CHEMISTRY PRACTICAL REVISION

1. **PROCEDURE I**

You are provided with:

- 2.5g of sodiumHydrogencarbonate (D).-**in two different containers**
-distilled water
- Solution C -Hydrochloric acid
-Solution B, containing 19.2g per litre of a basic Compound $Na_2 B_4O_7 . nH_2O$

You are required to determine

(a).(i) The molar heat of solution of solid D.

(ii) The enthalpy of reaction between HCl and sodiumhydrogencarbonate

(b) Calculate the heat of solution of solid D by applying Hess' law.

(c) Determine the value of n in the compound B

Procedure I:

-Place $30cm^3$ of distilled water into a 100ml plastic beaker.
-Measure the initial temperature of the water and record it in table II below. Add all the solid D at once.
-Stir the mixture carefully with the thermometer until all the solid dissolves. Do not break the thermometer.
-Measure the final temperature reached and record it in table II below.

(a) (i) **Table II**

Final temperature (^0C)	
Initial temperature (^0C)	

(ii) Determine the change in temperature, ΔT_1. (1 mark)

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(b) Calculate the:

(i) Heat change when solid D dissolves in water. (Assume the heat capacity of the solution is $4.2kJkg^{-1}k^{-1}$ and density is $1gcm^{-3}$) (2 marks)

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(ii) Moles of solid D used (Na=23,H = 1.0, C = 12.0, O = 16.0) (1 mark)

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(iii) Molar heat of solution, ΔH_1 of solid E (sodiumhydrogencarbonate). (1 mark)

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Procedure II:

-Place 30cm^3 of solution C (HCl) into a clean 100ml plastic beaker.
-Measure its temperature and record it in table III below.
-Add all the remaing solid D at once to HCl in the beaker.
-Stir the mixture gently with the thermometer.
-Measure the final temperature reached and record it in table III below**.(DO NOT POUR THE CONTENTS OF THE BEAKER)**

Table III

(c) (i)

Temperature of solution D, T1(^{0}C)	
Final temperature of mixture (^{0}C)	

(ii) Determine the change in temperature, ΔT_2. (1 mark)

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(d) Determine the:

(i) .Heat change for the reaction (Assume heat capacity of solution = 4.2kJkg^{-1}k^{-1} and density of solution is 1gcm^{-3}) (2 mark)

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(ii) .Number of moles of HCl used in this reaction .given the mole ratio =1:1(1 mark)

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(iii) .Heat of reaction, ΔH_2, of one mole of acid with sodiumhyrogencarbonate. (1 mark)

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(e) Given that:

ΔM_1 is the molar heat of solution of solid oxalic acid; reaction:

$KHCO_{3(s)} \xrightarrow{\text{Water}} KHCO_{3(aq)}$

ΔM_2 is the heat of reaction of one hydrochloric acid with sodiumhydrogencarbonate ;

$HCO_3^- + H^+_{(aq)} \longrightarrow CO_{2(g)} + 2H_2O_{(l)}$

Calculate ΔH_3, for the reaction:

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PROCEDURE III

- Transfer the contents of the beaker obtained in procedure II into a volumetric flask and top up to 250ml mark with distilled water. Label as solution C1

Fill a clean burette with solution C1. Using a pipette place 25.0cm³ of solution B into a clean conical flask. Add two drops of methyl orange indicator and titrate with solution C1. Repeat the titration two more times and complete the table.

	I	II	III
Final burette reading (cm³)			
Initial burette reading(cm³)			
Volume of C1 used (cm³)			

(4marks)

(**a**) Calculate the average volume of solution C1 used. (1 mark)

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b) Calculate the number of moles of the acid in solution C1 used (2 marks)

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c) Given that the ionic equation for the reaction is

$B_4O_7^{2-}(aq) + 2\ H^+(aq) + 5H_2O(l) \longrightarrow 4H_3B_4(aq)$

(1 mole of the base reacts with two moles of the acid).

Calculate

(i). The number of moles of the basic compound in 25.0cm³ of solution Z. (1 mark)

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ii) The concentration of solution C in moles per litre. (1 mark)

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iii) The relative molecular mass of the basic compound. (1 mark)

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iv) the value of n in the formula $Na_2B_4O_7.nH_2O$. (2 marks)

[B = 10.8, H=1.0, Na=23.0, O=16]

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EXTRA QUESTION

2.You are provided with:

- Solution A – 0.1M hydrochloric acid
- Solution B – Containing 19.1g per litre of a basic compound $B_2X.10H_2O$.

You are required to determine the relative atomic mass of metal B in the formula $B_2X.10H_2O$

Procedure

- Fill the burette with solution A upto the zero mark.
- Using a pipette and a pipette filler, place $25cm^3$ of solution B into a $250cm^3$ conical flask.
- Add three drops of methyl orange indicator and titrate.
- Record your results in the table below.
- Repeat the procedure two more times and complete table I.

(a) (i) **TABLE I**

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

(4 marks)

(ii) Calculate the average volume of solution A used. (1 mark)

……

(b).Given that one mole of $B_2X.10H_2O$ reacts with 2 moles of hydrochloric acid, calculate the:

(i) Moles of $B_2X.10H_2O$ in the volume of solution B used. (2 marks)

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(ii) Concentration of solution B in moles per litre. (2 marks)

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(iii) Relative formula mass of $B_2X.10H_2O$. (2 marks)

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(iv) Relative atomic mass of metal B in $B_2X.10H_2O$ (Relative formula mass of X = 156, H = 1.0, O = 16.0) (1mark)

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QUESTION 2

.(a)You are provided with solution N.using a 10ml measuring cylinder measure $2cm^3$ portion and put it in 5 different test tubes placed in atest tube rack

(i).To the 1^{st} portion of Q add drops of 2.0M ammoniumhydroxide

Observations	inferences
½mk	½mk

(ii).Dip a metallic spatula in solution Q and burn it directly on a non-luminous flame.

Observations	inferences
1mk	1mk

(iii)To 2^{nd} portion of Q add three drops of 1.0M barium nitrate solution provided and keep the mixture.

Observations	inferences
1mk	1mk

(iv).To the mixture in (iv) above add a few drops of 2.0M HNO_3 acid

Observations	inferences
1mk	1mk

(v).To 3rd portion of Q add three drops of acidified potassium dichromate (VI) solution.

Observations	inferences
1mk	1mk

(vi) To the 4th portion put the aluminum provided followed by sodium hydroxide then warm,test the gases produced using red litmus paper.

Observations	inferences
1mk	1mk

Question 3

You are provided with solid M which is an organic compound.Carry out the tests below,write your observations and inferences in the spaces provided

(a) Scoop half of solid M using ametallic spatula and ignite in a nonluminous flame.

Observations	inferences
1mk	1mk

(b)Place the remaining portion of M in aboiling tube and add some distilled water. And test the solution using red litmus paper, Divide the resulting solution into three portions

Observations	inferences
1mk	1mk

(b)(i)To the 1st portion in a test tube add 2-3 drops of bromine water.

Observations	inferences
1mk	1mk

(ii)To 2nd portion in a test tube add 2-3 drops of acidified dichromate(VII) solution and warm

Observations	inferences
1mk	1mk

(iii).To the 3rd portion add all the sodium carbonate provided,test the gas produced using aburning splint

Observations	inferences
1mk	1mk

NOTES

1. Solution A – 0.1M HCl made by dissolving 8.6cm^3 of conc. HCl (1.18cm^3/g) in 1 litre of solution.

2. Solution B is made of 19.2 gl^{-1} of disodium tetraborate decahydrate (Dissolve 19.2g in 600cm^3 of distilled water, warm to increase solubility)

3.Solid M-oxalic acid

4.Solution N-mixture of sodiumsulphite and sodiumnitrate in equal portions