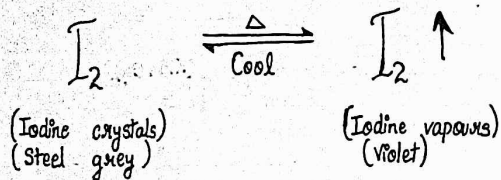


Identification and characteristics of gases :-

| S. No. | Name | Colour | Odour | Action on litmus | Confirmatory test |
|--------|--------------------------------|------------|---------------|--|--|
| 1. | Hydrogen (H_2) | Colourless | Odourless | No change | Burns with pop sound. |
| 2. | Oxygen (O_2) | Colourless | Odourless | No change | Rekindles a glowing splinter. |
| 3. | Water Vapour | Colourless | Odourless | No change | a) Turns anhydrous copper sulphate ($CuSO_4$) from white to blue. b) Turns anhydrous cobalt chloride ^{paper} ($CoCl_2$) from blue to pink. |
| 4. | Carbon dioxide (CO_2) | Colourless | Odourless | Turns moist blue litmus paper \rightarrow claret red | Turns lime water [$Ca(OH)_2$] milky. |
| 5. | Hydrogen chloride (HCl) | Colourless | Pungent odour | Turns moist blue litmus paper \rightarrow red | Gives dense white fumes with glass rod dipped in ammonium hydroxide (NH_4OH). |

| | | | | | |
|-----|---|-------------------------------------|--------------------------------|--|---|
| 6. | Chlorine Cl_2 | Greenish - yellow | Pungent odour | Turns moist blue litmus paper \rightarrow red and finally bleaches it | It turns starch iodide paper \rightarrow blue black. |
| 7. | Sulphur dioxide (SO_2) | Colourless | Smell of burning sulphur | Turns moist blue litmus paper \rightarrow red and finally bleaches it. | a.) It decolourises acidified potassium permanganate solution ($KMnO_4$). b.) It turns acidified potassium dichromate [$(NH_4)_2 Cr_2O_7$] solution from orange to apple green. |
| 8. | Hydrogen sulphide (H_2S) | Colourless | Rotten egg smell | Turns blue litmus paper \rightarrow red. | It turns lead acidic paper \rightarrow silvery black. |
| 9. | Nitrogen Hydrogen dioxide NO_2 (NO_2) | Reddish brown | Pungent odour | Turns moist blue litmus paper \rightarrow red. | It turns acidified ferrous sulphate (Fe_2SO_4) solution green \rightarrow black. |
| 10. | Ammonia NH_3 | <u>Odour</u> Ammoniacal odour | <u>Colour</u> Colourless | Turns moist red litmus paper \rightarrow blue. | a.) It gives dense white fumes with glass rod dipped in concentrated hydrochloric acid (HCl). b.) It turns Nessler's reagent \rightarrow brown (K_2HgI_4) |



Date _____

Expt. No. 1

Page No. _____

Experiment 1 :-

Aim: To observe the effect of heat on the given unknown substance (A₁).

Physical appearance: Shining steel grey crystals.

| S. No. | Experiment | Observation | Inference |
|--------|--|---|---------------------------|
| 1. | Took a little amount of a substance into a test tube and heated it gently. | a) On heating, the substance did not melt but boiling vapours were evolved. | a) May be iodine vapours. |
| | | b) It turns moist starch paper → blue black. | b) Iodine confirmed. |
| | | c) Sublimation took place. | c) Iodine confirmed. |

Result: On heating, the substance gave boiling vapours and showed sublimation. Hence, the given substance (A₁) was Iodine.

Done
19/4/22

Teacher's Signature _____



(Hydrated Copper Sulphate)
(Blue crystalline)

(Anhydrous
Copper
Sulphate)
(White amorphous)

(Water of
crystallisation)
(Colourless)

Experiment - 2 :-

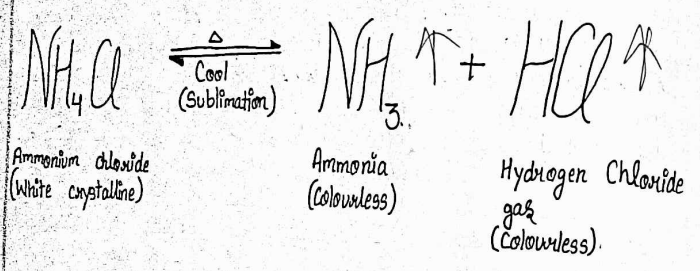
Aim: To observe the effect of heat on the ^{unknown} given substance (A₂).

Physical Appearance : Blue crystalline substance

| S.No. | Experiment | Observation | Inference |
|-------|---|--|---|
| 1. | Put a little amount of substance in a clean and dry test tube and heat it gently. | i) Colourless vapours condensed on the cooler parts of the test tube, which had no effect on litmus paper. | i) May be water vapours. |
| 2. | Expose the colourless liquid to anhydrous cobalt chloride. | ii) It turned pink. | ii) Water of crystallisation confirmed. |

Residue: It was white powdery substance. It was anhydrous copper sulphate (CuSO₄).

Result: Since the colourless liquid was water vapour and white powdery was anhydrous copper sulphate and hence, the given substance was hydrated copper sulphate (CuSO₄ · 5H₂O).



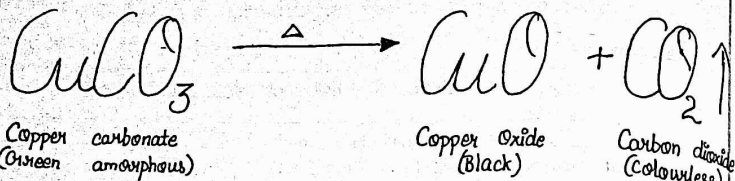
Experiment - 3:-

Aim: To observe the effect of heat on the given unknown substance (A₂).

Physical appearance: White crystalline solid

| S. No. | Experiment | Observation | Inference |
|--------|---|--|--|
| 1. | Took a small amount of substance in a clean and dry test tube and heat it gently. | i) A colourless gas was evolved turning moist blue litmus paper → red. ii) Another gas was evolved which turned moist red litmus paper → blue. iii) Dense white fumes were given off which condensed on the cooler parts of the test tube. | i) The gas was acidic in nature. May be hydrogen chloride (HCl) gas. ii) The gas was basic in nature. May be ammonia (NH ₃) gas. iii) Sublimation took place. May be ammonium chloride (NH ₄ Cl). |

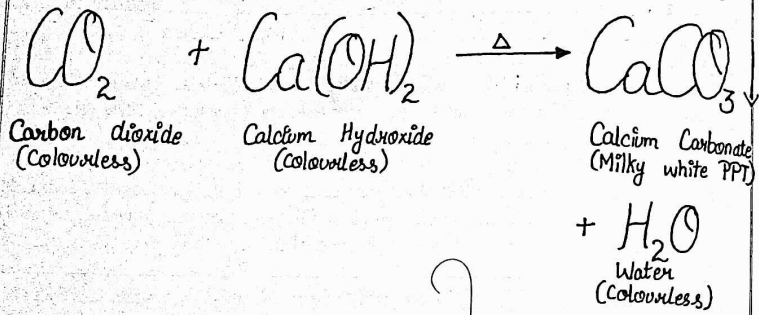
Result: Since sublimation took place both acidic and basic gases were evolved. Thus, the given substance was ammonium chloride (NH₄Cl).



Copper carbonate
(Green amorphous)

Copper Oxide
(Black)

Carbon dioxide
(Colourless)



Carbon dioxide
(Colourless)

Calcium Hydroxide
(Colourless)

Calcium Carbonate
(Milky white ppt)

+ H₂O
Water
(Colourless)

?

Date _____

Page No. _____

Expt. No. 4

Experiment - 4 :-

Aim: To observe the effect of heat on the ^{unknown} given substance (A₄).

Physical appearance: Green amorphous solid

| S.No. | Experiment | Observation | Inference |
|-------|--|--|---|
| 1. | Took a small amount of a substance in a clean and dry test tube. | i) A colourless gas was evolved. | i) Maybe nitrogen gas (N ₂) or hydrogen gas (H ₂) or oxygen gas (O ₂) or carbon dioxide gas (CO ₂). |
| | | ii) The gas turned moist blue litmus paper → claret red. | ii) The gas was acidic in nature. |
| | | iii) It extinguished a glowing splinter. | iii) The gas was a non-supporter of combustion. |
| | | iv) It turned lime water (Ca(OH) ₂) milky. | iv) Carbon dioxide (CO ₂) confirmed. |

Residue: ^{for} Black powder was left behind in the test tube. It was copper oxide.

Result: Since carbon dioxide was evolved and the residue was copper oxide, hence the given substance was copper carbonate (CuCO₃).

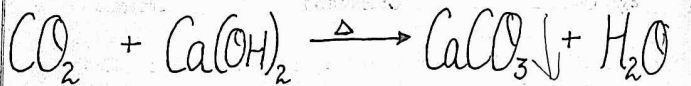
Teacher's Signature _____



Zinc carbonate
(White amorphous)

Zinc Oxide
(Yellow when hot,
white when cooled)

Carbon dioxide
(Colourless)



Carbon dioxide
(Colourless)

Lime water
(Colourless)

Calcium Carbonate
(Milky white
suspension)

Water
(Colourless)

Expt. No. 5

Date _____

Page No. _____

Experiment - 5 :-

Aim: To observe the effect of heat on the given substance (A5)

Physical appearance: White amorphous solid

| S.No. | Experiment | Observation | Inference |
|-------|---|---|---|
| 1. | Took a small amount of substance in a clean and dry test tube and heated it gently. | i) A colourless gas was evolved. ii) The gas turned moist blue litmus paper \rightarrow claret red. iii) It extinguished a glowing splinter. iv) It turned lime water (Ca(OH)_2) milky white. | i) Maybe Hydrogen (H_2), Oxygen (O_2), Carbon Dioxide (CO_2). ii) The gas was acidic in nature. iii) The gas was non-supporter of combustion. iv) Carbon dioxide confirmed. |

Residue: It was yellow when hot and white when cooled, it was Zinc Oxide (ZnO).

Result: Since the gas carbon dioxide and the residue was zinc oxide. Hence, the given substance was Zinc Carbonate (ZnCO_3).

Teacher's Signature _____

Experiment – 6:

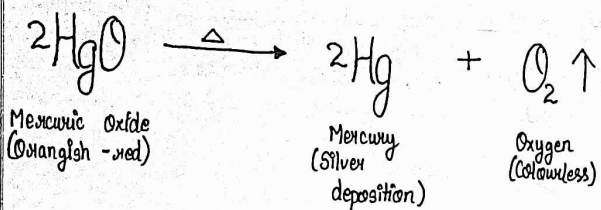
Aim: To study the effect of heat on the given unknown substance (A_6).

Physical Appearance: Orange Crystalline Solid

| Experiment | Observation | Inference |
|---|--|------------------------------|
| 1. Heated a small amount of substance in a clean and dry test tube. | i. Colourless vapours condensed on the cooler parts of the test tube. | i. Maybe water vapour. |
| | ii. Introduced litmus paper. No effect. | ii. Maybe water vapour. |
| | iii. Introduced anhydrous cobalt chloride paper. It turned pink. | iii. Water vapour confirmed. |
| | iv. On further heating, the substance decomposed violently and hydrogen gas was evolved with... (forgot 😊) | |

Residue: A fluffy green substance was left behind, it was Chromic Oxide (Cr_2O_3). Its volume was 6-7 times more than the original volume.

Result: Since nitrogen gas and water vapour were evolved and the residue was Chromic Oxide, the substance was Ammonium Dichromate $[(NH_4)_2Cr_2O_7]$.



Mercuric Oxide
(Orange-red)

Mercury
(Silver
deposition)

Oxygen
(Colourless)

Expt. No. 7

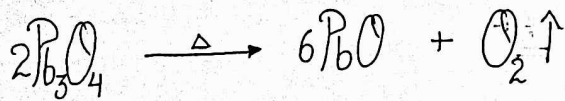
Experiment - 7 :-

Aim: To study the effect of heat on the given unknown substance (A₁).

Physical appearance: Orange-red powder

| S. No. | Experiment | Observation | Inference |
|--------|--|--|-------------------------------------|
| 1. | Heated a small amount of substance in a given clean and dry test tube. | i) A colourless gas was evolved, which was neutral to litmus. | i) Maybe oxygen or nitrogen gas. |
| 2. | Brought a glowing splinter near the mouth of the test tube. | ii) The gas rekindles the glowing splinter. | ii) Oxygen confirmed. |
| | | iii) On continuous heating, the colour darkened and silver mirror was seen on cooler parts of test tube. | iii) Silver deposition was mercury. |

Result: Since the gas evolved was oxygen and silver mirror of mercury was seen. Hence, the given substance was mercuric oxide (HgO).



Lead tetraoxide
(Orange-red)

Lead monoxide
(Yellow on cooling)

Oxygen
(Colourless)

Experiment - 9 :-

Aim: To study the effect of heat on the given unknown substance (A₂)

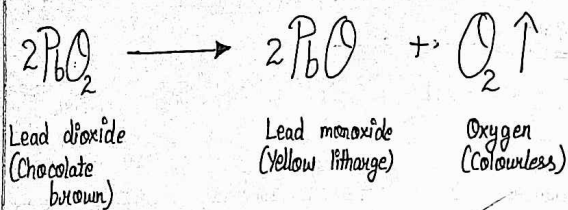
Physical appearance: Orange-red powder

| S.No | Experiment | Observation | Inference |
|------|--|--|------------------------------|
| 1. | Heated a small amount of substance in a given clean and dry test tube. | i) A colourless gas was evolved which was neutral to litmus. | i) Maybe oxygen or nitrogen. |
| 2. | Brought a glowing splinter near the mouth of the test tube. | ii) The gas rekindles the glowing splinter. iii) On continuous heating, the colour darkened up. | ii) Oxygen confirmed. |

Residue: The solid left in test tube was yellow in colour which fused with the glass of the test tube. It was lead monoxide (PbO) commonly known as litharge.

Result: Since the residue was lead monoxide and oxygen was evolved. Thus, the given substance was lead tetraoxide (Pb₃O₄).
Commonly known as Red Lead.

Teacher's Signature _____



Lead dioxide
(Chocolate
brown)

Lead monoxide
(Yellow litmarge)

Oxygen
(Colourless)

Date _____
Page No. _____

Expt. No. 9

Experiment - 9 :-

Aim: To study the effect of heat on the given unknown substance (Aq).

Physical appearance: Chocolate brown amorphous solid.

| S. No. | Experiment | Observation | Inference |
|--------|---|--|------------------------------|
| 1. | Heated a small amount of substance in a given clean and dry test tube. | i) Colourless vapours evolved was neutral to litmus. | i) Maybe oxygen or nitrogen. |
| 2. | Brought a glowing splinter near the mouth of test tube. | ii) The gas rekindles a glowing splinter. | ii) Oxygen confirmed. |
| 3. | On continuous heating, the dark coloured powder became lighter in colour. | | |

Residue: The solid left in the test tube was yellow in colour which fused with the glass of the test tube. It was lead monoxide (PbO). Commonly known as litharge.

Result: Since the residue was lead monoxide and oxygen was evolved. The substance was lead dioxide (PbO₂).

Teacher's Signature _____
16/8/22

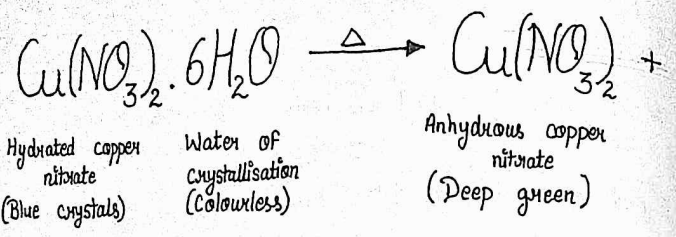
Experiment - 10 :-

Aim : To study the effect of heat on the given unknown substance (A₁₀).

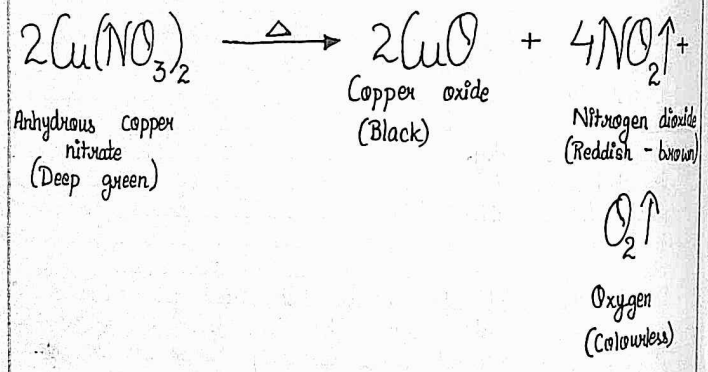
Physical appearance : Blue crystalline solid

| S. No. | Experiment | Observation | Inference |
|--------|---|---|--|
| 1. | Heated a small amount of substance in a given clean and dry test tube | A colourless vapour was evolved which condensed on the cooler parts of the test tube. | i) Maybe water vapour. |
| | | ii) The liquid was neutral to litmus. | ii) Maybe water vapour. |
| | | iii) The liquid turned anhydrous cobalt chloride paper blue → pink. | iii) Water vapour confirmed. |
| | | iv) The blue solid melted to deep green coloured liquid. | iv) Salt contained water of crystallisation. |

Teacher's Signature _____



6H₂O ↑
Water of crystallisation (Colourless)



v) A reddish-brown gas with a pungent odour was evolved which turned blue litmus paper \rightarrow red.

v) Maybe nitrogen dioxide (NO_2)

vi) The reddish-brown gas turned freshly prepared ferrous sulphate solution \rightarrow black.

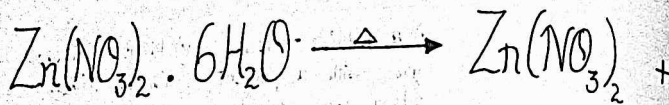
vi) Nitrogen dioxide confirmed.

vii) The gas which rekindles the glowing splinter was evolved.

vii) Oxygen confirmed.

Residue: A black residue was left behind which was copper oxide (CuO).

Result: Since the residue left was copper oxide and water vapour, oxygen and nitrogen dioxide was evolved. Thus, the given substance was hydrated copper nitrate [$\text{Cu}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$]



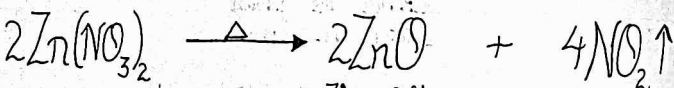
Hydrated zinc nitrate
(White crystals)

Water of crystallisation
(Colourless)

Anhydrous zinc nitrate
(Colourless)



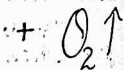
Water of crystallisation
(Colourless)



Anhydrous zinc nitrate
(Colourless)

Zinc Oxide
(Yellow when hot,
white when cooled)

Nitrogen dioxide
(Reddish-brown)



Oxygen
(Colourless)

Date _____

Expt. No. 11

Page No. _____

Experiment - 11:-

Aim: To observe the effect of heat on the given substance (R_{12})

Physical appearance: White crystalline solid

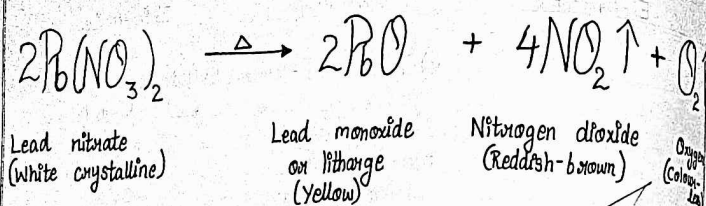
| S. No. | Experiment | Observation | Inference |
|--------|---|--|--|
| 1. | Took a little amount of substance in a clean and dry test and heated it gently. | i) A colourless and odourless vapour was evolved which condensed on the cooler parts of the test tube. | i) Maybe water vapour. |
| | | ii) The liquid was neutral to litmus. | ii) Maybe water vapour. |
| | | iii) The liquid turned anhydrous cobalt chloride paper blue \rightarrow pink. | iii) Water vapour confirmed. |
| | | iv) The substance melted to a colourless liquid. | iv) Water of crystallisation confirmed. |
| | | v) A reddish-brown coloured gas with pungent odour was evolved which turned blue litmus \rightarrow red. | v) Maybe nitrogen dioxide (NO_2). |

Teacher's Signature _____

| Experiment | Observation | Inference |
|------------|--|---|
| | v) The reddish-brown coloured gas turned freshly prepared ferrous sulphate solution \rightarrow black. | vi) Nitrogen dioxide (NO_2) gas confirmed. |
| | vii) A colourless gas which rekindles a glowing splinter was evolved. | vii) Oxygen gas confirmed. |

Residue: A yellow residue was left behind which turned white when cooled. It was Zinc Oxide (ZnO).

Result: Since the residue was zinc oxide and water vapour, nitrogen dioxide and oxygen gas were evolved. Hence, the substance was Hydrated Zinc Nitrate [$\text{Zn}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$].



Lead nitrate
(white crystalline)

Lead monoxide
on litmus
(yellow)

Nitrogen dioxide
(reddish-brown)

Oxygen
(colourless)

Date 12-10-22

Expt. No. 12

Page No.

Experiment - 12 :-

Aim: To observe the effect of heat on the given substance (Pb)

Physical appearance: White crystalline substance

| Experiment | Observation | Inference |
|--|--|--|
| 1. Gently heated a small amount of substance in a clean and dry test tube. | i) The substance decolorates (breaking of bigger particles into smaller particles with a crackling sound) and decomposed liberating a gas with the following characteristics: (a) A reddish-brown with a pungent odour was evolved. (b) It turned moist blue litmus \rightarrow red. | i) Maybe nitrogen dioxide (NO_2) gas. The gas was acidic in nature. |
| 2. Passed the gas to freshly prepared ferrous sulphate solution. | i) It turned the solution black. ii) The colourless gas which rekindles a glowing splint was evolved. | ii) Nitrogen dioxide gas confirmed. iii) Oxygen (O_2) confirmed. |

Teacher's Signature

Date _____

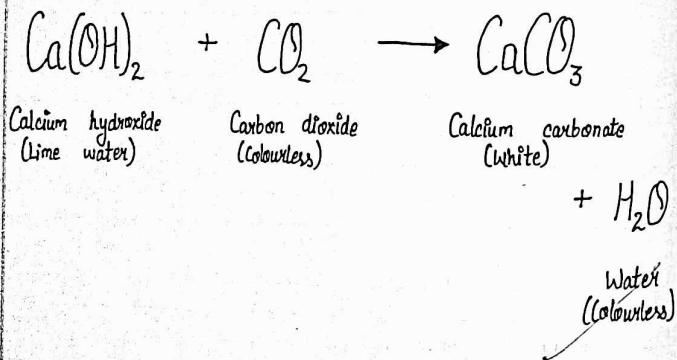
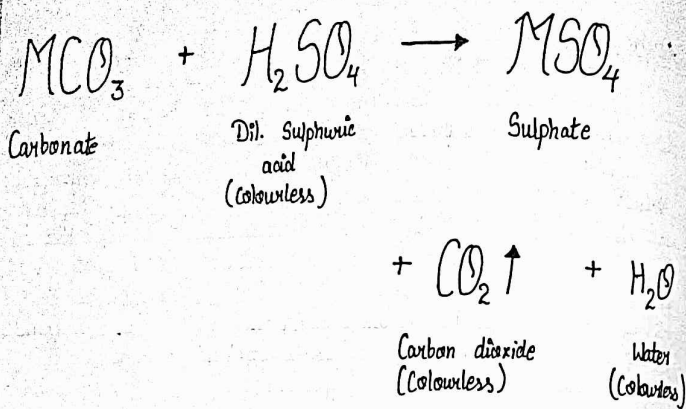
Expt. No. _____

Page No. _____

Residue: The solid left in the tube was yellow in colour and fused with the walls of the test tube. It was lead monoxide (PbO).

Result: Since the substance showed decipitation on heating and the gases evolved were nitrogen dioxide (NO_2) and oxygen (O_2) and the residue left was lead monoxide (PbO) Hence, the substance was lead nitrate [$\text{Pb}(\text{NO}_3)_2$] given

Teacher's Signature _____



Experiment 13 :-

Aim: To detect the acidic radical present in the given salt with the help of dil. sulphuric acid (H₂SO₄)

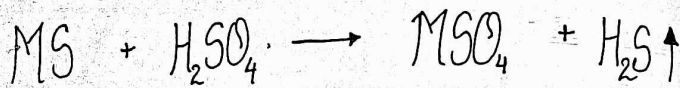
Physical appearance: White amorphous solid

| Experiment | Observation | Inference |
|--|--|---|
| 1. Took a small amount of substance in a clean and dry test tube and added dil. sulphuric acid (H ₂ SO ₄) | i) A brisk effervescence first observed colourless odourless gas evolved | i) Maybe carbon dioxide gas |
| | ii) It turned moist blue litmus → claret red | ii) The gas was acidic in nature |
| | iii) It extinguished the glowing splinter | iii) The gas was a non-supporter of combustion |
| | iv) It turned lime water milky | iv) Carbon dioxide (CO ₂) gas confirmed |

Acidic radical: Carbonate (CO₃²⁻)

Result: Since the gas evolved was CO₂. Hence, the ^{given} salt was carbonate radical (CO₃²⁻)

Teacher's Signature _____

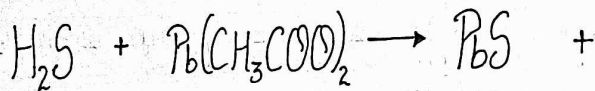


Metallic sulphide (Yellow)

Dil. sulphuric acid (Colourless)

Metallic sulphate (Colourless)

Hydrogen sulphide (Colourless)



Hydrogen sulphide (Colourless)

Lead acetate (Colourless)

Lead sulphide (Silvery black)



Acetic ← Acidic acid (Colourless)

Date 02/11/22

Expt. No. 14

Page No.

Experiment - 14:-

Aim: To identify the acidic radical present in the given salt with the help of dil. sulphuric acid (H_2SO_4).

Physical appearance: Whitish - yellow flacky chips

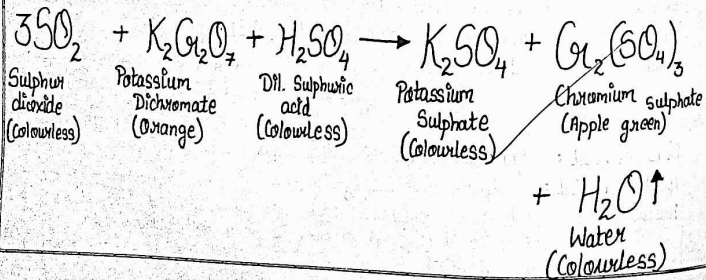
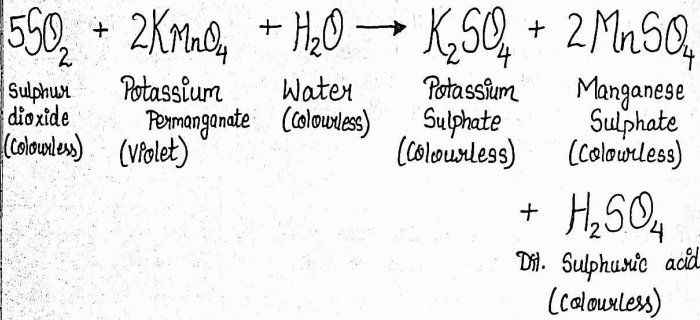
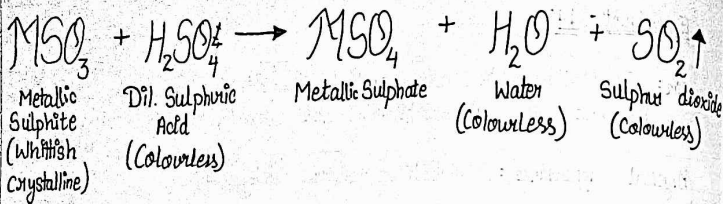
| Experiment | Observation | Inference |
|--|---|--|
| 1. Took a small amount of substance in a clean and dry test tube and added a few drops of dil. sulphuric acid (H_2SO_4). | i) A brisk effervescence and a colourless gas was evolved with a smell of rotten egg. | i) Maybe Hydrogen sulphide (H_2S) gas. |
| 2. Brought a moist blue litmus paper near the mouth of the test tube. | ii) It turns moist blue litmus → red. | ii) The gas was acidic in nature. |
| 3. Brought a filter paper dipped in lead acetate solution near the mouth of the test tube. | iii) It turned silvery black due to formation of lead sulphide (PbS). | iii) Hydrogen sulphide (H_2S) gas confirmed. |

Gas evolved: Hydrogen sulphide (H_2S) gas.

Acidic radical: Sulphide (S^{2-})

Result: Since hydrogen sulphide (H_2S) gas was evolved with the help of dil. sulphuric acid (H_2SO_4). Hence, the given salt contained sulphide acidic radical (S^{2-}).

Teacher's Signature



Date 9/11/22

Expt. No. 15

Page No.

Experiment - 15 :-

Aim: To detect the acidic radical in the given substance with the help of dil. sulphuric acid (H_2SO_4)

Physical appearance: White crystalline substance

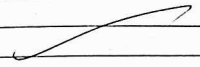
| S. No. | Experiment | Observation | Inference |
|--------|--|--|--|
| 1. | Took a small amount of substance in a clean and dry test tube and added a few drops of dil. sulphuric acid (H_2SO_4) | A brisk effervescence was observed and a colourless gas with a choking smell of burning sulphur was evolved. | Maybe sulphur dioxide (SO_2) gas. |
| 2. | Brought a moist blue litmus paper near the mouth of the test tube. | The gas turned moist blue litmus → red and finally bleaches it. | The gas was acidic in nature. |
| 3. | Passed the gas through potassium permanganate solution (KMnO_4) | The solution decolourised. | Sulphur dioxide (SO_2) gas confirmed. |
| 4. | Brought filter paper dipped in acidified potassium dichromate ($\text{K}_2\text{Cr}_2\text{O}_7$) | The filter paper changes colour from yellow → apple green. | Sulphur dioxide (SO_2) gas confirmed. |

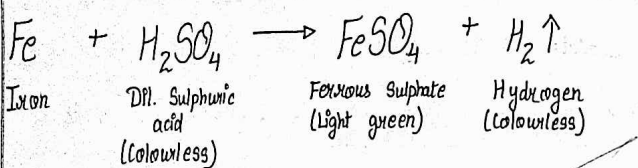
Teacher's Signature

Gas evolved: Sulphur dioxide (SO_2)

acidic radical: Sulphite (SO_3^{2-})

Result: The gas evolved was SO_2 . Hence, the given substance contained (SO_3^{2-}) acidic radical.





Date 16/11/22

Expt. No. 16

Page No. _____

Experiment - 16 :-

Aim: To detect the gas evolved when an active metal reacts with dil. sulphuric acid (H_2SO_4).

Physical appearance: Brown - filling

| Experiment | Observation | Inference |
|---|--|--|
| 1. Took a small amount of filling in the test tube and added a few drops of dil. sulphuric acid (H_2SO_4) in it, then closed the mouth of the test tube with thumb. | * An effervescence was observed and a colourless, odourless gas was evolved. | * Maybe Hydrogen gas (H_2). |
| 2. Brought a burning splinter near the mouth of the test tube. | * The gas burned with a pop sound and the test tube heated up. | * Hydrogen gas was evolved, the reaction was exothermic. |

Gas evolved: Hydrogen (H_2)

Result: When an active metal reacts with dil. sulphuric acid (H_2SO_4) and it displaces hydrogen from it and forms the corresponding salts.

[Signature]
16/11/22

Teacher's Signature _____

Flame Test

It is a characteristic of a certain metallic ion to impart coloured flames when they are introduced into the flame. This is the test to detect the metallic ion. Platinum wire is cleaned by alternatively dipping in conc. HCl and putting it into non-luminous flame of bunsen burner till the wire imparts colour to the flame. It is done to oxidise the impurity present in the platinum wire. It is now cleaned and can now be used for the flame test.

- i) Took the given salt in a watch glass and added a few drops of conc. HCl and mixed it to form a paste.
- ii) Took a platinum wire and made it into loop and introduced the the paste of salt into non-luminous flame of bunsen burner.
- iii) Following colours are imparted to the flame. These colours can be used to identify the metallic ion in the salt.

| | Metallc ion | Colour imparted to them. |
|------|---------------------------|--------------------------|
| i) | Potassium ion (K^+) | Lilac blue / violet |
| ii) | Sodium ion (Na^+) | Golden yellow |
| iii) | Calcium ion (Ca^{2+}) | Brick red |

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Experiment - 17 :-

Aim: To detect the metallic ion present in the salt A, B, C by observing the colour of flame by heating.

| Given salt | Colour Flame |
|-------------------------------|---------------|
| A - Potassium ion (K^+) | Violet |
| B - Sodium ion (Na^+) | Golden yellow |
| C - Calcium ion (Ca^{2+}) | Brick red |

Result:

- i) Since Salt - 'A' gave violet coloured flame the metallic ion present in it was Potassium ion (K^+)
- ii) Since Salt - 'B' gave golden-yellow coloured flame, the metallic ion present in it was Sodium ion (Na^+)
- iii) Since Salt - 'C' gave brick red coloured flame, the metallic ion present in it was Calcium ion (Ca^{2+})

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