From the graph, determine the volume of solution T that react with 1cm^3 of the mixture after 3½ minutes. (1mk)
(ii) Calculate the concentration of the mixture after 3½ minutes. (1mk)
(c) In terms of rate of reaction explain the shape of the graph. (1mk)

Procedure II

Filter solution S obtained in procedure 1 above into a clean conical flask. Pipette 25cm^3 of this solution into a clean conical flask. Add 20cm^3 of distilled water. Rinse the burette and fill with fresh solution T. Titrate using 2-3 drops phenolphthalein indicator. Record your results in the table II. Repeat the procedure two more times and complete the table II below.

Table II

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

(4mks)

(a) Calculate the volume of solution T used. (1mk)
(b) Calculate:-
(i) The number of moles of the excess acid in 25cm^3 of solution Q. (1mk)
(ii) The number of moles of the excess acid in 100cm^3 of solution Q. (1mk)
(c) Calculate the mass of carbonate that reacted with 100cm^3 of solution Q. (1mk)
(d) Calculate the percentage purity of the carbonate in solid S. (1mk)

2. You are provided with solid **F** to carry out the tests indicated below and record your observation and inferences in the spaces provided.

(a) Place a spatula end-full of F in a boiling tube. Add about $10cm^3$ of distilled water and shake to dissolve. **(Retain the remaining solid F for use in test (b) below).**

Divide the resultant mixture into four portions.

(i) To the first portion, add $1cm^3$ nitric acid followed by 3 drops of Barium Nitrate solution.

Observation	Inference
(1mk)	(1mk)

(ii) To the second portion, add $1cm^3$ nitric acid followed by 3 drops of Lead (II) nitrate solution.

Observation	Inference
(1mk)	(1mk)

(iii) To the third portion, add aqueous ammonia dropwise until in excess.

Observation	Inference
(1mk)	(1mk)

(iv) To the fourth portion, add sodium hydroxide dropwise until in excess.
Retain the mixture for use in part (v) below.

Observation	Inferences
(1mk)	(1mk)

(v) To the mixture from (iv) above, add a piece of Aluminium foil and warm the mixture gently and carefully.

Observation	Inferences
(2mks)	(1mk)

(i) Using a clean metallic spatula, place a little of the remaining solid F and burn it strongly on a non-luminous flame.

Observation	Inferences
(½mk)	(½mk)

3. You are provided with substance **G.** Carry out the following tests and record your observations and inferences in the spaces provided.

(a) Place a spatula end-full of solid G on a clean metallic spatula and ignite.

Observation	Inference
(1mk)	(1mk)

(b) Put the remaining solid G in a clean boiling tube and add about $10cm^3$ of distilled water divide the solution into four portions.

(i) To the first portion add two drops of acidified potassium manganate (VII).

Observation	Inference
(½ mk)	(1mk)

(ii) To the second portion, add 3 – 4 drops of acidified dichromate (VI).

Observation	Inferences
(½ mk)	(1mk)

(iii) To the third portion, add a half spatula end-full of sodium hydrogen carbonate.

Observation	Inferences
(1mk)	(1mk)

(iv) To the fourth portion, test the PH with universal indicator.

Observation	Inferences
(1mk)	(1mk)