

DETERMINATION OF SOLUBILITY OF SALTS IN WATER.

Practical1: solubility of borax in water

1. You are provided with:

- 2.0g of substance **J (borax)**, labeled solid **J**
- Solution **K**, 0.05M hydrochloric acid.
- Methyl orange indicator.

You are required to determine the:

- Solubility of substance **J (borax)** in water
- Relative formula mass of substance **J (borax)**

PROCEDURE I

- Place 200cm³ of water in a 250ml beaker and keep it for use in step (vi).
- Place all of solid J in a dry boiling tube.
- Using a burette, measure 10.0cm³ of distilled water and add it to the substance J in the boiling tube.
- While stirring the mixture in the boiling tube with a thermometer, warm the mixture using a Bunsen burner, until the temperature rises to 65C⁰. Stop warming the mixture.
- Allow it to cool while stirring with a thermometer.
- When the temperature drops to 60C⁰, start the stop watch, place the boiling tube in the beaker with water prepared in step (i).
- Continue stirring and record the temperature of the mixture after every one minute interval and complete table I below. Retain the mixture with the thermometer inside for use in procedure II below.

Time (min)	0	1	2	3	4	5	6	7	8	9	10
Temp(C ⁰)											

(4marks)

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



- i. Using the graph determine the temperature (T) when 2.0g of substance J dissolves completely in 10.0cm³ of water. (1mark)
- ii. Calculate the solubility of substance J in g/100g of water at temperature T. (2marks)

DETERMINATION OF RMM BORAX

PROCEDURE II

Using a funnel, transfer all the mixture obtained from procedure I into a 250ml volumetric flask. Rinse the boiling tube and the thermometer with about 30cm³ of water and add the rinses into the volumetric flask. Repeat the rinsing two more times until all solid **J** enters into the flask. Shake until it dissolves. Add more

Common evaluation tests (CET)

distilled water to the 250ml mark. Label this as solution **J**. fill the burette with solution **J**. using pipette, place 25.0 cm³ of solution **K**, into a 250 ml conical flask. Add three drops of the indicator provided and titrate solution B using solution A. record your readings in table 2 below. Repeat the titration two more time and complete the table.

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

(3marks)

c) calculate the:

i. Average volume of solution **J** used. (1mark)

ii. The number of moles of hydrochloric acid, solution **K** used. (1mark)

d) Give that two moles of acid react with one mole of substance **J**, calculate:

i. Number of moles of **J** used. (1mark)

ii. Concentration of **J** in moles per litre (1mark)

iii. Concentration of solution **J** in g per litre. (1mark)

iv. Relative formula mass of substance **J** (1mark)

Common evaluation tests (CET)

2. You are provided with solid **L** (**fused calcium chloride**). Carry out the following tests and record your observations and inferences in the spaces provided. Place all the **L** in a boiling tube. Add about 15cm³ of distilled water and shake until the solid dissolves. Use 2cm³ portions of the solution in a test-tube, for each of the tests in (a), (b), (c), (d), (e) and (f).

- a) Add sodium hydroxide dropwise until in excess.

<u>Observations</u>	<u>Inferences</u>
(1Mk)	(1 Mk)

- b) Add aqueous ammonia dropwise until in excess.

<u>Observations</u>	<u>Inferences</u>
(1 Mk)	(1 Mk)

- c) Add 2 or 3 drops of solution **M** (aqueous sodium carbonate.)
Retain the remaining solution **D** for use in question 3

<u>Observations</u>	<u>Inferences</u>
(1 Mk)	(2 Mks)

- d) Add 2 to 3 drops of hydrochloric acid.

<u>Observations</u>	<u>Inferences</u>
(1Mk)	(1Mk)

- e) Add 2 or 3 drops of aqueous barium chloride.

<u>Observations</u>	<u>Inferences</u>
(1Mk)	(1Mk)

f) Add 2 or 3 drops of solution N (aqueous lead (ii) nitrate)

g)

<u>Observations</u>	<u>Inferences</u>
(1 Mk)	(1 Mk)

3. You are provided with substance (**ethanoic acid**). carry out the following tests and record your observations and inferences in the spaces provided. Use about 2cm³ portions of substance **L** in the test-tube for each of the tests. (a), (b), (c) and (d).

- a) Add 2 or three drops of bromine water.

<u>Observations</u>	<u>Inferences</u>
(1Mk)	(1 Mk)

- b) Add about 1cm³ of acidified potassium dichromate (vi). Warm the mixture

<u>Observations</u>	<u>Inferences</u>
(1Mk)	(1 Mk)
c) Add about 1 cm ³ of solution M, aqueous sodium carbonate provided.	
<u>Observations</u>	<u>Inferences</u>
(1Mk)	(1 Mk)
d) Add the piece of magnesium ribbon provided.	
<u>Observations</u>	<u>Inferences</u>
(1Mk)	(1 Mk)