Answer the following questions.

1. What is inert pair effect?
   1) As we move down the group in p–block elements the outer ns² electrons become inert and do not involve in chemical combination.
   2) Only np electrons take part in chemical combination.
   3) This is known as inert pair effect.

   ➢ Because their outer electronic configuration is ns²np⁴.
   ➢ In these elements the last electron enters np orbital.
   ➢ Hence they belong to p–block elements.

3. Explain why fluorine always exhibit an oxidation state of –1?
   1) Since fluorine is the most electronegative element it exhibits only a negative state of –1.
   2) Electronic configuration of fluorine is 1s²2s²2p⁵.
   3) To attain noble gas configuration it gains 1 electron and exhibit -1 oxidation state.

4. Give the oxidation state of halogen in the following
   a) OF₂  b) O₂F₂  c) Cl₂O₃  d) I₂O₄
   Oxidation state of fluorine is -1
   a) OF₂ is –1

   b) O₂F₂ is –1

   c) Cl₂O₃
   \[2x + 3(-2) = 0\]
   \[2x - 6 = 0\]
   \[2x = +6\]
   \[x = +3\]
   O.S of Cl is +3

   d) I₂O₄
   \[2x + 4(-2) = 0\]
   \[2x - 8 = 0\]
   \[2x = +8\]
   \[X = +4\]
   O.S of I is +4
5. What are inter halogen compounds? Give examples
   Each halogen combines with other halogens to form a series of compounds called inter halogen compounds.
   E.g. IF₇.

6. Why fluorine is more reactive than other halogens?
   ➢ Fluorine is the most reactive element among halogen.
   ➢ This is due to the low value of F–F Bond dissociation energy.

7. Give the uses of helium.
   1) Helium and oxygen mixture is used by divers in place of air oxygen mixture. This prevents the painful dangerous condition called bends.
   2) Helium is used to provide inert atmosphere in electric arc welding of metals.
   3) Helium has lowest boiling point hence used in cryogenics.
   4) Helium is much less denser than air and hence used for filling air balloons.

8. What is the hybridisation of iodine in IF₇? Give its structure.

<table>
<thead>
<tr>
<th>Interhalogen</th>
<th>Hybridisation</th>
<th>Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF₇</td>
<td>Sp³d³</td>
<td>Pentagonal bipyramidal</td>
</tr>
</tbody>
</table>

9. Give the balanced equation for the reaction between chlorine with cold NaOH and hot NaOH?
   • Chlorine reacts with cold NaOH to give sodium hypochlorite
     \[ \text{Cl}_2 + 2\text{NaOH} \rightarrow \text{NaOCl} + \text{NaCl} + \text{H}_2\text{O} \]
     sodium hypochlorite
   • Chlorine reacts with hot NaOH to give sodium chlorate
     \[ 3\text{Cl}_2 + 6\text{NaOH} \rightarrow \text{NaClO}_3 + 5\text{NaCl} + 3\text{H}_2\text{O} \]
     sodium chlorate

10. How will you prepare chlorine in the laboratory?
    In the laboratory, chlorine is prepared by the oxidation of hydrochloric acid by potassium permanganate.
    \[ 2\text{KMnO}_4 + 16\text{HCl} \rightarrow 2\text{KCl} + 2\text{MnCl}_2 + 8\text{H}_2\text{O} + 5\text{Cl}_2 \]

11. Give the uses of sulphuric acid.
    ➢ In the manufacture of fertilizers, ammonium sulphate and super phosphates.
    ➢ In the manufacture of other chemicals such as hydrochloric acid, nitric acid etc.,

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pg. 2
+2 CHEMISTRY

SAIVEERA ACADEMY

STUDY MATERIALS

As a drying agent.

In the preparation of pigments, explosives etc.,

12. Give a reason to support that sulphuric acid is a dehydrating agent.
   ➢ Sulphuric acid is highly soluble in water.
   ➢ It has strong affinity towards water and thus it absorbs water quickly.
   ➢ Hence it can be used as a dehydrating agent.
   ➢ When dissolved in water, it forms mono (H₂SO₄.H₂O) and dihydrates (H₂SO₄.2H₂O)

13. Write the reason for the anomalous behaviour of Nitrogen.
   ➢ Small size
   ➢ High electro negativity
   ➢ Non–availability of d–orbitals in valency shell
   ➢ Chemically inert due to high bonding energy
   ➢ High ionization energy

14. Write the molecular formula and structural formula for the following molecules
   a) Nitric acid
   b) Dinitrogen pentoxide
   c) Phosphoric acid
   d) Phosphine

<table>
<thead>
<tr>
<th>Compound</th>
<th>Molecular Formula</th>
<th>Structural Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) Nitric acid</td>
<td>HNO₃</td>
<td><img src="image" alt="Nitric Acid Structure" /></td>
</tr>
<tr>
<td>b) Dinitrogen pentoxide</td>
<td>N₂O₅</td>
<td><img src="image" alt="Dinitrogen Pentoxide Structure" /></td>
</tr>
<tr>
<td>c) Phosphoric acid</td>
<td>H₃PO₄</td>
<td><img src="image" alt="Phosphoric Acid Structure" /></td>
</tr>
<tr>
<td>d) Phosphine</td>
<td>PH₃</td>
<td><img src="image" alt="Phosphine Structure" /></td>
</tr>
</tbody>
</table>

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pg. 3
15. Give the uses of argon.
   - Argon prevents the oxidation of hot filament and prolongs the life in filament bulbs.
   - Argon is used in radio valves and tubes.

    Valence shell electronic configuration of group 15 elements is $\text{ns}^2\text{np}^3$.

17. Give two equations to illustrate the chemical behaviour of phosphine.

**Basic Nature**

Phosphine is weakly basic and forms phosphonium salts.

$$\text{PH}_3 + \text{HI} \rightarrow \text{PH}_4\text{I}$$

$$\text{PH}_4\text{I} + \text{H}_2\text{O} \xrightarrow{\Delta} \text{PH}_3 + \text{H}_3\text{O}^+ + \text{I}^-$$

**Combustion**

When phosphine is heated with air or oxygen it burns to give metaphosphoric acid

$$\Delta$$

$$4\text{PH}_3 + 8\text{O}_2 \rightarrow \text{P}_4\text{O}_{10} + 6\text{H}_2\text{O}$$

**Phosphorous pentoxide**

$$\Delta$$

$$\text{P}_4\text{O}_{10} + 6\text{H}_2\text{O} \rightarrow 4\text{HPO}_3 + 4\text{H}_2\text{O}$$

**Metaphosphoric acid**

18. Give a reaction between nitric acid and a basic oxide.

Nitric acid reacts with a basic oxide to form salt and water.

$$3\text{FeO} + 10\text{HNO}_3 \rightarrow 3\text{Fe(NO}_3)_3 + \text{NO} + 5\text{H}_2\text{O}.$$ 

19. What happens when PCl$_5$ is heated?

   On heating Phosphorous pentachloride decomposes into phosphorus trichloride and chlorine.

   $$\text{PCl}_5(\text{g}) \rightarrow \text{PCl}_3(\text{g}) + \text{Cl}_2(\text{g}).$$

20. Suggest a reason why HF is a weak acid, where as binary acids of the all other halogens are strong acids.

   - Among halogen acids, the **electronegativity difference is maximum** (1.9) in HF acid.
   - Hence the **bond between H and F is stronger** and the acid HF is weaker.
   - It takes tremendous amount of energy to break the H-F bond in water.
22. What type of hybridisation occur in  
\[ \text{a) BrF}_5 \quad \text{b) BrF}_3 \]  

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Inter Halogen Compound</th>
<th>Hybridisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>BrF$_5$</td>
<td>sp$^3$d$^2$</td>
</tr>
<tr>
<td>b)</td>
<td>BrF$_3$</td>
<td>sp$^3$</td>
</tr>
</tbody>
</table>

23. Complete the following reactions

\[ \text{Answer:} \]

1. \[ 4\text{NaCl}+\text{MnO}_2+4\text{H}_2\text{SO}_4 \rightarrow \text{Cl}_2 + \text{MnCl}_2 + 4\text{NaHSO}_4 + 2\text{H}_2\text{O} \]

2. \[ \text{NaNO}_2+\text{HCl} \rightarrow \text{NaCl} + \text{HNO}_2 \]

3. \[ \text{IO}^3^-+5\text{I}^-+6\text{H}^+ \rightarrow 3\text{I}_2 + 3\text{H}_2\text{O} \]

4. \[ \text{I}_2+2\text{S}_2\text{O}_3^{2-} \rightarrow \]  

5. \[ \text{P}_4+3\text{NaOH}+3\text{H}_2\text{O} \rightarrow 3\text{NaH}_2\text{PO}_2 + \text{PH}_3\uparrow \]

\[ \text{i. sodium hypophosphitephosphine} \]

6. \[ 6\text{AgNO}_3+\text{PH}_3+3\text{H}_2 \rightarrow 6\text{Ag} + 6\text{HNO}_3 + \text{H}_3\text{PO}_3 \]

7. \[ 4\text{Mg}+10\text{HNO}_3 \rightarrow 4\text{Mg(NO}_3)_2 + \text{NH}_4\text{NO}_3 + 3\text{H}_2\text{O} \]

8. \[ 2\text{KClO}_3 \stackrel{\Delta}{\rightarrow} 2\text{KCl} + 3\text{O}_2\uparrow \]

9. \[ \text{Cu}+2\text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + 2\text{H}_2\text{O} + 2\text{SO}_2\uparrow \]

10. \[ 2\text{Sb}+3\text{Cl}_2 \rightarrow 2\text{SbCl}_3 \]

11. \[ 2\text{HBr}+\text{H}_2\text{SO}_4 \rightarrow 2\text{H}_2\text{O} + \text{Br}_2 + \text{SO}_2 \]

12. \[ \text{XeF}_6+3\text{H}_2\text{O} \rightarrow \text{XeO}_3 + 6\text{HF} \]

13. \[ 5\text{XeO}_6^{4+}+2\text{Mn}^{2+}+14\text{H}^+ \rightarrow 2\text{MnO}_4^-+5\text{XeO}_3+7\text{H}_2\text{O} \]

14. \[ 2\text{XeOF}_4+\text{SiO}_2 \rightarrow 2\text{Xeo}_2\text{F}_2 + \text{SiF}_4 \]
15. Xe + 3F₂ → XeF₆
400°C

Book inside short answers

1. What is Aquaregia? Write down its use.
   When three parts of concentrated hydrochloric acid and one part of concentrated nitric acid are mixed, Aquaregia (Royal water) is obtained.
   Use: This is used for dissolving gold, platinum

2. Give the uses of Xenon and radon.
   Xenon:
   1) Xenon is used in fluorescent bulbs, flash bulbs and lasers.
   2) Xenon emits an intense light in discharge tubes instantly. Due to this it is used in high speed electronic flash bulbs used by photographers

   Radon:
   1) Radon is radioactive and used as a source of gamma rays
   2) Radon gas is sealed as small capsules and implanted in the body to destroy malignant i.e. cancer growth

3. Give the uses of neon, argon, krypton
   Neon:
   Neon is used in advertisement as neon sign and the brilliant red glow is caused by passing electric current through neon gas under low pressure.

   Argon:
   Argon prevents the oxidation of hot filament and prolongs the life in filament bulbs

   Krypton:
   1) Krypton is used in fluorescent bulbs, flash bulbs etc...
   2) Lamps filled with krypton are used in airports as approaching lights as they can penetrate through dense fog.

4. Give Uses of hydrochloric acid
   1. Hydrochloric acid is used for the manufacture of chlorine, ammonium chloride, glucose from corn starch etc.,
   2. Extraction of glue from bone and for purification of bone black
5. Give the Uses of chlorine
1. Purification of **drinking water**
2. **Bleaching of cotton textiles**, paper and rayon
3. It is used in extraction of gold and platinum

6. **How will you prepare** bleaching powder from chlorine
Bleaching powder is produced by passing chlorine gas through dry slaked lime (calcium hydroxide)
\[ \text{Ca(OH)}_2 + \text{Cl}_2 \rightarrow \text{CaOCl}_2 + \text{H}_2\text{O} \]

7. **Write down tests for sulphate/sulphuric acid**
Dilute solution of sulphuric acid/aqueous solution of sulphates gives white precipitate (barium sulphate) with barium chloride solution. It can also be detected using lead acetate solution. Here a white precipitate of lead sulphate is obtained.
\[
\text{BaCl}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{BaSO}_4 \downarrow + 2\text{HCl}
\]
Barium sulphate (white precipitate)
\[
(\text{CH}_3\text{COO})_2\text{Pb} + \text{H}_2\text{SO}_4 \rightarrow \text{PbSO}_4 \downarrow + \text{CH}_3\text{COOH}
\]
Lead sulphate (white precipitate)

8. **Why sulphuric acid is called as** strong dibasic acid
It is a strong dibasic acid. Hence it forms two types of salts namely sulphates and bisulphates.
\[
\text{H}_2\text{SO}_4 + \text{NaOH} \rightarrow \text{NaHSO}_4 + \text{H}_2\text{O}
\]
\[
\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}
\]

9. **Give uses of sulphur dioxide**
1. Sulphur dioxide is used in bleaching hair, silk, wool etc...
2. It can be used for disinfecting crops and plants in agriculture.

10. **Give the uses of oxygen**
1. Oxygen is one of the essential component for the survival of living organisms.
2. It is used in welding (oxyacetylene welding)
3. Liquid oxygen is used as fuel in rockets
11. Hybridisation and structure of xenon fluoride Compounds

<table>
<thead>
<tr>
<th>Compound</th>
<th>Hybridisation</th>
<th>Shape / Structure</th>
</tr>
</thead>
<tbody>
<tr>
<td>XeF</td>
<td>sp'd</td>
<td>Linear</td>
</tr>
<tr>
<td>XeF₄</td>
<td>sp'd²</td>
<td>Square planar</td>
</tr>
<tr>
<td>XeF₆</td>
<td>sp'd³</td>
<td>Distorted octahedron</td>
</tr>
<tr>
<td>XeOF₂</td>
<td>sp'd</td>
<td>T Shaped</td>
</tr>
<tr>
<td>XeOF₄</td>
<td>sp'd²</td>
<td>Square pyramidal</td>
</tr>
<tr>
<td>XeO₃</td>
<td>sp³</td>
<td>Pyramidal</td>
</tr>
</tbody>
</table>

12. Structure, Hybridisation of interhalogen compounds

<table>
<thead>
<tr>
<th>Type</th>
<th>Structure</th>
<th>Hybridisation</th>
<th>bond pairs / lone pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>AX</td>
<td>Linear</td>
<td>sp³</td>
<td>1 / 3</td>
</tr>
<tr>
<td>AX₃</td>
<td>T shaped</td>
<td>sp'd</td>
<td>3 / 2</td>
</tr>
<tr>
<td>AX₅</td>
<td>Square pyramidal</td>
<td>sp'd²</td>
<td>5 / 1</td>
</tr>
<tr>
<td>AX₇</td>
<td>Pentagonal bipyramidal</td>
<td>sp'd³</td>
<td>7 / 0</td>
</tr>
</tbody>
</table>

13. Explain about Holmes signal

Uses of phosphine:
- Phosphine is used for producing smoke screen as it gives large smoke. In a ship, a pierced container with a mixture of calcium carbide and calcium phosphide, liberates phosphine and acetylene when thrown into sea.
- The liberated phosphine catches fire and ignites acetylene.
- These burning gases serves as a signal to the approaching ships. This is known as Holmes signal.

14. What is Haber's process?
The synthesis of ammonia from nitrogen and hydrogen at high pressure and optimum temperature in presence of iron catalyst is known as Haber's process.

\[ \text{N}_2 + 3\text{H}_2 \leftrightarrow 2\text{NH}_3 \]

15. Write the uses of nitrogen
- In the manufacture of ammonia, nitric acid and calcium cyanamide etc.
- Liquid nitrogen is used for producing low temperature required in cryosurgery and so used in biological preservation.

16. What happens when ammonia reacts with excess of chlorine?
With excess of chlorine ammonia reacts to give an explosive substance nitrogen trichloride

\[ 2\text{NH}_3 + 6\text{Cl}_2 \rightarrow 2\text{NCl}_3 + 6\text{HCl} \]

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pg. 8
17. Prove that nitric acid is an oxidising agent & nitrating agent.
Non metals like carbon, sulphur are oxidised by nitric acid.
\[
\text{C} + 4\text{HNO}_3 \rightarrow \text{CO}_2 + 4 \text{NO}_2 + 2\text{H}_2\text{O}
\]
Nitric acid replaces hydrogen atom from organic compounds with nitronium ion \(\text{NO}^{2+}\). This is called nitration.
\[
\text{C}_6\text{H}_6 + \text{HNO}_3 \rightarrow \text{C}_6\text{H}_5\text{NO}_2 + \text{H}_2\text{O}
\]

18. Write the uses of nitric acid
- It is used as an oxidising agent.
- It is used in the preparation of aquaregia.
- Salts of nitric acid are used in photography (\(\text{AgNO}_3\)) and gunpowder for fire arms (\(\text{NaNO}_3\)).

19. What is phosphorescence?
White phosphorous undergoes spontaneous slow oxidation in air giving a greenish yellow glow which is visible in the dark. This is known as phosphorescence.

20. How is phosphine prepared?
Phosphine is prepared by the action of sodium hydroxide with white phosphorous in an inert atmosphere of carbon dioxide
\[
\text{P}_4 + \text{NaOH} + \text{CO}_2 \rightarrow 3\text{NaH}_2\text{PO}_2 + \text{PH}_3 \uparrow
\]

21. How is orthophosphoric acid prepared in the laboratory?
When phosphorous is treated with conc. nitric acid in the presence of iodine catalyst, it is oxidised to orthophosphoric acid.
\[
\text{P}_4 + 20\text{HNO}_3 \rightarrow 4\text{H}_3\text{PO}_4 + 20\text{NO}_2 + 4\text{H}_2\text{O}
\]

22. Write about the reducing property of phosphine?
Phosphine reduces silver nitrate into silver
\[
\text{PH}_3 + 6\text{AgNO}_3 + 3\text{H}_2\text{O} \rightarrow 6\text{Ag} + 6\text{HNO}_3 + \text{H}_3\text{PO}_3
\]

23. Write the uses of oxygen
- Oxygen is one of the essential component for the survival of living organisms.
- Oxygen is used in oxyacetylene welding.
- Liquid oxygen is used as a rocket fuel.

24. Illustrate the dehydrating property of sulphuric acid
\[
\text{C}_12\text{H}_2\text{O}_11 + \text{H}_2\text{SO}_4 \rightarrow 12 \text{C} + \text{H}_2\text{SO}_4.11\text{H}_2\text{O}
\]
\[
\text{HCOOH} + \text{H}_2\text{SO}_4 \rightarrow \text{CO} + \text{H}_2\text{SO}_4.\text{H}_2\text{O}
\]
25. Write about the bleaching action of chlorine.
Chlorine is a strong oxidising and bleaching agent since it produces nascent oxygen.

\[ \text{H}_2\text{O} + \text{Cl}_2 \rightarrow \text{HCl} + \text{HOCl} \]

\[ \text{HOCl} \rightarrow \text{HCl} + [O] \]

Colouring matter + Nascent oxygen → Colourless oxidation product.
The bleaching of chlorine is permanent.

25. Show that sodium per xenate is a strong oxidising agent
Sodium per xenate oxidises manganese (II) ion into permanganate ion even in the absence of a catalyst

\[ 5\text{XeO}_6^{4-} + 2\text{Mn}^{2+} + 14\text{H}^+ \rightarrow 2\text{MnO}_4^{4-} + 5\text{XeO}_3 + 7\text{H}_2\text{O} \]

See all the structure, preparation, chemical properties of compounds which may be asked in exam.
1. What are the Properties of inter halogen compounds
   i. The **central atom will be the larger one**
   ii. It can be formed only between two halogen and not more than two halogens.
   iii. **Fluorine can’t act as a central metal atom** being the smallest one
   iv. Due to high electronegativity with small size fluorine helps the central atom to attain high coordination number
   v. They can undergo the **auto ionization**.
   vi. They are **strong oxidizing agents**

2. Explain trend in various properties of Hydrogen halide from fluorine to iodine

<table>
<thead>
<tr>
<th>Property</th>
<th>Order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactivity of hydrogen</td>
<td>Decreases from fluorine to iodine</td>
</tr>
<tr>
<td>Stability</td>
<td>Decreases from HF to HI</td>
</tr>
<tr>
<td>Volatility of the hydrides</td>
<td>HF &lt; HI &lt; HBr &lt; HCl</td>
</tr>
<tr>
<td>Thermal stability</td>
<td>HF &gt; HI &gt; HBr &gt; HCl</td>
</tr>
<tr>
<td>Boiling point</td>
<td>HCl &lt; HBr &lt; HI</td>
</tr>
<tr>
<td>Acid strength</td>
<td>Increases from HF to HI</td>
</tr>
</tbody>
</table>

3. Explain the manufacture of chlorine by electrolytic method and Deacon’s process

**Electrolytic process**

➢ When a solution of brine (NaCl) is electrolysed, Na⁺ and Cl⁻ ions are formed. Na⁺ ion reacts with OH⁻ ions of water and forms sodium hydroxide.
➢ Hydrogen and chlorine are liberated as gases.

\[ \text{NaCl} \rightarrow \text{Na}^+ + \text{Cl}^- \]
\[ \text{H}_2\text{O} \rightarrow \text{H}^+ + \text{OH}^- \]
\[ \text{Na}^+ + \text{OH}^- \rightarrow \text{NaOH} \]

**At the cathode,**

\[ \text{H}^+ + \text{e}^- \rightarrow \text{H} \]
\[ \text{H} + \text{H} \rightarrow \text{H}_2 \]

**At the anode,**

\[ \text{Cl}^- \rightarrow \text{Cl} + \text{e}^- \]
\[ \text{Cl} + \text{Cl} \rightarrow \text{Cl}_2 \]
Deacon’s process
In this process a mixture of air and hydrochloric acid is passed up a chamber containing a number of shelves, pumice stones soaked in cuprous chloride are placed. Hot gases at about 723 K are passed through a jacket that surrounds the chamber.

\[
4\text{HCl} + \text{O}_2 \xrightarrow{400^\circ C} 2\text{H}_2\text{O} + \text{Cl}_2
\]

\[
\text{Cu}_2\text{Cl}_2
\]

4. Explain about Manufacture of sulphuric acid by contact process
The contact process involves the following steps.

i. Initially sulphur dioxide is produced by burning sulphur or iron pyrites in oxygen/air.

\[
\text{S} + \text{O}_2 \rightarrow \text{SO}_2
\]

\[
4\text{FeS}_2 + 11\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3 + 8\text{SO}_2
\]

ii. Sulphur dioxide formed is oxidised to sulphur trioxide by air in the presence of a catalyst such as \(\text{V}_2\text{O}_5\) or platinised asbestos.

iii. The sulphur trioxide is absorbed in concentrated sulphuric acid and produces oleum (\(\text{H}_2\text{S}_2\text{O}_7\)). The oleum is converted into sulphuric acid by diluting it with water.

\[
\text{SO}_3 + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{S}_2\text{O}_7 \xrightarrow{\text{H}_2\text{O}} 2\text{H}_2\text{SO}_4
\]

To maximise the yield the plant is operated at 2 bar pressure and 720 K. The sulphuric acid obtained in this process is over 96 % pure.

5. Explain about Allotrophic forms of sulphur

1) Sulphur exists in crystalline as well as amorphous allotrophic forms.
2) The crystalline form includes rhombic sulphur (\(\alpha\) sulphur) and monoclinic sulphur (\(\beta\) sulphur). Amorphous allotrophic form includes plastic sulphur (\(\gamma\) sulphur), milk of sulphur and colloidal sulphur.
3) Rhombic sulphur also known as \(\alpha\) sulphur, is the only thermodynamically stable allotropic form at ordinary temperature and pressure.
4) The crystals have a characteristic yellow colour and composed of \(\text{S}_8\) molecules.
5) When heated slowly above 96\(^\circ\)C, it converts into monoclinic sulphur. Upon cooling below
6) 96 \(^\circ\)C the \(\beta\) form converts back to \(\alpha\) form.
7) Monoclinic sulphur also contains \(\text{S}_8\) molecules in addition to small amount of \(\text{S}_6\) molecules.
8) It exists as a long needle like prism and is also called as prismatic sulphur. It is stable between 96 \(^\circ\) - 119 \(^\circ\)C and slowly changes into rhombic sulphur.
9) When molten sulphur is poured into cold water a yellow rubbery ribbon of plastic sulphur is produced. They are very soft and can be stretched easily. On standing (cooling slowly) it slowly becomes hard and changes to stable rhombic Sulphur. Sulphur also exists in liquid and gaseous states. At around 140 °C the monoclinic sulphur melts to form mobile pale yellow liquid called λ sulphur.

6. Write about ozone
   ➢ Ozone is an allotropic form of oxygen
   ➢ Ozone is triatomic gas
   ➢ Although negligible amounts of ozone occurs at sea level, it is formed in the upper atmosphere by the action of UV light.
   ➢ In the laboratory ozone is prepared by passing electrical discharge through oxygen.
   ➢ At a potential of 20,000 V about 10% of oxygen is converted into ozone, it gives a mixture known as ozonised oxygen.
   ➢ Pure ozone is obtained as a pale blue gas by the fractional distillation of liquefied ozonised oxygen.

7. Write about the reducing property of sulphur dioxide
   i) SO₂ reduces chlorine into hydrochloric acid
      \[ \text{SO}_2 + 2\text{H}_2\text{O} + \text{Cl}_2 \rightarrow \text{H}_2\text{SO}_4 + 2\text{HCl} \]
   ii) SO₂ reduces potassium permanganate into manganese sulphate (Mn²⁺)
      \[ 2\text{K MnO}_4 + 5\text{SO}_2 + 2\text{H}_2\text{O} \rightarrow 2\text{K}_2\text{SO}_4 + 2\text{MnSO}_4 + 2\text{H}_2\text{SO}_4 \]
   iii) SO₂ reduces potassium dichromate into chromic sulphate (Cr³⁺)
      \[ \text{K}_2\text{Cr}_2\text{O}_7 + 3\text{SO}_2 + \text{H}_2\text{SO}_4 \rightarrow \text{K}_2\text{SO}_4 + \text{Cr}_2(\text{SO}_4)_3 + \text{H}_2\text{O} \]

8. Write about the bleaching action of sulphur dioxide.
   i) In presence of water, sulphur dioxide bleaches coloured wool, silk, sponges and straw into colourless due to its reducing property
      \[ \text{SO}_2 + 2\text{H}_2\text{O} \rightarrow \text{H}_2\text{SO}_4 + 2[\text{H}] \]
      \[ \text{X} + 2[\text{H}] \rightarrow \text{XH}_2 \]
      Coloured colourless
   ii) When the bleached product (Colourless) is allowed to stand in air, it is reoxidised by atmospheric oxygen to its original colour.
   iii) Hence bleaching action of sulphur dioxide is temporary

9. Show that sulphuric acid is an oxidising agent
   i) Sulphuric acid is an oxidising agent as it produces nascent oxygen

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Cu + 4HNO

Hence over all reaction is
10. Explain the action of nitric acid on metals with one example.

Primary reaction
Metal nitrate is formed with the release of nascent hydrogen.

Secondary reaction
Nascent hydrogen produces the reduction products of nitric acid

Tertiary reaction
With dilute acid the secondary products decompose to give final products.

Hence over all reaction is

Cu + 4HNO

Hence over all reaction is