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233/3 CHEMISTRY PAPER 3 MAY/JUNE 2014 Det TIME: 2 ¹ / ₄ HOURS.	nn fre	

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Chemistry Paper 3

INSTRUCTIONS TO CANDIDATES:

- Answer all the questions on the spaces provided. ٠
- All workings must be clearly shown where necessary
- Mathematical tables, and calculators may be used. ٠

For Examiner's Use Only:

Question	Maximum score	Candidate's score
1	24	
2	16	
Total	40	

This paper consists of 4 printed pages. Candidates should check to ascertain that all papers are printed as indicated and that no questions are missing.

You are provided with the following; 1.

- 2Pers. com 2.1g of solid sodium carbonate solid (i)
- Hydrochloric acid solution $\mathbf{Y}_{\mathbf{y}}$ (ii)
- 0.2M sodium hydroxide, solution V (iii)

This question has two parts:

<u>PART 1</u>

Measure 60cm ³ of solution Y hydrochloric acid an	d transfer into a plastic beaker and measu	re its
temperature T ₁ ,	.°C	
Take all the 2.1g sodium carbonate and transfer int	to the solution in the beaker. Stir with the	thermometer
and record final temperature reached, T_2	⁰ C	(½ mk)
Keep the mixture for part II and label it X.		

	AT CONTRACTOR OF THE PARTY OF T	
. (Calculations	
~0 ⁷	(a) Determine the rise in temperature	(1mk)
*	Δt	

(b) Determine the amount of heat evolved by the solution (density $=1g/cm^3$, specific heat capacity of solution = 4.2kJKg⁻¹K⁻¹) (2mks)

(c) If the acid was in excess, determine the number of moles of sodium carbonate (Na = 23, O=16, H=1) (2mks)

(d) Calculate the number of moles of hydrochloric acid which reacts	(2mks)
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(e) Determine the molar heat of reaction of sodium carbonate	(2mks)
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PART II To the mixture in part I(X) add 20cm³ of distilled water and mix well. Transfer the solution in the burette. Pipette 25cm³ of NaOH, solution V, into the conical flask and titrate with solution X using phenolphthalein indicator. Repeat the titration two more armes and complete the table below:

	In the second	II	III
Final burette reading	int .		
(cm ³)	5 ¹⁷²		
Initial burette reading			
(cm ³)			
Volume of X used			
(cm ³) (C ²)			

 $\mathbf{x}_{\mathbf{x}_{0}}$ Determine the average volume of **X** used

(ii) Calculate the number of moles of NaOH in 25cm³ of solution V

(iii) Determine the number of moles of hydrochloric acid that reacted with moles of 25cm³ of sodium hydroxide (2mks)

(iv) Determine the number of moles of hydrochloric acid in 80cm^3 of X (2mks)

(2mks)

(1mk)

- (v) What is the total number of moles of hydrochloric acid in the original 60cm^3 of HCL (1mk)
- (vi) Hence determine the concentration of hydrochloric acid, solution **Y** in moles per litre (2mks)

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2. You are provided with solid **N**. carry out the tests below, write your observations and inferences in the spaces provided.

Test	Observation	Inferences
(f) Take a spatula endful of N in a		
test-tube and add distilled water until		
half-filled. Shake well and divide the		
solution into 5 portions		
	(1mk)	(1mk)
(b) To the first portion add 2M NaOH		
solution drop wise until in excess		
		(11)
	(2mks)	(1mk)
(c)To the 2^{nd} portion add 2M NH _{3(aq)}		
drop wise until in excess		
	(2mks)	(1mk)
	()	()
(d) To the 3 rd portion add 3drops of		
2M HCl solution	(1mk)	(1mk)
(e) To the 4 th portion add about 1cm ³		
of 2M Pb(NO ₃) ₂ solution	(1mk)	(2mks)
	(1111K)	(2111K3)
(f) To the 5^{th} portion add about 1 cm^3		
of 2M Ba(NO ₃) ₂ solution followed by		
dilute nitric acid.	() mlra)	(1mh)
	(2mks)	(1mk)