PROGRESSIVE ASSESSMENT OF RECORD

SL. NO.	NAME OF THE JOB	PAGE NO.	DATE OF EXPERIMENT PERFORMED	GRADE/ MARK	SIGN. OF SUBJECT LECTURER	REMARK
01.	PREPARATION AND STUDY OF PHYSICAL AND CHEMICAL PROPERTIES CO_2 GAS.	01 – 04				
02.	PREPARATION AND STUDY OF PHYSICAL AND CHEMICAL PROPERTIES NH_3 GAS	05 – 08				
03.	CRYSTALLIZATION OF COPPER SULPHATE FROM COPPER CARBONATE.	09 – 11				
04.	SIMPLE ACID-BASE TITRATIONS					
	A. ACIDIMETRY	12 – 16				
	B. ALKALIMETRY	17 – 20				
05.	TESTS FOR ACID RADICALS (KNOWN):	21 – 26				
	I. CARBONATE					
	II. SULPHIDE					
	III. CHLORIDE					
	IV. NITRATE					
	V. SULPHATE					
06.	TEST FOR BASIC RADICALS (KNOWN):	27 – 35				
	I. AMMONIUM					
	II. ZINC					
	III. MAGNESIUM					
	IV. ALUMINIUM					
	V. CALCIUM					
	VI. SODIUM					
	VII. POTASSIUM					
07.	TEST FOR UNKNOWN ACID RADICALS	36 – 41				
08.	TEST FOR UNKNOWN BASIC RADICALS	42 – 50				
09.	TEST FOR UNKNOWN SALT (COMPOSED OF ONE BASIC RADICAL AND ONE ACID RADICAL)	51 – 68				

Assignment Mark :.....

Sessional Mark :.....

Final Viva Marks :.....

TOTAL MARKS :.....

Signature of the H.O.D./Lect. of the Department

EXPERIMENT NO. 01

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO.:..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Preparation and Study of Properties of Carbon Dioxide (CO_2) gas.

OBJECTIVES OF THE EXPERIMENT :

At the End of this Experiment, the Students will able to :

a. Know the physical and chemical changes and also properties of CO_2 in the laboratory.
b. Test carbonate radical in the given salt sample.
c. Know the features and causes of Carbon dioxide gas in greenhouse effect.
d. Familiar with the basic properties of CO_2 gas through a different demonstrations.

A. ***Apparatus Required :***

a.	Woulf's Bottle.	b.	Thistle Funnel.
c.	Delivery Tube.	d.	Rubber Cork.
e.	Gas Jar with Lid.	f.	Few Test Tubes .

B. ***Chemicals Required :***

a.	Marble Chips($CaCO_3$)	b.	Dilute Hydrochloric Acid (HCl)
c.	Litmus Paper	d.	Magnesium Ribbon
e.	Lime Water	f.	Phenolphthalein Solution.

THEORY :

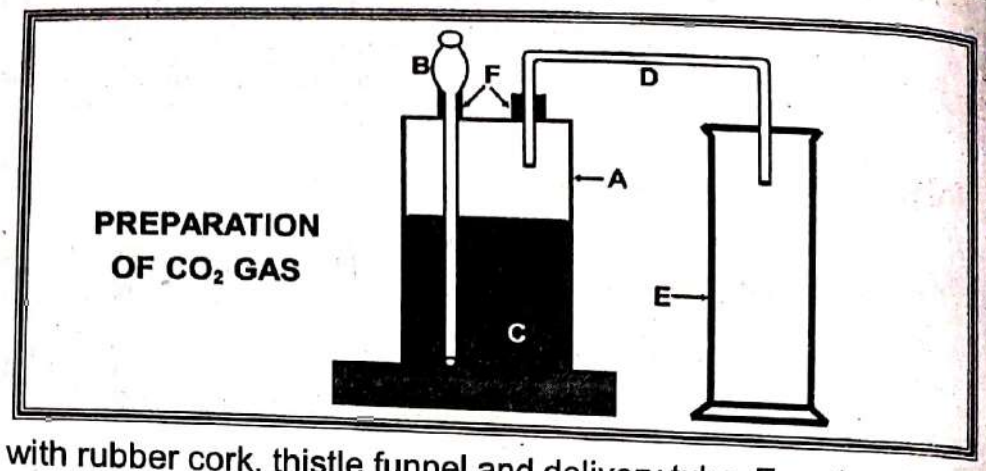
Carbon monoxide (CO) is a colourless, odorless, and tasteless gas that is slightly less dense than air. Carbon monoxide is produced from the partial oxidation of carbon-containing compounds; it forms when there is not enough oxygen to produce carbon dioxide (CO_2). In the Laboratory carbon dioxide (CO_2) gas is prepared by the action of dilute hydrochloric acid (HCl) upon marble chips ($CaCO_3$) in a Woulf's bottle.

CHEMICAL EQUATIONS :

$$CaCO_3 + 2HCl \longrightarrow CaCl_2 + H_2O + CO_2(g) \uparrow$$

LABORATORY DIAGRAM :

A = Woulf's Bottle
B = Thistle Funnel
C = Marble Chips + HCl
D = Delivery Tube
E = Gas Jar
F = Cork



PROCEDURE :

a. Take a Woulf's bottle fitted with rubber cork, thistle funnel and delivery tube, Examine that it is perfectly airtight. In case of air leakage, use melted paraffin wax or grease.
b. Introduce few small size marble chips into the Woulf's bottle by opening one of its mouths.
c. Now pour some water into the Woulf's bottle through the thistle funnel so as to cover the marble chips.
d. Insert the thistle funnel more into the Woulf's bottle such that its extreme end remains inside the water.
f. Now add little quantity of the dilute hydrochloric acid through the thistle funnel. Do not add excess amount of acid at a time to exhaust the marble chips before the experiment is completed.
g. Then collect the carbon dioxide gas in the gas jar by upward displacement of air. *Test* the collected gas in the jar by showing a burning splinter at the mouth of the gas jar.
h. Study the properties of CO_2 gas by collecting the gas in different test tubes.

OBSERVATION :

PHYSICAL PROPERTIES

SL.	EXPERIMENT	OBSERVATION	INFERENCE
01.	**Observe** the colour of the gas		
02.	**Observe** the odour of the gas		
03.	**Enter** a glowing splinter into a test tube full of CO_2 gas.		
04.	**Invert** test tube full of CO_2 gas over another empty test tube containing air. Then **add** little lime to the test tube containing air initially.		
05.	**Collect** the gas in a test tube half-filled with water. **Shake** the test tube vigorously by putting the thumb at its mouth and **remove** the thumb and **observe** the level/ volume of water in the test tube.		

CHEMICAL PROPERTIES

SL.	EXPERIMENT	OBSERVATION	INFERENCE
01.	A piece of moist blue litmus paper is shown to the gas.		
02.	**Pass** the CO_2 gas through 2 to 3ml. of very dilute solution of Sodium hydroxide (NaOH) containing one drop of phenolphthalein solution.		
03.			
a.	**Pass** the gas through limewater.		
b.	**Pass** the gas in excess.		
c.	**Boil** the solution.		
04.	Introduce a burning magnesium ribbon into a test tube/gas jar containing carbon dioxide gas.		

SAFETY AND PRECAUTIONS :

a. The fittings should be airtight.
b. The end of the thistle funnel must be/remain deep inside the solution.
c. The shorter end of the delivery tube should remain above the surface of the solution in the Woulf's bottle and the longer end of the delivery tube must reach the bottom of the gas jar.
e. The gas should be collected after removing air from the apparatus.

ASIGNMENT QUESTIONS

1. What is the nature of Carbon dioxide gas ?
2. What happens when carbon dioxide passes through the lime water ?
3. What happens when a burning magnesium ribbon is introduced in the gas jar containing carbon dioxide gas ?
4. What are the chemicals required for preparation of Carbon dioxide gas in the laboratory ?
5. Why carbon dioxide gas is acidic in nature ?
6. State the industrial uses of carbon dioxide gas.
7. What is the reaction of calcium with dilute hydrochloric acid ?
8. How many molecules are in Carbon dioxide ?
9. Why is carbon dioxide gas is collected by downward displacement of air ?
10. What are the best chemicals that absorb carbon dioxide ?
11. What is the common name for carbon dioxide ?
12. Write down the elements in the carbon dioxide.
15. Where liquid carbon dioxide is used ?
16. Why sulphuric acid is not used in the preparation of carbon dioxide in a labortory ?
17. How does Carbon dioxide affect the atmosphere ?
18. Why does lime water turn milky, when carbon dioxide is passed into it ?
19. Why is Carbon dioxide gas is used in the fire extinguisher ?

EXPERIMENT NO. 02

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO.:..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Preparation and Study of Physical and Chemical properties of NH_3 gas.

OBJECTIVES OF THE EXPERIMENT :

***At the End of this Experiment, the Students will be able to* :**

a. Know the chemical and physical properties of ammonia in the laboratary.
b. Know how ammonia diffuse faster than hydrogen chloride.
c. How to identify ammonia gas.
d. Ammonia gas is lighter than air and is therefore collected by downward displacement of air.

***Apparatus Required* :**

a.	Hard Glass Test Tube	b.	Delivery Tube
c.	Gas Jar with Liquid	d.	Clamp Stand
e.	Bunsen Burner	f.	Cork
g.	Cork Borer	h.	Triangular File
i.	Test Tube		

***Chemical Required* :**

a. Solid Ammonia Chloride (NH_4Cl)
b. Quick lime (CaO) or Dry slaked lime $Ca(OH_2)$

THEORY :

Ammonia is a colourless alkaline gas and is one of the most abundant nitrogen-containing compounds in the atmosphere. Ammonia is irritating to the skin, eyes, nose, throat, and lungs. It is essential for many biological processes and has various industrial applications.

Ammonia gas is prepared in the laboratory by heating an intimate mixture of solid ammonium chloride and quick lime or dry slaked lime in 1:3 ratio. The gas is collected by the downward displacement of air as it is lighter than air.

Physical Properties :

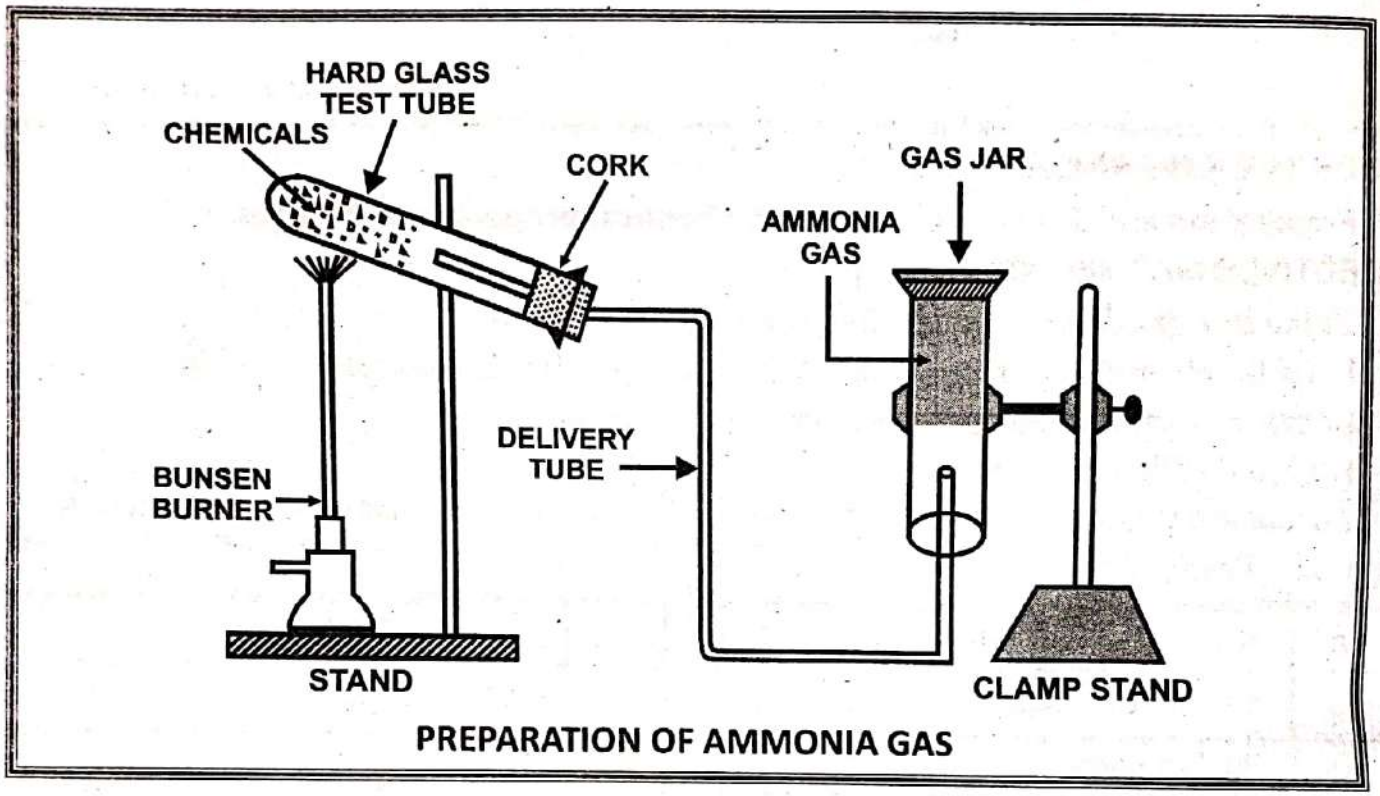
Ammonia is a colorless gas with a sharp, penetrating odor. Its boiling point is –33.35 °C, and its freezing point is –77.7 °C. NH_3 gas can be liquefied, however, due to its extremely low boiling point, liquid ammonia must be stored at low temperature and high pressure.

Chemical Properties :

In the laboratory, a mixture of $Ca(OH)_2$ and NH_4Cl is heated in order to produce NH_3 gas. In this reaction $CaCl_2$ and water vapor is also produced.

- $2NH_4Cl + CaO \xrightarrow{Heat} CaCl_2 + 2NH_3 + H_2O$
- $2NH_4Cl + Ca(OH)_2 \xrightarrow{Heat} CaCl_2 + 2NH_3 + 2H_2O$

LABORATORY DIAGRAM :



PREPARATION OF AMMONIA GAS

PROCEDURE :

a. Take a mixure of amonium chloride and quick lime in 1:3 ratio in a mortar and mix them thoroughly and take the mixure in a hard glass test tube.
b. The hard glass test tube should be half field with the mixure.
c. A cork is fitted along with the delivery tube into the mouth of the hard glass test tube.
d. The hard glass test tube is clamped in the clamp stand.
e. Heat the hard glass test tube continuosly.
f. Collect the gas by downward displacement of air.

OBSERVATION TABLE : Study of Properties

SL.	EXPERIMENT	OBSERVATION	INFERENCE
01.	The Colour of gas is observed.		
02.	The odour of gas is observed.		
03.	A burning match stick is introduced into the gas jar containing gas.		

04.	Invert the gas jar containing ammonia gas into a trough of water.		
05.	Show a moist red litmus paper to the gas.		
06.	Show a glass rod dipped in concentrated HCl to the gas.		
07.	Pass the gas through about 2 CC of Nessler's reagent in the clean dry test tube.		
08.	Pass the gas through 2 CC of Ferric chloride solution in a clean dry test tube.		
09.	Slowly pass the gas through 2 CC of aqueous copper sulphate solution in a clean dry test tube and then pass in excess.		

CONCLUSION :

SAFETY AND PRECAUTIONS :

a. The mixture should be prepared with proper ratio.
b. The hard glass test tube should be fitted slightly inclined with a mouth downward so that water droplets, which will be produced during the reaction are collected at the mouth of the test tube.
c. The fittings should be air light.
d. The collected gas should be perfectly dried.
e. The students should not inhale the gas.

ASIGNMENT QUESTIONS

1. How ammonia gas is prepared in the laboratory ?
2. Why does ammonia diffuse faster than Hydrogen chloride ?
3. Write down the main use of ammonia.
4. Is ammonia acid or base ?
5. What happens when ammonia and Hydrochloric acid are combined ?
6. What produces ammonia in the body ?
7. What products contain ammonia ?
8. What ammonia used for medically life ?
9. Why ammonium nitrate not used in the laboratory for preparation of ammonia ?
10. Why do we test for ammonia in water ?
11. How ammonia gas is formed ?
12. What is the chemical properties of ammonia ?

EXPERIMENT NO. 03

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO.:..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Crystallization of Copper Sulphate from Copper Carbonate.

OBJECTIVES OF THE EXPERIMENT :

At the End of this Experiment, the Students will be able to :

a. Know the formula of Blue Vitrol and Crystallisation Point.

b. Know that higher concentration of the coloured solution absorbs more light and transmit less than a solution of lower concentration.

c. Know important constitutent of Fehling–A.

d. Know simple method for preparation of Crystaline salt in Laboratory.

Apparatus Required :

a.	Beaker	b.	Funnel	c.	Glass Rod
d.	Porcelain Basin	e.	Tripod Stand	f.	Wire Gauge
g.	Bunsen Burner	h.	Filter Paper	i.	Filter Stand

Chemical Required :

- Copper Carbonate ($CuCO_3$) and Dilute H_2SO_4

THEORY :

$CuSO_4 . 5H_2O$ is known as Blue Vitrol. It can be prepared by reacting copper carbonate ($CuCO_3$) with dilute H_2SO_4. It results the formation of soluble $CuSO_4$ and CO_2 gas is evolved. The solution is evaporated to get the Crystals of $CuSO_4$.

- $CuCO_3 + H_2SO_4 \longrightarrow CuSO_4 + CO_2(\uparrow) + H_2O$

- $CuSO_4 + 5H_2O \longrightarrow CuSO_4 \cdot 5H_2O$

PROCEDURE :

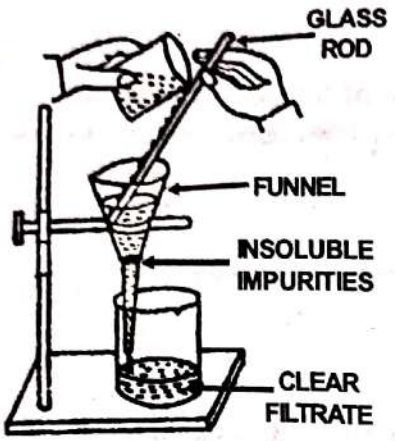
a. Take about 60 ml. of dilute sulfuric acid in a beaker.

b. Add the supplied copper carbonate pinch by pinch with continuous stirring till a small quantity of solid left undissolved.

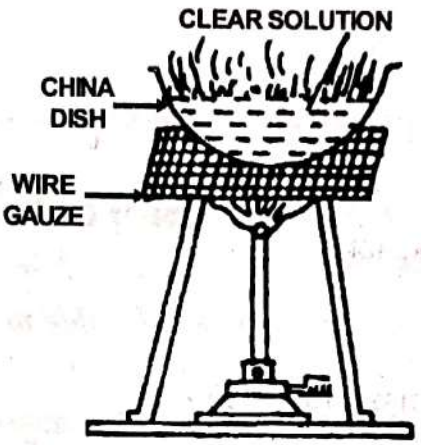
c. Heat the resulting solution in the beaker for 2 to 3 minutes to escape the CO_2 gas.

d. Cool slightly and filter into the procelien basin.

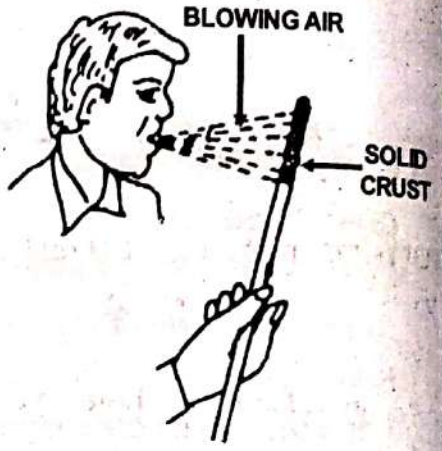
e. Add a few drops of dil H_2SO_4 to the filterate inorder to check hydrolysis of salt.
f. Concentrate the filltrate in the basin by evaporation through heating with constant stirring till a drop of solution forms crystal on the glass rod by blowing air into it from mouth.
g. Remove the basin from the flame and allow to cool slowly at room temperature for about an hour without disturbing the basin during cooling.
h. Decant the mother liquour to separate the blue crystals of copper sulphate.
i. Dry the crystals in the folds of filter paper.



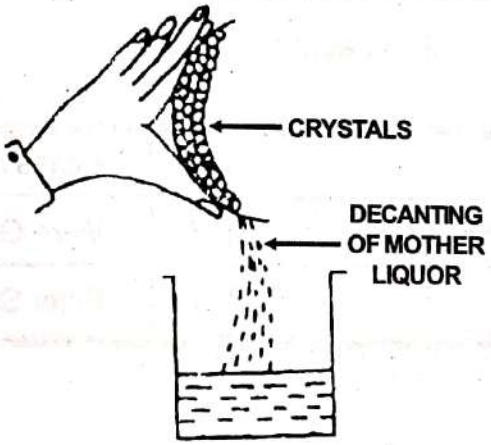
FILTRATION OF SOLUTION



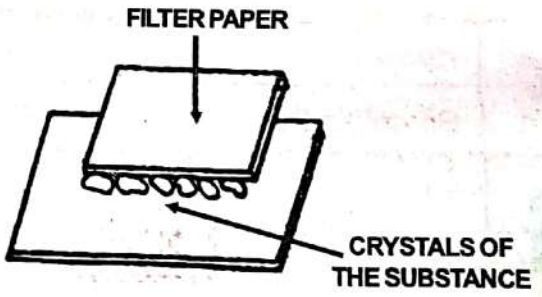
HEATING OF WIREGAUZE



CRYSTALLISATION POINT



DRAINAGE OF MOTHER LIQUOR



DRYING OF CRYSTALS

RESULT : *i.* Colour :.....
ii. Texture and Shape :.....
iii. Yield :..... gm.

SAFETY AND PRECAUTIONS :

a. Minimum amount of dilute H_2SO_4 should be used to prepare $CuSO_4$ solution.
b. The filtrate should be made slightly acidic with few drops of dilute H_2SO_4 to prevent hydrolysis of salt.
c. The solution should not be heated beyond crystallisation point unles the water of crystallisation of the crystal will evaporate and colour of the crystal will not be blue.
d. The crystals should not be dried by heating as it results the evaporation of water of crystallisation.
e. While adding the $CuCO_3$ to H_2SO_4 as the saturation point approaches, it delays the solubility of solute. So it should be given sufficient time for its solubility.

ASIGNMENT QUESTIONS

1. What is the Chemical formula of Blue vitrol ?
2. What is the shape of Copper sulphate Crystal ?
3. What is Crystallisation point ?
4. Dilute H_2SO_4 is added to the mother liquour after filtration to prevent what ?
5. How saturated solution of Copper sulfate can be prepared ?
6. What happens when Blue vitrol is heated ?
7. What is water of Crystalisation ?
8. Why Copper Sulphate crystals are given by the chemical formulae $CuSO_4 . 5H_2O$?
9. How do you make copper sulphate solution ?
10. What are the uses of Fehling solution ?
11. State the uses of Copper Sulphate ?
12. Why does the colour of copper sulphate solution change ?
13. Does copper sulphate crystals dissolve in water ?
14. What is the colour of ferrous sulphate crystals after heating ?
15. What happens when zinc is added to copper sulphate ?
16. What can cause copper to turn black ?
17. Who does copper react with acid ?
18. What is the colour of copper sulphate ?
19. What are the elements of copper carbonate ?
20. What happens when pure copper sulphate is kept in water ?
21. How do you purify copper sulphate ?

WRITTING SPACE FOR ASSIGNMENT

EXPERIMENT NO. 04(A)

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO.:..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Titration of N/10 Solution of an Alkali by using a Standard Solution of an Acid (Acidimetry).

OBJECTIVES OF THE EXPERIMENT :

At the End of this Experiment, the Students will able to :

a. Perform the different type of titration by using different types of indicators.
b. Calculate the strength of the solution.
c. Acquire knowledge about acidimetry, standard solution, normal solution, different types of indicators.
d. Know about neutralisation reaction and end point of titration.

Apparatus Required **:**

SL. NO.	NAME OF THE APPARATUS	SPECIFICATION / TYPE	QUANTITY
01	Burette	50 ml	1No
02	Pipette	10 ml	1No
03	Pipette	20 ml	1No
04	Conical Flask	250 ml	2Nos
05	Beaker	500 ml	2Nos
06	Wash bottle		1No
07	Burette stand with clamp		1Set
08	Funnel		2Nos
09	Dropper		2Nos
10	Anti parallel card.		1No
11	Volumetric flask	250 ml	1No
12	Volumetric flask	500 ml	1No
13	Analytical Balance		1No
14	Weighing Bottle		1No
15	White glazed porcelain tile		1No

Chemicals Required :

01	(N/10) Oxalic acid $(COOH)_2$	02	Unknown strength of Alkali (N/10) NaOH
03	Indicator : Methyl Orange	04	Filter paper

THEORY :

The Principle of Acidimetry is $V_A.S_A = V_B.S_B$ Where

V_A = Volume of used acid i.e. Burette reading

S_A = Strength of known acid $(COOH)_2$

V_B = Volume of Base (Pipette reading)

S_B = Strength of unknown base (NaOH)

PREPARATION OF STANDARD SOLUTION (Standardisation) : To prepare (N/10) NaOH solution.

250 ml of $\frac{N}{10}$ solution of Acid can be prepared by dissolving in $\frac{E_A \times 250}{1000 \times 10}$ g of Acid in 250 ml o Water. In this case strength of Acid is given accurately.

250 ml of $\frac{N}{10}$ solution of Base can be prepared by dissolving in $\frac{E_B \times 250}{1000 \times 10}$ g of Base in 250 ml o Water.

EXPERIMENTAL PROCEDURE :

a. *Clean* the burette first with Acid solution, then wash several times with distilled water. For more accurate result, rinse the burette with chromic acid and finally several times with distilled water.

b. *Take* the appropriate amount of acid solution in 100 ml, dry clean beaker and **pour** little amount of acid and **rinse** it with the acid thrice.

c. *Fill* the burette with acid solution to a little above the zero mark, **open** the stopcock momentarily in order to fill the jet with liquid, such that no air bubbles are in the burette. If necessary, **fill** burette with acid until the bottom of the meniscus just touches the zero mark of the burette. Now **clamp** the burette vertically to the burette stand.

d. *Take* a clean 20 ml, pipette. **Rinse** the pipette with the prepared alkali solution thrice.

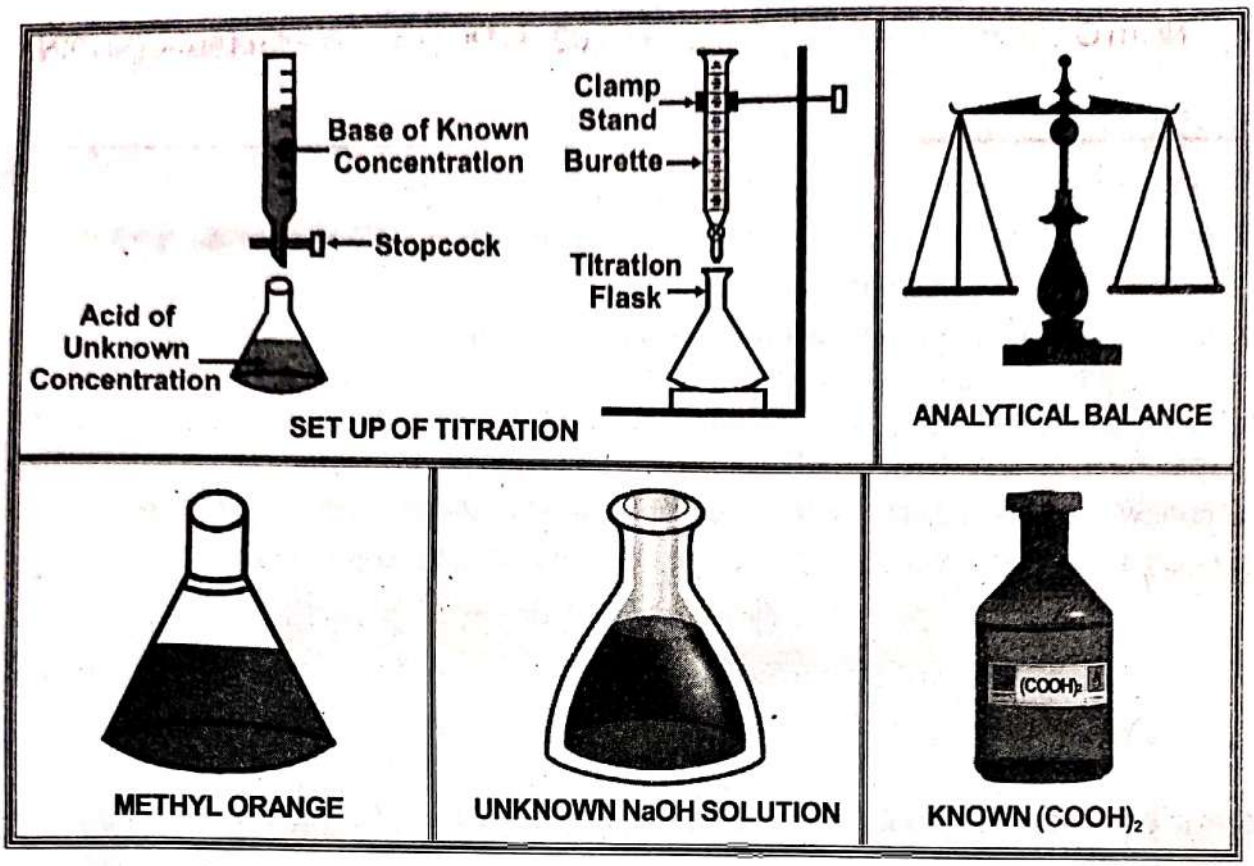
e. *Fill* the pipette with alkali solution by suction upto little above the mark, **close** the upper end immediately with the index finger firmly, **wipe out** the adhering liquid from the outside of lower stem with filter paper. Now **relax** the pressure and collect the alkali in a conical flask slowly. **Touch** the rip of the stem thrice slowly with the bottom of the flask.

f. Now *Place* conical flask containing alkali i.e. solution on the white glazed tile below the burette. **Note down** the original reading in the burette.

g. *Add* 1 to 2 drops of methyl orange indicator to this solution. The solution becomes straw yellow colour. Then slowly **add** the acid solution to the conical flask until the colour becomes faintly yellow.

h. *Continue* the addition of the acid solution carefully drop wise, shake until the colour of the solution just change from faint yellow to faint pink. This is the end point. **Note down** final burette reading. **Repeat** the process to get three constant readings.

LABORATORY SETUP DIAGRAM



OBSERVATION :

Sl. No.	Volume of (N/10) NaOH solution taken in ml. (V_B)	BURETTE READING			Volume of Acid Consumed in ml.(V_A)
		Initial ml.	Final ml.	Difference ml.	
01.	20				
02.	20				
03.	20				

CALCULATION :

We know that, $V_A S_A = V_B S_B$

Here V_A = Burette Reading (Volume of Acid)

V_B = Pipette Reading (volume of Acid)

$S_A = \frac{N}{10}$ and $S_B = \frac{V_A \times S_A}{V_B} \times \left(\frac{N}{10}\right)$

S_B = ?

RESULT :

Strength of **Unknown Acid Solution** = _____ (N/10).

CONCLUSION :

From the above titration result, the strength of **Unknown Acid Solution** is found to be _____ (N/10)

SAFETY AND PRECAUTIONS :

a. To read the correct initial burette reading, use anti-parallex card.
b. The air bubbles in the nozzle of the burette must be removed before taking the initial reading.
c. Indicator should not be added in excess.
d. Alkali should be taken in conical flask and acid in the burette, because if we take acid in conica flask during pipetting out of the acid, it may enter into our mouth and injure the tongue.
e. The small amount of the alkali which remains inside the pipetting during transferring the solutio from pipette to conical flask, should not be blown into the conical flask.
f. The conical flask should always be placed under the burette on a white glazed tile.
g. Acid must be added to the alkali drop by drop when end point approaches.

ASIGNMENT QUESTIONS

1. What is standard solution ?
2. What is the amount of Alkali is needed for preparation of 250 ml of $\left(\frac{N}{10}\right)$ alkali ?
3. Why acid is used in burette not in pipette ?
4. What is the end point of a Titration ?
5. What is the normality of a solution ?
6. Write down the features of normality of a solution ?
7. Define Acidimetry ?
8. Which reaction can take place in Acid–Base Titratio ?
9. What do you mean by Neutralisation reaction ?
10. Why burette and pipette are rinsed ?
11. What do you mean by Acidity and Basicity ?
12. Why alkali is taken in burette in the titration of NaOH versus Oxalic Acid ?
13. Which indicator is mostly used in acidimetry and alkalimetry ?

WRITTING SPACE FOR ASSIGNMENT

EXPERIMENT NO. 04(B)

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO.:..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Titration of N/10 Solution of an Acid using a Standard Solution of an Alkali (Alkalimetry).

OBJECTIVES OF THE EXPERIMENT :

At the end of this experiment, the students will able to :

a. Perform the different type of titration by using different types of indicators.
b. Calculate the strength of the solution.
c. Acquire knowledge about alkalimetry, standard solution, normal solution, different types of indicators.
d. Know the difference between Alkalimetry and Acidimetry.

***Apparatus Required* :**

SL. NO.	NAME OF THE APPARATUS	SPECIFICATION / TYPE	QUANTITY
01	Burette	50 ml	1No
02	Pipette	10 ml	1No
03	Pipette	20 ml	1No
04	Conical Flask	250 ml	2Nos
05	Beaker	500 ml	2Nos
06	Wash bottle		1No
07	Burette stand with clamp		1Set
08	Funnel		2Nos
09	Dropper		2Nos
10	Anti parallel card.		1No
11	Volumetric flask	250 ml	1No
12	Volumetric flask	500 ml	1No
13	Analytical Balance		1No
14	Weighing Bottle		1No
15	White glazed porcelain tile		1No

Chemicals Required :

01	(N/10) Na_2CO_3 solution	02	Unknown strength of H_2SO_4 solution
03	Indicator : Methyl Orange	04	Filter paper

THEORY :

The principle of Alkalimetry is $V_A.S_A = V_B.S_B$ Where

V_A = Volume of used acid i.e. Burette reading

S_A = Strength of acid (unknown)

V_B = Volume of alkali (Pipette reading)

S_B = Strength of Na_2CO_3 (known) N/10.

PREPARATION OF STANDARD SOLUTION (Standardisation) : To prepare (N/10) Na_2CO_3 solution.

250 ml of $\frac{N}{10}$ solution of Acid can be prepared by dissolving in $\frac{E_A \times 250}{1000 \times 10}$ g of Acid in 250 ml of Water. In this case strength of Alkalli is given accurately.

250 ml of $\frac{N}{10}$ solution of Base can be prepared by dissolving in $\frac{E_B \times 250}{1000 \times 10}$ g of Base in 250 ml of Water.

EXPERIMENTAL PROCEDURE :

a. ***Clean*** the burette first with Acid solution , then wash several times with distilled water. For more accurate result, rinse the burette with chromic acid and finally several times with distilled water.

b. ***Take*** the appropriate amount of acid solution in 100 ml, dry clean beaker and **pour** little amount of acid and **rinse** it with the acid thrice.

c. ***Fill*** the burette with acid solution to a little above the zero mark, **open** the stopcock momentarily in order to fill the jet with liquid, such that no air bubbles are in the burette. If necessary, **fill** burette with acid until the bottom of the meniscus just touches the zero mark of the burette. Now **clamp** the burette vertically to the burette stand.

d. ***Take*** a clean 20 ml, pipette. **Rinse** the pipette with the prepared alkali solution thrice.

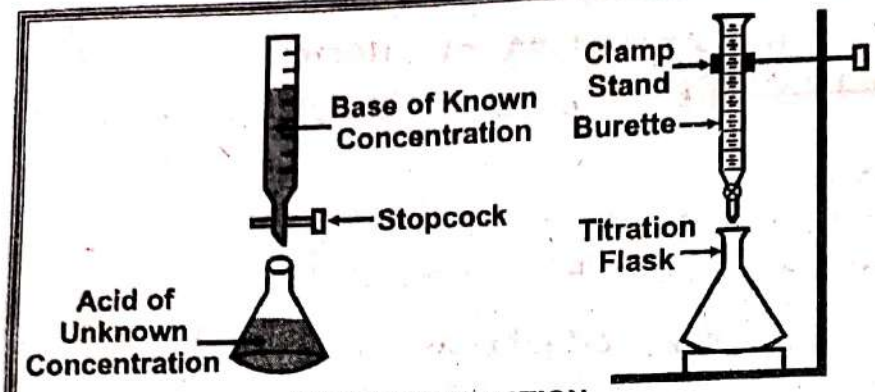
e. ***Fill*** the pipette with alkali solution by suction upto little above the mark, **close** the upper end immediately with the index finger firmly, **wipe out** the adhering liquid from the outside of lower stem with filter paper. Now **relax** the pressure and collect the alkali in a conical flask slowly. **Touch** the rip of the stem thrice slowly with the bottom of the flask.

f. Now ***Place*** conical flask containing alkali i.e. solution on the white glazed tile below the burette. **Note down** the original reading in the burette.

g. ***Add*** 1 to 2 drops of methyl orange indicator to this solution. The solution becomes straw yellow colour. Then slowly **add** the acid solution to the conical flask until the colour becomes faintly yellow.

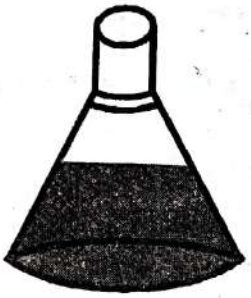
h. ***Continue*** the addition of the acid solution carefully drop wise, shake until the colour of the solution just change from faint yellow to faint pink. This is the end point. **Note down** final burette reading. **Repeat** the process to get three constant readings.

LABORATORY SETUP DIAGRAM

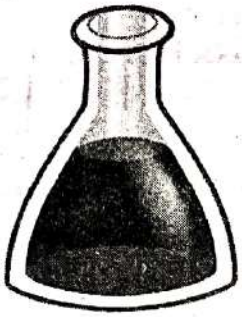


SET UP OF TITRATION

ANALYTICAL BALANCE



METHYL ORANGE



KNOWN Na_2CO_3 SOLUTION

UNKNOWN H_2SO_4

OBSERVATION :

Sl. No.	Volume of (N/10) Na_2CO_3 solution taken in ml. (V_B)	BURETTE READING			Volume of Acid Consumed in ml.(V_A)
		Initial ml.	Final ml.	Difference ml.	
01.	20	0	20.1	20.1	
02.	20	0	16	16	17
03.	20	16	34	18	

CALCULATION :

We know that, $V_A S_A = V_B S_B$

Here V_A = Burette Reading (Volume of Acid)

V_B = Pipette Reading (volume of Alkali)

$$S_B = \frac{N}{10} \text{ and } S_A = \frac{V_B \times S_B}{V_A} \times \left(\frac{N}{10}\right)$$

S_A = _____

Result :

Strength of **Unknown Alkali Solution** = _____ **(N/10).**

CONCLUSION :

From the above titration result, the strength of **Unknown Alkali Solution** is found to be _____ (N/10)

ASIGNMENT QUESTIONS

1. Why indicator is necessary for Titration ?
2. What do you mean by a Molar Solution ?
3. What is Neutralisation and equivalent mass of a substance ?
4. Define equivalent mass of a Salt and equivalent mass of a Base ?
5. What is Alkalimetry ?
6. Why we Remove Air Bubble from the nozzle of the burette ?
7. How the strength of the solution can be calculated ?
8. Define strength of a Solution ?
9. Which indicator is mostly used in alkalimetry ?

WRITTING SPACE FOR ASSIGNMENT

EXPERIMENT NO. 05

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO.:..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Test for Acid Radicals (Known).

OBJECTIVES OF THE EXPERIMENT :

***At the End of this Experiment, the Students will able to* :**

a. Test different basic radicals in the given salt sample.

b. Know the Acid radical present in different salts.

A. ***Apparatus Required :***

a.	Test Tubes and Test Tube Stand	b.	Test Tube Holder
c.	Test Tube Brush	d.	Dropper
e.	Gas Burner	f.	Charcoal Cavity

B. ***Chemicals Required :***

a. Given salt b. Various reagents. c. Litmus paper

THEORY :

Salt :

Salts regarded as compounds made up of positive and negative ions. The positive part comes from a base while negative part from an acid salts are ionic compounds. Therefore in other words, a salt is nothing but a compound made up positive and negative ions. The positive part comes from a base while the negative part from an acid. These are crystalline and souble in water.

The salt formed by the loss of all possible protrons [replaceable hydrogen atoms as H^+] are called normal salts. Such a salt doesn't containt either a replaceable hydrogen or hydroxyl group. ***For example*** **:**

$$\underset{\text{Base}}{NaOH} + \underset{\text{Acid}}{HCl} \xrightarrow{\text{Neutralisation}} \underset{\text{Salt}}{NaCl} + \underset{\text{Water}}{H_2O}$$

Radical :

It is one or group of atoms having positive or negative charge over it. Radicals are of two types such as : Basic radical and Acid radical. Metals form basic radicals and non-metals form acid radicals. Qualitative analysis is the identification of basic and acid radicals separately. Positively charged ions are called as **'basic radicals'** and negatively charged ions are called as **'acid radicals'.**

ACID RADICALS :

Carbonate sulphide, Chloride, Nitrate, Sulphite, Nitrite, Bromide, Iodide, Phosphate and Sulphate are the examples of Acid radicals.

BASIC RADICALS :

The basic radical is the cation left after removal of OH or other alkaline group from the bases. Cations are atoms that have lost an electron to become positively charged. Sodium has one valence electron, one electron in its outer energy level, so tends to lose one electron, and to become an ion with a +1 charge.

PRELIMINARY TEST :

a. Colour of the salt _____ (White / Coloured)

b. Solubility of the salt _____ (Soluble in water / hot water / dil HCl / concentrated HCl)

c. Odour of the salt _____ (Odour / Odourless)

d. Structure of the salt _____ (Crystalline / Amporphous)

WET TEST FOR ACID RADICALS

TEST WITH DILUTE HCl :

EXPERIMENT	OBSERVATION	INFERENCE
A pinch of salt is taken in a clean and dry test tube. Then 2 – 3 drops of dil HCl is added to it. Then it is slightly warmed.	a. Effervescence tooks place with the evolution of colourless and odourless gas and odourless gas which extinguishes a burning stick.	a. CO_2 gas coming out from carbonate. It may be CO_3^- **Then proceed to lime water Test.**

TEST WITH CONCENTRATED : H_2SO_4

EXPERIMENT	OBSERVATION	INFERENCE
A pinch of salt is taken in a clean and dry test tube. Then 2 – 3 drops of con– H_2SO_4 is added to it. Then slightly warmed.	a. Effervescence tooks place with the evolution of colourless gas which fumes in moist air and produces a dense white fumes when a glass rod dipped in con. NH_4OH is shown to the above gas.	a. HCl gas is coming out from Cl^-. It may be Cl^- Then proceed to test for Cl^-
	b. Effervescence tooks place with the brown fumes having pungent smell. To it added few pieces of copper turning then heated. Deep brown vapours are produced and the solution turned green.	b. It may be Nitrate (NO_3^-). **Then proceed to test for $FeSO_4$ and Brown Ring Test.**
	c. No effervescence and no gas is evolved.	c. Cl^-, and NO_3^- are absent.

TEST FOR CARBONATE (CO_3^{--}) :

EXPERIMENT	OBSERVATION	INFERENCE
1. A pinch of salt is taken in a test tube. To it is added 2–ml of dil HCl then it is warmed. 2. The above gas is passed through lime water through the delivery tube.	Effervescence tooks plate with the evolution of colorless and odourless gas. **a. Lime water turned milky.** $Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 \uparrow + H_2O$ $Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + CO_2 \uparrow + H_2O$ **b. Milkiness disappeared by passing excess of CO_2** $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O_3 + H_2O$ $CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$	CO_2 gas coming out from Carbonate. **a.** This is due to the formation of calcium Carbonate ($CaCO_3$) **b.** This is due to the formation of Calcium Bicarbonate $Ca(HCO_3)_2$.

TEST FOR SULPHIDE (S^{--}) :

EXPERIMENT	OBSERVATION	INFERENCE
1. A pinch of salt is taken in a test tube. About 2–ml of dil–HCl / H_2SO_4 is added to it. Then it is warmed. 2. A filter paper is soaked with Lead Acetate solution is shown to the above gas.	Effervescence tooks place with the evolution of colorless gas having rotten egg smell. $Na_2 + H_2SO_4 \rightarrow Na_2SO_4 + H_2S \uparrow$ $Na_2S + 2HCl \rightarrow 2NaCl + H_2S \uparrow$ **The Filter Paper turned black.** $(CHCOO)_2Pb + H_2S \rightarrow PbS + 2CH_3COOH$ (Lead Acetate) (Lead Sulphide)	H_2S gas coming out from sulphide. This is due to the formation of Lead Sulphide.

TEST FOR CHLORIDE (Cl^-) :

EXPERIMENT	OBSERVATION	INFERENCE
1. A pinch of salt is taken in a test tube. About 2–ml of H_2SO_4 is added to it. Then it was warmed. 2. A glass rod is dipped in con. NH_4OH is shown to the mouth of the test tube. 3. A pinch of salt is taken in a clean and dry test tube. To it is added a little amount of MnO_2 and 2 – 3 drops of Con. H_2SO_4. Then it is heated.	Effervescence tooks place with the evolution of colorless gas which fumes in moist air. $NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$ $NaCl + NaHSO_4 \rightarrow Na_2SO_4 + HCl$ **Dense white fumes are evolved.** Grinish yellow gas is evolved which turned a filter paper soaked in starch iodide paper blue. $2NaCl + MnO_2 + 2H_2SO_4 \rightarrow Na_2SO_4 + MnSO_4 + Cl + 2H_2O$ $2KI + Cl \rightarrow 2KCl + I$	HCl gas coming out from Chloride This is due to the formation of Ammonium Chloride Chlorine gas liberated Iodine from starch Iodide and deposited on the filter paper.

4. 1–ml of salt solution (Whether in soluble) is taken in a test tube and then it is acidified with dil – HNO_3. It is added Silver Nitrate ($AgNO_3$) solution.	**A curdy white precipitate is obtained.** $NaCl + AgNO_3 \rightarrow AgCl\downarrow + NaNO_3$ (White ppt)	This is due to the formation of Silver Chloride.
5. The above ppt. Was allowed to settle down. The ppt is washed with distilled water. It is divided in to two parts.	$AgCl + 2NH_4OH \rightarrow [Ag(NH_3)_2]Cl + 2H_2O$ $[Ag(NH_3)_2Cl] + 2HNO_3 \rightarrow AgCl + 2NH4NO_3$ **The ppt. does not dissolve.**	AgCl is not soluble in HNO_3.
Part – 1 : To it is added dil HNO_3 and well shaken.		
Part – 2 : To it is added dil – NH_4OH and well shaken.	The ppt dissolved and reappeared when acidified with dil–HNO_3.	It is due to the formation of a Complex.

TEST FOR NITRATE (NO_3^-) :

EXPERIMENT	OBSERVATION	INFERENCE
1. A pintch of salt is taken in a clean and dry test tube and 2 – 3 drops of Con. H_2SO_4 is added to it. Then it is warmed. Cool the above test tube and few pieces of copper turning is added to it.	Effervescence tooks place with the evolution Copious Brown fumes are evolved. $2NaNO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2HNO_3$ $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$	This is due to the formation of NO_2 gas.
2. A filter paper soaked with freshly prepared Ferrous Sulphate ($FeSO_4$) solution is shown to the above gas.	**Filter Paper Turned Brown**	
3. **Brown Ring Test :** About 1–ml of salt solution (Whether in soluble) is taken in a clean and dry test tube. To it is added equal volume of Con. H_2SO_4. The test tube is cooled perfectly under tap water. Then slowly added freshly prepared Ferrous Sulphate ($FeSO_4$) solution without disturbing the liquid.	**A Brown ring was obtained at the junction of the two liquid layer.** $2NaNO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2HNO_3$ $6FeSO_4 + 2HNO_3 + 3H_2SO_4 \rightarrow 3Fe(SO_4)_3 + 2NO + 4H_2O$ $FeSO_4 + NO \rightarrow [Fe(NO)]SO_4$	Nitrate is confirmed.

TEST FOR SULPHATE (SO_4^{--})

EXPERIMENT	OBSERVATION	INFERENCE
A pinch of salt is taken in a clean and dry test tube. It is acidified with dil HCl. Then it is added few drops Barium Chloride ($BaCl_2$) solution.	a. White Precipitate was obtained.	a. SO_4^{--} is confirmed.

ASIGNMENT QUESTIONS

1. What is the Name of Acidic Part of the Supplied Salt ?
2. Define Acid radical ?
3. How does a salt become crystaline and amorphous ?
4. Why do you prepare the solution of salt ?
5. What happens when SO_2 is passed through the lime water ?
6. How brown ring test is performed for Nitrate ?
7. Give the example of chemical reaction which involved for Carbonate radical ?
8. What is the confirmatory test for Chloride ion ?
9. What is the test for Sulphate radical ?
10. Why most of the inorganic salts are soluble in water ?
11. What are the features possible textures of salt ?
12. Why does iodine gives a blue colour with starch solution ?
13. How you can detect the presence of Phosphate ion ?

WRITTING SPACE FOR ASSIGNMENT

EXPERIMENT NO. 06

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO.:..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Test for Basic Radicals (Known).

OBJECTIVES OF THE EXPERIMENT :

At the End of this Experiment, the Students will able to :

a. Know different test of basic radicals in the given salt sample.

b. Detect the basic radical present in different salts.

A. ***Apparatus Required :***

a.	Test Tubes and Test Tube Stand	b.	Test Tube Holder
c.	Test Tube Brush	d.	Dropper
e.	Gas Burner	f.	Charcoal Cavity

B. ***Chemicals Required :***

a.	Given salt	b.	Various reagents.	c.	Litmus paper

PROCEDURE :

Preliminary Test :

a. Salt No._____

b. Colour of the salt _____ (White / Coloured)

c. Structure _____ Crystalline/Amorphous

d. Solubility of the salt _____ (Soluble in water / hot water / dil HCl / concentrated)

TEST OF AMMONIUM (NH_4^+) :

EXPERIMENT	OBSERVATION	INFERENCE
1. Dry Test Tube Heating : A pinch of salt is taken in a clean and dry test tube. The test tube is held by a test tube holder. First heated gently then strongly for about five min in non–luminous flame.	**a.** The salt voltileges and a white sublimate is formed	**a.** Volatile salt. **i.** May be NH_4^+ salt **To perform sodalime test.**
2. Soda Lime Test : A pinch of salt is taken in a watch glass A little amount of soda lime (CaO + NaOH) and one or, two drop of water is added to it. Then it is rubed with our hand.	**b.** Ammonia gas is evolved.	**b.** May be NH_4^+

CONFIRMATORY TEST FOR ZINC (Zn^{2+}) :

EXPERIMENT	OBSERVATION	INFERENCE
1. Dry Test Tube Heating : A pinch of salt is taken in a clean and dry test tube. The test tube is held by a test tube holder. First heated gently then strongly for about five minutes in non–luminous flame.	a. The salt changed colour.	a. May be Zn^{2+}
2. Cobalt Nitrate Test: A drop of cobalt nitrate solution is added to the infusible incandiscent residue is obtained from the charcoal cavity test. Then it is heted again in non–luminous flame for two minutes.	a. Green mass is obtained.	a. May be Zn^{2+}
3. Test with group Reagent: One ml of the salt solution is saturated with solid NH_4Cl followed by the addition of dil. NaOH solution till alkaline. Then H_2S gas is passed through it.	a. A white ppt. is formed.	a. May be Zn^{2+}

EXPERIMENT	OBSERVATION	INFERENCE
4. **Confirmatory Test:** (A) Potassium ferrocyanide solution is added drop by drop to one ml of the salt solution. (B) About 2 – ml of salt solution is taken in a test tube. To it is added test NaOH solution drop by drop and then in excess.	a. A white ppt is obtained. a. White ppt is first obtained which is soluble with excess NaOH.	a. May be Zn^{2+} a. Zn^{2+} confirmed.

TEST FOR MAGNESIUM (Mg^{++}) :

EXPERIMENT	OBSERVATION	INFERENCE
1. Dry Test Tube Heating : A pinch of salt is taken in a clean and dry test tube. The test tube is held by a test tube holder. First heated gently then strongly for about five minutes in non–luminous flame.	a. The salt melts on heating and solidifies on cooling.	a. May be alkali or alka earth metal salt.
2. Charcoal cavity Test: A small cavity wais made on one side of a charcoal block with the help of a charcoal borer. A little of salt is filled with cavity. The salt was moistened with a drop of water. The charcoal block is held in the left hand and deflect in non–luminous flame with the help of a blow pipe to the salt. Heated for about two minutes.	a. The salt melts and sinks into the cavity on heating and reappears on cooling.	a. May be alkali or alk earth metal salt.
3. Test with group Reagents: One ml of the salt solution is saturated with solid NH_4Cl followed by the addition of dil. NH_4OH solution till alkaline. The disodium hydrogen phosphate solution is added.	a. A white ppt is obtained.	a. May be Mg^{2+}.
4. Confirmatory Test: One ml of the salt solution is acidified with dil HCl and then treated with a few drops of magneson reagent followed by the addition of excess of dil NaOH solution.	a. A blue ppt. is obtained.	a. Mg^{2+} confirmed.

CONFIRMATORY TEST FOR ALUMINIUM (Al^{3+}) :

EXPERIMENT	OBSERVATION	INFERENCE
1. **Dry Test Tube Heating:** A pinch of salt is taken in a clean and dry test tube. The test tube is held by a test tube holder. First heated gently then strongly for about five minutes in non–luminous flame.	a. The salt swells on heating	a. May be Al^{3+} salt.
2. **Cobalt nitrate Test:** A drop of cobalt nitrate solution is added to the infusible incandescent residue is obtained from the charcoal cavity test. Then it is heated again in non–luminous flame for two minutes.	a. Blue mass is obtained.	a. May be Al^{3+}salt.
3. **Test with NaOH solution:** About 2 – m*l* of salt solution is taken in a test tube. To it is added NaOH solution drop by drop.	a. Gelatinous white ppt is obtained which soluble in excess NaOH.	a. May be Al^{3+}
4. **Test with group Reagent :** 1-2 m*l* of the salt solution is saturated with solid NH_4Cl followed by the addition of dil. NH_4OH solution till alkaline.	a. A white ppt. is formed.	a. May be Al^{3+}
5. **Confirmatory Test:** (a) Dilute NaOH solution is added drop by drop and then in excess to 1 m*l* of the above solution.	a. The white ppt. dissolved	a. May be Al^{3+}
(b) Disodium hydrogen phosphate solution is added to 1 m*l* of the above solution.	b. Gelatinous white ppt. is formed which is soluble in dil. HCl solution.	a. Al^{3+} confirmed.

TEST FOR CALCIUM (Ca^{2+}) :

EXPERIMENT	OBSERVATION	INFERENCE
1. Dry Test Tube Heating: A pinch of salt is taken in a clean and dry test tube. The test tube is held by a test tube holder. First heated gently then strongly for about five minutes in non–luminous flame.	a. The salt melts on heating and solidifies on cooling.	a. May be alkali or alkalin earth metal salt.
2. Cobalt Nitrate Test: A drop of cobalt nitrate solution is added to the infusible incandiscent residue is obtained from the charcoal cavity test. Then it is heted again in non–luminous flame for two minutes.	**a.** Grey mass is obtained.	a. May be Ca^{2+}
3. Flame Test: A nichrome wire or, a platinum wire is rubed with sand paper. Then it is strongly heated and quenched in con–HC*l* till the wire imparted no colour to the non–luminous flame. The clean wire is moisted with con–HC*l* and a pinch of the salt is taken by touching the moist wire to the salt. It is shown to the outer most zone of the non–luminous flame. The colour of the flame is observed in naked eye and also through a pair of double blue glass.	a. Brick red through naked eye and light green through double blue glass.	a. May be Ca^{2+}
4. Test with group Reagent : (a) 1-2 ml of the salt solution is saturated with solid NH_4Cl followed by the addition of dil. NH_4OH solution till alkaline. The saturated solution of $(NH_4)_2CO_3$ is added.	a. A white ppt. is obtained.	a. May be Ca^{2+}
(b) The ppt. obtained above is dissolved in a minimum amount of CH_3COOH, boiled to remove CO_2 and then ammonium oxalate solution is added to it.	b. A white ppt. is obtained which is soluble in dil HCl but insoluble in CH_3COOH solution.	b. Ca^{2+} confirmed.

TEST FOR SODIUM (Na^+) :

EXPERIMENT	OBSERVATION	INFERENCE
1. Dry Test Tube Heating: A pinch of salt is taken in a clean and dry test tube. The test tube is held by a test tube holder. First heated gently then strongly for about five minutes in non–luminous flame.	a. The salt decrepitates or melts on heating and solidifies on cooling.	a. May be Na^+
2. Charcoal cavity Test: A small cavity wais made on one side of a charcoal block with the help of a charcoal borer. A little of salt is filled with cavity. The salt was moistened with a drop of water. The charcoal block is held in the left hand and deflect in non–luminous flame with the help of a blow pipe to the salt. Heated for about two minutes.	a. The salt produces crackling sound.	b. May be Na^+
3. Flame Test: A nichrome wire or, a platinum wire is rubed with sand paper. Then it is strongly heated and quenched in con–HCl till the wire imparted no colour to the non–luminous flame. The clean wire is moisted with con–HCl and a pinch of the salt is taken by touching the moist wire to the salt. It is shown to the outer most zone of the non–luminous flame. The colour of the flame is observed in naked eye and also through a pair of double blue glass.	a. Golden yellow colour through naked eye.and colorless through double blue glass.	a. May be Na^+
4. Confirmatory Test: To about 1 ml of the salt solution potassium pyroantimonate solution is added.	a. White ppt of sodium pyro-antimonate is obtained.	a. Na^+ is confirmed

TEST FOR POTASSIUM (K^+) :

EXPERIMENT	OBSERVATION	INFERENCE
1. Dry Test Tube Heating: A pinch of salt is taken in a clean and dry test tube. The test tube is held by a test tube holder. First heated gently then strongly for about five minutes in non–luminous flame.	a. The salt melts on heating and solidifies on cooling.	a. May be K^+
2. Charcoal cavity Test: A small cavity wais made on one side of a charcoal block with the help of a charcoal borer. A little of salt is filled with cavity. The salt was moistened with a drop of water. The charcoal block is held in the left hand and deflect in non–luminous flame with the help of a blow pipe to the salt. Heated for about two minutes.	a. The salt melts and sinks into the cavity on heating and reappears on cooling.	a. May be K^+.
3. Flame Test: A nichrome wire or, a platinum wire is rubed with sand paper. Then it is strongly heated and quenched in con–HCl till the wire imparted no colour to the non–luminous flame. The clean wire is moisted with con–HCl and a pinch of the salt is taken by touching the moist wire to the salt. It is shown to the outer most zone of the non–luminous flame. The colour of the flame is observed in naked eye and also through a pair of double blue glass.	a. Violet colour through naked eye and crimson red through double blue glass.	a. May be K^+
4. Confirmatory Test: About 2–ml of supplied salt solution is taken in a test tube. Few drops of cobalt nitrate solution was added to it and saturated with sodium nitrite. To it is added dilute CH_3COOH. Then allowed to stand for 5 minutes.	a. Yellow ppt of potassium cobaltic nitrite is obtained.	a. K^+ is confirmed.

ASIGNMENT QUESTIONS

1. Why the freshly prepared ferrous sulphate solution is added during the brown ring test ?
2. What is the name of the Basic Part of the Supplied Salt and define basic radical ?
3. Write down the difference between dry and wet test of basic radical.
4. What happens when NaCl, KCl, $NaNO_3$, $AgNO_3$, $CaCl_2$ salts are heated ?
5. Which types of salt is subjected to soda lime test ?
6. What is the features of soda lime test ?
7. What is the features of flame test ?
8. Which types of wire can be used in the flame test ?
9. What is the principle of charcoal cavity reduction test ?
10. Write down the basic of classification cations into different groups.
11. How can you test Na^+ and Mg^{2+} ?
12. Why Na_2CO_3 can not be used in place of ammonium carbonate in the IV group ?

WRITTING SPACE FOR ASSIGNMENT

EXPERIMENT NO. 07

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO.:..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Test for Unknown Acid Radicals.

OBJECTIVES OF THE EXPERIMENT :

At the End of this Experiment, the Students will able to :

a. Detect the presence of acid radicals in the supplied salt.

b. Understand the rationale and procedure behind the separation for various cations and anions.

c Perform qualitative analysis of unknown solution that contains various ions.

A. ***Apparatus Required :***

a.	Test Tubes and Test Tube Stand	b.	Test Tube Holder
c.	Test Tube Brush	d.	Dropper
e.	Gas Burner	f.	Charcoal Cavity

B. ***Chemicals Required :***

a. Given salt b. Various reagents. c. Litmus paper

THEORY :

Salt :

Salts regarded as compounds made up of positive and negative ions. The positive part com from a base while negative part from an acid salts are ionic compounds. Therefore in other words, salt is nothing but a compound made up positive and negative ions. The positive part comes from base while the negative part from an acid. These are crystalline and souble in water.

The salt formed by the loss of all possible protrons [replaceable hydrogen atoms as H^+] are call normal salts. Such a salt doesn't containt either a replaceable hydrogen or hydroxyl group. ***For exampl***

$$\underset{\text{Base}}{NaOH} + \underset{\text{Acid}}{HCl} \xrightarrow{\text{Neutralisation}} \underset{\text{Salt}}{NaCl} + \underset{\text{Water}}{H_2O}$$

Radical :

It is one or group of atoms having positive or negative charge over it. Radicals are of two type such as : Basic radical and Acid radical. Metals form basic radicals and non-metals form acid radical Qualitative analysis is the identification of basic and acid radicals separately. Negatively charged ion are called as **'acid radicals'.**

ACID RADICALS :

Carbonate sulphide, Chloride, Nitrate, Sulphite, Nitrite, Bromide, Iodide, Phosphate and Sulphate are the examples of Acid radicals.

PRELIMINARY TEST :

COLOUR OF THE SALT	SOLUBILITY OF THE SALT	ODOUR OF THE SALT	STRUCTURE OF THE SALT

WET TEST FOR ACID RADICALS

TEST WITH DILUTE HC*l* :

EXPERIMENT	OBSERVATION	INFERENCE
A pinch of salt is taken in a clean and dry test tube. Then 2 – 3 drops of dil HC*l* is added to it. Then it is slightly warmed.	a. Effervescence tooks place with the evolution of colourless and odourless gas and odourless gas which extinguishes a burning stick.	a. CO_2 gas coming out from carbonate. It may be CO_3^- **Then proceed to lime water Test.**

TEST WITH CONCENTRATED : H_2SO_4

EXPERIMENT	OBSERVATION	INFERENCE
A pinch of salt is taken in a clean and dry test tube. Then 2 – 3 drops of con– H_2SO_4 is added to it. Then slightly warmed.	a. Effervescence tooks place with the evolution of colourless gas which fumes in moist air and produces a dense white fumes when a glass rod dipped in con. NH_4OH is shown to the above gas.	a. HC*l* gas is coming out from Cl^-. It may be Cl^-. Then proceed to test for Cl^-
	b. Effervescence tooks place with the brown fumes having pungent smell. To it added few pieces of copper turning then heated. Deep brown vapours are produced and the solution turned green.	b. It may be Nitrate (NO_3^-). **Then proceed to test for $FeSO_4$ and Brown Ring Test.**
	c. No effervescence and no gas is evolved.	c. Cl^-, and NO_3^- are absent.

ACID RADICALS :

Carbonate sulphide, Chloride, Nitrate, Sulphite, Nitrite, Bromide, Iodide, Phosphate and Sulphate are the examples of Acid radicals.

PRELIMINARY TEST :

COLOUR OF THE SALT	SOLUBILITY OF THE SALT	ODOUR OF THE SALT	STRUCTURE OF THE SALT

WET TEST FOR ACID RADICALS

TEST WITH DILUTE HC*l* :

EXPERIMENT	OBSERVATION	INFERENCE
A pinch of salt is taken in a clean and dry test tube. Then 2 – 3 drops of dil HC*l* is added to it. Then it is slightly warmed.	**a.** Effervescence tooks place with the evolution of colourless and odourless gas and odourless gas which extinguishes a burning stick.	**a.** CO_2 gas coming out from carbonate. It may be CO_3^- **Then proceed to lime water Test.**

TEST WITH CONCENTRATED : H_2SO_4

EXPERIMENT	OBSERVATION	INFERENCE
A pinch of salt is taken in a clean and dry test tube. Then 2 – 3 drops of con– H_2SO_4 is added to it. Then slightly warmed.	**a.** Effervescence tooks place with the evolution of colourless gas which fumes in moist air and produces a dense white fumes when a glass rod dipped in con. NH_4OH is shown to the above gas.	**a.** HC*l* gas is coming out from Cl^-. It may be Cl^- Then proceed to test for Cl^-
	b. Effervescence tooks place with the brown fumes having pungent smell. To it added few pieces of copper turning then heated. Deep brown vapours are produced and the solution turned green.	**b.** It may be Nitrate (NO_3^-). **Then proceed to test for $FeSO_4$ and Brown Ring Test.**
	c. No effervescence and no gas is evolved.	**c.** Cl^-, and NO_3^- are absent.

TEST FOR SULPHATE (SO_4^{--})

EXPERIMENT	OBSERVATION	INFERENCE
A pinch of salt is taken in a clean and dry test tube. It is acidified with dil HCl. Then it is added few drops Barium Chloride ($BaCl_2$) solution.	a. White Precipitate was obtained.	a. SO_4^{--} is confirmed.

TEST FOR CARBONATE (CO_3^{--})

EXPERIMENT	OBSERVATION	INFERENCE
1. A pinch of salt is taken in a test tube. To it is added 2–ml of dil HCl then it is warmed. 2. The above gas is passed through lime water through the delivery tube.	Effervescence tooks plate with the evolution of colorless and odourless gas. **a. Lime water turned milky.** $Na_2CO_3 + 2HCl \rightarrow 2NaCl + CO_2 \uparrow + H_2O$ $Na_2CO_3 + H_2SO_4 \rightarrow Na_2SO_4 + CO_2 \uparrow + H_2O$ **b. Milkiness disappeared by passing excess of CO_2** $Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O_3 + H_2O$ $CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$	CO_2 gas coming out from Carbonate. a. This is due to the formation of calcium Carbonate ($CaCO_3$) b. This is due to the formation of Calcium Bicarbonate $Ca(HCO_3)_2$.

TEST FOR SULPHIDE (S^{--})

EXPERIMENT	OBSERVATION	INFERENCE
1. A pinch of salt is taken in a test tube. About 2–ml of dil–HCl / H_2SO_4 is added to it. Then it is warmed. 2. A filter paper is soaked with Lead Acetate solution is shown to the above gas.	Effervescence tooks place with the evolution of colorless gas having rotten egg smell. $Na_2 + H_2SO_4 \rightarrow Na_2SO_4 + H_2S \uparrow$ $Na_2S + 2HCl \rightarrow 2NaCl + H_2S \uparrow$ **The Filter Paper turned black.** $(CHCOO)_2Pb + H_2S \rightarrow PbS + 2CH_3COOH$ **(Lead Acetate) (Lead Sulphide)**	H_2S gas coming out from sulphide. This is due to the formation of Lead Sulphide.

TEST FOR CHLORIDE (Cl^-)

EXPERIMENT	OBSERVATION	INFERENCE
1. A pinch of salt is taken in a test tube. About 2–ml of H_2SO_4 is added to it. Then it was warmed.	Effervescence tooks place with the evolution of colourless gas which fumes in moist air.	HCl gas coming out from Chloride
2. A glass rod is dipped in con. NH_4OH is shown to the mouth of the test tube.	$NaCl + H_2SO_4 \rightarrow NaHSO_4 + HCl$ $NaCl + NaHSO_4 \rightarrow Na_2SO_4 + HCl$ **Dense white fumes are evolved.**	This is due to the formation of Ammonium Chloride
3. A pinch of salt is taken in a clean and dry test tube. To it is added a little amount of MnO_2 and 2 – 3 drops of Con. H_2SO_4. Then it is heated.	Grinish yellow gas is evolved which turned a filter paper soaked in starch iodide paper blue. $2NaCl + MnO_2 + 2H_2SO_4 \rightarrow Na_2SO_4 + MnSO_4 + Cl + 2H_2O$ $2KI + Cl \rightarrow 2KCl + I$ **A curdy white precipitate is obtained.**	Chlorine gas liberated Iodine from starch Iodide and deposited on the filter paper.
4. 1–ml of salt solution (Whether in soluble) is taken in a test tube and then it is acidified with dilute HNO_3. It is added Silver Nitrate ($AgNO_3$) solution.	$NaCl + AgNO_3 \rightarrow AgCl\downarrow + NaNO_3$ (White ppt)	This is due to the formation of Silver Chloride.
5. The above ppt. Was allowed to settle down. The ppt is washed with distilled water. It is divided in to two parts.	$AgCl + 2NH_4OH \rightarrow [Ag(NH_3)_2]Cl + 2H_2O$ $[Ag(NH_3)_2Cl] + 2HNO_3 \rightarrow AgCl + 2NH4NO_3$ **The ppt. does not dissolve.**	$AgCl$ is not soluble in HNO_3.
Part – 1 : To it is added dilute HNO_3 and well shaken.	The ppt dissolved and reappeared when acidified with dil–HNO_3.	It is due to the formation of a Complex.
Part – 2 : To it is added dilute NH_4OH and well shaken.		

TEST FOR NITRATE (NO_3^-)

EXPERIMENT	OBSERVATION	INFERENCE
1. A pintch of salt is taken in a clean and dry test tube and 2 – 3 drops of Con. H_2SO_4 is added to it. Then it is warmed. Cool the above test tube and few pieces of copper turning is added to it.	Effervescence tooks place with the evolution Coplous Brown fumes are evolved. $2NaNO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2HNO_3$ $Cu + 4HNO_3 \rightarrow Cu(NO_3)_2 + 2H_2O + 2NO_2$	This is due to the formation of NO_2 gas.
2. A filter paper soaked with freshly prepared Ferrous Sulphate ($FeSO_4$) solution is shown to the above gas.	**Filter Paper Turned Brown**	
3. **Brown Ring Test :** About 1-- ml of salt solution (Whether in soluble) is taken in a clean and dry test tube. To it is added equal volume of Con. H_2SO_4. The test tube is cooled perfectly under tap water. Then slowly added freshly prepared Ferrous Sulphate ($FeSO_4$) solution without disturbing the liquid.	**A Brown ring was obtained at the junction of the two liquid layer.** $2NaNO_3 + H_2SO_4 \rightarrow Na_2SO_4 + 2HNO_3$ $6FeSO_4 + 2HNO_3 + 3H_2SO_4 \rightarrow 3Fe(SO_4)_3 + 2NO + 4H_2O$ $FeSO_4 + NO \rightarrow [Fe(NO)]SO_4$	Nitrate is confirmed.

ASIGNMENT QUESTIONS

1. Why the negative part of a salt is called acidic redical ?
2. What do you mean by dry test and wet test ?
3. Define group reagent ?
4. What is effervescence ?
5. Which gas is evolved when sulphides are treated with dilute H_2SO_4 ?
6. Write down any iron salt which is light green ?
7. Why sodium carbonate extract prepared in salt analysis ?
8. Why HCl is used for the flame test instead of H_2SO_4 ?
9. Why anions are called acid radicals ?
10. What are the anions detected by concentration H_2SO_4 ?
11. What are anions detected with help of dilute H_2SO_4 ?

EXPERIMENT NO. 08

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO. :..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Test for Unknown Basic Redicals.

OBJECTIVES OF THE EXPERIMENT :

At the End of this Experiment, the Students will able to :

a. Detect the presence of basic radicals in the supplied salt.

b. Understand the rationale and procedure behind the separation for various cations and anions.

c. Perform qualitative analysis of unknown solution that contains various ions.

A. ***Apparatus Required :***

a.	Test Tubes and Test Tube Stand	b.	Test Tube Holder
c.	Test Tube Brush	d.	Dropper
e.	Gas Burner	f.	Charcoal Cavity

B. ***Chemicals Required :***

a. Given salt b. Various reagents. c. Litmus paper

THEORY :

Salt :

Salts regarded as compounds made up of positive and negative ions. The positive part come from a base while negative part from an acid salts are ionic compounds. Therefore in other words, salt is nothing but a compound made up positive and negative ions. The positive part comes from base while the negative part from an acid. These are crystalline and souble in water.

The salt formed by the loss of all possible protrons [replaceable hydrogen atoms as H^+] are calle normal salts. Such a salt doesn't containt either a replaceable hydrogen or hydroxyl group. ***For example***

$$\underset{\text{Base}}{NaOH} + \underset{\text{Acid}}{HCl} \xrightarrow{\text{Neutralisation}} \underset{\text{Salt}}{NaCl} + \underset{\text{Water}}{H_2O}$$

Radical :

It is one or group of atoms having positive or negative charge over it. Radicals are of two type such as : Basic radical and Acid radical. Metals form basic radicals and non-metals form acid radicals Qualitative analysis is the identification of basic and acid radicals separately. Positively charged ion are called as ***'basic radicals'.***

BASIC RADICALS :

The basic radical is the cation left after removal of OH or other alkaline group from the bases. Cations are atoms that have lost an electron to become positively charged. Sodium has one valence electron, one electron in its outer energy level, so tends to lose one electron, and to become an ion with a +1 charge.

PRELIMINARY TEST :

COLOUR OF THE SALT	*SOLUBILITY OF THE SALT*	*ODOUR OF THE SALT*	*STRUCTURE OF THE SALT*

DRY TEST FOR BASIC RADICALS

DRY TEST TUBE HEATING :

EXPERIMENT	*OBSERVATION*	*INFERENCE*
A pinch of salt is taken in a clean and dry test tube. The test tube is held by a test tube holder. First heated gently then strongly for about five min in non–luminous flame.	***a.*** The salt decripitates (Cracking Sound) ***b.*** The salt deflagrates. (Catches fire) ***c.*** Water particles are deposited at the cooler part of the teswt tube. ***d.*** The salt voltileges and a white sublimate was formed ***e.*** The salt swells on heating ***f.*** The salt fuses (Melts) on heating and solidifies on cooling. ***g.*** A white infusible incandiscent mass is left. ***h.*** A brown fumes are evolved. ***i.*** The salt changes colour ***a.*** Yellow when hot and white when cold ***b.*** Yellow when hot and cold.	a. May be cryastaline salt b. Some nitrate / nitrite salt c. The salt contains water of crystalisation. d. Volatile salt. i. May be NH_4^+ salt ***To perform sodalime test.*** e. May be Al^{3+} salt. f. It may be alkali salt ***To perform cobalt nitrate test*** g. It may be Mg^{2+}, Sn^{2+} / alkaline earth metal. ***To Perform Cobalt Nitrate Test.*** h. May be NO_3^- salt. i. May be Zn^{2+} salt ***To Perform Cobalt Nitrate Test*** ii. May be Pb^{2+} salt ***To Perform Charcoal Reduction Test*** iii. Cu^{2+} ***To Perform Borax Bead Test.***

SODA LIME TEST

EXPERIMENT	OBSERVATION	INFERENCE
A pinch of salt is taken in a watch glass A little amount of soda lime (CaO + NaOH) and one or, two drop of water is added to it. Then it is rubed with our hand.	a. Ammonia gas is evolved.	a. May be NH_4^+

CHARCOAL CAVITY TEST

EXPERIMENT	OBSERVATION	INFERENCE
A small cavity is made on one side of a charcoal block with the help of a charcoal borer. A little of salt is filled with cavity. The salt is moistened with a drop of water. The charcoal block is held in the left hand and deflect in non–luminous flame with the help of a blow pipe to the salt. Heated for about two minutes.	**a.** The salt decrepitates. (Cracking Sound) **b.** The salt deflagrates. (Cathes Fire) **c.** The salt fuses (melts) on heating and sinks in to the charcoal cavity. **d.** Leaves behind a infusible, incandescent white residue. **e.** The colour of the salt yellow when hot and white when cold. **f.** Leaves behind a coloured residue.	**a.** May be crystalline salt. ***To Perform Flame Test.*** **b.** May be NO_2^- and NO_3^- salt. **c.** May be alkali salt. ***To Perform Flame Test.*** **d.** May be Al^{+3}, Mg^{+2}, or Alkaline earth metal. ***To Perform Cobalt Nitrate Test.*** **e.** It may be Zn^{+2} salt. ***To Perform Cobalt Nitrate Test.*** **f.** Chrcoal reduction test is to be performed.

COBALT NITRATE TEST

EXPERIMENT	OBSERVATION	INFERENCE
A drop of cobalt nitrate solution is added to the infusible incandiscent residue is obtained from the charcoal cavity test. Then it is heted again in non–luminous flame for two minutes.	**a.** Blue mass is obtained. **b.** Green mass is obtained. **c.** Pink mass is obtained. **d.** Grey mass is obtained.	**a.** May be Al^{3+} **b.** May be Zn^{2+} **c.** May be Mg^{2+} **d.** May be Ca^{2+} ***Flame Test is to be Performed.***

FLAME TEST

EXPERIMENT	OBSERVATION		INFERENCE
	Colour Observed In Naked Eye	Colour Through double Blue Glass	
A nichrome wire or, a platinum wire is rubed with sand paper. Then it is strongly heated and quenched in con–HCl till the wire imparted no colour to the non–luminous flame. The clean wire is moisted with con–HCl and a pinch of the salt is taken by touching the moist wire to the salt. It is shown to the outer most zone of the non–luminous flame. The colour of the flame is observed in naked eye and also through a pair of double blue glass.	*a.* Golden yellow *b.* Brick red	*a.* Colourless *b.* Not to be viewed	*a.* May be Na^+ *b.* May be Ca^{2+}

CHARCOAL REDUCTION TEST

EXPERIMENT	OBSERVATION	INFERENCE
A mixture is prepared of the salt, charcoal powder and fusion mixture (Na_2CO_3 + K_2CO_3) in the ratio of ***1 : 3 : 1*** proportion. A little of the mixture is taken in a charcoal cavity and heated strongly in reducing (luminous) flame. The colour of the residue is observed.	*a.* White shining malleable bead with lemon yellow incrustain and marking paper. *b.* Red scale without any incrustation.	*a.* May be Pb^{2+} salt. *b.* May be Cu^{2+} salt.

WET TEST FOR GR – I – RADICALS : (Pb^{2+}, Hg_2^{2+}, Ag^+)

GROUP REAGENT : DILUTE – HCl

EXPERIMENT	OBSERVATION	INFERENCE
About 1 -ml of salt solution is taken in a clean test tube and it was added dil – HCl.	*a.* White ppt. was formed which was obtained which is soluble on boiling and ppt was reappeared on cooling.	*a.* Pb^{2+} may be present.

WET TEST FOR GR – II (A) RADICALS : (Pb^{2+}, Hg^{2+}, Cu^{2+}, Bi^{3+}) AND Gr – II (B) RADICALS (As^{3+}, Sn^{2+}, Sb^{3+})

Group Reagent : Dilute – HC*l* in presence of H_2S gas.

EXPERIMENT	OBSERVATION	INFERENCE
1. About 1 – ml of salt solution is taken in a clean test tube and to it is added dilute HC*l*. Then it is passed thorugh H_2S gas.	***a.*** Black ppt is formed.	***a.*** Pb^{2+}, Cu^{2+} may be present

WET TEST FOR GR – III (A) RADICALS : (Fe^{3+}, Al^{3+}, Cr^{3+})

GROUP REGENT : Dilute – NH_4OH in presence of solid NH_4Cl.

EXPERIMENT	OBSERVATION	INFERENCE
About 1 – ml of salt solution was taken in a clean test tube. To it is added solid NH_4Cl till saturated and dil – NH_4OH is added to it till alkaline.	***a.*** Gelatinous white ptt is obtained.	***a.*** Al^{3+} may be Present.

WET TEST FOR GROUP : III (B) RADICALS : (Sn^{2+}, Mn^{2+}, Co^{2+}, Ni^{2+})

GROUP REAGENT : NH_4Cl and Dilute – NH_4OH in presence of H_2S gas.

EXPERIMENT	OBSERVATION	INFERENCE
About 2 – ml of supplied salt solution is taken in a clean test tube. To it is saturated with solid NH_4Cl and then alkaline with dil – NH_4OH and H_2S gas is passed through it.	***a.*** White ppt is obtained.	***a.*** Zn^{2+} may be present.

WET TEST FOR GROUP – IV – RADICALS : (Ba^{2+}, Sr^{2+}, Ca^{2+})

GROUP REAGENT : $(NH_4)_2CO_3$, NH_4Cl in presence of dilute – NH_4OH.

EXPERIMENT	OBSERVATION	INFERENCE
About 2 – ml of supplied salt solution is taken in a clean test tube. To it is saturated with solid NH_4Cl and then alkaline with dilute NH_4OH. Then saturated solution are absent $(NH_4)_2CO_3$ is added to it.	White ppt is obtained.	Ca^{2+} present

WET TEST FOR GROUP – V – RADICALS : (Mg^{++}, Na^{+}, K^{+}, NH_4^{+})

(Therre is no specific group reagent, No specific Gr – Test, They are tested individualy for this group.)

CONFIRMATORY TEST FOR MAGNESIUM : (Mg^{++})

EXPERIMENT	OBSERVATION	INFERENCE
1. About 2 – ml of suplied salt solution is taken in a clean test tube. To it is saturated with solid NH_4Cl and then alkaline with dilute NH_4OH. Then disodium Ortho phosphate (Na_2HPO_4) solution is added	White ppt of magnesium ammonium Gelatinous blue ppt is obtained.	Mg^{2+} is confirmed Mg^{2+} is confirmed.
2. About 1–ml of supplied salt solution is taken in a test tube. To it is added 5 – drops of dil – HCl and 1 – drop of magnesor reagent. Then excess of NaOH added to it.		

CONFIRMATORY TEST FOR SODIUM : (Na^{+})

EXPERIMENT	OBSERVATION	INFERENCE
About 1–ml of supplied salt solution is taken in a test tube. To it is add it is added Potassium Pyroanti–monate solution.	White ppt of sodium pyroantimonate.	Na^{+} is confirmed

CONFIRMATORY TEST FOR COPPER (Cu^{2+})

EXPERIMENT	OBSERVATION	INFERENCE
About 1– 2ml of supplied salt solution NH_4OH taken in a test tube is added dropwise and then in excess.	Bluish white PPT is first formed which is dissolved with excess NH_4OH forming a deep blue solution.	Cu^{2+} is confirmed

CONFIRMATORY TEST FOR POTASSIUM (K^{+})

EXPERIMENT	OBSERVATION	INFERENCE
About 2–ml of supplied salt solution is taken in a test tube. Few drops of cobalt nitrate solution was added to it and saturated with sodium nitrite. To it is added dilute CH_3COOH. Then allowed to stand for 5–minutes.	Yellow ppt of potassium cobaltic nitrite is obtained.	K^{+} is confirmed.

CONFIRMATORY TEST FOR AMMONIUM (NH_4^+)

EXPERIMENT	OBSERVATION	INFERENCE
About 2–m of the salt solution is taken in a test tube. To it is added few drops of NaOH and a little amount Nessler's Reagent.	Brown ppt is obtained.	NH_4^+ is confirmed

CONFIRMATORY TEST FOR CALCIUM (Ca^{2+})

EXPERIMENT	OBSERVATION	INFERENCE
The above white ($CaCO_3$) ppt. dissolved in dil – CH_3COOH. To it is added Ammonium Oxalate solution dilute NH_4OH	White ppt. of Calcium Oxalate is obtained.	Ca^{2+} is confirmed.

CONFIRMATORY TEST FOR ALUMINIUM (Al^{3+})

EXPERIMENT	OBSERVATION	INFERENCE
About 2 – m*l* of salt solution is taken in a test tube. To it is added NaOH solution drop by drop.	Geletinous white ppt is obtained which soluble in excess NaOH.	Al^{3+} is confirmed.

CONFIRMATORY TEST FOR ZINC (Zn^{2+})

EXPERIMENT	OBSERVATION	INFERENCE
About 2 – m*l* of salt solution is taken in a test tube. To it is added test NaOH solution drop by drop then excess.	White ppt is first obtained which is soluble with excess NaOH.	Zn^{2+} is confirmed.

ASIGNMENT QUESTIONS

1. What are the basic radicals which are coloured ?
2. What is the group reagent for group-III ?
3. What is the name of product obtained by the reaction of lead ion with potassium chromate solution ?
4. Why the positive part of a salt is called basic radicals ?
5. What is the colour of residue when zinc salt is heated ?
6. Write down a cation which is not obtained from a metal ?
7. What are the basic radicals which are absent, if the given salt is white ?
8. How is dry heating test performed and what information you get if the residue changes to yellow when hot ?
9. How is charcoal cavity test performed ?
10. Why do inorganic salts ionise when dissolved in water ?
11. Name the basic radicals which are absent, if the given salt is white.
12. Name the salts which produce crackling sound when heated.
13. What is the expected observation when copper sulphate is heated in a dry test tube
14. Which ion gives grassy green color with non - luminous flame?
15. What is a colored basic radical (cation) ?
16. Which cation is not present in Group II ?
17. Which cation gives flesh coloured precipitate with hydrogen sulphide gas in presence of NH_4Cl and and NH_4OH?
18. Which reagent is used to test the presence of ammonium ion in a given salt ?

WRITTING SPACE FOR ASSIGNMENT

EXPERIMENT NO. 09

DATE :..... BRANCH :..... SECTION :.....

NAME :..... ROLL NO. :.....

REGD. NO.:..... MARKS :..... COMPLETE :.....

Sign. of Sr. Lect./Lecturer

AIM OF THE EXPERIMENT :

Test for unknown salt (Composed of one Basic Radical and one Acid Radical).

OBJECTIVES OF THE EXPERIMENT :

At the End of this Experiment, the Students will able to :

1. Detect the presence of basic and acid radicals in the supplied salt.

PRELIMINARY TEST :

COLOUR OF THE SALT	SOLUBILITY OF THE SALT	ODOUR OF THE SALT	STRUCTURE OF THE SALT

: DRY TEST FOR BASIC RADICAL :

DRY TEST TUBE HEATING :

EXPERIMENT	OBSERVATION	INFERENCE
A small quantity of the salt is taken in a clean and dry test tube and heated strongly in the hottest part of the non luminous flame.	(a) A sublimate is formed (Note the colour of the sublimate). (b) Water particles condense at the cooler part of the test tube. (c) Decripitation or cracking sound is produced. (d) Deflagration takes place. (e) The salt changes colour. i. Yellow when hot and white when cold. ii. Reddish brown when hot and yellow when cold. iii. Yellowish brown when hot and brown when cold. iv. Red to black when hot and brown when cold.	(a) It is volatile salt, (Soda lime test and bulbtube test should be performed). (b) Salt contains water of crystallisation. (c) May be crystalline salt. (d) The salt may be nitrate of alkali or alkaline earth metal. (e) i. It may be Zinc salt. ii. It may be Lead salt. iii. It may be Tin or Bismuth salt. iv. It may be Iron salt.

EXPERIMENT	OBSERVATION	INFERENCE
	(f) It blackens without burning. (g) Salt fuses on heating and solidifies on cooling. (h) Salt swells upon heating. (i) A gas is evolved. i. Reddishbrown gas evolved and it supports combustion. ii. Colourless, odourless gas is evolved and it extinguishess burning splinter. iii. Colourless, odourless gas is evolved and it rekindles glowing splinter. iv. Reddishbrown gas is evolved which burns inside the tube and water vapour comes out. Cracking sound is produced. (j) No change of salt is observed.	(f) It may be copper, Nickel o Manganese salt. (g) May be alkali or alkaline eart metal salt. (h) It may be Aluminium or Zin salt. (i) The salt decomposes. It ma be salt of heavy metal. i. It may be Nitrate of heav metal. ii. May be Carbondioxide fro Carbonate salt. iii. It may be Nitrate salt. iv. It may be Ammoniu Nitrate. (j) Other tests should be performed

SODALIME TEST :

EXPERIMENT	OBSERVATION	INFERENCE
A little of the salt is taken in a clean watch glass along with sodalime and it is rubbed by adding two drops of water.	(a) A colourless gas evolved with strong smell of Ammonia and colour of the mixture is unchanged. (b) The colour of the residue changes to brown and there is no evolution of any gas. (c) The colour of the residue is not changed.	(a) NH_4^+ may be present. (To be conformed in the we test) (b) Hg^{2+} may be present. (Bulb test should be performed) (c) As^{3+} may be present. (Bulb test should be performed)

BULB TEST :

EXPERIMENT	OBSERVATION	INFERENCE
An intimate mixture of the salt, an hydrous sodium carbonate and wood charcol powder is prepared in the ratio of 1:3:1. About two gram of the mixture is taken in a clean test tube and heated strongly for five minutes. White mirror is tapped in to a watch glass containing dilute HCl.	(a) White shining mirror is performed. (b) Black mirror is formed with garlic odour.	(a) Hg^{2+} may be present. (To be conformed in the we test) (b) As^{3+} may be present. (To be conformed in the we test)

EXPERIMENT	OBSERVATION	INFERENCE
CHARCOL CAVITY HEATING : A little of the Salt is taken in the charcoal cavity and heated by oxidising flame with the help of a blow pipe.	(a) The salt decripitates. (b) The salt defagrates. (c) The salt fuses and sinks into the charcoal cavity. (d) Infusible incandescent white residue. (e) Originally white but leaves a coloured residue. (f) Originally coloured salt and leaves a coloured residue. (write the colour)	(a) May be crystalline salt. (b) May be NO_3^- or NO_2^- salt. (c) Salt contains alkali oral kaline earth metal. (flame test should be performed). (d) Cobalt nitrate test should be performed. (e) Charcoal reduction test should be performed.
COBALT NITRATE TEST : The salt is taken in the charcoal cavity and heated in the oxidising flame with the help of a blow pipe till an infusible, incandescent white mass is obtained. Then one drop of cobalt nitrate solution is added to it and heated strongly.	(a) Blue mass is obtained. (b) Green mass is obtained. (c) Rosy mass is obtained. (d) Dirty green mass is obtained. (e) Grey mass is obtained.	(a) Al^{3+} or PO_4^{3-} may be present. (b) Zn^{2+} may be present. (c) Mg^{2+} may be present. (d) Sn^{2+} may be present. (e) Ca^{2+}, Sr^{2+} or Ba^{2+} may be present. (Flame test should be performed)
FLAME TEST : The nichrome wire is cleaned with sand paper and dipped in conc. HCl and show to non-luminous flame. This process is repeated till no colour is imparted to the flame. Then the wire is moistened with conc HCl and a little of the salt is taken by touching to the salt is taken by touching to the salt and shown to the oxidising flame.	(a) Persistent golden yellow coloured flame is seen in naked eye and colourless through double blue glass. (b) Violet flame is seen in naked eye and red through a prir of blue glass. (c) Brick red flame is observed. (d) Crimson red flame is observed. (e) Pea green flame. (f) Green flame with blue centre.	(a) Na^+ may be present. (b) K^+ may be present. (c) Ca^{2+} may be present. (d) Sr^{2+} may be present. (e) Ba^{2+} may be present. (f) Cu^{2+} may be present.
CHARCOAL REDUCTION TEST : An intimate mixture of salt, wood charcoal powder and fusion mixture in the ratio 1:3:1 is prepared. The mixture is taken in the charcoal cavity and heated in the luminous flame with the help of a blow pipe.	(a) White shinning malleable bead without any incrustation and the bead do not mark the paper. (b) White shining malleable bead with lemon yellow in crustation and bead marks the paper. (c) Brittle bead with yellow incrustation. (d) Brittle bead with bluish white incrustation. (e) Red scales without incrustations. (f) Malleable white bead. (g) Gray magnetic mass without incrustation.	(a) Ag^+ may be present. (b) Pb^{2+} may be present. (c) Bi^{3+} may be present. (d) Sb^{3+} may be present. (e) Cu^{2+} may be present. (f) Sn^{2+} may be present. (g) Fe^{2+}, Co^{2+} or Ni^{2+} may be present.

IDENTIFICATION OF ACID RADICAL :

EXPERIMENT	OBSERVATION	INFERENCE
1 cc dilute H_2SO_4 taken in a test tube and slightly warmed. To this a pinch of salt is added.	1. Effervescence takes place with the evolution of : (a) a colourless and odourless gas. (b) Colourless gas with rotten egg smell. (c) Colourless gas with burning sulphur smell. (d) Reddish brown fumes having pungent odour. (e) No effervescence takes place.	(a) Carbonate may be present. (Other test should be performed for its conformation) (b) Sulphite may be present. (Other test should be performed for its conformation) (c) SO_3^{2+} may be present. (Other test should be performed for its conformation) (d) Nitrite may be present. (Other test should be performed for its conformation) (e) Gr-I acid radicals absent. (Test for Gr-II acid radicals should be performed)

TEST FOR GROUP-II ACID RADICAL :

EXPERIMENT	OBSERVATION	INFERENCE
In a clean test tube a little of the salt is taken. To it conc. H_2SO_4 is added by the side of the test tube.	1. Effervescence takes place with the evolution of : (a) Colourless. (b) Reddish brown vapour. (c) Violet vapour. (d) No effervescence takes place	(a) Chloride may be present. (Other test should be performed for its conformation) (b) Bromide may be present. (Other test should be performed for its conformation) (c) Iodide may be present. (Other test should be performed for its conformation) (d) Group-II acid radicals absent. (Test for Gr-III acid radicals should be performed)

TEST FOR GROUP-III ACID RADICAL :

EXPERIMENT	OBSERVATION	INFERENCE
TEST FOR NITRATE : A pinch of the salt is taken in a clean test tube. A piece of the Copper turning is added to it followed by addition of three drops of concentrated H_2SO_4 and heated.	(a) Copious brown fumes evolved. (b) No remarkable observation is noted.	(a) Nitrate may be present. (Other test should be performed for its conformation) (b) Nitrate is absent.

TEST FOR GROUP-III ACID RADICAL :

EXPERIMENT	OBSERVATION	INFERENCE
TEST FOR SULPHATE : 1 ml. of salt solution is taken in a clean test tube and it is acidified with dilute HCl. Then barium chloride solution is added to it.	(a) White precipitate is obtained. (b) No white precipitate is obtained.	(a) Sulphate may be present. (Other test should be performed for its conformation) (b) Sulphate is absent. (Test for Phosphate should be performed).
TEST FOR PHOSPHATE : 1 ml. of Ammonium molybdate solution is taken in a clean test tube. 1 ml. of concentrated nitric acid is added to it and warmed. Then few drops of salt solution is added.	(a) Yellow precipitate is formed. (b) No yellow precipitate is formed.	(a) Phosphate is present and conformed. (b) Phosphate is absent.

: TEST FOR ACID RADICAL :

CONFORM TEST FOR CO_3^{2-} :

EXPERIMENT	OBSERVATION	INFERENCE
1. 1 cc of dilute HCl is taken in a clean test tube. It is generaly warmed and to it a little salt is added.	1. Effervescence takes place with the evolution of a colourless and odourless gas.	1. CO_3^{2-} may be present.
2. A burning match stick is shown to the evolved gas.	2. The burning stick is extinguished.	2. CO_3^{2-} may be present.
3. A little more salt is added to the above test tube and the evolved gas is passed through the lime water with the help of a delivery tube.	3. At first white turbidity (milk colour) appears which dissappears with excess passing of the gas.	3. CO_3^{2-} may be present.
4. A little more salt is added to the above test tube and the evolved gas is passed through acidified pottassium dichromate solution with the help of a delivery tube.	4. No change of the colour takes place.	4. CO_3^{2-} is confirmed.

ONFORM TEST FOR SO_3^{2-} :

EXPERIMENT	OBSERVATION	INFERENCE
. 1 cc of dilute HCl is taken in a clean test tube. It is gently warmed and to it a little salt is added.	1. Effervescence takes place with the evolution of a colourless gas with burning sulphur smell.	1. SO_3^{2-} may be present.
. A little more salt is added to the above test tube and the evolved gas is passedthrough the lime water with the help of a delivery tube.	2. At first white turbidity (milk colour) appears which disappears with excess passing of the gas.	2. SO_3^{2-} may be present.
. A little more salt is added to the above test tube and the evolved gas is passed through acidified potassium dichromate solution with the help of a delivery tube.	3. Colour of acidified potassium dichromate changes to green.	3. SO_3^{2-} is confirmed.

CONFORM TEST FOR S^{2-} :

EXPERIMENT	OBSERVATION	INFERENCE
1. 1 cc of dilute HCl is taken in a clean test tube. It is gently warmed and to it a little salt is added.	1. Effervescence takes place with the evolution of a colourless gas with rotten egg smell.	1. S^{2-} may be present.
2. A filter paper soaked with lead acetate solution is shown to evolved gas.	2. Filter paper turns black.	2. S^{2-} is confirmed.

CONFORM TEST FOR NO_2^- :

EXPERIMENT	OBSERVATION	INFERENCE
1. 1 cc of dilute HCl is taken in a clean test tube. It is gently warmed and to it a little salt is added.	1. Effervescence takes place with the evolution of reddish brown fumes having pungent odour.	1. NO_2^- may be present.
2. A filter paper is soaked with starch iodide solution is shown to evolved gas.	2. Filter paper turns blue.	2. NO_2^- may be present.
3. A filter paper soaked with a freshly prepared ferrous sulphate solution is shown to the evolved gas.	3. The filter paper turns brown.	3. NO_2^- is confirmed.

: ANALYSIS OF GROUP - II ACID RADICAL :

TEST FOR CHLORIDE :

EXPERIMENT	OBSERVATION	INFERENCE
1. A little of the salt is taken in a clean and dry test tube and 2–3 drops of conc sulphuric acid is added by the side of the test tube.	1. Effervescence takes place with the evolution of a colourless gas which fumes in moist air.	1. Cl^- may be present.
2. A glass rod dipped in conc. ammonium hydroxide is shown to the above test tube.	2. Dense white fumes are produced.	2. Cl^- may be present.
3. To the above test tube a little manganese dioxide is added flowed by addition of 2–3 drops of conc H_2SO_4 and the test tube is heated.	3. Greenish yellow gas is evolved.	3. Cl^- may be present.
4. A filter paper soaked in starch iodide solution is shown to the evolved gas.	4. Filter paper turns blue.	4. Cl^- may be present.

5. 1 cc of salt solution is prepared in a clean test tube and the solution is acidified by adding 0.5 ml of dilute nitric acid. To this test tube silver nitrate solution is added and shaken well.	5. Curdy white precipitate is formed.	5. Cl^- may be present.
6.(a) The above precipititate is allowed to stand and the liquid is decanted off. The precipitate is washed 3 times with water and divided into 3 parts.	6. (a)	
Part-I : To the first part dilute HNO_3 is added and heated.	i. Precipitate does not dissolve.	
Part-II : To the second part dilute ammonium hydroxide solution is added and shaken well.	ii. The precipitate dissolves.	
Part-III : To the third part conc. ammonium hydroxide is added drop by drop with shaking.	iii. The precipitate dissolves.	
(b) To the part-2 and part-3 test tube dilute nitric acid is added.	(b) The precipitate reappears.	(b) Cl^- is confirmed.

TEST FOR BROMIDE :

EXPERIMENT	*OBSERVATION*	*INFERENCE*
1. A little of the salt is taken in a clean and dry test tube and 2–3 drops of conc. sulphuric acid is added by the side of the test tube.	1. Effervescence takes place with the evolution of reddish brown vapour.	1. Br^- may be present.
2. To the above test tube a little manganese dioxide is added followed by addition of 2-3 drops of con. H_2SO_4 and the test tube is heated.	2. A deep reddish brown gas is evolved.	2. Br^- may be present.
3. A filter paper soaked in starch iodide solution is shown to the evolved reddish brown gas.	3. The paper turns blue.	3. Br^- may be present.
4. 1 cc of salt solution is prepared in a clean test tube and the solution is acidified by adding 0.5 ml of dilute nitric acid. To it silver nitrate solution is added and shaken well.	4. Yellowish white precipitate is formed.	4. Br^- may be present.

5. The above precipitate is allowed to stand and the liquid is decanted off. The precipitate is washed 3 times with water and divided into 3 parts.	5.	5. Br^- is confirmed.
Part-I : Dilute HNO_3 is added and heated.	i. The precipitate is not soluble.	
Part-II : Dilute ammonium hydroxide solution is added in excess.	ii. The precipitate is not solubel.	
Part-III : Conc. ammonium hydroxide solution is added.	iii. The precipitate is soluble.	

TEST FOR IODIDE :

EXPERIMENT	OBSERVATION	INFERENCE
1. A little of the salt is taken in a clean test tube and 2-3 drops of conc. sulphuric acid is added by the side of the test tube.	1. Effervescence takes place with athe evolution of violet gas and deposition of black solids at the bottom of the test tube.	1. Iodide (I^-) may be present
2. The above test tube is heated and filter paper soaked with starch solution is shown to the evolved gas.	2. More gas evolved by heating and the filter paper turns blue.	2. I^- may be present.
3. 1 cc of salt solution is prepared in a clean test tube and the solution is acidified by adding 0.5 ml of dilute nitric acid. To this test tube silver nitrate solution is added and shaken well.	3. Yellow precipitate is obtained.	3. I^- may be present.
4. The above precipitate is llowed to stand and the liquid is decanted off. The precipitate is washed 3 times with water and ddivided into 3 parts.	4.	4. I^- is confirmed.
Part-I : To the first part dilute nitric acid is added and boiled.	i. The precipitate is not soluble.	
Part-II : To the second part dilute ammonium hydroxide is added and shaken well.	ii. The precipitate remains insoluble.	
Part-III : To the third part conc. ammonium hydroxide is added and shaken well.	iii. The precipitate is insoluble.	

: ANALYSIS OF GROUP-III ACID RADICALS :

CONFORM TEST FOR NITRATE :

EXPERIMENT	OBSERVATION	INFERENCE
1. A little of the salt is taken in a clean and dry test tube and to it a piece of Copper turning is added followed by addition of 2-3 drops of concentrated H_2SO_4 and the test tube is heated.	1. Coplous brown fumes are evolved.	1. NO_3^- may be present.
2. A filter paper is soaked with freshly prepared ferrous sulphate solution is shown to the evolved gas.	2. The paper turns black.	2. NO_3^- may be present.
3. 1 ml. of salt solution is taken in a clean test tube and to it 1 ml. of conc. H_2SO_4 is added and cooled thoroughly under the tap water. Then freshly prepared ferrous sulphate solution is added slowly by means of a dropper through the side of the test tube without disturbing the test tube.	3. A borwn ring is formed at the junction of liquide layers.	3. NO_3^- is conformed.

CONFORM TEST FOR SULPHATE :

EXPERIMENT	OBSERVATION	INFERENCE
1. A pinch of salt is taken in a clean and dry test tube. It is acidified with dil HCl. Then it is added few drops Barium Chloride ($BaCl_2$) solution.	1. A white precipitate is formed.	1. SO_4^{2-} may be present.
2. A little of the above precipitate is taken in a clean test tube. To it conc. HCl is added and boiled.	2. Precipitate is insoluble.	2. SO_2^- is conformed.
CONFORM TEST FOR PHOSPHATE : 1. 1 ml. of ammonium molybdate solution is taken in a clean test tube along with 10 drops of conc. HNO_3. The content is warmed slightly. Then salt solution is added drop by drop.	1. A yellow precipitate is formed.	1. PO_4^{3-} present and conformed.

: WET TEST FOR BASIC RADICALS :

IDENTIFICATION OF GROUP :

EXPERIMENT	OBSERVATION	INFERENCE
1. To 1 ml. of salt solution in a clean test tube 1 ml. of dilute HCl is added.	1.(a) White precipitate is formed. (b) No white precipitate is formed.	1.(a) One of the Gr.-I basic radica may be present. (b) Gr.-I basic radicals are absen
2. Contents in the above test tube is boiled and H_2S gas is pass through it under pressure.	2.(a) A precipitate is obtained. (Colour should be noted) (b) No precipitate is obtained.	2.(a) One of the Gr.-II basic radica may be present. (b) Gr.-II basic radicals are absen
3. To 1 ml. of salt solution in a clean test tube solid NH_4Cl is added till saturation followed by addition of dilute NH_4OH till alkaline.	3.(a) A precipitate is formed. (Colour should be noted) (b) No precipitate is formed.	3.(a) One of the Gr.-III A basi radicals may be present. (b) Gr.-III A basic radicals ar absent.
4. Through the contents of the above test tube H_2S gas is passed under pressure.	4.(a) A precipitate is formed. (Colour should be noted) (b) No precipitate is formed.	4.(a) One of the Gr.-III B basi radicals may be present. (B) Gr.-III B basic radicals ar absent.
5. To 1 ml. of the salt solution taken in a clean test tube solid NH_4Cl is added till saturation followed by addition of dilute NH_4OH till alkaline. To this saturated solution of ammonium carbonate solution is added.	5.(a) A precipitate is formed. (Colour should be noted) (b) No precipitate is formed.	5.(a) One of the Gr.-IV basi radical may be present. (b) Gr.-IV basic radicals ar absent.

ANALYSIS OF GROUP-I BASIC RADICALS :

EXPERIMENT	OBSERVATION	INFERENCE
1. To 1ml. of salt solution in a clean test tube dilute HCl is added. 2. The above precipitate is washed with distilled water and divided into two parts.	1. A white precipitation is formed.	1. One of the Gr.-I basic radic is present.
CONFIRM TEST FOR Pb^{2+} : 1. To part one of the above precipitate distilled water is added and boiled. 2. 1 ml. of solution taken in a clean test tube and it is acidified with acetic acid followed by addition of potassium chromate solution. 3. 1 ml. of salt solution is taken in a clean test tube and to it a little KI solution is added. 4. A little of the above precipitate is taken in a clean test tube and diluted with distilled water and boiled.	1.(a) The precipitate dissolves on heating and reappears on cooling. (b) The precipitation is not soluble one warming. 2. Yellow precipitate is formed. 3. Yellow precipitate is formed. 4. On boiling it becomes yellow solution and on cooling shining yellow plates reappear.	1.(a) Pb^{2+} may be present. (Other test of Pb^{2+} should b performed for its confirmatio (b) Pb^{2+} is absent. (Test for Hg^{+} and Hg^{2+} shou be performed). 2. Pb^{2+} may be present. 3. Pb^{2+} may be present. 4. Pb^{2+} is confirmed.

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR Ag^+ :		
1. To the part-II of the above precipitate of dilute NH_4OH is added and shaken well.	1.(a) The precipitate is soluble. (b) The precipitate is insoluble and turns black.	1.(a) Ag^+ may be present. (Test for Ag^+ should be followed for its confirmation) (b) Hg_2^{2+} may present. (Test for Hg_2^{2+} may be followed for it confirmation)
2. Above solution is acidified with dilute HNO_3.	2. The precipitate reappears.	2. Ag^+ may be present.
3. 1 ml. of salt solution is taken in a clean test tube and potassium chromate solution is added to it.	3. A light red colour precipitate is formed.	3. Ag^+ may be present.
4. The above precipitate is acidified with dilute HNO_3.	4. The precipitate becomes soluble.	4. Ag^+ may be present.
5. 1 ml. of the salt solution is taken in a clean test tube and to it dilute NaOH solution is added drop by drop.	5. Black precipitate is formed on standing.	5. Ag^+ is confirmed.
CONFIRM TEST FOR Hg_2^{2+} :		
1. To 1 ml. of salt solution in a clean test tube dilute HCl is added.	1. A white precipitate is formed.	1. Hg_2^{2+} may be present.
2. To the above precipitate dilute NH_4OH is added and shaken well.	2. The white precipitate turns black.	2. Hg_2^{2+} may be present.
3. 1 ml. of salt solution is taken in a clean test tube and to it stannous chloride solution is added drop by drop.	3. At first white precipitate is	

: ANALYSIS OF GROUP-II A RADICALS :

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR Pb^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube, acidified with dilute HCl and warmed. Then H_2S gas is passed through it under pressure.	1. A black precipitate is formed.	1. Pb^{2+} may be present.
CONFIRM TEST FOR Hg^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube, acidified with dilute HCl and warmed. Then H_2S gas is passed through it under pressure.	1. A black precipitate is formed.	1. Hg^{2+} may be present.
2. 1 ml. of salt solution is taken in a clean test tube and to it one piece of copper turning is added and allow to stand for five minutes.	2. A grey deposite over copper is formed.	2. Hg^{2+} may be present.

EXPERIMENT	OBSERVATION	INFERENCE
3. 1 ml. of salt solution is taken in a clean test tube and stannous chloride solution is added to it drop by drop till in excess.	3. A white precipitate appears at first which turns grey on excess addition of $SnCl_2$.	3. Hg^{2+} is confirmed.
CONFIRM TEST FOR Cu^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube, acidified with dilute HCl and warmed. Then H_2S gas is passed through it under pressure.	1. A black precipitate is formed.	1. Cu^{2+} may be present.
2. 1 ml. of salt solution is taken in a clean test tube and dilute NH_4OH is added to it drop by drop till it excess.	2. A bluish white precipitate appears at first which turns deep blue solution on addition of excess of NH_4OH.	2. Cu^{2+} is confirmed.
CONFIRM TEST FOR Bi^{3+} :		
1. 1 ml. of salt solution is taken in a clean test tube and acidified with dilute HCl and warmed. Then H_2S gas is passed through it under pressure.	1. A dark brown coloured precipitate is obtained.	1. Bi^{3+} may be present.
2. A test tube full of water is taken and a drop of the salt solution is added to it.	2. White precipitate is formed which settles down the test tube.	2. Bi^{3+} is present.
3. H_2S gas is passed through the above test tube under pressure.	3. Brown precipitate is formed.	3. Bi^{3+} is confirmed.

: ANALYSIS OF GR.-II B RADICALS :

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR As^{3+} :	1. Yellow precipitate is obtained.	1. As^{3+} may be present.
1. 1 ml. of salt solution is taken in a clean test tube, acidified with dilute HCl and warmed. Then H_2S gas is passed under pressure.		
2. To the contents of the above test tube yellow ammonium sulphide is added.	2. The precipitate become soluble.	2. As^{3+} is present.
3. Dilute HCl is added to the above test tube.	3. The yellow precipitate reappears.	3. As^{3+} is confirmed.

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR Sb^{3+} :		
1. 1 ml. of salt solution is taken in a clean test tube, acidified with dilute HCl and warmed. Then H_2S gas is passed under pressure.	1. Orange coloured precipitate is obtained.	1. Sb^{3+} may be present.
2. A test tube fill of water is taken in a clean test tube and a drop of the solution is added to it.	2. White turbidity appears which settles down the test tube.	2. Sb^{3+} is confirmed.
CONFIRM TEST FOR Sn^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube, acidified with dilute HCl and warmed. Then H_2S gas is passed under pressure.	1. Dirty yellow coloured precipitate is obtained.	1. Sn^{2+} may be present.
2. 1 ml. of salt solution is taken in a clean test tube and dilute NaOH is added to drop by drop till in excess.	2. White precipitate is formed at first, which becomes soluble on excess addition of dilute NaOH.	2. Sn^{2+} is present.
3. 1 ml. of salt solution is taken in a clean test tube and Mercuric chloride solution is added to it drop by drop and the content is warmed slightly.	3. A grey precipitate is obtained.	3. Sn^{2+} is confirmed.

: ANALYSIS OF GR.-III A BASIC RADICALS :

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR Fe^{3+} :		
1. 1 ml. of salt solution is taken in a clean test tube and solid NH_4Cl is added to it till saturation. Then dilute NH_4OH is added till alkaline.	1. Reddis brown precipitate is obtained.	1. Fe^{3+} may be present.
2. 1 ml. of salt solution is taken in a clean test tube and acidified by adding two drops of conc. HNO_3 and boiled. Then it is divided into two parts. To the part-I : Ammonium thiocyanate solution is added. To the part-II : Potassium ferro cyanide solution is added.	2.(a) Blood red colouration is obtained. (b) Prussian blue colour precipitate is formed.	2. Fe^{3+} is comfirmed.

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR Al^{3+} : 1. 1 ml. of salt solution is taken in a clean test tube and solid NH_4Cl is added to it till saturation. Then dilute NH_4OH is added till alkaline. 2. 1 ml. of salt solution is taken in a clean test tube and dilute NaOH is added to it drop by drop till in excess.	1. Gelatinous white precipitate is formed. 2. Gelatinous white precipitate is first formed which is soluble with excess of NaOH.	1. Al^{3+} may be present. 2. Al^{3+} is comfirmed.
CONFIRM TEST FOR Cr^{3+} : 1. 1 ml. of salt solution is taken in a clean test tube and solid NH_4Cl is added to it till saturation. Then dilute NH_4OH is added till alkaline. 2. 1 ml. of salt solution is taken in a clean test tube and dilute NaOH is added followed by three dorps of Bromine water and boiled. 3. The content in the above test tube are cooled and a little acetic acid is added followed by addition of lead acetate solution to it.	1. Greenish white precipitate is obtained. 2. A yellow solution is obtained. 3. A yellow precipitate is obtained.	1. Cr^{3+} may be present. 2. Cr^{3+} may be present. 3. Cr^{3+} is confimred.

: ANALYSIS OF GR.-III B BASIC RADICALS :

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR Zn^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube and solid NH_4Cl is added to it till saturation followed by addition of dilute NH_4OH is added till alkaline. Then H_2S gas is passed through it under pressure.	1. White precipitate is obtained.	1. Zn^{2+} may be present.
2. 1 ml. of salt solution is taken in a clean test tube and to it dilute NaOH is added drop by drop till in excess.	2. White precipitate is first formed which is soluble with excess of NaOH.	2. Zn^{2+} is comfirmed.

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR Mn^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube and solid NH_4Cl is added to it till saturation followed by addition of dilute NH_4OH is added till alkaline. Then H_2S gas is passed through it under pressure.	1. Light brown coloured precipitate is obtained.	1. Mn^{2+} may be present.
2. 1 ml. of salt solution is taken in a clean test tube and two drops of con. HNO_3 is added to it and boiled. Then a little sodium bismuthate is added.	2. Pink coloured solution is obtained.	2. Mn^{2+} is comfirmed.
CONFIRM TEST FOR Ni^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube and solid NH_4Cl is added to it till saturation followed by addition of dilute NH_4OH is added till alkaline. Then H_2S gas is passed through it under pressure.	1. A black precipitate is formed.	1. Ni^{2+} may be present.
2. 1 ml. of salt solution is taken in a clean test tube and two drops of dimethyl glyoxime reagent is added followed by addition of excess dilute NH_4OH.	2. Red precipitate is formed.	2. Ni^{2+} is comfirmed.
CONFIRM TEST FOR Co^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube and solid NH_4Cl is added to it till saturation followed by addition of dilute NH_4OH is added till alkaline. Then H_2S gas is passed through it under pressure.	1. A black precipitate is formed.	1. Co^{2+} may be present.
2. 1 ml. of salt solution is taken in a clean test tube and three drops of KCl solution is added to it followed by addition of solid sodium nitrite and dilute acetic acid.	2. Yellow precipitate is formed.	2. Co^{2+} is comfirmed.

: ANALYSIS OF GR.-IV BASIC RADICALS :

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR Ba^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube and solid NH_4Cl is added till saturation, followed by addition of dilute NH_4OH till alkaline. Then saturated solution of $(NH_4)_2CO_3$ is added to it.	1. A white precipitate is obtained.	1. Ba^{2+} may be present.
2. A little of the above precipitate is taken in a clean test tube and to it 1 ml. of dilute acetic acid is added and warmed. Then potassium chromate solution is added.	2. Yellow precipitate is formed.	2. Ba^{2+} is confirmed.
CONFIRM TEST FOR Sr^{2+} :		
1. 1 ml. of sait solution is taken in a clean test tube and solid NH_4Cl is added till saturation, followed by addition of dilute NH_4OH till alkaline. Then saturated solution of $(NH_4)_2CO_3$ is added to it.	1. A white precipitate is obtained.	1. Sr^{2+} may be present.
2. A little of the above precipitate is taken in a clean test tube and 1 ml. of dilute acetic acid is added to it. Then ammonium sulphate solution is added to it.	2. White precipitate is formed.	2. Sr^{2+} is confirmed.
CONFIRM TEST FOR Ca^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube and solid NH_4Cl is added till saturation, followed by addition of dilute NH_4OH till alkaline. Then saturated solution of $(NH_4)_2CO_3$ is added to it.	1. A white precipitate is obtained.	1. Ca^{2+} may be present.
2. A little of the above precipitate is taken in a clean test tube and 1 ml. of dilute acetic acid is added to it. Then ammonium Oxalate solution is added followed addition of dilute NH_4OH.	2. White precipitate is formed.	2. Ca^{2+} is confirmed.

: ANALYSIS OF GR.-V BASIC RADICALS :

EXPERIMENT	OBSERVATION	INFERENCE
CONFIRM TEST FOR NH_4^+ :		
1. 1 ml. of salt solution is prepared in a clean test tube and to it five drops of NaOH solution is added followed by addition of a little Nessler's reagent.	1. A brown precipitate is formed.	1. NH_4^+ is confirmed.
CONFIRM TEST FOR Mg^{2+} :		
1. 1 ml. of salt solution is taken in a clean test tube and to it solid NH_4Cl is added till saturation. Then dilute NH_4OH is added till alkaline and disodium hydrogen phosphate solution is added to it.	1. A white precipitate is formed.	1. Mg^{2+} may be present. (Confirmatory test should be perfomed)
2. 0.5 ml. of salt solution is taken in a clean test tube and it is acidified with dilute HCl followed by addition of Magneson reagent.	2. Gelatinous blue precipate is obtained.	2. Mg^{2+} is confirmed.
CONFIRM TEST FOR Na^+ :		
1. 1 ml. of salt solution is taken in a clean test tube and to it potassium pyroantimonate solution is added.	1. A white precipitate is formed.	1. Na^+ is confirmed.
CONFIRM TEST FOR K^+ :		
1. 1 ml. of salt solution is taken in a clean test tube and two drops of cobalt nitrate solution is added to it. Then solid sodium nitrite is added to it followed by addition of acetic acid. The mixture is allowed to stand for five miniutes.	1. Yellow precipitate is formed.	1. K^+ is confirmed.

ASIGNMENT QUESTIONS

1. Define qualitative analysis ?
2. Why a salt containing lead turn black in colour, when placed for a long time in laboratory ?

3. How is dry heating test performed & what information you get if the residue changes to yellow when hot ?
4. If the residue in dry heating test is white, name the radicals which are absent.
5. Write down the importance of preliminary tests in qualitative analysis.
6. How charcoal cavity test is performed ?
7. Which flame is used in charcoal cavity test & how it is obtained ?
8. In the flame test, sodium imparts yellow colour to the flame while magnesium does not impart any colour, why ?
9. Why do we use concentrated HCl in preparing a paste of the salt for flame test ?
10. What is Nessler's Re-agent ?
11. Write down the acid radicals detected by concentrated Hydrosulphuric acid.
12. How will you test the presence of carbonate ?
13. How do you test for sulphide ?
14. How is ring test performed for Nitrates ?
15. Why does Iodine give a blue colour with starch solution ?

WRITTING SPACE FOR ASSIGNMENT