

# FOCUS A365

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## FORM 4 TERM 1 CHEMISTRY PP3 EXAMINATIONS 2018

NAME: \_\_\_\_\_ ADM NO: \_\_\_\_\_ CLASS: \_\_\_\_\_

### INSTRUCTION TO CANDIDATES

- Answer all questions in the spaces provided in the question paper.
- You are not allowed to start working with apparatus for the first 15 minutes of the 2  $\frac{1}{4}$  hours allowed for this paper. This time is to enable you to read the question paper and make sure you have all the chemicals and apparatus that you may need.
- All working must be clearly shown

### FOR EXAMINER'S USE ONLY

QUESTION	MAXIMUM SCORE	CANDIDATE SCORE
1	12	
2	14	
3	14	
<b>TOTAL SCORE</b>	<b>40</b>	

1. You are provided with the following

- i. Anhydrous Sodium Carbonate solid x.
- ii. Distilled water
- iii. 0.2M Hydrochloric acid solution A.

You are required to determine molar heat of solution of solid x.

Procedure I

- i) Place 50.0cm<sup>3</sup> of water in a 250ml plastic beaker.
- ii) Note the temperature of the water and record it in the table I below as the initial temperature.
- iii) Add all the solid x provided into the water in the beaker, stir gently with the thermometer and record the final temperature of the solution in the table I below. Keep the resulting solution for procedure II.

**TABLE I**

Final temperature (°C)	
Initial temperature (°C)	
Change in temperature (°C)	

(2mks)

- a) Calculate the enthalpy change for reaction. (Assume the density of the solution in 1g/cm<sup>3</sup> and specific heat capacity is 4.2Jg<sup>-1</sup>K<sup>-1</sup>) (1mk)

## PROCEDURE II

Transfer the contents of the beaker into a 250ml volumetric flask. Rinse both the beaker and thermometer with distilled water and transfer this water into the volumetric flask. Add more water to make up to the mark. Label this solution as solution x. Fill the burette with solution A. using a pipette place 25.0ml of solution x into a conical flask. Add 3 drops of methyl orange indicator and titrate with solution A. Record your readings in table II below. Repeat the titration two more times and complete the table.

**TABLE II**

Experiment	I	II	III
Final burette reading (cm <sup>3</sup> )			
Initial burette reading (cm <sup>3</sup> )			
Volume of solution A used (cm <sup>3</sup> )			

(3mks)

a) Calculate

i) The average volume of solution A used. (1mk)

ii) The number of moles of solution A used. (1mk)

iii) The number of moles of solution X that reacted with the number of moles of solution A in (ii) above. (1mk)

iv) The number of moles of solid x used in procedure I. (1mk)

v) Molar heat of solution of anhydrous sodium carbonate. (2mks)

2. You are provided with :

- Solution M which is hydrochloric acid.
- Solution N which is 1.0M sodium hydroxide solution.

You are required to:

- Determine the concentration of the HCl in moles/Litre.
- Determine the molar heat of neutralization of the hydrochloric acid.

### PROCEDURE

- Using a clean measuring cylinder measure  $50.0\text{cm}^3$  of solution N and place it in a 250ml plastic beaker provided.
- Measure the temperature of solution N and record in the table below. At the instant when the volume of solution M is  $0.0\text{cm}^3$ .
- Measure  $5.0\text{cm}^3$  portion of solution M.
- Add the  $5.0\text{cm}^3$  portion of solution M to solution N in the beaker. Stir the mixture with a thermometer and record the highest temperature.
- Measure another  $5.0\text{cm}^3$  portion of solution M and add it to the solution in the 250ml plastic beaker. Stir the mixture and record the highest temperature attained after each addition continue adding  $5\text{cm}^3$  portions until a total volume of  $50.0\text{cm}^3$  has been added and record the highest temperature after each addition.

TABLE II

Volume of solution M ( $\text{cm}^3$ )	0.0	5.0	10.0	15.0	20.0	30.0	35.0	40.0	45.0	50.0
Temperature ( $^{\circ}\text{C}$ )										

(4mks)

- Plot a graph of temperature against the volume of solution M added. (3mks)
- From the graph determine the volume of solution M that reacted completely with  $50\text{cm}^3$  of solution N. (1mk)

- Calculate the concentration of solution M in moles/litre. (2mks)

d) From the graph determine the maximum temperature rise when solution N is fully neutralized. (1mk)

e) Calculate the molar heat of neutralization of solution M hydrochloric acid. (3mks)

You are provided with

- Solid K
- 2M sodium hydroxide solution
- 2M Ammonia solution
- Acidified 0.25M Barium nitrate solution
- Aqueous sodium sulphate
- Distilled water
- 1 red and 1 blue litmus paper.

Solid K is suspected to be a mixture of aluminium sulphate and ammonium sulphate.



v)

Test 5	Expected Observations
$\frac{1}{2}$ mark	$\frac{1}{2}$ mark

a) Carry out the five tests described in (a) above and record the observations and inferences.  
In the spaces provided.

i) Test 1

observations	Inferences
$\frac{1}{2}$ mark	$\frac{1}{2}$ mark

ii) Test 2

observations	Inferences
$\frac{1}{2}$ mark	$\frac{1}{2}$ mark

iii) Test 3

observations	Inferences
$\frac{1}{2}$ mark	$\frac{1}{2}$ mark

iv) Test 4

observations	Inferences
       ½ mark	       ½ mark

v) Test 5

observations	Inferences
       ½ mark	       ½ mark

b) You are provided with solid Z. carry out the tests below and record your observations and inferences in the spaces provided.

I. i) Scoop about half of solid Z with a clean metallic spatula and burn it on a non-luminous flame.

observation	inference
       ½ mark	       ½ mark

II. Place the remaining solid Z in a boiling tube and add about 6cm<sup>3</sup> of distilled water. Shake the mixture until all the solid dissolves. Divide the solution into 3 portions.

(ii) To the first portion add 3 drops of acidified potassium managanate (VII) solution and warm gently.

observation	inference
       ½ mark	       ½ mark



