SUBJECT - *CHEMISTRY* | SUB. CODE - 41

INSTRUCTIONS FOR PRACTICAL EXAMINATION - 2022

1- The practical record book should be collected from the candidate before the commencement of the examination.

2- Candidates should not be allowed to use calculator and consult books.

3- The candidates should be instructed not to use pencil and there no rubber or any other eraser. The correction, if any, made by the candidate must be duly initialled by the examiner. A change in reading or over writing without the initial of the examiner can be considered as a case of unfairmeans.

4- The candidates should be instructed not to waste their time in drawing diagrams or writing the procedure in the volumetric exercise as no marks are alloted for these.

5- Marking-scheme should be explained to the candidates.

6- The distribution of seat unknown solution, Salt and organic compounds will be done by lot drawn by the candidate himself. In this procedure, it is just possible that two adjacent candidates may get the same solution, Salt or organic compound.

7- In any batch not more than two candidates should be given the same Inorganic mixture and question no. 3 should be different for every student in a batch. If the number of students are up to ten in a batch then every student should be given different Inorganic mixture.

8- Three unknown solutions of different strengths should be prepared for distribution for each batch irrespective of the number of candidates to be examined in that batch. Different volumetric exercise as given in the question paper should be set for each batch and be repeated as far as possible only after all exercises are over.Any deviation, wherever, necessary from this instruction should be reported to the Board.

9- The examiner should properly fill correct result and marks in the illustrated proforma for distribution of exercise and submit it with the assessed answer-books. In the answer-books, the correct result must be written for each exercise.

10- Marks should be awarded for every step as per marking scheme and total be circled for each exercise.

11- If the marks are awarded more than 28 and below than the reason must be given to the board in examiner's report.

12- The distribution of marks for the practical examination shall be as follows:-

Min. Pass Marks - 10

Time : 3 Hrs. **Max. Marks - 30**

Exercise

(a)	Volumetric exercise	10 marks
(b)	Analysis of Inorganic salt containing one anion and one cation	6 marks
(c)	(i) Identification of Functional group in a given organic compound (ii) Test for Protein, fat, carbohydrate from food stuff (iii) Preparation of any one Inorganic compound from the following potash allum or ferrous ammonium sulphate	4 marks
(d)	Content based any one experiment	5 marks
(e)	Practical record book	3 marks
(f)	Viva-voce	2 marks
	Total	**30 marks**

13- Volumetric Exercise **10 marks**

The marking shall be as follows :-

(1) Proper use of glasswares 2

(2) Correct observation table including name of solution used and writing their volumes using significant figure concept. 2

(3) Complete balanced equation for the chemical reaction involved including ionic reaction 1+1=2

(4) Use of correct formula and calculations. (If all steps of calculation are not correct than ½ mark should be deducted out of 2). 1+2=3

(5) Correct Result up to 1.0% error (If more than 1.0 % error 0(Zero) should be awarded out of one). 1

14- **Qualitative Inorganic Salt** **6 Marks**

It shall contain one anion and one cation soluble in water or hydrochloric acid. **Insolubles are to be excluded.**

Marking scheme for Inorganic Salt :-

(A) For anion

(i) Preliminary identification in the group. 1½

(ii) Confirmatory test. 1½

TOTAL **3**

(b) For Cation -

(i) Systematic identification of group of cation. 1½

(ii) Systematic confirmatory tests. 1½

TOTAL **3**

15 **Identification of Functional Group** **4 marks**

Monofunctional organic compound should be given for the identification of functional group

Distribution of marks :

(i) Reporting Physical Characteristics of the Compound (Solid/Liquid, Colour, Smell and also nature of organic compound i.e. acidic/ alkaline/ neutral/phenolic). ½

(ii) Reporting Aliphatic or Aromatic. ½

(iii) Detection of Nitrogen element and its systematic reporting. ½

(iv) Correct test for the given functional group and its systematic reporting 1½

(v) Correct identification of the functional group and writing its structural formula. ½ + ½ = 1

Total = 4

or Food test 4 marks

Physical characteristics 1 mark

Confirmatory test 2 marks

Correct identification 1 mark

or Inorganic preparation 4 marks

(i) Principle 1 mark

(ii) Synthesis method 1½ marks

(iii) M.P. / B.P. ½ mark

(iv) yield 1 mark

16- **Content based experiment** **5 marks**

(i) Principle 1 mark

(ii) Method and Observation 3 marks

(iii) Result 1 mark

17- **Practical record-book** **3 marks**

The record of the candidates should be duly signed with date by the teacher.

For the experiments performed by a candidate during the session, marks should be awarded as follows :

No. of experiments 20 : 2 marks

No. of experiments less than 20 : 1 mark

No. of experiments less than 10 : 0 mark

18- **Viva-voce -** **2 marks**

As far as possible,at least four questions should be asked on the work set for the examination so as to ascertain whether the candidate understands the chemistry involved.

19- Reasons for deviation from any of the instructions should be recorded in writing and should be reported to the board.

प्रश्न पत्र प्रारूप

समय : 4 घण्टे | पूर्णांक : 30

Exercise - 1. | 10

(i) आपको $\frac{M}{30}$ मोलरता का क्रिस्टलीय फैरस अमोनियम सल्फेट का मानक विलयन दिया गया है। इस विलयन की सहायता से दिए गए पोटैशियम परमैगनेट विलयन की सान्द्रता ग्राम प्रति लीटर में ज्ञात कीजिए।

Find out the concentration of given potassium permangnate solution in gram per litre. For this purpose you are provided a standard solution of crytalline famous ammonium sulphate of $\frac{M}{30}$ molarity.

Or

(ii) आपको 13.0666 ग्राम प्रतिलीटर सान्द्रता का क्रिस्टलीय फैरस अमोनियम सल्फेट का मानक विलयन दिया गया है। इस विलयन की सहायता से दिए गए पोटैशियम परमैगनेट विलयन की मोलरता ज्ञात कीजिए।
Find out the molarity of potassium permangnate solution. For this purpose you are provided a standard solution of crystalline famous ammonium sulphate containing 13.0666 grams of salt per litre.

Or

(iii) आपको $\frac{M}{30}$ मोलरता का क्रिस्टलीय फैरस अमोनियम सल्फेट का मानक विलयन दिया गया है। इस विलयन की सहायता से अशुद्ध पोटैशियम परमैंगनेट ($KMnO_4$) के नमूने की प्रतिशत शुद्धता ज्ञात कीजिए। जिसके एक लीटर विलयन में 2.0 ग्राम पोटैशियम परमैगनेट घुला हुआ है।
Find out the percentage purity of impure potassium permangnate $KMnO_4$ sample 2.0 grams of which have been dissolved in one litre solution. For this purpose you are provided a standard solution of crystalline Ferrous ammonium sulphate of $\frac{M}{30}$ molarity.

Or

(iv) आपको 19.6000 ग्राम प्रतिलीटर सान्द्रता का क्रिस्टलीय फैरस अमोनियम सल्फेट का मानक विलयन दिया गया है। इस विलयन की सहायता से दिए गए पोटैशियम परमैंगनेट विलयन की मोलरता ज्ञात कीजिए।
Find out the molarity of potassium permangnate solution. For this purpose you are provided a standard solution of crystalline Ferrous ammonium sulphate containing 19.6000 grams of salt per litre.

Or

(v) आपको $\frac{M}{40}$ मोलरता का क्रिस्टलीय ऑक्सेलिक अम्ल का मानक विलयन दिया गया है। इस विलयन की सहायता से दिए गए पोटैशियम परमैंगनेट विलयन की सान्द्रता ग्राम प्रति लीटर में ज्ञात कीजिए।

Find out the concentration of potassium permangnate solution in gram per litre. For this purpose you are provided a standard solution of crytalline oxalicacid of $\frac{M}{40}$ molarity.

Or

(vi) आपको $\frac{M}{30}$ मोलरता का क्रिस्टलीय ऑक्सेलिक अम्ल का मानक विलयन दिया गया है। इस विलयन की सहायता से दिए गए अशुद्ध पोटैशियम परमैगनेट नमूने की प्रतिशत शुद्धता ज्ञात कीजिए।

Find out the percentage purity of impure of potassium permangnate sample 2.5 grams of which have been dissolved in one litre solution oxalic acid of $\frac{M}{30}$ molarity.

2. लवण का एक ऋणायन तथा एक धनायन के लिये क्रमबद्धता के साथ विश्लेषण कीजिए।
To analyse systematically the given salt for one anion and one cation. 6

3. दिए गए कार्बनिक यौगिक में क्रियात्मक समूह का परीक्षण कीजिए एवं समूह पहचानिए।
Test and identify the functional group in a given organic compound. 4

Or

दिए गए खाद्य पदार्थों में कार्बोहाइड्रेट / वसा / प्रोटीन की उपस्थिति का परीक्षण कीजिए।
To detect the presence of carbohydrate / fat / protein in the given food stuff.

Or

फेरस अमोनियम सल्फेट अथवा पोटाश ऐलम में से कोई एक अकार्बनिक यौगिक का विरचन कीजिए।
To prepare any one inorganic compound either ferrous ammonium sulphate or potash alum.

4. विषयवस्तु आधारित एक प्रयोग (प्रत्येक बैच में अधिकत्तम तीन विद्यार्थियों के समूह में एक पृथक प्रयोग)
Content based any one experiment (Separate experiment for group of maximum three students in each batch) 5

5. प्रायोगिक अभिलेख पुस्तिका (Practical record book) 3

6. मौखिक प्रश्न (Viva-voce) 2

GENENAL INSTRUCTIONS :-

1- The Number of candidate in every batch should be 10-20. It may variate according to lab capacity.

2- The following articles should be provided at each seat :-

250ml. beaker (1), 400 ml. beaker (1) 2" funnel (1), test tube stand (1), boiling tubes (2), 8" long, glass rod (2), Glass tube 8" long (1), wiregauze (1) bunsen burner or spirit lamp (1), spatula (1), charcoal block (1), mouth blow pipe (1), pipette 20ml (1), filter papers round (6), Burette stand (1), 100 ml. conical flask (1), 250 ml. conical flask (1), glazed tile(1), wash bottle (1), tripod stand (1), test tubes (6), burette 50ml. (1), tongs (1), china dish (1), Ignition tubes and Platinum wire, water bath.

3- Volumetric exercise : The following provision should be made :

Stock of solutions of each crystalline oxalic acid, sodium hydroxide, sodium carbonate, hydrochloric acid, crystalline ferrous sulphate, crystalline ferrous ammonium sulphate, potassium permangnate, potassium dichromate. Indicator solution - phenolphthalein, methyl orange N-phenyl anthranilic acid. The strength of the solutions should not differ as far as possible by more than 10% either way In a batch of 20 candidate, Three solutions whose strength is to be determind shall be prepared for volumetric exercise. Necessary articles for each candidate in a batch are -

250ml. conical flasks, marked (A)	2
100ml. conical flasks, marked (B)	2
Winchester bottles of 2 to 3 litres, marked 'A'	3
Winchester bottles of 2 to 3 litres, marked 'B'	3
250ml. graduated cylinders	2
Graduated cylinder 50ml., 100ml.	1
Buckner Funnel	1

4- Qualitative analysis - The following provision should be made :

(a) Kipp's appratus (2) for a batch of 20 candidates.

Mortar and Pastle for grinding mixture, Spatulas, Glasstubes corks, etc.

(b) Acids and required pretested laboratory reagents for organic and inorganic analysis.

(c) Salts sufficient in number to cover all the ions prescribed in the syllabus and to provide different salts to each candidate in the batch. Purity of these chemicals should be pre-tested by the teacher incharge of the laboratory and grinded thoroughly before giving the salt.

(d) Adequate gas supply and proper sanitary arrangements.

5- Batch-wise typed lists of the names of the candidates in alphabetic order as per nominal rolls provided by the Board.

6- Following compounds and reagents should be made available :

Oxalic acid, Benzoic acid, formic acid, ethylalcohol, methyl alcohol, phenol, 10% alkaline β-naphthol, formaldehyde, benzaldehyde, acetone, acetophenone, fructose, glucose, sucrose, ethyl accetate, nitrobenzene, aniline, acetamide, urea, cerric- ammonium nitrate, ferric chloride, sodium nitrate, 2,4-dinitrophenyl hydrazine, Schiff's reagent, Zinc dust, β-naphthol, potassium-iodide, starch, copper sulphate, sodium-thiosulphate, magnesium sulphate, magnesium acetate, ferrous ammonium sulphate, potassium dichromate, sodium nitroprusside, Nickel foil or porcelain piece, Molisch reagent, Tollen's reagent, Fehling 'A' and 'B' Benedict solution, Protien source and fat source, acetic anhydride, acetanilide, aluminium chloride, gum.

INSTRUCTION TO THE CANDIDATES FOR CHEMISTRY PRACTICAL

1. Candidates should report half an hour before the commencement of the examination.
2. Candidates should bring their practical record book with them.
3. During examination a candidate may leave the laboratory only with the permission of the examiner.
4. Consultation of any notes, books, or mutual talking during examination accounts to unfairmeans, if there is any difficulty, they should consult the examiner.
5. Candidates should write down the question-paper carefully in their answerbook and required observations be recorded in the answer-book directly. No recording should be done elsewhere.
6. Any change in the observations be made only by the permission of the examiner Overwriting should be avoided.
7. Candidates should get concordant reading checked and initialled by the examiner, they must calculate the result up to the fourth place of decimal calculations should be done in the answer book. Diagrams or writing procedure in the volumetric exercise carries no marks.
8. Candidates must show the yield of Inorganic compound prepared and also melting or boiling point of prepared compound.
9. Correct test of protein / carbohydrate / fat must be shown to the examiner.

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Experiment No. - 1

★ **Object :-**
Find out percentage purity of impure sol" of crystalline ferrous ammonium sulphate given in bottle 'B', which is prepared by dissolving 14.0 gm impure sample in one litre for. This purpose standard solution of crystalline ferrous ammonium sulphate is given in bottle 'A' having concentration 13.0666 gm per litre, intermediate solution is potassium permagnate.

★ **Apparatus :-**
Burette, Pipette, Conical Flask, funnel, wash bottle

★ **Principle :-**
$KMnO_4$ is a strong oxidising agent in acidic medium. Ferrous ammonium sulphate is a reducing agent. $KMnO_4$ is an auto indicator which gives a light pink colour at end point.

★ **Chemical Reaction :-**
Molecular Reaction

Reducing half Reaction

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$$

Teacher's Signature _____

★ Calculations:

(a) Calculation of the molarity of FAS

$$\text{Molarity} = \frac{\text{Conc. of FAS in gm per litre}}{\text{molar mass}}$$

$$= \frac{13.0666}{392} \text{ M}$$

(b) Calculations of molarity of intermediate $KMnO_4$ solution

$$M_1V_1 = 5M_2V_2$$

M_1 = Molarity of standard FAS = $\frac{13.0666}{392}$ M

V_1 = Volume of standard FAS = 20ml

M_2 = Molarity of intermediate solution = ?

V_2 = Volume of intermediate solution = 23.6

$$M_2 = \frac{M_1V_1}{5V_2}$$

$$= \frac{13.0666 \times 20}{392 \times 5 \times 20} \text{ M}$$

(c) Calculation of molarity of unknown FAS solution

$$M_3V_3 = 5M_4V_4$$

M_3 = Molarity of unknown FAS = ?

V_3 = Volume of unknown FAS = 20ml

M_4 = molarity of intermediate solution

$$M_2 = \frac{13.0666 \times 20}{392 \times 5 \times 18.7} \text{ M}$$

V_4 = Volume of intermediate solution = 22.4

$$M_3 = \frac{5}{20} \times \frac{13.0666}{392} \times \frac{20}{5} \times \frac{22.4}{23.6} \text{ M}$$

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Oxidation half Reaction

$2FeSO_4(NH_4)_2SO_4 \cdot 6H_2O + H_2SO_4 + O \longrightarrow Fe(SO_4)_3 + 2(NH_4)_2SO_4$

Final Reaction

$2KMnO_4 + 10FeSO_4(NH_4)_2SO_4 \cdot 6H_2O + 8H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 5Fe_2(SO_4)_3 + 10(NH_4)_2SO_4 + 68H_2O$

★ Ionic Reaction

Reduction half reaction

$MnO_4^- + 8H^+ + 5e^- \longrightarrow Mn^{2+} + 4H_2O$

Oxidation half reaction

$5Fe^{2+} \longrightarrow 5Fe^{3+} + 5e^-$

Complete reaction

$MnO_4^- + 5Fe^{2+} + 8H^+ \longrightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O$

★ Observation :-

(A) Titration of known solution V/S intermediate solution

S.No.	Volume of known FAS solution (V) (ml)	Burette Reading		Vol. of $KMnO_4$ sol^n used (b-a) ml	Concordant Reading V_2 ml
		Initial (a)	Final (b)		
1.	20 ml	0.0 ml	23.8 ml	23.8 ml	
2.	20 ml	0.0 ml	23.6 ml	23.6 ml	23.6 ml
3.	20 ml	0.0 ml	23.6 ml	23.6 ml	

Teacher's Signature _____

Concentration of FAS gm/litre = Molarity of FAS x molar mass of FAS

$$= \frac{5}{20} \times \frac{13.0666}{392} \times \frac{20}{5} \times \frac{22.4}{23.6} \times 392$$

$$= 13.7669\ C^{-1}$$

(d) Calculation the % purity of unknown FAS

$$\% \text{ purity} = \frac{\text{Calculated conc}^{n} \text{ of FAS}}{\text{Given conc of FAS}} \times 100$$

$$= \frac{13.766}{14.0} \times 100 = 98.33\%$$

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(B) Titration of unknown solution V/s Intermediate sol^n

S.No.	Volume of unknown FAS solution (V3) (ml)	Burette Reading		Volume of $KMnO_4$ sol^n used (b-a) ml	Concordant Reading (V_4) ml
		Initial (a)	Final (b)		
1.	20ml	0.0ml	23.0	23.0	
2.	20ml	0.0ml	22.4	22.4	22.4ml
3.	20ml	0.0ml	22.4	22.4	

* Result :-

The percentage purity of the given sample of FAS is 98.33%.

Teacher's Signature

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Experiment No- 2

* **Object :-**
Find out the concentration of unknown oxalic acid solution in gram per litre given in bottle 'B'. For this purpose standard solution of crystalline oxalic acid having concentration 2.1013 gram per 500 ml is given. Intermediate solution potassium permagnate.

* **Apparatus :-**
Burette, Pipette, conical flask, funnel, wash bottle, burner etc.

* **Principle :-**
$KMnO_4$ is a strong oxidising agent in acidic medium. Oxalic acid is a reducing agent. This is a redox titration. $KMnO_4$ is an auto indicator which gives a light pink colour at the end point.

* **Chemical Reactions :-**
Molecular Reaction

Reduction half reaction

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5(O)$$

Oxidation half Reaction

$$[H_2C_2O_4 + [O] \longrightarrow 2CO_2 + H_2O] \times 5$$

Teacher's Signature _____

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Final Reaction

$2KMnO_4 + 3H_2SO_4 + 5H_2C_2O_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 8H_2O + 10CO_2$

★ Ionic Equations :-

Reduction half reaction

$[MnO_4^- + 5e^- + 8H^+ \longrightarrow Mn^{2+} + 4H_2O] \times 2$

Oxidation half reaction

$[C_2O_4^{2-} \longrightarrow 2CO_2 + 2e^-] \times 5$

Overall reaction

$2MnO_4^- + 5C_2O_4^{2-} + 16H^+ \longrightarrow 2Mn^{2+} + 10CO_2 + 8H_2O$

$KMnO_4$ is decolourized in the beginning due to reduction by oxalic acid. The oxalate ions are exhausted at the end dusp and one drop in excess of $KMnO_4$ turns the solution light pink. This reaction takes plac at slightly high temperature turns and so the solution is heated to about 50°C.
The $MnSO_4$ or the Mn^{2+} ion formed in the reaction works as catalyst. The reaction is slow in beginning and becomes fast as the reaction proceeds.

★ Observation :-

(A) Titration of known solution V/s intermediate solution.

Teacher's Signature _____

* Calculations :-

(a) Calculation of molarity of standard oxalic acid solution

Molarity = $\frac{\text{Concentration in gm per litre}}{\text{molar mass of oxalic acid}}$

= $\frac{2.1013 \times 2}{126}$ * M

(b) Calculation of molarity of intermediate solution

$2M_1V_1 = 5M_2V_2$

M_1 = Molarity of known oxalic acid = $\frac{2.1013 \times 2}{126}$ M

V_1 = Volume of known oxalic acid = 20 ml

~~= 2.1013 x 2~~

M_2 = Molarity of intermediate solution = ?

V_2 = Volume of intermediate solution = 18.6

$M_2 = \frac{2M_1V_1}{5V_2}$ = ~~5M4V4~~ $\frac{2.1013 \times 2 \times 2 \times 20}{126 \times 5 \times 18.6}$

(c) Calculation of molarity of unknown oxalic acid solution

$2M_3V_3 = 5M_4V_4$

M_3 = molarity of unknown oxalic acid = ?

V_3 = Volume of unknown oxalic acid = 20ml

M_4 = Molarity of intermediate ~~K~~ $KMnO_4$ = ~~17.6~~ M_2

V_4 = Volume of intermediate $KMnO_4$ = 17.6

$M_3 = \frac{5M_4V_4}{2V_3} = \frac{5 \times 2 \times 2 \times 2.1013 \times 20}{2 \times 126 \times 5 \times 20 \times 17.6}$ M

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S.No	Volume of known oxalic acid (V_1) ml	Burette Reading		Volume of $KMnO_4$ used (b-a) ml	Concordant Reading (V_2) ml
		Initial (a)	Final (b)		
1.	20ml	0.0ml	18.8	18.8	
2.	20ml	0.0ml	18.6	18.6	18.6 ml
3.	20ml	0.0ml	18.6	18.6	

(B) Titration of unknown solution v/s intermediate solution

S.No	Volume of unknown oxalic acid (V_3) ml	Burette Reading		Volume of $KMnO_4$ used (b-a) ml	Concordant Reading (V_4) ml
		Initial (a)	Final (b)		
1.	20ml	0.0ml	17.8	17.8	
2.	20ml	0.0ml	17.6	17.6	17.6 ml
3.	20ml	0.0ml	17.6	17.6	

Teacher's Signature _____

(d) Concentration of unknown Oxalic acid = molarity × molar mass

$$= \frac{5 \times 2 \times 2 \times 2.1013 \times 17.6}{2 \times 126 \times 5 \times 20 \times 18.6} \times 126$$

$$\text{Conc.} = \frac{2.1013 \times 2}{18.6} \times 176 = 3.97 \text{ gm } L^{-1}$$

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* Result :-

The concentration of unknown oxalic acid in bottle B is 397 $gm L^{-1}$.

Teacher's Signature _____

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Experiment No. - 3

* **Object :-**
Find out the Concentration of unknown solution of oxalic acid in gram per litre in bottle 'B'. For this purpose standard solution of crystalline oxalic acid is given in bottle 'A' having molarity M. Intermediate solution is sodium hydroxide. [Indicator Phenophtalein]

* **Apparatus :-**
Burette, Pipette, Conical flask, Burette stand, Funnel, Wash bottle etc.

* **Principle :-**
This is an acid - base titration. The known and the unknown solution are same so this is a double titration in which NaOH solution is an intermediate solution. Phenophtalein is the indicator which is colourless in acid and pink in base.

* **Chemical Reactions :-**
Molecular reaction

$$H_2C_2O_4 + 2NaOH \longrightarrow Na_2C_2O_4 + 2H_2O$$

* **Ionic Reactions :-**

$$2H^+ + 2OH^- \longrightarrow 2H_2O$$

Teacher's Signature _____

★ Calculations :-

(a) Determination of the molarity of the intermediate NaOH solution

$$2M_1V_1 = M_2V_2$$

M_1 = Molarity of the known oxalic acid solution = $\frac{M}{30}$

V_1 = Volume of known oxalic acid solution = 20 ml

M_2 = Molarity of the intermediate solution = ?

V_2 = Volume of the intermediate solution

$$M_2 = \frac{2M_1V_1}{V_2} = \frac{2 \times M}{30} \times$$

(b) Determination of molarity of unknown oxalic acid solution

$$2M_3V_3 = M_4V_4$$

M_3 = molarity of unknown oxalic acid = ?

V_3 = Volume of unknown oxalic acid = 20 ml

M_4 = Molarity of the intermediate solution = M_2

V_4 = Volume of intermediate solution

$$M_3 = \frac{M_4V_4}{2V_3} = \frac{2}{2} \times \frac{M}{30} \times 20 \times \frac{\quad}{20} \times 126$$

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★ Observation :-

(A) Titration of known solution V/s intermediate solution

S.No.	Volume of standard oxalic acid solution by pipette (V_1) ml	Burette Reading		Volum of NaOH solution (b-a) ml	Concordant reading (V_2) ml
		Initial (a)	Final (b)		
1.	20ml	0.0 ml			
2.	20 ml	0.0 ml			
3.	20 ml	0.0 ml			

(B) Titration of Unknown solution V/s intermediate solution

S.No.	Volume of unknown oxalic acid sol^n. taken by pipette (V_3) ml			Volum of NaOH solution (b-a) ml	Concordant Reading (V_2) ml
		Initial (a)	Final (b)		
1.	20 ml	0.0 ml			
2.	20 ml	0.0 ml			
3.	20 ml	0.0 ml			

★ Result :-

Concentration of the unknown oxalic acid solution given in bottle 'B' is.

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Experiment No. - 4

★ **Object :-**
Find out the molarity of unknown solution of sodium Carbonate given in bottle 'B'. For this purpose standard solution of crystalline sodium carbonate is given in bottle 'A' having molarity M/20. Intermediate solution is hydrochloric acid. [Indicator - Methyl orange]

★ **Apparatus :-**
Burette, Pippette, conical flask, Burette stand, Funnel, wash bottle etc.

★ **Principle :-**
This is an acid - base double titration. This is a double titration as both the known and the unknown solutions are same. HCl is the intermediate solution.

★ **Indicator :-**
Methyl orange is indicator which gives light yellow colour in base and red colour in acid.

★ **Chemical Reaction -**
Molecular Reaction

$$Na_2CO_3 + 2HCl \longrightarrow 2NaCl + CO_2 + H_2O$$

★ **Ionic Reaction :**

$$CO_3^{2-} + 2H^+ \longrightarrow H_2O + CO_2$$

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* Calculation :-

(a) To determine the molarity of the intermediate HCl solution

$$2M_1V_1 = M_2V_2$$

M_1 = Molarity of standard solution = M/20

V_1 = Volume of standard solution = 20 ml

M_2 = Molarity of intermediate solution = ?

V_2 = Volume of intermediate solution

$$M_2 = \frac{2M_1V_1}{V_2} = \frac{2 \times M}{20} \times 20$$

(b) To determine the molarity of the unknown sodium carbonate solution.

M

$$2M_3V_3 = M_4V_4$$

M_3 = Molarity of unknown solution = ?

V_3 = Volume of the unknown solution = 20 ml

M_4 = Molarity of the intermediate solution = M_2

V_4 = Volume of the intermediate solution

$$M_3 = \frac{M_4V_4}{2V_3} = \frac{2}{2} \times \frac{1}{20} \times 20 \times \frac{\quad}{20} M$$

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* Observations :-

(A) Titration of known solution V/s intermediate solution

S.No.	Volume of known Na_2CO_3 sol^n taken by pipette (V_2) ml	Burette Reading		Volume of HCl sol^n used (b-a) ml	Concordant Reading V_2 (ml)
		Initial (a)	Final (b)		
1.	20 ml	0.0 ml			
2.	20 ml	0.0 ml			
3.	20 ml	0.0 ml			

(B) Titration of unknown solution V/s Intermediate solution

S.No.	Volume of unknown Na_2CO_3 sol^n taken in pipette V_3 (ml)	Burette Reading		Volume of HCl sol^n used (b-a) ml	Concordant Reading V_2 (ml)
		Initial (a)	Final (b)		
1.	20 ml	0.0 ml			
2.	20 ml	0.0 ml			
3.	20 ml	0.0 ml			

* Result :-

The molarity of the sodium carbonate solution given in bottle 'B' is .

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Experiment No - 5

* **AIM**: Analyse the given mixture of inorganic salts (by dry and wet test) containing two cation and two anions.

* **Apparatus**: Test tube, holder, spirit lamp, filter paper, stand.

* **Observation**:
(i) Colour - white
(ii) Solubility - sparingly soluble
(iii) Test with heat - white pale residue with NH_3

S.No	Treatment	Observations	Interference
	Test for acidic radicals		
(1)	Mixture + dil H_2SO_4	reddish brown gas with pungent smell is evolved	In week group NO_2^- may be present.
	Confirmatory Test		
	To sodium carbonate extract, add dil H_2SO_4 + Freshly prepared $FeSO_4$.	The sol. colour changed to black	
	Bring filter paper wetted with dil H_2SO_4 + KI + starch sol. to the mouth of the test tube	Filter paper turns blue.	
(2)	Mixture + Conc. H_2SO_4 + heat	Colourless gas with	In strong acidic

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		Pungent smell	1 group, Cl^- may be present.
(g)	Add solid MnO_2 in above test tube	Evolution of greenish yellow gas having pungent smell.	Cl^- may be present
	Confirmatory test		
I	Silver Nitrate test Sodium carbonate extract + dil. HNO_3 + $AgNO_3$ sol^n.	White ppt. is formed which is soluble in excess of NH_4OH	Cl^- is confirmed.
II	Chromyl Chloride test		
(a)	Mixture + Conc. H_2SO_4 + solid $K_2Cr_2O_7$ + Heat	Dark reddish brown gas is evolved.	
(b)	The gas which is evolved is passed in NaOH sol^n.	Sol^n of NaOH is change to Yellow colour	
(c)	To above sol^n add CH_3COOH + $(CH_3COO)_2Pb$ solution	Yellow ppt. is obtained	Cl^- is confirmed
	Test for basic radicals		
	Mixture + NaOH solution heat the solution till smell of ammonia	Colourless gas smelling ammonia	NH_4^+ may be present

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	Confirmatory Test		
(i)	Bring a glass rod dipped in Conc. HCl near the mouth of the test tube	white dense fumes	NH_4^+ ⊕ HCl is confirmed
(ii)	Bring filter paper dipped in Nessler reagent near the mouth of test tube	filter paper turned reddish brown.	NH_4^+ is confirmed
(i)	Original solution + dil. HCl of mixture	white ppt is not obtained	I group is ⊖nt.
(ii)	To above sol^n pass H_2S gas	No ppt form	II group is ⊖nt
(iii)	To above solution, boil off H_2S gas		
(iv)	To the mouth of test tube bring filter paper dipped in lead acetate solution	filter paper not turn back	H_2S is escaped.
(v)	To above solution, add Conc. HNO_3, 2-4 drops + boil + solid NH_4Cl + NH_4OH (excess) solution.	no ppt. is obtained.	IIIrd group is absent
(vi)	To above solution, pass H_2S gas	no ppt is formed.	IVth group is absent.

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(vii)	Boil off the H_2S from sol^n		
(viii)	To mouth of test tube, bring a lead acetate dipped filter paper.	white ppt is formed	H_2S gas is evolved In IInd group Ba^{+2}, Sr^{+2}, Ca^{+2} may be present
(ix)	To above sol^n + NH_4OH + $(NH_4)_2CO_3$ sol^n	white ppt is formed	In Vth group Ba^{+2}, Sr^{+2}, Ca^{+2} may be present
(x)	To above ppt, add acetic acid solution to dissolve the ppt & divide the sol^n into 3 parts		
•	I part + K_2CrO_4	Yellow ppt is not formed.	Ba^{+2} absent
•	II part + $(NH_4)_2SO_4$	white ppt is formed	Sr^{+2} is confirmed
	Dry Test Dip the platinum wire in dil. HCl and ignite it with ppt.	Crimson red flam is obtained	Sr^{+2} is confirmed

* Result :- The above given mixture contain two anion NO_2^- and Cl^- and two cation NH_4^+, Sr^{+2} are present.

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Experiment No. - 6

* **AIM** :- Analyse the given mixture of inorganic salts (by dry and wet test) containing two cations and two anions.

* **Apparatus** :- Test tube, holder, sprit lamp, filter paper, stand.

* **Observations** :-

Colour - Brown, blue

Solubility - water

Test with heat - Green flame with red blue & residue.

S.No	Treatment	Observation	Inference
	Test for Acidic radicals		
(1)	Mixture + dil. H_2SO_4	no reaction	weak acidic grup is absent.
(2)	Mixture + Conc. H_2SO_4	brownish gas with pungent smell	Br^- may be present is strong grup.
	Confirmatory test		
(3)	Silver Nitrate test Na^- Carbonate extract + dil HNO_3 + $AgNO_3$ sol^n.	light yellow ppt. is obtained which is partially soluble in NH_4OH	Br^- is confirmed.

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(4)	Chlorine water test Na carbonate extract + HNO_3 + $CHCl_3$ / CCl_4 + Cl_2 water stirred the solution.	layer of $CHCl_3$ / CCl_4 is changed to brownish	Br^- is confirmed
(5)	Na - carbonate extract + dil HCl or dil. HNO_3 + $BaCl_2$ solution. The above ppt is dissolved in Conc. HNO_3 or Conc. HCl.	white ppt. is obtained ppt. is insoluble	SO_4^{-2} may be ⊕nt SO_4^{-2} is confirmed.
	Test for Basic radicals		
(1)	Mixture + NaOH + Δ	no smell of NH_3	O grup ⊖nt
(2)	Original sol^n + Dil HCl	white ppt. not obtained	I grup ⊕nt.
(3)	Pass H_2S gas to the above solution	black ppt is obtain	II grup ⊕nt.
(4)	The above ppt is dissolved in yellow ammonium sulphide	ppt is not dissolve	II A grup may be ⊕nt (Pb^{+2}, Hg^{+2}, Al^{+3}, Cu^{+2})
(5)	Dissolve ppt in Dil HNO_3	ppt is soluble	Hg^{+2} is ⊕nt
(6)	Divide the solution into two		

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	parts.		
(ii)	I part + Dil H_2SO_4 + C_2H_5OH	white ppt not obtained	Pb^{+2} is ⊖nt
(iii)	II part + NH_4OH is excess	blue sol. is obtained	Cu^{+2} may be ⊕nt.
	Confirmatory test To above solution, add CH_3COOH and $K_4[Fe(CN)_6]$	Chocolate ppt. obtained	Cu^{+2} is confirmed
	Dry test (flame test) Dipped the ppt. wire in dil. HCl + Mixture + Ignite it	stable green coloured flame is obtained	Cu^{+2} is confirmed.
(7)	Boil off the H_2S from above solution		
(8)	Bring a filter paper dipped in lead acetate to the mouth of the test tube.	Filter paper not turn black	H_2S gas is escaped.
(9)	Add conc. HNO_3 to above solution + heat + add solid NH_4Cl + NH_4OH (excess)	Brown red ppt is obtained.	Fe^{+3} may be ⊕nt
	Confirmatory test Dissolve the ppt in dil. HCl		

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then divide the sol^n into two parts		
I part + KCNS	Blood red Colour sol. is obtained	Fe^{+3} is confirmed.
II part + $K_4[Fe(CN)_6]$	Prumian HCl Colour sol^n. obtained	Fe^{+3} is confirmed
Dry test (Bead test) Pt wire + borax powder + ppt. then ignite	Yellow green bread obtained.	Fe^{+3} is confirmed
A Result :- The above mixture contains Cation Cu^{+2}, Fe^{+3} are Ant.	two anion Br^-	and SO_4^{-2} two

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Experiment No. - 7

* **AIM**:- Analyse the given mixture of inorganic salts (by dry and wet test) containing two cations and two anions.

* **Apparatus** :- Test tube, holder, spirit lamp, filter paper, stand.

* **Observation** :-
  Colour - Brown, Blue
  Solubility - water soluble
  Test with heat - Green flame with red blue residue.

S.No.	Treatment	Observation	Inference
	Test for acidic radicals		
(i)	Mixture of dil. H_2SO_4	Colourless gas having vinegar like smell	CH_3COO^- may be present.
	Confirmatory Test		
(i)	Sodium Carbonate extract + neutral $FeCl_3$ sol^n.	reddish colour sol^n contain	CH_3COO^- is present.
ii)	Mixture + oxalic acid + 2-4 drop of water and rub the mixture.	Vinegar smell is produced	CH_3COO^- is confirmed.
(2)	Mixture + Conc. H_2SO_4 + heat	reddish brown	NO_3^- may be

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add copper turning to above solution.	gas with pungent smell	present in strong grup
Confirmatory Test (Ring test) Add a small quantity of freshly prepared solution of ferrous sulphate to a sodium carbonate extract of the mixture and then pour concentrated sulphuric acid slowly along the sider of test tube.	A dark brown ring is formed at the junction of the layers of the acid & the sol"	NO_3^- is confirmed.
Test for basic radicals		
(1) Mixture + NaOH .+ Δ	no smell of NH_3	O grup ⊖nt.
(2) Original solution + dil HCl	white ppt ⊖nt	I grup ⊖nt.
(3) Pass H_2S gas to the about solution.	No ppt. form	II grup ⊖nt.
(4) Boil off the H_2S to the above solution		
(5) Bring filter paper dipped in lead acetate to the mouth of the test tube.	Filter paper not turn black	H_2S gas is escaped.

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(6)	To above sol^n, add Conc. HNO_3 + boil + solid NH_4Cl & NH_4OH in excess	no ppt is obt.	IIIrd group Ont.
(7)	Pass H_2S gas to above sol^n	white ppt. is formed.	In IV group Zn^{+2} may be Ont.
	Confirmatory test - Dissolve the ppt. in dil. HCl and boil off H_2S gas and add NaOH solution in excess and divide the solution into two parts.		
(i)	I part + H_2S gas	white ppt. is obtained	Zn^{+2} is confirmed
(ii)	II pard + CH_3COOH + $K_4[Fe(CN)_6]$	Sky blue ppt is obtained.	Zn^{+2} is confirmed
	Dry test Cobalt Nitrate test Take the above white ppt. on filter paper and add cobalt Nitrate sol. then burn the filter paper	green ash is obtained	Zn^{+2} is confirmed.
(8)	Filtrate of IV grup boiled to		

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escape H_2S gas		
(iv) Bring a filter paper dipped in a lead acetate to the mouth of the test tube.	Filter paper not turns black	H_2S gas is escaped.
(v) To above sol" add NH_4OH and $(NH_4)_2CO_3$ sol".	white ppt is not Obtained	In VI grup is not present
(vi) To above sol" add Na_2HPO_4 solution	white ppt is obtained	In VI grup Mg^{+2} may be present.
Confirmatory Test Dissolve the ppt. in dil HCl and add NaOH + Titan yellow solution	reddish pink ppt is obtained	Mg^{+2} is confirmed
Dry Test Cobalt Nitrate test Take the ppt on filter paper and add 2-3 drop of CN sol" burn the paper in oxidising flame	Pink residue is obtained	Mg^{+2} is confirmed
* Result: The above mixture contain two cation Zn^{+2}, Mg^{+2}	two anion CH_3COO^- - & NO_3^- and	

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Experiment No. - 8

* **AIM:-** Analyse to given mixture of inorganic salts by dry and wet test containing two cation and two anion extraction.

* **Apparatus** :- Test tube, holder, sprit, lamp, filter paper stand.

* **Observation** :-

Colour - Heavy white fully powder

Solubility - sparingly soluble

Test with heat - apple green flame with green white residue.

Sr.	Treatment	Observation	Inferences
	Test for acidic radical		
(i)	Mixture + dil. H_2SO_4	light brown gas is evolved	NO_2^- may be present.
	Confirmatory test		
(ii)	Bring filter paper dipped in KI + starch solution to the mouth of test	Filter paper is turned violet coloured	NO_2^- is confirmed
(iii)	NO_3^- Carbonate extract + dil. H_2SO_4 + freshly prepared $FeSO_4$ sol^n	sol^n turned to black.	NO_2^- is confirmed

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2. Mixture + Conc. H_2SO_4 and heat add solid MnO_2 to above test tube	Colourless gas with pungent smell green Yellow gas is evolved.	Cl^- may be ⊕nt.
Confirmatory Test Silver Nitrate test		
1. No- carbonate extract + dil HNO_3 + $AgNO_3$ solution	white ppt is obtained which is insoluble in NH_4OH	Cl^- may be ⊕nt.
2. Chromyl Chloride test		
(A) Mixture + Conc. H_2SO_4 + solid. $K_2Cr_2O_7$ + heat	Brownish gas with pungent smell is evolved	
(B) Pass the above gas to NaOH sol^n.	sol^n turns Yellow	
(C) To above sol^n add CH_3COOH + lead acetate.	Yellow ppt is obtained	Cl^- is confirmed
Test for basic radical		
(1) Mixture + NaOH + heat	no smell of NH_3	O grup is ⊖nt.
(2) Original solution + dil. HCl	white ppt is not obtained	I grup is ⊖nt.
(3) Pass H_2S gas to above sol^n.	no ppt is obtained	II grup is ⊖nt.

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(4) Boil off the H_2S gas from the above sol^n.		
(5) Bring filter paper dipped in lead acetate on the mouth of the test tube.	Filter paper not turn black	H_2S is escaped.
(6) To the above sol^n, add Conc. HNO_3 + boil + solid NH_4Cl + NH_4OH sol^n in excess	white gelatinous ppt is obtained	Al^{+3} may be present.
Confirmatory test Dissolve the ppt. in dil HCl + add NH_4Cl + boil it.	Gelatinous ppt is again obtained	Al^{+3} is confirmed
Dry test (Cobalt Nitrate test) Take the ppt. on filter paper + add cobalt nitrate solution and ignite it.	Blue Ash is obtained	Al^{+3} is confirmed
(7) Pass the H_2S gas to the filtrate of III solution.	No ppt is obtained	IV grup is present.
(8) Boil off the H_2S from the solution		
(9) Bring a filtrate paper dipped in $(CH_3COO)_2Pb$ on the	filter paper not turn black	H_2S gas is escaped

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	mouth of test tube		
(10)	Add NH_4OH in above sol. then add $(NH_4)_2CO_3$ sol^n	white ppt is obtained	V group is confirmed (Ba^{+2}, Sr^{+2}, Ca^{+2})
	Confirmatory Test Dissolve the ppt in CH_3COOH solution into three parts I part + K_2CrO_4 solution	Yellow ppt. is obtained	Ba^{+2} is confirmed
	Dry test (flame test) Dipped Pt wire in dil. HCl then touch the mixture and ignite it	Green apple like flame is obtained	Ba^{+2} is confirmed

★ Result :-

The above mixture contain two canion NO_2^-, Cl^- and two cation Al^{+3}, Ba^{+2} are present

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Experiment No. - 9

* **AIM:-** Analyse the given mixture of inorganic salts (by dry and wet test) containing two cation and two anion.

* **Apparatus:-** Test tube, holder, filter paper, spirit lamp, stand

* **Observation:-**

Colour - Heavy white crystal
Solubility - water soluble with vinegar smell
Test with heat - Blue flame NH_4^+ smell and black residue.

S.No	Treatment	Observation	Inference
	Test for acidic radicals		
(i)	Mixture + dil H_2SO_4	Colourless vapour having smell of vinegar	CH_3COO^- may be present
	Confirmatory Test		
(i)	No^- carbonate extract + Neutral $FeCl_3$ solution	Red solution is obtained	CH_3COO^- is confirmed
(ii)	Mixture + Conc H_2SO_4 + heat + add Cu^- turning	Brown fumes that intensify on add^n of Cu^- turning	NO_3^- may be present.
	Confirmatory Test -		
	No^- carbonate extract + freshly	Brown ring	NO_3^- is confirmed

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	prepared $FeSO_4$ sol^n + 2-4 drop of Conc. H_2SO_4 along the side of the tube.	is obtained	
	Test for Basic Radicals		
(i)	Mixture + NaOH + heat	Smell of NH_3	O grup (NH_4^+) is present
	Confirmatory test		
(ii)	Bring a filter paper dipped in Nesselar's reagent on the mouth of the test tube	filter paper turn reddish Brown	NH_4^+ is confirmed.
(iii)	Bring a filter paper dipped in Nesselar's reagent on the mouth of the test tube.	filter paper turn reddish Brown	NH_4^+ is confirmed.
(iv)	Original solution + dil. HCl above ppt. is dissolved in hot water	white ppt. obtained ppt. dissolve and again appeared after cooling the solution.	I grup is ⊕nt Pb^{+2} may be ⊕nt.
	Confirmatory test		
	Divide the solution into two parts -		
	I part + K_2CrO_4	Yellow ppt. obtained	Pb^{+2} is confirmed
	II part + KI	Yellow ppt. obtained	Pb^{+2} is confirmed.

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Dry test (Charcoal Cavity Test) Performed Charcoal Cavity test with ppt.	Yellow brown ppt. is obtained	Pb^{+2} is confirmed

* Result :-

In the above mixture two anion NO_3^- and CH_3COO^- and two cation NH_4^+ and Pb^{+2} are present.

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Experiment No. - 10

* **AIM:-** Analyse the given mixture of inorganic salts (by dry and wet test) containing two cation and two anion.

* **Apparatus :-** Test tube, holder, sprit lamp, filter paper, stand.

* **Observation :-**

Colour - Green white Colour
Solubility - sparingly soluble
Test with heat - Blue flame with black residue.

S.No	Treatment	Observation	Inference
	Test for ~~acidic~~ acidic radical		
(1)	Mixture + dil. H_2SO_4	Colourless, odourless gas with brisk efference	CO_3^{2-} may be present.
	Confirmatory test		
(A)	The gas is ~~prepared~~ passed to lime water	lime water turn milky	CO_3^{2-} confirm
(B)	Gas is passed for longer time	milkness of sol^n disappear	CO_3^{-2} is confirm
(2)	Mixture + Conc. H_2SO_4 + heat	No reaction	strong grup is absent.
(3)	Na$^-$ Carbonate extract + dil. HCl	white ppt. is	SO_4^{-2} may be

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+ $BaCl_2$	formed	confirmed
Confirmatory test ppt is dissolve in Conc. HCl / ppt is dissolve in Conc. HNO_3	ppt. is insoluble	SO_4^{-2} is confirmed
Test for basic radicals		
(a) Mixture + NaOH + heat	No smell of NH_3	0 grup ont.
(b) Original sol^n + dil HCl	white ppt not obt.	I grup ont
(c) H_2S gas passed above sol^n	no ppt. form	2 grup ont
(d) H_2S is boil off from the above solution.		
(e) Bring a filter paper dipped in lead acetate on the mouth of test tube.	Filter paper not turn black	H_2S is escaped.
(f) To above sol^n, add few drops of Conc. NO_3 + boil + solid NH_4Cl + NH_4OH	no. ppt is formed	III grup ont.
(g) Pass H_2S gas to the above solution above ppt. + dil HCl ppt insoluble, ppt dissolved	black ppt form	IV grup (Ni^{+2}, Co^{+2}) may be ont.

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in aqua ~~reg~~ region and divide the sol^n in two parts.		
i) First part + NaNH$_4$OH + DHCl	Pink ppt is obtained	Ni^{+2} is confirmed
ii) Boil off H_2S from sol^n		
(a) Bring a filter paper dipped in (CH_3COOH) Pb on the mouth of test tube.	Filter paper not turns black	H_2S gas is escaped
(b) To above sol^n add NH_4OH and $(NH_4)_2CO_3$ sol^n.	white ppt not obtained	V group ⊖nt.
(c) To above sol^n, add NH_4OH PO_4 sol^n	white ppt is obtained	VI group may be ⊕nt.
Confirmatory test The ppt is dissolved in dil HCl and add NaOH solution + titan yellow solution	Reddish pink ppt is obtained	Mg^{+2} is confirmed
Dry test (Cobalt Nitrate test) Take ppt on filter paper + cobalt Nitrate sol^n and ignite it	Pink ash is obtained	Mg^{+2} is confirmed

Result :- The above mixture is consist of two anion CO_3^{-2} & SO_4^{-2} and two cation Ni^{+2}, Mg^{+2} are present.

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Experiment No. - 1

* **AIM:-** Analyse the given mixture of inorganic salt (by dry and wet test) containing two cation and two anion.

* **Apparatus:-** Test tube, holder, stand, sprit lamp, filter paper

* **Observation:-**

Colour - white powder

Solubility - water soluble with vinegar like smell

Test with heat - Brick red colour flame with white glowing residure.

S.No	Treatment	Observation	Inference
	Test for acidic radicals		
(1)	Mixture + dil H_2SO_4	smell of vinegar	CH_3COO^- may be present.
	Confirmatory Test		
(a)	Na carbonate extract + Neutral $FeCl_3$ sol^n	red colour sol^n is formed.	CH_3COO^- is confirmed.
(2)	Mixture + Conc. H_2SO_4 + heat	Colourless, pungent smell gases evolved	Cl^- may be present.
	Confirmatory Test		
(i)	Bring a glass rod dipped in NH_4OH sol^n on the mouth of test tube	white fumes is appeared	Cl^- is confirmed

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(g) Silver nitrate test Na carbonate extract + oil. HNO_3 + $AgNO_3$	white ppt is formed which is soluble in NH_4OH	Cl^- is confirmed
(h) Chromyl Choride Test (a) Mixture + Conc. H_2SO_4 + solid $K_2Cr_2O_7$ + heat	Dark red gas is evolved sol^n become Yellow	
(b) Gas is passed to NaOH sol^n	Yeelow ppt. form	
(c) To above sol^n, add CH_3COOH $(CH_3COO)_2Pb$		Cl^- is confirmed
Test for basic radicals		
(1) Mixture + NaOH sol^n + heat	No smell of NH_3	O grup Ont.
(2) Original sol^n + dil HCl	white ppt not from	I group Ont.
(3) Pass H_2S gas to above sol^n	braun ppt is formed.	II group may be Ont.
(4) Ppt is dissolved in yellow ammonium sulphide	ppt is soluble	II B group Sn^{+2} may be Ont.
Confirmatory test		
(5) To above sol^n, add dil HCl + Iron dust and boil it then divide the sol^n in two parts. First part + $HgCl_2$	white ppt is formed which turns black later	Sn^{+2} is confirmed

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II part + NaOH + $BiCl_2$ sol^n	black ppt is formed	Sn^{+2} is confirmed
Dry test (Co-Nitrate test) Ignite the ppt with Co-nitrate sol^n on filter paper.	Blue green ash is obtained	Sn^{+2} is confirmed
(7) Boil off the H_2S from the sol^n (8) Bring a filter paper dipped in lead acetate on the mouth of the test tube.	Filter paper not turn black	H_2S is escaped
(8) To above sol^n, add Conc. HNO_3 + boil + add NH_4Cl + NH_4OH is excess	no ppt is formed	III group is $\ominus$ nt
(9) Pass H_2S gas to the above sol^n	no ppt is formed	IV group $\ominus$nt.
(10) H_2S is boil off from the sol^n		
(11) Bring a filter paper dipped in $(CH_3COO)_2$ Pb on the mouth of the test tube	Filter paper not turn black	H_2S gas is escaped.
(12) To the above sol^n add NH_4OH + $(NH_4)_2CO_2$ sol^n	white ppt form	V group may be $\oplus$nt (Ba^{+2}, Sr^{+2}, Ca^{+2})

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(3) Dissolved the ppt. in CH_3COOH and divide the solⁿ into 3parts		
I part + $K_2Cr_2O_4$	Yellow ppt not form	Ba^{+2} absent
II part + $(NH_4)_2SO_4$	white ppt not form	Sr^{+2} absent
III part + $(NH_4)_2C_2O_4$	white ppt not form	Ca^{+2} present
Dry test (flame test)		
Dip the pt wire in dil HCl + touch the ppt and ignite it	Red flame like brick is product	Ca^{+2} is confirmed

Result:-

The above mixture consist of two anion CH_3COO^-, Cl^-, Sn^{+2}, Ca^{+2}

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Experiment No. - 12

* AIM:- Analyse the given mixture of inorganic salts (by dry and wet test) containing two anion and two cation.

* Apparatus:- Test tube, holder, sprit lamp, filter paper, stand etc.

* Observation :-

Colour - white powder

Solubility - water soluble

Test with heat - Yellow flame with green black residue.

S.No	Treatment	Observation	Inference
	Test for Acidic radical		
i	Mixture + dil. H_2SO_4	light brown gas is evolved	NO_2^- may be present.
	Confirmatory test		
ii	Bring a filter paper dipped in dil. H_2SO_4 + KI + starch sol^n on the mouth of test tube	Filter paper turns blue	NO_2^- is confirmed.
iii	Na Carbonate extract + dil. H_2SO_4 + freshly prepared $FeSO_4$ sol^n	Sol^n turns black	NO_2^- is confirmed.
iv	Mixture + Conc. H_2SO_4	No rxn.	strong group
v	Mixture + dil. HCl or dil HNO_3 +	white ppt is	SO_4^{-2} may be

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$BaCl_2$	obtained	present
Confirmatory test ppt is dissolve in Conc. HNO_3/ Conc. HCl	ppt not dissolve	SO_4^{-2} is Confirmed
Test for basic radicls. (i) Mixture + NaOH + heat	Smell of NH_3	NH_4^+ may be ont.
Confirmatory Test (i) Bring a glass rod dipped in Conc. HCl on the mouth of test tube	white dense fumes appeard.	NH_4^+ is Confirmed
(ii) Bring a filter paper dipped in Nessler is reagent on the mouth of test tube	Braun spot on filter paper appear	NH_4^+ is confirmed
(2) Original sol^n + dil HCl	No ppt form	I group is ont.
(3) Pass H_2S gas to above sol^n	no ppt form	II group is ont
(4) Boil off H_2S from sol^n		
(5) Bring a filter paper dipped in lead acetate on the mouth of the test tube.	Filter paper not turn black	H_2S is escaped.

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(6)	To above solⁿ add Conc. HNO_3 + boil + solid NH_4Cl + NH_4OH in excess	red brown ppt form	III group Fe^{+3} may be ⊕nt.
(7)	Dissolve the ppt in dil HCl and divide the solⁿ in two parts	dark red colour solⁿ form	Fe^{+3} may be ⊕nt
	I first part + KCNS		Fe^{+3} is confirm
	II part + $K_4[Fe(CN)_6]$	Prussion blue colour solⁿ ⊕nt	
	Dry test (Borax Bread test) Paste the Borax powder on pt wire and ignite it thin touch the bead to the ppt and again ignite it	Yellow green bead is form	Fe^{+3} is Confirm

★ Result :-

The above Mixture Contain the two anion NO_2^-, SO_4^{-2} and two cation NH_4^+ and Fe^{+3}.

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Experiment No-13

* AIM :- Analyse the given mixture of inorganic salts (by dry and wet test) containing two cations and two anions.

* Apparatus :- Test tube, holder, sprit lamp, filter paper stand etc.

* Observation :-
Colour -
Solubility -
Test with heat -

S.No.	Treatment	Observation	Inference
	Test for Acidic radicals		
1.	Mixture + dil H_2SO_4	Colourless, odourless gas with brisk effervescence is evolved.	CO_3^{2-} may be present
	Confirmatory Test		
	(A) the gas is pass to lime water	lime water turns milky	
	(B) the gas is pass for longer time	lime water change to colourless	CO_3^{2-} is confirmed
2.	Mixture + Conc. H_2SO_4 + Heat	braun gas with pungent smell is evolved	NO_3^- may be present
	add copper turning to above solution	Colour braun fumes are evolved	NO_3^- may be present.

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	Confirmatory test Sodium carbonate extract + freshly prepared $FeSO_4$ + Conc. H_2SO_4 along the side of the test tube	brown ring is formed at the junction of two liquids	NO_3^- is confirmed
	Test for basic radicals		
1.	mixture + NaOH + heat	no smell of ammonia	zero group is -nt
2.	Original sol^n + dil HCl	white ppt is not formed	Ist group is -nt
3.	Pass H_2S gas to the above sol^n	black ppt is formed	IInd group is +nt
4.	black ppt is dissolved in ammonium sulphide	ppt is not dissdued	IIA group may be present
5.	Dissolve the ppt in dil HNO_3	ppt is soluble	Hg^{2+} is absent
6.	divide the solution into two parts Ist part + dil H_2SO_4 + C_2H_5OH IInd part + NH_4OH (excess)	white ppt is not formed Blue ppt is formed	Pb^{2+} is absent Cu^{2+} may be +nt
	Confirmatory test		
7.	dissolve CH_3COOH + $K_4[Fe(CN)_6]$	Chocolate ppt is formed.	Cu^{2+} is confirmed
8.	Boil off the solution to escaped H_2S the bring a filter paper dipped in lead acetate on the mouth of the test tube.	filter paper is not turn black	H_2S gas is escaped.
9.	To above sol^n add Conc^n HNO_3 + boil + solid NH_4Cl + NH_4OH in excess to above solution	white gelatineous ppt is formed.	Al^{3+} may be present in IIIrd group.

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10.	Filter the ppt and dissolve in dil HCl	ppt is soluble	Al^{3+} may be +nt
11.	Add NaOH solution to above solution Dry test (Cobalt Nitrate Test)	white ppt is formed which is soluble in excess of NaOH sol^n	Al^{3+} is confirmed
12.	Take the ppt on filter paper and add cobalt nitrate solution then ignite it.	bluish ash is obtained	Al^{3+} is confirmed

* Result:- The above mixture contains two anions CO_3^{2-}, NO_3^- and two cations Cu^{2+}, Al^{3+}

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Experiment No. - 14

★ **AIM**:- Analyse the given mixture of inorganic salts (by dry and wet test) containing two cations and two anions.

★ **Apparatus**:- Test tube, holder, sprit lamp, filter paper, stand.

★ **Observation**:-

Colour - Heavy white paper

Solubility - water soluble

Test with heat - Apple green yellow flame with brown shade of & yellow brown residue.

S.No.	Treatment	Observation	Inference
	Test for Acidic radicals		
1.	Mixture + dil H_2SO_4	light brown pungent smell gas is evolved	Weak acidic group is present NO_2^- may be present
	Confirmatory Test		
i)	Bring a filter paper wetted with dil H_2SO_4 + KI solution and starch solution to the mouth of the test tube of the above test.	Filter paper turns blue	NO_2^- is confirmed
ii)	Na - Carbonate extract + dil H_2SO_4 + freshly prepared $FeSO_4$ solution	whole solution turns brown or black	NO_2^- is confirmed

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2.	Conc. H_2SO_4 + heated + mixture	brown colour gas evolved	Strong acid group is present Br^- may be present
	Confirmatory test		
i)	Silver Nitrate Test - Sodium Carbonate extract + dil. HNO_3 + $AgNO_3$ solution	light yellow ppt is obtained which is partially should in NH_4OH	Br^- is confirmed
ii)	Layer test - Sodium carbonate extract + dil HNO_3 + $CHCl_3$ / CCl_4 + Cl_2 water stirred the solution	layer of $CHCl_3$ / CCl_4 become brown	Br^- is confirmed
	Test for basic radicals		
1.	Mixture + NaOH + Δ	no smell of NH_3	0 group ~~test~~ -nt
2.	Original sol. + dil HCl	white ppt form	I group present (Pb^{2+}, Hg^{2+}, Ag^{2+}) Pb^{2+} may be present
	above ppt is dissolved in hot water	ppt is soluble and again appear after cooling the solution	(Hg^{2+}, Ag^{2+} -nt)
	Confirmatory Test		
	Above solution divided into two parts.		
	I part + K_2CrO_4	yellow ppt obtained	Pb^{2+} is confirm

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	II part → KI solution	Yellow ppt obtained	Pb^{2+} is confirmed
	Dry Test Performed charcoal cavity test with ppt.	yellow brown ppt is obtained.	Pb^{2+} is confirm
3.	Pass H_2S gas to filtrate of I group	no ppt is obtained	III group is absent
4.	Boil off H_2S gas from the above solution		
5.	Bring a filter paper dipped in lead acetate to the mouth of test tube	Filter paper not turn black	H_2S gas is escaped.
6.	To above solution, add Conc. HNO_3 + boil + solid NH_4Cl + NH_4OH solution in excess	no ppt is obtained	III group is absent
7.	Pass H_2S gas to above solution	no ppt form	IV group absent
8.	Boil off H_2S from the above sol^n		
9.	Bring a filter paper dipped in lead acetate to the mouth of the test tube	filter paper not turn black	H_2S gas is escaped.

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10.	Above solution + NH_4OH + $(NH_4)_2CO_3$ solution	white ppt is obtained	V group present (Ba^{2+}, Sr^{2+}, Ca^{2+})
11.	Above white ppt dissolved in acetic acid and solution divide into three parts		
	I part + K_2CrO_4	yellow ppt not obtained	Ba^{2+} is absent
	II part + $(NH_4)SO_4$	white ppt not obtained	Sr^{2+} is absent
	III part + $(NH_4)_2CrO_4$	white ppt is obtained	Ca^{2+} is confirmed
	Dry Test (Flame Test) Dipped the ppt wire in dil HCl and ignite it with ppt	~~Brick~~ red flame produced	Ca^{2+} is confirmed.

★ Result :- The above mixture contain two anion NO_3^-, Br^- and two cation Pb^{2+}, Ca^{2+} are present.

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Experiment No. - 15

* **AIM**:- Analyse the given mixture of inorganic salts (by dry and wet test) containing two cations and two anions.

* **Apparatus** :- Test tube, holder, sprit lamp, stamp, filter paper.

* **Observation** :-
Colour - white powder
Solubility - water soluble with ammonical smell
Test with heat - Yellow flame with white glowing residue

S.No	~~Observation~~ Treatment	Observation	Inference
	Test for acidic radicals		
1.	Mixture + dil H_2SO_4	No reaction	Weak group -nt
2.	Mix. + Conc. H_2SO_4 + heat	Colourless gas with pungent smell	Strong group Cl^- may be +nt
	add solid MnO_2 to above test tube.	Smell is evolved greenish yellow gas is evolved	Cl^- may be +nt
	Confirmatory Test		
i)	Sodium carbonate extract + dil HNO_3 + $AgNO_3$ sol^n	white ppt is obtained which is soluble in NH_4OH	Cl^- is confirmed

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ii)	**Chromyl Chloride Test** A) mixture + Conc. H_2SO_4 + solid $K_2Cr_2O_4$ + heat	Reddish brown gas is evolved with pungent smell	
	(B) Pass the above gas to NaOH solution (C) To above sol^n add CH_3COOH + $(CH_3COO)_2Pb$	Solution turns to yellow yellow ppt form	Cl^- is confirmed
3.	Na carbonate extract of mixture + dil HCl or dil HNO_3 + $BaCl_2$ solution	white ppt is formed	SO_4^{2-} may be present
	Confirmatory Test ppt dissolve in Conc. HCl / Conc. HNO_3	ppt is insoluble	SO_4^{2-} is confirmed
	Test for basic radicals		
1.	Mixture + NaOH solution +	Smell of NH_3	O group ion NH_4^+ may be present
	Confirmatory Test		
i)	Bring a glass rod dipped in Conc. HCl to the mouth of test tube	white fumes obtained on the mouth of the test tube	NH_4^+ is confirmed
ii)	Bring a filter paper, dipped in Nessler's reagent to the mouth of test tube	filter paper turns reddish brown	NH_4^+ is confirmed

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2.	Original sol^n + dil HCl	no ppt form	I group absent
3.	Pass H_2S gas to the above sol^n	No ppt form	II group -nt
4.	Boil off H_2S gas to the sol^n.		
5.	Bring a filter paper dipped in $(CH_3COO)_2Pb$ to the mouth of test tube.	filter paper not turn black	H_2S gas is escaped
6.	To above solution add Conc. HNO_3 + boil + solid NH_4Cl + NH_4OH solution in excess	no ppt form	III group -nt
7.	Pass H_2S gas to above solution	No ppt form	IV group -nt
8.	Boil off H_2S gas to above solution		
9.	Bring a filter paper dipped in lead acetate to the mouth of test tube	filter paper not turn black	H_2S gas is escaped
10.	To above sol^n add NH_4OH and add ammonium carbonate solution	not ppt is formed	V group is -nt
11.	To above sol^n add disodium	white ppt is obtained	VI group +nt

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hydrogen phosphate (Na_2HPO_4) solution.		Mg^{2+} may be present
Confirmatory Test Dissolve the above white ppt in dil HCl and add NaOH + titan yellow solution	reddish pink ppt is obtained	Mg^{2+} is confirmed
Dry Test (Cobalt Nitrate Test) Take the ppt on filter paper add 2-3 drops of Cobalt nitrate solution and ~~s~~ the paper in oxidising flame.	pink residue is obtained	Mg^{2+} is confirmed

★ **Result**:- The above mixture contain two anion Cl^-, SO_4^{2-} and two cation NH_4^+, Mg^{2+} are present.

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Experiment No. - 15

* **AIM:-** Analyse the given mixture of inorganic salts (by dry and wet test) containing two cations and two anions.

* **Apparatus:-** Test tube, holder, stand, filter paper, sprit, lamp.

* **Observation:-**
Colour - pink, blue, green colour.
Solubility - water soluble
Test with heat - light green blue, green residue.

S.No.	Treatment	Observation	Inference
	Test for Acidic Radicals		
i.	Mixture + dil H_2SO_4	Colourless, odourless gas with brisk effervescence	CO_3^{2-} may be pnt is weak group.
	Confirmatory Test		
i)	The gas is passed to lime water	lime water turns milk	
ii)	Gas is passed for longer time	milkness of solution disappear	CO_3^{2-} is confirmed
2.	Mixture + Conc. H_2SO_4 + heat	Colourless gas with pungent smell is evolved.	Strong group is ϕ pnt Cl^- may be pnt.

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3.	Add solid MnO_2 to above test tube	Greenish yellow gas is evolved	Cl^- may be +nt
	Confirmatory Test		
i)	Silver Nitrate Test - Na Carbonate extract + dil HNO_3 + $AgNO_3$ sol^n	Reddish brown gas white ppt obtained sol^n NH_4OH	Cl^- is confirmed
ii)	Chromyl Chloride Test -		
A)	mixture + Conc. H_2SO_4 + solid $K_2Cr_2O_7$ + heat	Reddish brown gas with pungent smell is evolved.	
B)	Pass the above gas to NaOH sol^n	Solution turns yellow	
C)	To above sol^n add CH_3COOH + $(CH_3COO)_2Pb$	Yellow ppt is obtained	Cl^- is confirmed.
	Test for basic radicals		
1.	Mixture + NaOH + heat	no smell of NH_3	O group ~~+~~ -nt
2.	Original solution + dil HCl	no ppt is form	I group -nt
3.	Pass H_2S gas to above solution	no ppt is form	II group is -nt
4.	Boil off H_2S from the above solution.		
5.	Bring a filter paper dipped	Filter paper not	H_2S gas is escaped.

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	in lead acetate to the mouth of the test tube	turn black.	H_2S gas is escaped
6.	To above solution add few drops of Conc. HNO_3 + boil + solid NH_4Cl + NH_4OH in excess	Green ppt is obtained	III group +nt Cr^{3+} may be +nt.
	Confirmatory Test		
i)	Filter the above ppt and add dil HCl and heat.	green ppt is insoluble	Cr^{3+} may be present.
ii)	Filter the ppt and taken in porcellene dish then add fusion mixture and heated.	Yellow ppt is obtained	
iii)	Dissolve the above yellow ppt in water and add acetic acid + lead acetate acetic acid + lead acetate	Yellow ppt is obtained	Cr^{3+} is confirmed
	Dry Test (Borax Bead Test) Paste the Borax powder on Pt wire and ignite it then touch the based to the ppt and again ignite it.	Green bead is formed.	Cr^{3+} is confirmed
7.	Pass H_2S gas to filtrate of III group.	PPt is obtained like almond colour	IV group +nt Zn^{2+}, Mn^{2+} may be +nt.

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8.	Confirmatory Test		
i)	Boil the above ppt with dil HCl	ppt is soluble	Zn^{2+}, Mn^{2+} may be +nt.
ii)	Boil off H_2S gas from the above sol^n and add NaOH sol^n gradually is excess	ppt is soluble	Zn^{2+} is -nt Mn^{2+} may be +nt.
iii)	Above the ppt dissolve in Conc. HNO_3 and sol^n divided into two parts -	Violet colouration	Mn^{2+} is confirmed.
	(A) I part + sodium bismuthate solution ($NaBiO_3$)		
	(B) II part + PbO_2 + boil & cooling the solution	Violet colouration	Mn^{2+} is confirmed.
	Dry Test		
	Performed borax bead test	Violet bead is formed.	Mn^{2+} is confirmed.
★	Result:- The above mixture Cation Cr^{2+}, Mn^{2+} are present.	two anion CO_3^{2-},	Cl^- and two

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Experiment No. - 17

* **AIM:-** Analyse the given mixture of inorganic salts (by dry and wet test) containing two cations and two anion.

* **Apparatus :-** Test tube, holder, stand, spirit lamp, filter paper.

* **Observation :-**

Colour -

Solubility -

Test with heat -

S.No.	Treatment	Observation	Inference
	Test for Acidic Radicals		
1.	Mixture + dil H_2SO_4 + Heat + gently	A Colourless gas with a suffocating smell like	In weak group CH_3COO^- may be +nt.
	Confirmatory Test		
i)	Sodium carbonate extract + neutral $FeCl_3$ solution	reddish coloured sol^n is obtained	CH_3COO^- is confirmed
ii)	Mixture + oxalic acid (solid) + 2-4 drops of water and rub the mixture on palm	Vinegar like smell is produced	CH_3COO^- is confirmed.
iii)	Ester test Mixture + C_2H_5OH + Conc. H_2SO_4 + heat.	Fruity smell is produced due to formation of ester.	CH_3COO^- is confirmed.

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2. Mixture + Conc H_2SO_4 + Heat	Brown fumes are evolved which becomes copious brown when copper turnings or paper pellets are added and the mixture is heated.	NO_3^- may be +nt in strong group
Confirmatory Test Ring Test Add a small quantity of freshly prepared solution of ferrous sulphate to sodium carbonate extract of the mixture and then pour Conc. H_2SO_4 slowly along the side of the test tube	A dark brown ring is formed at the junction of two liquids.	NO_3^- is confirmed.
Test for Basic radicals		
1. Mixture + NaOH + Δ	no smell of ammonia	Zero group -nt
2. Original solution of mixture + dil. HCl	no ppt is formed	I group -nt
3. Boil off H_2S gas from the above solution		
4. ~~Boil~~ Pass H_2S gas to the above sol^n	no ppt is formed	II group is -nt
5. Bring a filter paper dipped in lead acetate to the mouth	Filter paper not turn black	H_2S gas is escaped.

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6.	To above solution add conc. HNO_3 + boil + solid NH_4Cl + NH_4OH in excess	no ppt is obtained	III group is -nt
7.	Pass H_2S gas to the above sol^n.	white ppt is formed.	In IV group Zn^{2+} may be +nt
	Confirmatory Test		
i)	Dissolve the ppt in dil. HCl and boil off H_2S gas and then add NaOH solution gradually in excess.	no ppt is formed	Mn^{2+} is -nt Zn^{2+} may be +nt.
ii)	Divide the above solution into two parts		
	A) I part + CH_3COOH + $K_4Fe(CN)_6$	Sky blue ppt is obt.	Zn^{2+} is confirmed
	B) II part + H_2S gas	white ppt is obt.	Zn^{2+} is confirmed
	Dry Test		
	Cobalt Nitrate test		
	Take the above white ppt of IV group on filter paper and add cobalt nitrate solution then burn the filter paper.	green ash of filter paper is formed.	Zn^{2+} is confirmed
8.	Boil off H_2S from the filtrate of IV group		
9.	Bring a filter paper dipped	filter paper not	H_2S gas is escaped

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	in lead acetate to the mouth of the test tube	turn black	H_2S gas is escaped.
b.	Bring a filter paper dipped in lead acetate to the mouth of test tube.	white ppt is formed ~~filter paper not turn black~~	V group is +nt ~~H_2S~~ gas is escaped (Ba^{2+}, Sr^{2+}, Ca^{2+} may be +nt)
II.	Dissolve the above ppt in acetic acid and divide the solution into three parts -		
i)	I part + K_2CrO_4	Yellow ppt not formed	Ba^{2+} is ~~p~~ - absent
ii)	II part + $(NH_4)_2SO_4$	white ppt not formed	Sr^{2+} is absent
iii)	III part + $(NH_4)_2C_2O_4$	white ppt is formed	Ca^{2+} is +nt
	Dry Test (Flame test)		
	Dipped the Pt wire in dil. HCl and touch the ppt and ignite it.	Flame like brick is produced	Ca^{2+} is +nt

* **Result :-** The above mixture contains two anions CH_3COO^-, NO_3^- and two cations Zn^{2+}, Ca^{2+}, are present.

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Experiment - 18

* **AIM:-** Analyse the given mixture of inorganic salts (by dry and wet test) containing two cations and two anions.

* **Apparatus :-** Test tube, holder, stand filter paper, sprit lamp.

* **Observation :-**

Colour -

Solubility -

Test with heat -

S.No	Treatment	Observation	Inference
	Test for Acidic Radicals		
i.	Mixture + dil. H_2SO_4 + heat gently	A colourless gas with a suffocating smell like burning sulpur is evolved.	In week group SO_3^{2-} may be present
	Confirmatory Test		
i)	Bring a filter paper wetted with acidified $K_2Cr_2O_7$ ($K_2Cr_2O_7$ + dil H_2SO_4) to the mouth of the test tube of the above test.	filter paper turns green	SO_3^{2-} is confirmed
ii)	The above gas passed to lime water	lime water turns to milky	SO_3^{2-} is confirmed.
iii)	Na carbonate + dil HCl + fuccine reagent	Colour of fuccine disappear ~~violet~~	SO_3^{2-} is confirmed.

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2.	Mixture + Conc. H_2SO_4 + heat	Violet vapour are evolved	In strong group may be +nt
	Confirmatory Test		
i)	Silver nitrate test Sodium Carbonate extract + dil HNO_3 + $AgNO_3$ solution.	dark yellow ppt is obtained which is insoluble in NH_4OH	I^- is confirmed
ii)	Layer Test Sodium Carbonate extract + dil HNO_3 + CH_3Cl_3 / CCl_4 + Cl_2 water + shake the solution	layer of CH_3Cl_3/CCl_4 changed to violet	I^- is confirmed
	Test for basic radicals		
1.	Mixture + NaOH + Δ	no smell of NH_3	O^- group is -nt.
2.	Original solution of mixture + dil HCl	no ppt is formed	I group is -nt
3.	Pass H_2S gas to the above sol^n	Black ppt is formed	II group is -nt Sn^{2+} may be +nt
4.	Dissolve some part of above ppt in yellow ammonium sulphide	ppt is soluble	II B group is +nt Sn^{2+} may be +nt
	Confirmatory Test		
	Dissolve Fe + $HgCl_2$	Grey ppt is formed	Sn^{2+} is confirmed

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85	II part + H_2S gas.		
6.	Bring a filter paper dipped in lead acetate to the mouth of the test tube.	filter paper not turns black	H_2S gas is escaped
7.	To above solution add few drops of Conc. HNO_3 + boil + solid NH_4Cl + NH_4OH in excess Confirmatory Test Above white ppt dissolve in dil HCl and solution divided into three parts Lake Test	white gelatineous ppt is obtained	III group is +nt Al^{3+} may be +nt
i)	I part + few drops of blue litmus sol^n and add NH_4OH drop by drop like alkaline	Blue lake floating	Al^{3+} is confirmed
ii)	II part + solid NH_4Cl	white gelatineous ppt is obtained	Al^{3+} is confirmed
iii)	III part + NaOH solution	white ppt is formed which is soluble in excess of NaOH	Al^{3+} is confirmed
	Dry Test (Cobalt nitrate test) Take the ppt on filter paper and add few drops of cobalt nitrate to sol^n and ignite it		

* Result:- Above mixture contain 2 anions SO_3^{2-}, $\overline{I}^-$ & 2 cations Sn^{2+}, Al^{3+}

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Experiment No. - 19

* **Object** :- Identify the functional group present in the given organic compound.

* **Apparatus** :- Test tube, holder, sprit, lamp, stand, filter paper.

* **Observation** :-

i) physical state - solid
ii) Colour - white
iii) Odour - No smell
iv) Solubility in water - soluble in water

S.No	Experiment	Observation	Inference
1)	Nature of the compound - Put a crystal of compound on moist blue litmus paper	Litmus paper turns red.	Organic Compound is acidic in nature may be -COOH or >C-OH functional group
2)	Burning Test - Take some organic compound on copper wire and bring it into flame.	The compound burns with non-sooty blue flame	Compound is aliphatic
3.	Detection of element -		
i)	Lassaigne solution + NaOH + $FeSO_4$ (freshly prepared)	Green ppt	

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ii) Few drops of dil. H_2SO_4	solution does not turn green or blue	N - absent
4. Test for functional group:- Aqueous solution of compound + a pinch of $NaHCO_3$	Brisk effervescence colourless odourless gas evolved	>C-OH group absent - COOH group in present
5. Ester Test:- Organic compound + 2-3 drops of H_2SO_4 + 0.5 m^2 C_2H_5OH warm	Fruity smell evolved.	-COOH group is confirmed.

* **Result:-** Carboxylic acid ($-\overset{\overset{O}{\|}}{C}-OH$) group is present in the given organic compound.

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Experiment No. - 20

* Object :- Identify the functional group present in the given organic compound.

* Apparatus :- Test tube, holder, sprit lamp, stand, filter paper.

* Observation :-

i) Physical state - Liquid
ii) Colour - Colourless
iii) Solubility - Pleasant smell like that of of sprit
iv) Odour - Pleasant smell like that of sprit

S.No	Experiment	Observation	Inference.
1.	Nature of the compound - Put a drop of liquid on moist blue litmus paper and moist red litmus paper respectively	No reaction	Organic Compound is neutral
2.	Burning Test Bring a copper wire dipped in given liquid into flame.	The compound burns with non sooty blue flame	Compound is aliphatic
3.	Detection in element- i) Lassaigne solution + NaOH + freshly prepared $FeSO_4$ solution	Green ppt	

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i) Add few drops of dil. H_2SO_4	Sol^n does not turn green or blue	N^- absent
4. Test for functional group -		
i) Sodium metal Test. Organic liquid + Na piece	Brisk effervescence with evolution of H_2 gas	OH^- (alcoholic) group is +nt.
ii) Ceric ammonium nitrate test - Aqueous solution of compound + Ceric ammonium nitrate solution	Solution turns red	OH^- group is confirmed
iii) Ester Test - Compound + solid CH_3COONa + few drops of Conc H_2SO_4 and heat	Fruity smell evolved	OH^- group is confirmed
* Result :- The given organic functional group in it.	compound has	alcoholic (OH^-)

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Experiment No. - 21

* **Object** :- Identify the functional group present in the given organic compound.

* **Apperatus** :- Test tube, holder, sprit lamp, stand, filter paper.

* **Observation** :-

i) Physical state - solid
ii) Colour - Light pink
iii) Odour - Phenolic smell
iv) Solubility in water - soluble in water

S.No	Experiment	Observation	Inference
1.	Nature of the compound Put a drop of liquid on moist blue litmus paper	Litmus paper turns red	The given compound is acidic. May has -COOH or >C-OH group
2.	Burning Test - Bring a crystal of the Compound on glass rod into the flame	The compound burns with sooty flame.	Organic Compound is arromatic
3.	Detection of element -		
i)	Lassaigne solution + NaOH + $FeSO_4$ sol^n	Green ppt	

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ii) Add few drops of dil. H_2SO_4	Solution does not turns green or blue	N^- absent
4. Test for functional groups - $FeCl_3$ test - aqueous solution of compound + neutral $FeCl_3$ solution	solution turns green	Phenolic (>C-OH) group is present
5. Libermann Nitroso Test -		
i) Compound + solid $NaNO_2$ + dil. H_2SO_4	blue coloured solution is obtained	
ii) Dilute the solution with H_2O	solution becomes red	Phenolic group is confirmed
iii) Above red solution + NaOH solution	Colour of solution again becomes blue	

* Result - Phenolic ($-\overset{\overset{O}{\|}}{C}-OH$) group is present in the given organic compound.

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Experiment No. - 29

* **Object :-** Identify the functional group in the given organic compound.

* **Apparatus :-** Test tube, holder, spirit lamp, stand, filter, filter paper.

* **Observation :-**

i) Physical state :- Liquid
ii) Colour - Colourless
iii) Odour - Pungent smell
iv) Solubility in water - soluble in water

S.No.	Experiment	Observation	Inference
1.	Nature of the Compound - Put a drop of given liquid on moist blue and red litmus papers seperately	No reaction	Organic compound is neutral
2.	Burning Test - Bring a glass rod dipped in given liquid into the flame	The compound burns with non-sooty blue flame	Given compound is aliphatic
3.	Detection of element -		
i)	Lassaigne solution + NaOH + FeSO4 soln	Green ppt	

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ii) Add few drops of dil H_2SO_4	solution does not turns blue or green	N - absent
4. Test for functional group i) Compound + 2, 4 - dinitrophenyl hydrazine, shakes	yellow ppt is formed.	Carbonyl (>C=O) group is present may be -CHO or >C=O group
ii) Compound + Tollen's reagent warm in water bath	silver mirror is formed	-CHO group is present
iii) Equal amount of Fehling's sol^n. A and B in a test tube and add to it 1 mL given compound and ~~that~~ heat.	Red ppt. is formed	-CHO present >C=O absent
iv) Schiff's reagent and the given organic liquid	Red colouration	Aldehyde group (-CHO) is confirmed.
* Result:- Aldehyde group (-C(=O)-) is present. in the given organic compound.		

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Experiment No. - 23

* **Object** :- Identify the functional group in the given organic compound.

* **Apparatus** - Test tube, holder, sprit, lamp, stand, filter paper.

* **Observation** :-

i) Physical state – liquid
ii) Colour – Colourless
iii) Odour – smell like nail polish ~~remover~~
iv) Solubility in water – Insoluble in water

S.No.	Experiment	Observation	Inference
1.	Nature of the compound - Put a drop of given liquid on moist blue and red litmus papers seperately	No reaction	Organic compound is neutral
2.	Burning Test - Bring a glass rod dipped in the given liquid into flame	The compound burns with non-sooty blue flame	Given Compound is aliphatic
3.	Detection of element -		
i)	Lassaigne sol^{n} + f + NaOH + freshly prepare $FeSO_4$ sol^{n}	Green ppt.	
ii)	Add few drops of dil H_2SO_4	Solution does not	N^- absent

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		turns blue or green
4. Test for functional groups - i) Given Compound + 2,4-dinitrophenyl hydrozine, shake	yellow ppt. is formed.	(>C=O) Carbonyl group is present may be aldehyde (-CHO) or ketonic (>C=O) group.
ii) Tollen's test - Organic Compound + Tollen reagent	No reaction	-CHO group absent
iii) Nitropresside Test. Organic Compound + sodium nitroprusside sol^n + NaOH	A wine red colouration	>C=O group is present
iv) m-dinitrobenzene test - Organic compound + powered m-dinitrobenzene + dil. NaOH in excess, shake well	A violet colour appears	(>C=O) Ketonic group is confirmed.
★ Result:- The given organic fundional group.	liquid has Ketonic	(>C=O)

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Experiment No. - 24

* **Object** :- Identify the functional group in a given Compound.

* **Apparatus** :- Test tube, holder, sprit lamp, stand, filter paper.

* **Observation** :-

i) Physical state - Crystalline solid
ii) Colour - colourless
iii) Odour - Odourless
iv) Solubility in water - soluble

S.No	Experiment	Observation	Inference
1.	Nature of the compound - Put a drop of liquid on moist blue and red litmus paper	No effect	Compound's nature is neutral
2.	Burning test - Bring a crystal of the compound on glass rod into the flame.	Burns with non-sooty flame with blue flame	The compound is ~~aro~~ aliphatic
3.	Detection of elements -		
i)	L.S. + NaOH + Fe SO4 solution and then add few drops of dil H_2SO_4	Green ppt. is obtained	N is present

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iii)	In above ppt. + 2-4 drop of dil. H_2SO_4	solution appears blue	N is present
4.	Solution of organic compound is heated	Smell like of NH_3 occurs	$-CONH_2$ is present
5.	Organic Compound + dil. HCl + $NaNO_2$ (aqueous)	Brisk effervescence with evolution of N_2 gas	$-CONH_2$ is present
6.	Aromatic amide Test 0^oC + 8-10 drops of H_2O_2, Boil and cooled + $FeCl_3$ solution	Blue red colours in cold and brown is hot	$-CONH_2$ is present

★ **Result**:- In a given, compound the functional given $-\overset{\overset{O}{\|}}{C}-\overset{H}{\underset{H}{N}}$ (acid amide)

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Experiment No. - 25

* **Object** - Identify the functional group present in the given organic compound.

* **Apparatus** :- Test tube, holder, sprit lamp, stand, filter paper.

* **Observations** :-

i) Physical state - Liquid
ii) Colour - Light yellow
iii) Odour - smell like bitter almond.
iv) Solubility in water - Insoluble in water.

S.No	Experiment	Observation	Inference
1.	Nature of the compound - Put a crystal of the compound on moist blue litmus paper.	Litmus paper turn red.	Organic compound is acidic in nature.
2.	Burning Test - Take some organic compound on copper wire and bring it into the flame.	The compound burns with sooty black flame.	Compound is aromatic
3.	Detection of elements -		
i)	Lassaigne solution + NaOH + FeSO4 (freshly prepared)	Green ppt	

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ii)	Add few drops of dil H_2SO_4	solution turns green or blue	N is present
4.	Milliken's Barkes - Test - 0.C + alcohol + some drops of NH_4Cl + Zn dust + heated, cooled and filterate in Tollen's reagent.	Brown black ppt - comes	$-NO_2$ group is present
5.	A2O - dye test - 0.C + granulated Sn + Conc. HCl, boil. Filterate the solution and cooled + 1mL $NaNO_2$ + β - Napthol	Red ~~orange~~ appears	$-NO_2$ group is confirmed

★ **Result** :- In a given compound $-N\overset{Cl}{\underset{O}{=}}$ ~~or~~ nitro group is present.

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Experiment - 26

* **Object** :- Identify the functional group present in the given compound.

* **Apparatus** :- Test tube, holder, sprit lamp, stand, filter paper.

* **Observation** -

i) Physical state - Liquid
ii) Colour - Colourless
iii) Odour - Fruity smell
iv) Solubility in water - soluble in water.
v) Nature - Weak acidic

S No.	Experiment	Observation	Inference
1.	Nature of the compound - Put a drop of liquid on moist blue litmus paper.	Litmus paper turns red.	The given compound is acidic.
2.	Burning Test - Bring a crystal of the compound on glass rod into flame.	The compound burns with non-sooty flame.	Organic compound is aliphatic
3.	Detection of element - i) Lassaigne solution + NaOH + FeSO4 solution.	Green ppt.	

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iii)	Add few drops of dil. H_2SO_4	solution does not turns green or blue	
4.	Test for functional group- O.C. + one drop of phenol-phthaline + one drop of NaOH pink colour obtained solution is boiler.	Pink colour is disappeared	ester group is present
5.	Figure Test - O.C. + Methanol + hydroxyl amine + hydrochloric solution + CH_3OH + KO + heated, cooled and diluted by dil. HCl & $FeCl_3$	Red, violet colour is obtained	ester group is confirmed

★ Result :- In the given Organic compound, the functional group ester $-\overset{\overset{O}{\|}}{C}-O-R$

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Experiment No. - 27

* **Object** - To prepare crystals of potash alum from the given quantities of the constituent salts.

* **Apparatus** :- 250 mL beaker, glass rod, funnel, china dish, wire gauze, tripod stand, filter paper, burner etc.

* **Chemical required** :-
Potassium sulphate - 7.0 g
Aluminium sulphate - 26.5 g
Conc. H_2SO_4 - 3-4 drops

* **Procedure** -

i) Take 7.0 g potassium sulphate in a clean beaker of 250 mL capacity.

ii) Dissolve it in minimum quantity of distilled water by constant stirring with a glass rod.

iii) Take 26.5 g aluminium sulphate crystals in another beaker and ~~add~~ add sufficient distilled water and 1 mL conc. H_2SO_4 to dissolve it. H_2SO_4 is added to prevent the hydrolysis of aluminium sulphate. Heat the solution for about 5 minutes if milkiness still persists, filter the solution.

iv) Mix the two solutions in a china dish, place it on a wire gauze over a tripod stand and put burner below it.

v) Concentrate the solution, keep it stirring by a glass

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rod till crystallization point is reached.

vii) Now, transfer the liquid in a crystallization dish, allow it to cool slowly, undisturbed over the mouth of a beaker full of water.

viii) After crystallization is complete, decant off the mother liquor carfully and wash the crystals with a small quantity of ice cold water.

viii) Dry the crystals by pressing b/w rough filter papers.

ix) Note the colour and shape of the crystals and weight.

* Result :-

Colour of the crystal - colourless

shape of the crystal - Octahedral

Yield - 4.2 gm

* Precautions -

i) Chemicals used should be of A.R. grade

ii) Salts must be dissolved in minimum volume of water

iii) Few drops of Conc. H_2SO_4 should be added while preparing aluminium sulphate solution to prevent its hydrolysis

iv) Wash the crystals of potash - alum with ice - cold water.

v) Cooling should be done slowly to get crystals of good quality.

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Experiment No. - 28.

* **Object** :- To prepare crystals of ferrous ammonium sulphate from the given quantities of substances

* **Apparatus** :- 250 mL beaker, glass rod, funnel, china dish, wire gauze, tripod stand, filter papers, burner etc.

* **Chemical required** :-
Ferrous sulphate - 14 g
Ammonium sulphate - 6.5 g
Dilute H_2SO_4 - 2 mL
ethyl alcohol - 5 mL

* **Procedure** -

i) Take 6.5 g ammonium sulphate and 14.0 g ferrous sulphate in a clean beaker of 250 mL capacity.

ii) Boil about 40 mL water in another beaker to expel out dissolved air in it.

iii) Add 2 mL H_2SO_4 solution to water and add this acidic water to the beaker containing the mixture of two salts. Stir the mixture with a glass rod to dissolve the salts.

iv) Filter the solution to remove suspended impurities if any.

v) Collect the filtrate in china dish and Concentrate it, until the crystallization point is reached.

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vi) Transfer the concentrated solution into the crystallization dish. Cover it with a watch glass and keep it undisturbed for cooling.

vii) After crystallization is complete, decant off the mother liquor carefully into beaker.

viii) Wash the crystals in the crystallization dish with 3-4 mL of ethyl alcohol.

ix) Transfer the crystals on filter paper, then dry them by pressing gently in b/w filter papers.

x) Note the colour and shape of the crystals and weight.

* Result :-

Colour of the crystals - light green
shape of the crystals - Monoclinic
Yield (weight of crystals = 4.5gm
Theoretical yield - 5gm

* Precautions -

i) Ferrous sulphate used should be free from Fe^{3+} ions.

ii) Used boiled water to dissolve the salts. It minimise the oxidation of ferrous ions into ferric ions by dissolved Oxygen in water.

iii) Do not concentrate the solution too much, otherwise only a solid mass instead of crystals will be obtained

iv) Cooling should be done slowly to get crystals of good quality.

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