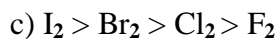


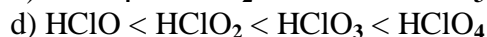
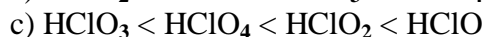
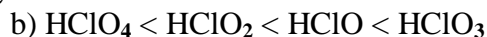
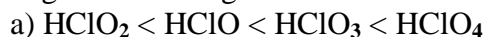
UNIT - 3.p - Block Elements II

Choose the best answer:

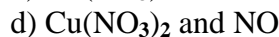
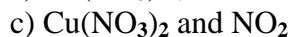
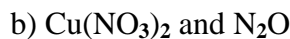
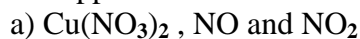
1. In which of the following, NH_3 is not used?
 - a) Nessler's reagent
 - b) Reagent for the analysis of IV group basic radical
 - c) Reagent for the analysis of III group basic radical
 - d) Tollen's reagent
2. Which is true regarding nitrogen?
 - a) least electronegative element
 - b) has low ionisation enthalpy than oxygen
 - c) d- orbitals available
 - d) ability to form $p\pi - p\pi$ bonds with itself
3. An element belongs to group 15 and 3rd period of the periodic table, its electronic configuration would be
 - a) $1s^2 2s^2 2p^4$
 - b) $1s^2 2s^2 2p^3$
 - c) $1s^2 2s^2 2p^6 3s^2 3p^2$
 - d) $1s^2 2s^2 2p^6 3s^2 3p^3$
4. Solid (A) reacts with strong aqueous NaOH liberating a foul smelling gas (B) which spontaneously burns in air giving smoky rings. A and B are respectively
 - a) P_4 (red) and PH_3
 - b) P_4 (white) and PH_3
 - c) S_8 and H_2S
 - d) P_4 (white) and H_2S
5. In the brown ring test, brown colour of the ring is due to
 - a) a mixture of NO and NO_2
 - b) Nitroso ferrous sulphate
 - c) Ferrous nitrate
 - d) Ferric nitrate
6. On hydrolysis, PCl_3 gives
 - a) H_3PO_3
 - b) PH_3
 - c) H_3PO_4
 - d) POCl_3
7. P_4O_6 reacts with cold water to give
 - a) H_3PO_3
 - b) $\text{H}_4\text{P}_2\text{O}_7$
 - c) HPO_3
 - d) H_3PO_4
8. The basicity of pyrophosphorous acid ($\text{H}_4\text{P}_2\text{O}_5$) is
 - a) 4
 - b) 2
 - c) 3
 - d) 5
9. The molarity of given orthophosphoric acid solution is 2M. its normality is
 - a) 6N
 - b) 4N
 - c) 2N
 - d) none of these
10. Assertion : bond dissociation energy of fluorine is greater than chlorine gas
Reason: chlorine has more electronic repulsion than fluorine
 - a) Both assertion and reason are true and reason is the correct explanation of assertion.
 - b) Both assertion and reason are true but reason is not the correct explanation of assertion.
 - c) Assertion is true but reason is false.
 - d) Both assertion and reason are false.
11. Among the following, which is the strongest oxidizing agent?
 - a) Cl_2
 - b) F_2
 - c) Br_2
 - d) I_2
12. The correct order of the thermal stability of hydrogen halide is
 - a) $\text{HI} > \text{HBr} > \text{HCl} > \text{HF}$
 - b) $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$
 - c) $\text{HCl} > \text{HF} > \text{HBr} > \text{HI}$
 - d) $\text{HI} > \text{HCl} > \text{HF} > \text{HBr}$
13. Which one of the following compounds is not formed?
 - a) XeOF_4
 - b) XeO_3
 - c) XeF_2
 - d) NeF_2
14. Most easily liquefiable gas is
 - a) Ar
 - b) Ne
 - c) He
 - d) Kr
15. XeF_6 on complete hydrolysis produces
 - a) XeOF_4
 - b) XeO_2F_2
 - c) XeO_3
 - d) XeO_2
16. On oxidation with iodine, sulphite ion is transformed to
 - a) $\text{S}_4\text{O}_6^{2-}$
 - b) $\text{S}_2\text{O}_6^{2-}$
 - c) SO_4^{2-}
 - d) SO_3^{2-}
17. Which of the following is strongest acid among all?
 - a) HI
 - b) HF
 - c) HBr
 - d) HCl
18. Which one of the following orders is correct for the bond dissociation enthalpy of halogen molecules?
 - a) $\text{Br}_2 > \text{I}_2 > \text{F}_2 > \text{Cl}_2$
 - b) $\text{F}_2 > \text{Cl}_2 > \text{Br}_2 > \text{I}_2$



19. Among the following the correct order of acidity is



20. When copper is heated with conc HNO_3 it produces



ANSWER

1	2	3	4	5	6	7	8	9	10
a	d	d	b	b	a	a	b	a	d
11	12	13	14	15	16	17	18	19	20
b	b	d	c	c	c	a	d	d	c

Answer the following questions:

1. What is inert pair effect?

In heavier post-transition metals, the outer s electrons (ns) have a tendency to remain inert and show reluctance to take part in the bonding, which is known as inert pair effect.

2. Chalcogens belongs to p-block. Give reason.

Elements belonging group 16 with electronic configuration ns^2np^4 are called chalcogens or ore forming elements as most of the ores are oxides or sulphides.

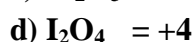
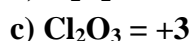
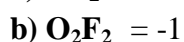
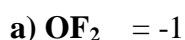
Since the last electrons enters into the p-orbital.

3. Explain why fluorine always exhibit an oxidation state of -1?

The first element of group 17, fluorine the most electronegative element,

It shows only -1 oxidation state. Due to the absence of d-orbitals fluorine does not show positive oxidation state.

4. Give the oxidation state of halogen in the following. a) OF_2 b) O_2F_2 c) Cl_2O_3 d) I_2O_4



5. What are interhalogen compounds? Give examples.

Each halogen combines with other halogens to form a series of compounds called inter halogen compounds.

Example : ClF_3 , IF_7

6. Why fluorine is more reactive than other halogens?

Fluorine is most reactive element among halogens due to the minimum value of F-F bond dissociation energy.

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7. Give the uses of Helium.

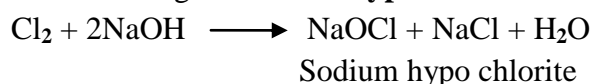
1. Helium and oxygen mixture is used by divers in place of air oxygen mixture.
This prevents the painful dangerous condition called bends.
2. Helium is used to provide inert atmosphere in electric arc welding of metals
3. Helium has lowest boiling point hence used in cryogenics (low temperature science).
4. It 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.

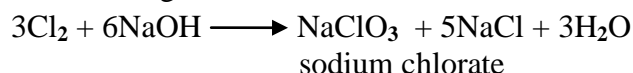
IF₇ undergo sp³d³ hybridisation. It has pentagonal bipyramidal structure.

9. Give the balanced equation for the reaction between chlorine with cold NaOH and hot NaOH.

With Cold NaOH it give **Sodium hypo chlorite**



With Hot NaOH it give **Sodium Chlorate**

**10. How will you prepare chlorine in the laboratory?**

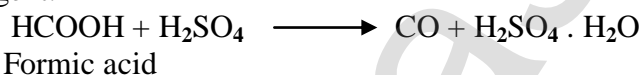
Chlorine is prepared by the action of conc. hydrochloric acid potassium permanganate or dichromate

**11. Give the uses of sulphuric acid.**

1. Sulphuric acid is used in the manufacture of fertilisers, ammonium sulphate and super phosphates and other chemicals such as hydrochloric acid, nitric acid etc...
2. It is used as a drying agent and also used in the preparation of pigments, explosives etc..

12. Give a reason to support that sulphuric acid is a dehydrating agent.

It is highly soluble in water and has strong affinity towards water and hence it can be used as a dehydrating agent.

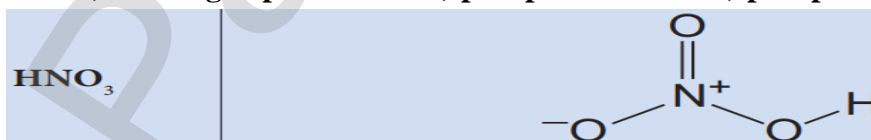
**13. Write the reason for the anomalous behaviour of Nitrogen.**

1. Small size
2. High ionisation enthalpy and high electronegativity.
3. Absence of d-orbitals in their valence shell.
4. Nitrogen is a diatomic gas unlike the other members of the group.

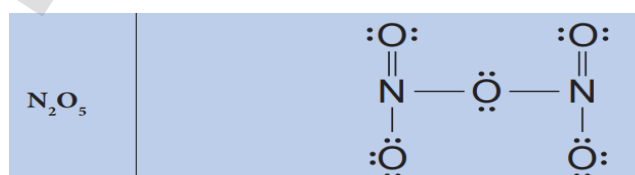
14. Write the molecular formula and structural formula for the following molecules.

a) Nitric acid b) dinitrogen pentoxide c) phosphoric acid d) phosphine

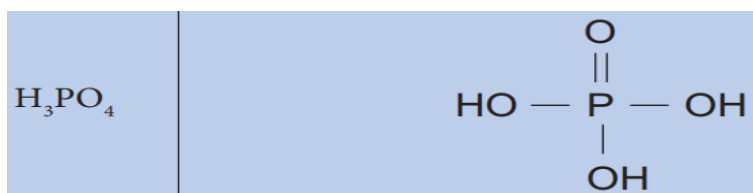
a) Nitric acid



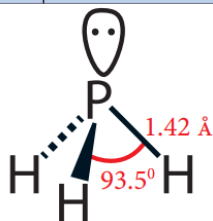
b) Dinitrogen pentoxide



c) Phosphoric acid



d) Phosphine



15. Give the uses of Argon.

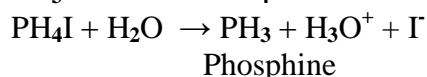
Argon prevents the oxidation of hot filament and prolongs the life in filament bulbs.

16. Write the valence shell electronic configuration of group-15 elements.

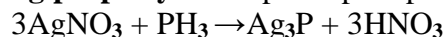
The valence shell electronic configuration of group-15 elements is ns^2np^3 .

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

Basic nature: Phosphine is weakly basic and forms phosphonium salts with halogen acids.

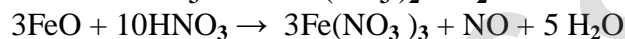
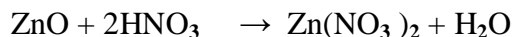


Reducing property : Phosphine precipitates some metal from their salt solutions.



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

Nitric acid reacts with bases and basic oxides to form salts and water

19. What happens when PCl_5 is heated?

On heating phosphorous pentachloride, it decomposes into phosphorus trichloride and chlorine.



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



Solutions of hydrogen halides are therefore acidic and known as hydrohalic acids. Hydrochloric, hydrobromic and hydroiodic acids are almost completely ionised and are therefore strong acids but HF is a weak acid because HF bond dissociation energy is high (574 kJ/mol)

21. Deduce the oxidation number of oxygen in hypofluorous acid – HOF.

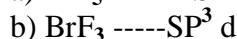
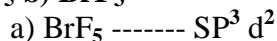
Hydrogen has a +1 oxidation number.

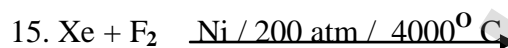
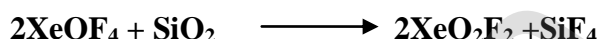
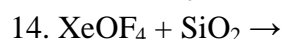
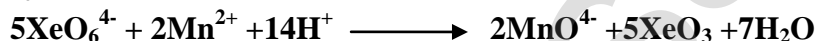
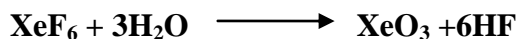
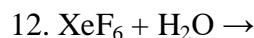
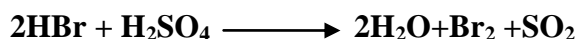
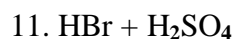
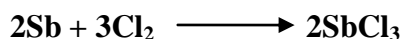
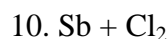
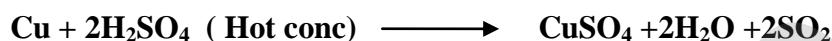
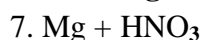
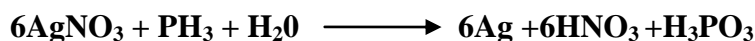
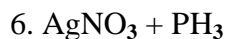
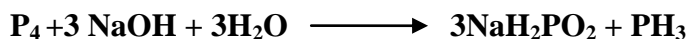
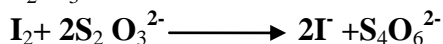
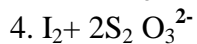
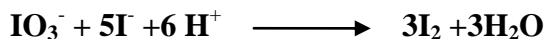
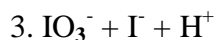
Oxygen generally has a -2 oxidation number.

But, **fluorine is a more electronegative element than that of oxygen.**

Hence, the oxidation state of oxygen must be higher than that of fluorine in positive sense.

22. What type of hybridisation occur in

a) BrF_5 b) BrF_3 

23. Complete the following reactions.

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ONE MARK FROM INSIDE THE LESSON

- Which of the following halides of group 15 is not hydrolysed?
a) NF_3 b) PF_3 c) NI_3 d) both (a) and (b)
- Pick the wrong one among the following
a) F_2 – yellow b) Br_2 – red c) Cl_2 – colourless d) I_2 – violet
- Oxalic acid on heating with conc. H_2SO_4 gives
a) CO only b) CO_2 only c) $\text{CO}_2 + \text{H}_2\text{O}$ d) $\text{CO} + \text{CO}_2 + \text{H}_2\text{O}$
- Orthophosphorus acid on heating gives _____
a) Hypophosphorus b) Orthophosphoric c) Phosphine gas d) Both (b) and (c)
- Maximum covalent character is shown by _____
a) PCl_3 b) NCl_3 c) AsCl_3 d) SbCl_3
- Strong reducing behaviour of H_3PO_2 is due to _____
a) High oxidation state of phosphorus
b) High electro gain enthalpy of phosphorus
c) Presence of two $-\text{OH}$ groups and one P-H bond
d) Presence of one $-\text{OH}$ groups and two P-H bonds
- Oxidation states of P in $\text{H}_4\text{P}_2\text{O}_5$, $\text{H}_4\text{P}_2\text{O}_6$, $\text{H}_4\text{P}_2\text{O}_7$ are respectively _____
a) +3,+4,+5 b) +3,+5,+4 c) +5,+3,+4 d) +5,+4,+
- Chile salt petre is
a) NaNO_2 b) NaNO_3 c) KNO_2 d) KNO_3
- Which is used in match boxes?
a) White phosphorous b) Red phosphorous c) Black phosphorous d) Scarlet phosphorous
- Thermodynamically stable allotropic form of sulphur is
a) Rhombic sulphur b) Monoclinic sulphur c) Plastic sulphur d) Colloidal sulphur
- Aquaregia is a mixture of conc. HCl and conc. HNO_3 in the ratio
a) 1 : 3 b) 3 : 1 c) 2 : 3 d) 3 : 2
- The correct order of acid strength is
a) $\text{HF} > \text{HCl} > \text{HBr} > \text{HI}$ b) $\text{HF} < \text{HCl} < \text{HBr} < \text{HI}$
c) $\text{HF} > \text{HCl} < \text{HBr} > \text{HI}$ d) $\text{HF} < \text{HCl} > \text{HBr} < \text{HI}$
- Hydrolysis of urea gives
a) ammonia b) liquid nitrogen c) nitrous oxide d) nitric oxide
- _____ is used to produce smoke screen
a) PH_3 b) H_3PO_3 c) P_2O_3 d) H_3PO_3
- The bond angle in ammonia is
a) 104° b) $104^\circ 28'$ c) 107° d) 180°

ANSWER

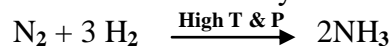
1	2	3	4	5	6	7	8	9	10
<i>d</i>	<i>c</i>	<i>d</i>	<i>d</i>	<i>b</i>	<i>d</i>	<i>a</i>	<i>b</i>	<i>b</i>	<i>a</i>
11	12	13	14	15					
<i>b</i>	<i>b</i>	<i>a</i>	<i>a</i>	<i>c</i>					

ADDITIONAL QUESTIONS AND ANSWERS**1. Why HF is a weak acid but other acids are strong acids?**

Fluorine is highly electro negative and electron affinity.
H-F bond energy is very high, So difficult to break.

2. Explain the Haber's process of Ammonia.

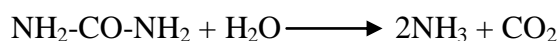
Ammonia is Manufactured by Haber's process.

**3. List the uses of Nitrogen**

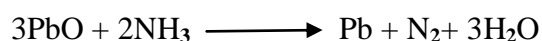
- i) It is used to prepare Ammonia and Nitric acid.
- ii) Liquid nitrogen is used in Biological preservation.

4. How to prepare of Ammonia from Urea?

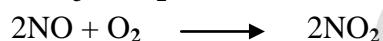
Hydrolysis of Urea gives Ammonia.

**5. Explain the reducing property of Ammonia.**

Ammonia acts as a reducing agent. It reduces the metal oxides to metal when passed over heated metallic oxide.

**6. Explain the Commercial method of preparation of Nitric Acid.**

Nitric acid prepared in large scales using Ostwald's process. In this method ammonia from Haber's process is mixed about 10 times of air. This mixture is preheated and passed into the catalyst chamber where they come in contact with platinum gauze. The temperature rises to about 1275 K and the metallic gauze brings about the rapid catalytic oxidation of ammonia resulting in the formation of NO, which then oxidised to nitrogen dioxide.



The nitrogen dioxide produced is passed through a series of adsorption towers. It reacts with water to give nitric acid. Nitric acid formed is bleached by blowing air.

**7. Write the Uses of nitric acid.**

1. Nitric acid is used as an oxidising agent and in the preparation of aquaregia.
2. Salts of nitric acid are used in photography (AgNO_3) and gunpowder for firearms. (NaNO_3)

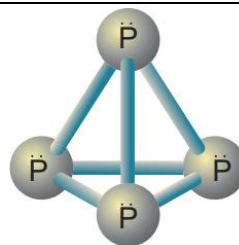
8. Explain the Allotropic forms of phosphorus.

Phosphorus has several allotropic modification of which the three forms namely white, red and black phosphorus are most common.

White Phosphorous

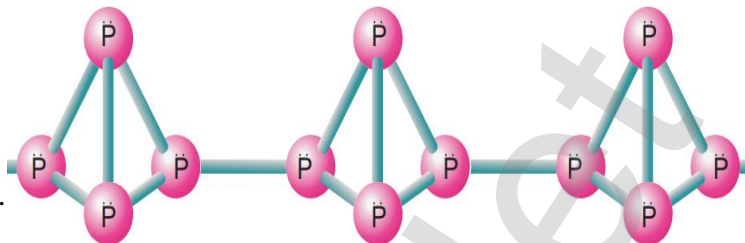
1. White phosphorous is converted to red phosphorous by heating at 420°C in the absence of air and light.
2. It is poisonous.
3. It has a Garlic smell.

4. It glow in the dark due to Phosphorescence.
5. Its ignition temperature is very low.
6. It spontaneously gets combusted.
7. It has a tetrahedral structure.



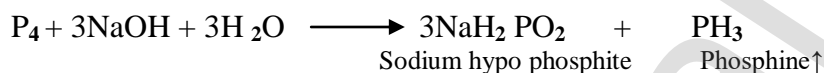
Red Phosphorous

1. Red phosphorous is converted to white phosphorous by boiling in an inert atmosphere and condensing the vapours in water.
2. It is non poisonous.
3. It has no smell.
4. No phosphorescence.
5. Its ignition temperature is very high.
6. No spontaneous combustion.
7. It has a linear polymeric Structure.



9. Explain the Preparation of Phosphine.

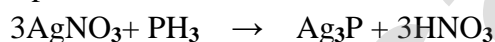
Phosphine is prepared by action of sodium hydroxide with white phosphorous in an inert atmosphere of carbon dioxide or hydrogen.



Phosphine is freed from phosphine dihydride (P_2H_4) by passing through a freezing mixture. The dihydride condenses while phosphine does not.

10. Write a note about the reducing property of Phosphine.

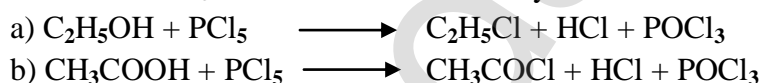
Phosphine precipitates some metal from their salt solutions.



11. What is Holmes signal?

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 serve as a signal to the approaching ships. This is known as **Holmes signal**.

Give the action of PCl_5 with Ethanol and carboxylic acid

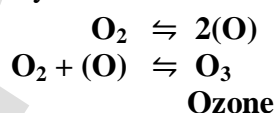


12. Give the laboratory preparation of Ozone. (Define Ozonised Oxygen)

It is prepared by passing electric discharge through Oxygen at 20,000V.

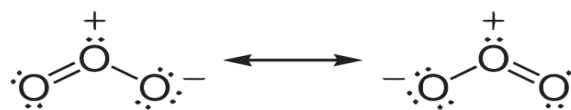
10% of Oxygen is converted into ozone. This mixture is called as **Ozonised oxygen**.

Pure ozone is separated by Fractional distillation



13. Write about the Shape of Ozone.

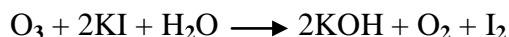
The ozone molecule has a bent shape and is symmetrical with delocalised bonding between the oxygen atoms.



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14. Give one example for ozone as a powerful oxidising agent.

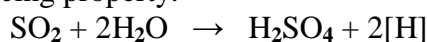
Ozone oxidises potassium iodide to iodine. This reaction is quantitative and can be used for estimation of ozone.

**15. What are the Allotropic forms of sulphur?**

Sulphur exists in crystalline as well as amorphous allotropic forms. The crystalline form includes rhombic sulphur (α sulphur) and monoclinic sulphur (β sulphur). Amorphous allotropic form includes plastic sulphur (γ sulphur), milk of sulphur and colloidal sulphur.

16. Give an account on bleaching action of SO_2 .

In the presence of water, SO_2 bleaches coloured wool, silk, sponges & straw into colourless product due to its reducing property.



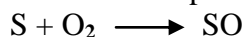
Coloured

Colourless

17. Explain the Manufacture of sulphuric acid by contact process:

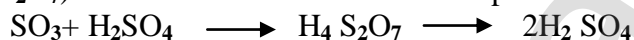
The contact process involves the following steps.

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



- ii. Sulphur dioxide formed is oxidised to sulphur trioxide by air in the presence of a catalyst such as V_2O_5 or platinised asbestos.

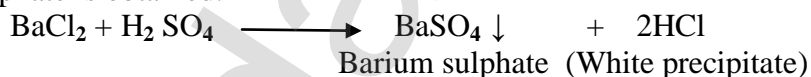
- iii. The sulphur trioxide is absorbed in concentrated sulphuric acid and produces oleum ($\text{H}_2\text{S}_2\text{O}_7$). The oleum is converted into sulphuric acid by diluting it with water.



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.

18. Write test 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.

**19. Write a note about Oxidising and bleaching action of Chlorine.**

Chlorine is a strong oxidising and bleaching agent because of the nascent oxygen.

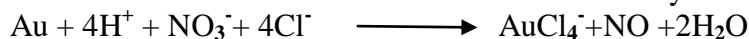


Colouring matter + Nascent oxygen \rightarrow Colourless oxidation product

The bleaching of chlorine is permanent.

20. Define Royal water or Aqua regia. Give its uses.

3:1 ratio of Conc. HCl and Conc. nitric acid is called as Royal water. It is used to dissolve gold.

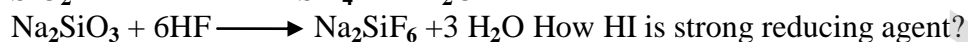
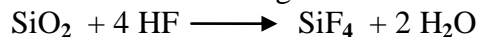


21. List the used of Hydrochloric acid

Prepare chlorine and ammonium chloride.
 Purification of bone black.
 Extraction of Glue from bones.
 Used to prepare Glucose from Starch.

22. Give the action of HF with Glass and silica

HF acid cannot be stored in glass containers. Because it reacts with Silica and glass.



Hydrogen iodide and ionic iodides are rapidly reduced by H_2SO_4 into H_2S and not into SO_2 .

**23. List the properties of Inter halogens compounds**

The central atom must be large.
 Formed between two halogens not more than two.
 Since Fluorine is smaller in size, it cannot be a central atom.
 Since Fluorine is smaller in size, it has high Coordination number.
 They are strong oxidising agents.
 They undergo Auto ionizations.

24. What are 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 (low temperature science).
4. It is much less denser than air and hence used for filling air balloons

25. Write some uses of 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.

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