Practical Work

Test for hydrogen (H_2):

- A burning wooden splint when brought near this gas gets off and burns with a pale blue flame producing a pop sound.

Test for oxygen (O_2):

- **A burning wooden splint when brought near this gas re-lights brightly which shows that it is a supporter of combustion.**

Test for water vapour (H_2O):

- **It turns anhydrous copper sulphate to blue.**
- It turns blue copper chloride to pink.

Test for ammonia (NH_3):

- **Dense white fumes are formed when a rod dipped in HCl is brought near this gas.**

Test for carbon dioxide (CO_2):

- **A burning wooden splint when brought near this gas goes off which shows that it is not a supporter of combustion.**

Test for sulphur dioxide (SO_2):

- **It turns potassium permanganate solution colourless.**
- It changes the colour of acidified potassium dichromate from orange to green.

Test for hydrogen sulphide (H_2S):

- **It is a colourless gas having rotten egg like smell.**

- It turns lead acetate solution silvery black.
- It turns moist blue litmus paper red. This shows that it is acidic in nature.

Test for nitrogen dioxide (NO_2):

- **It is a reddish-brown in colour.**
- It has pungent and irritating odour.
- It turns moist blue litmus paper red. This shows that it is acidic in nature.
- It turns moist potassium iodide paper brown.

Test for chlorine (Cl_2):

- It is a greenish-yellow in colour.
- It has sharp pungent choking odour.
- It turns moist blue litmus paper red followed by bleaching it. This shows that it is acidic in nature.
- It turns moist starch iodide paper blue black.
- It forms a white precipitate when passed through silver nitrate solution.

Test for hydrogen chloride (HCl):

- It is colourless.
- It has pungent choking odour.
- It turns moist blue litmus paper red.
- It produced dense white fumes when a rod dipped in ammonia solution is brought near the gas.
- It forms a white precipitate when passed through silver nitrate solution. This precipitate is soluble in excess of ammonium hydroxide solution.

1. **Copper (II) carbonate:**

On strong heating, the light green amorphous powder of copper carbonate changes to black colour residue of copper oxide.

2. **Zinc Carbonate**

On strong heating, the light white coloured amorphous solid of zinc carbonate changes to pale yellow colour residue of zinc oxide.

3. **Sodium carbonate decahydrate**

On strong heating, the white crystalline solid swells and gives off steamy vapour which turns blue colourd cobalt chloride paper pink. This shows that the liquid is water.

4. **Copper (II) sulphate pentahydrate**

On strong heating, the blue coloured crystalline solid crumbles to form white amorphous powder and steamy vapours which turn blue coloured cobalt chloride paper pink. This shows that the liquid is water.

5. **Calcium sulphite**

On addition of dilute hydrochloric acid, a gas is liberated out which turns potassium dichromate paper orange to green due to the reduction of dichromate (VI) to chromium (III). The liberated gas is sulphur dioxide.

6. **Lead (II) nitrate**

On strong heating, the white crystalline solid crumbles with cracking noise. A reddish brown gas liberates which turns moist blue litmus paper red and starch potassium iodide paper blue. This shows that the gas is nitrogen dioxide. On cooling, the reddish brown residue changes to yellow colour and some part of it fuses in the glass test tube and stains it yellow. The residue is lead (II) oxide.

7. **Lead oxide**

On strong heating, reddish brown residue of lead oxide is formed.

8. **Ammonium chloride**

On strong heating, the white crystalline solid sublimes to form dense white fumes.

9. **Ammonium dichromate**

On strong heating, the orange red crystalline solid swells up many times its volume and liberate steamy fumes which on cooling condense on the cooler parts of the test tube and forms tiny droplets of colourless liquid. This colourless liquid turns cobalt chloride paper pink which shows that the liquid is water. The greenish grey residue is chromium oxide (Cr_2O_3).

10. **Zinc nitrate hexahydrate**

On heating the white deliquescent solid forms a white sticky mass and sends out steamy vapours. The sticky mass releases reddish-

brown fumes on strong heating, which convert moist blue litmus paper. The reddish brown gas bursts a glowing wooden splinter into flames, indicating that the gas is mixed with oxygen. On heating the residue it turns yellow, and when cooled it changes back to white.

11. **Copper (II) nitrate hexahydrate**

On heating, the blue-green crystalline solid melts and forms a bluish green mass and sends out steamy vapours. The vapours convert into droplets of water after condensing on the cooler part of the test tube. On strong heating, the bluish green mass converts into the black residue of copper oxide (CuO). The substance releases reddish brown gas. The glowing wooden splinter starts burning on coming in contact with the gas.

12. **Iodine**

On strong heating the violet crystalline solid converts directly into violet vapours. These vapour deposit back the violet crystals on the cooler part of the test tube. No residue is left at the bottom of the test tube. The violet vapours turn the filter paper dipped in starch solution blue. A filter paper dipped in silver nitrate solution turns yellow on coming in contact with the vapours.

Experiment	**Observation**	**Inference**
Unknown Substance + dil H_2SO_4 + Heat	• Vigorous effervescence • Evolution of colourless, odourless gas • The gas burns with a pop sound when a burning splint is brought near it	• The gas evolved is hydrogen • Given substance may be **reactive metals** like Fe, Mg, Zn
Unknown Substance + dil H_2SO_4 + Heat	• Brisk effervescence • Evolution of colourless and odourless gas • Not support combustion • Turns moist litmus red • Turns lime water milky • No effect on acidified potassium dichromate	• The gas evolved is carbon dioxide • Salt contains **carbonate or hydrogen carbonate**
Unknown Substance + dil H_2SO_4 + Heat	• Rotten egg smell gas • Turns moist blue litmus paper red • Turns moist lead acetate paper black	• The gas evolved is hydrogen sulphide • Salt contains **sulphide**
Unknown Substance + dil H_2SO_4 + Heat	• Suffocating gas • Turns golden yellow or orange coloured filter paper moist with acidified potassium dichromate green	• The gas evolved is sulphur dioxide • Salt contains **sulphite**

1. **Colour and Odour**

Physical property	Experiment	Observation	Inference
Colour	Observe colour of the salt	Pink Blue Light green Dark brown Flesh colour White	Co^{2+} Cu^{2+} Fe^{2+} Fe^{3+} Mn^{2+} Pb^{2+}, Zn^{2+}, Ca^{2+}, Na^{+}, K^{+}, NH4+
Odour	Rub a pinch of salt between the fingers with a drop of water	Ammoniacal smell Vinegar like smell Rotten egg like smell Smell of sulphur dioxide gas	NH_4^{+} CH_3COO^{-} S^{2-} SO32-

2. Dry heating test

	Observation/ Gas evolved	**Inference**
1	*CO_2 gas* :-	CO_3^{2-} or $C_2O_4^{2-}$

	Colourless and odourless gas which turns lime water milky.	
2	*H_2S gas* :- Colourless gas with smell like rotten egg, turns lead acetate paper black.	S^{2-}
3	*SO_2 gas*:- Colourless gas with smell like burning sulphur, turns acidified potassium dichromate paper green.	SO_3^{2-}
4	*HCl gas* :- Colourless gas with pungent smell, forms white fumes with ammonia and white ppt. with silver nitrate.	Cl^-
5	Colourless gas with vinegar like smell	CH_3COO^-
6	*NH_3 gas* :- Colourless gas with characteristic smell, turns Nessler's reagent brown.	NH_4^+
7	*NO_2 gas*:- Reddish brown gas, turns ferrous sulphate solution black.	NO_2^- or NO_3^-
8	*Br_2 gas* :- Reddish brown vapours.	Br^-
9	*I_2 gas*:- Dark violet vapours.	I^-
10	*O_2 gas*:- Supports combustion, glowing wooden splinter burns.	O^{2-}
11	*H_2O* vapours:- Droplets of water on the cooler part of the test tube	Hydrated salt

3. Flame test

	Colour of flame	Inference
1	Brick red	Calcium
2	Crimson red	Strontium
3	Grassy-green	Barium
4	Bright-bluish green	Copper
5	Green flashes	Zn or Mn
6	Bull bluish	Lead

4. Solubility test

Anion→ Cation ↓	NO_3^-	CH_3COO^-	Cl^-	SO_4^{2-}	OH^-	S^{2-}	CO_3^{2-}	SO_3^{2-}	PO_4^{3-}
Al^{3+}	√	√	√	√	×	Not exist	Not exist	Not exist	×
Na^+	√	√	√	√	√	√	√	√	√
Ba^{2+}	√	√	√		√	√	×	×	×
Ca^{2+}	√	√	√	√	√	√	×	×	×
Mg^{2+}	√	√	√	√	√	√	×	×	×
K^+	√	√	√	√	√	√	√	√	√
Zn^{2+}	√	√	√	√	×	×	×	×	×
Hg^{2+}	√	√	√	√	Not exist	×	×	×	×
Fe^{3+}	√	√	√	√	×	Not exist	×	×	×
Mn^{2+}	√	√	√	√	×	×	×	×	×
Pb^{2+}	√	√	×	×	×	×	×	×	×
Cu^{2+}	√	√	√	√	×	×	×	×	×
Ag^{2+}	√	√	×	√	×	×	×	×	×
Fe^{2+}	√	√	√	√	×	×	×	Not exist	×

Water pollution:

- Ways to identify polluted water:
  - Foul smell
  - Bad taste
  - Oil or grease floating on the surface
  - Excessive algal growth
  - Growth of weeds
- Sources of water pollution:
  - Point sources: Sewage discharge pipes, oil spills, household and industrial waste, etc.
  - Non-point sources: Acid rain, agricultural run off, thermal pollution
- Cause of water pollution:

    - Pathogens: Enter water from sewage and animal excreta, for example, *E.Coli* and *S.faecalis*
    - Organic wastes: Leaves, grass trash, etc. reach water with run off
    - Chemical pollutants: Heavy metals dissolved in water, acids and raw salts, organic chemicals, fertilizers, etc.
- Water quality parameters:
    - pH value
    - Bacteria
    - Hardness
    - Dissolved oxygen
    - Biological oxygen demand
    - Turbidity
- Ways to Control Water Pollution
    - Proper treatment of sewage before its discharge in water bodies.
    - Neutralization of chemicals released from factories.
    - Gravity settlement and screening processes helps in removal of heavy floating solids.
    - Oxidation of organic matter for its removal.
    - Destruction of pathogens by ultraviolet radiations.