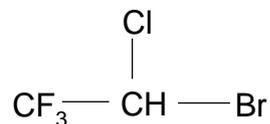


1. What is halothane? Write its formula.

Halothane is 2-Bromo-2-chloro-1, 1, 1-trifluoro-ethane



It is mostly used as an anesthetic agent.

2. On what factors the oxidizing power of halogens depend upon?

Following are the factors upon which oxidizing power of halogens depends.

- (i) Heat of dissociation.
- (ii) Electron affinities of atoms.
- (iii) Hydration energies of ions.
- (iv) Heats of vaporization (for Br₂ and I₂)

3. Give uses of Ne and Rn. (two of each)

- Neon is largely used in making neon advertising signs, in high voltage indicators and TV tubes.
- Neon and helium arc is used in making glass lasers.
- Radon being radioactive is used in radiotherapy for cancer.
- Radon is used for earth quake prediction.

4. Why fluorine shows peculiar behavior? Give four reasons.

Fluorine shows peculiar behavior due to

- Small size of F atom than and of F⁻ ion.
- High ionization energy and electronegativity.
- Less bond energy of F₂ molecule.
- Restriction of valence shell to an octet.
- Direct combination with inert gases.

5. What happen when bleaching powder react with dil.H₂SO₄& NH₃ separately?

When bleaching powder reacts with dilute acid in small quantity, hypochlorous acid is formed



When bleaching powder reacts with excess of acid (weak or strong), chlorine gas is evolved.



Reaction with Ammonia:

It oxidizes ammonia to nitrogen.



6. What is iodized salt? Give its uses.

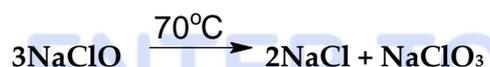
Iodized salt:

The mixture of common salt (NaCl) and 0.02% KI by weight is called iodized salt.

Sodium iodide can also be used in common salt to get iodized salt. Diet within sufficient iodide ions leads to the enlargement of "thyroid gland" called Goiter. To ensure the presence of iodide ions in the diet, sodium or potassium iodide is added to the common salt which is known as iodized salt.

7. Write equation for the reaction of Cl₂ with hot and cold NaOH.

In cold (15°C) state, chlorine will react with NaOH to form hypochlorite and a halide.



8. What are disproportionation reactions? Explain your answer with an example.

Ans: Disproportionation Reactions:

A reaction in which a specie (molecule, atom or ion) is simultaneously oxidized and reduced is called disproportionation reaction.

Example:



This reaction is a disproportionation reaction because the zero oxidation state of chlorine atom in Cl₂ is converted to -1 in chloride and +1 in hypochlorite.

9. How Halogen acids are ionized in water?

Ans: When Halogen acids are dissolved in water, they undergo ionization as follows.



Halogen acids donate a proton to H₂O. As a result, H₃O⁺ and X⁻ ions are formed. The extent of ionization of different Halogen acids is in the following order.



HF has exceptionally small extent of ionization due to hydrogen bonding.

10. Why HF is weaker acid than HCl?

Ans: HF is a weaker acid than HCl:

A substance which has a tendency to - give proton (H^+) in an aqueous solution is called acid. The strength of an acid is directly proportional to its proton(H) releasing power. In HF, strong hydrogen bonding is present and partial positive hydrogen atom is entrapped between two strong electronegative Fluorine atoms. Consequently it becomes difficult for proton to be ionized in water which makes it weak acid.

On the other hand, in HCl dipole-dipole interaction is present which is weaker than hydrogen bonding. Therefore proton (H^+) releasing power of HCl is more which makes it strong acid.

11. In the following set, arrange the substances in order of increasing acidic character.

Give reason. $HClO, HClO_2, HClO_3, HClO_4$

Ans: Increasing acidic character:

$HClO < HClO_2 < HClO_3 < HClO_4$

Reason:

The strength of oxyacids of halogens increases with increase in number of oxygen atoms. As the oxidation state of halogen atom in oxyacids increases, the bonding electrons are shifted away from hydrogen atom and tendency of molecules to lose proton increases. This accounts for increasing the strength of oxy-acids. Thus increasing order of acidic strength of oxy-acids is $HClO, HClO_2, HClO_3, HClO_4$

12. In the following set, arrange the substances in order of increasing oxidizing power.

Give reason. F_2, Cl_2, Br_2, I_2

Ans: The oxidizing power of halogens depends upon following factors:

- (i) Energy of dissociation
- (ii) Electron affinity of atoms
- (iii) Hydration energy of ions
- (iv) Heat of vapourization (for Br_2 and I_2)

If halogen has low energy of dissociation, a high electron affinity and a higher hydration energy of its ions, it will have high oxidizing power. Thus, the order of increasing oxidizing power of halogens is $I_2 < Br_2 < Cl_2 < F_2$.

13. What are Freons and Teflon?

Ans: Freons:

"Freon is the commercial name of low molecular mass chlorofluorocarbons.

Fluorine is used for preparation of Freons.

Example:-

- (i) CCl_2F_2
- (ii) $CClF_3$

Uses:

Freons are being used as refrigerants and aerosol propellants.

Telfons:

"It is a polymerized tetra-fluoroethylene compound".

Fluorine is used to prepare Teflon. $(-CF_2 - CF_2)_n$

Uses:

- (i) It is a valuable plastic which resists the action of oxidants, acids and alkalies.
- (ii) Corrosion proof parts of machinery are made of it.
- (iii) It is used for coating the electrical wiring.
- (iv) It is used as non-stick coating for cooking pans.

14. Arrange the following ions in order of increasing size: F⁻, Cl⁻, I⁻, Br⁻

Ans: Ionic radii increases from top to bottom with the increase in no. of shells and shielding effect and decrease of attraction of electrons towards nucleus. Fluorine is present at the top of VI -A group and its ion (F⁻) is smaller as compared to the size of I⁻ ion.

Thus, the arrangement of given ions -in increasing order of their sizes is

$F < Cl < Br < I$

15. Why iodine has metallic luster?

Ans: Metallic luster of iodine is due to the excitation and the de -excitation of valence electrons. Due to bigger size of iodine molecule valence electrons experience weak nuclear attraction. When light falls on iodine surface weakly bounded valence electrons go into excited state by absorbing energy. These excited electrons when de -excite they emit energy in the form of radiations. These radiations give grayish -black metallic luster to iodine.

16. Which halogen sublimes to violet vapours?

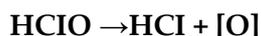
Ans: Sublimation:- A substance which upon heating directly converts into vapours without passing through liquid phase is called sublimeable substance. Among halogens F₂ and Cl₂ are gases at room temperature while Br₂ exists as a liquid and on the other hand I₂ exist as a solid. Due to weak intermolecular forces I₂ convert into violet vapours upon heating.

17. Which halogen is used as an antiseptic?

Ans: Iodine is used as an antiseptic in pharmaceutical industry. Tincture of iodine is an example of use of iodine as an antiseptic.

18. Which Halogen is used in water treatment to kill bacteria?

Ans: Chlorine is used in water treatment to kill bacteria. When Chlorine is passed through water, mixture of HCl and HClO is formed. This HClO undergo decomposition to liberate oxygen as follows.



This liberated Atomic Oxygen is responsible for killing bacteria.

19. Name the gas which is used in earth quake prediction?

Ans: Radon is used in earth quake prediction.

20. Name the gas which is used in bactericidal lamps.

Ans: Xenon is used in bactericidal lamps.

21. Bleaching powder is not used to bleach costly fabrics. Why?

Ans: Bleaching powder acts as oxidizing agent as well as bleaching agent. It can not be used to bleach delicate fabrics like wool, silk etc, because these could be damaged by chlorine.

22. Why HClO_4 is the strongest oxy acid?

Ans: Strength of an acid depends upon its tendency to lose proton in aqueous solution. In oxyacids, the acidic strength increases with the increase in the number of oxygen atoms. As the oxidation state of halogen increases, the bonding electrons shift away from hydrogen atom and the tendency of the molecule to lose a proton increases. So HClO_4 with highest oxidation state of Chlorine is strongest acid among HClO_3 , HClO_2 and HClO .

23. Give four properties which differentiate fluorine from other halogens.

Ans: (i) Small size of F atom and F^- ion.

(ii) High first ionization energy and electronegativity.

(iii) Low dissociation energy of F_2 molecule as compared to Cl_2 and Br_2 .

(iv) Restriction of the valence shell to an octet.

(v) Direct combination with inert gases.

24. Fluorine is restricted to -1 oxidation state. why?

Ans: Electronic configuration of F is $[\text{He}] 2s^2 2p^5$. It does not have any empty d-orbital. So after gaining one electron, F^- ion is formed and valence shell completes. Due to the restriction of valence shell to an octet, fluorine remains restricted to -1 oxidation state.

25. Why dissociation energy of F_2 is lesser than Cl_2 ?

Ans: The dissociation energy of fluorine molecule is $154.8 \text{ kJ mol}^{-1}$, which is very less than other halogen molecules. The reason for this is very small bond length. Due to this, there exists repulsion between the electron clouds of fluorine atoms, which decrease the force of attraction, hence the bond dissociation energy also become less than expected.

26. Chlorine shows the oxidation state of +7 but fluorine does not, why?

Ans: In case of chlorine atom, the presence of d-orbitals permit the excitation of electrons from p-orbitals to higher d-orbitals which then are used in bond formation. So chlorine can have +1, +3, +5, +7 oxidation states along with -1. But in case of Fluorine, the d-orbitals are not available to the valence electrons. So the electrons are not excited and Fluorine can only

use its one unpaired electron of 2p, orbital. Therefore, it cannot show any of higher oxidation state, than -1.

27. Fluorine has the highest oxidizing power, why?

Ans: Fluorine has the highest oxidizing power, due to low bond dissociation energy and higher hydration energy of its ions. Normally we compare the oxidizing powers of element from their standard reduction potential (E^\ominus). The standard reduction potential for F_2 is +2.87, which is highest among all the halogens so it must have highest oxidizing power.

28. Why halogens gain electrons readily?

Ans: The halogen gain electrons readily because, they have high positive values of standard reduction potentials. If the value of standard reduction potential is positive, it means the element can gain electrons and greater the value more is the chance of gaining the electrons and stronger will be the oxidizing agent.

29. Why van der Waal forces are strong in I_2 ?

Ans: As we move down the group, the atomic size of halogen atoms increase, with greater atomic size, the polarizability of halogen molecules increase. As there exists Van der Waal forces in halogens which increase with increasing atomic size. Therefore iodine being at the bottom of halogens family will have the largest size, hence will have most strong Van der Waal's force of attraction.

30. Write factors on which oxidizing power of halogens depend.

Ans: Following are the factors upon which oxidizing power of halogens depends.

- (i) Heat of dissociation.
- (ii) Electron affinities of atoms.
- (iii) Hydration energies of ions.
- (iv) Heats of vapourization (for Br_2 and I_2)

31. Why the forces of attraction are weak in noble gases?

Ans: In noble gases there is not present electron pair interaction among atoms as they cannot form bond with each other. So they exist in mono atomic state. where only van der Waals forces or London dispersion forces can exist. So they have very weak category of force i.e. London dispersion forces.

32. Give use of Halothane.

Ans: Halothane is 2-Bromo-2-chloro-1,1,1-trifluoro-ethane, which is mostly used as an anesthetic agent.

33. How- can we predict earthquake?

Ans: Earthquakes can be predicted by using Radon. Radon is the heaviest gas, which is usually present just

5-10 cm above ground level. When earthquake is just to happen then some radioactive change occurs, which can be detected by using radio transmitters. So earthquake can be predicted.

34. Why noble gases do not react with other elements?

Ans: Noble gases have already complete valence shell, they do not need to gain or lose electrons. So they are already at a stable configuration state. Therefore, they usually do not react with other elements.

35. Among noble gases, Xenon form maximum number of compounds with other elements? Give reason.

Ans: Noble gases are sufficiently inert. Anyhow, Xenon show some reactivity and form some compounds with Fluorine and Oxygen. The first compound of Xenon was discovered is XePtF_6 . Xenon shows different oxidation states which vary from +2 to +8. This is due to larger size and less ionization energy of Xenon than Oxygen and Fluorine.

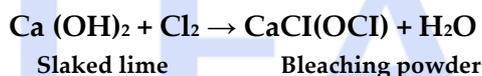
36. Explain Hasenclever's method for the formation of bleaching powder.

Ans: Hasenclever's method

This is an old method for the preparation of bleaching powder.

Chemicals

- (i) Slaked lime
- (ii) Chlorine



Explanation:

The Hasenclever's plant consists of four to eight horizontally placed iron cylinders one above the other. The slaked lime Ca(OH)_2 is added through a hopper in the upper cylinder and is transported from one cylinder to the other with rotating stirrers. Chlorine is introduced into the lower cylinder. Chlorine travels in opposite direction to the slaked lime and reacts with slaked lime to form the bleaching powder. The bleaching powder is collected in a barrel through an outlet in the lowest cylinder.

37. Write four applications of noble gases.

Ans: Helium is used in weather balloons.

Argon is used in electric light bulbs.

Krypton is used in filling fluorescent tubes.

Xenon is used in bacterial lamps.

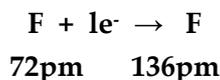
38. Give the reason, why the radius of fluorine atom is smaller than that of fluoride ion.

Ans: The radius Of fluorine atom is smaller than that of fluoride ion due to the following reasons:

- Repulsion between valence shell electrons and incoming electron. As a result, valence shell expands to minimize repulsion.

- Imbalance of proton - electron ratio. As a result, hold of nucleus on valence .electron decreases and consequently, size increases.

Example:



39. Why fluorine and chlorine act as decolourizing agents?

Ans: Fluorine and chlorine act as decolourizing agents because both of them are strong oxidizing agents.

40. F₂ is gas while I₂ is solid at room temperature. Why?

Ans: F₂ is small in size therefore it exist as gas where as I₂ is large in size and has greater polarization which makes greater inter molecular forces (LDF) , hence Iodine exist as solid at room temperature.

41. How is the activity of bleaching powder measured?

Ans: Available Chlorine:

The amount of chlorine which is set free during the reaction of bleaching powder with acid is called available chlorine. When bleaching powder reacts with excess of acid (weak or strong), chlorine gas is evolved.



The activity of bleaching powder is measured in terms of available chlorine. The average percentage of available chlorine in bleaching powder is 35-40 percent. The bleaching action of bleaching powder is due to its oxidizing property.

42. What is chromyl chloride test? Give its equation using NaCl as starting material.

Ans: Chromyl chloride test is used to identify chloride ions in a given salt.

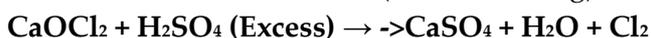


43. What happens when bleaching powder reacts with the following reagents dil. H₂SO₄ , excess of conc. H₂SO₄, NH₃, HI and CO₂.

Ans: When bleaching powder reacts with dilute acid in small quantity, hypochlorous acid is formed

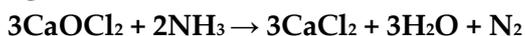


When bleaching powder reacts with excess of acid (weak or strong), chlorine gas is evolved.



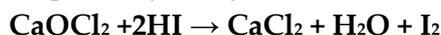
Reaction with Ammonia:

It oxidizes ammonia to nitrogen.



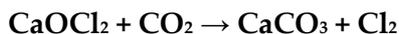
Reaction with Halogen acids:

It oxidizes halogen acids to corresponding halogens.



Reaction with carbon dioxide:

It reacts with carbon dioxide and chlorine evolved.

**44. The elements of VIIIA group are called noble gases comment.**

Ans: The elements like Helium, Neon, Argon, Krypton, Xenon and Radon which are placed in group VIII -A or zero group of the periodic table are called noble gases. Initially they were named as rare gases because they are present in trace amount in the air. Then they were named as inert gases when it was found that they do not react with each other and with other elements. But in 1962, however some compounds of Xenon were prepared. Hence, their name inert gases was changed to Noble gases. All noble gases are colourless, odourless and are monoatomic in nature. They can be liquefied and solidified.

CHAPTER 5**LONG QUESTIONS**

1. What is iodized salt??
2. Write any two uses of krypton?.
3. What is chromyl chloride test? Write its chemical equation??
4. What are Freon and Teflon?
5. Write two uses of helium?
6. Describe hydrogen bonding in HF molecule?
7. Why oxyacids of chlorine are stronger than oxyacids of bromine?
8. How HF is weaker acid than HCl??
9. Give four applications of noble gases?
10. Reaction of Cl_2 with aqueous solution of NaOH at 15°C is a disproportionation reaction. Justify??
11. Give two applications of radon gas?
12. Halogens are strong oxidizing agent. Justify?
13. Perchloric acid is considered as valuable analytical agent. Why?
14. Why does iodine has metallic luster?
15. What is halothane? Write its formula.
16. On what factors the oxidizing power of halogens depend upon?
17. Give uses of Ne and Rn. (two of each)
18. Why fluorine shows peculiar behavior? Give four reasons.
19. What happen when bleaching powder react with dil. H_2SO_4 & NH_3 separately?
20. What is iodized salt? Give its uses.
21. Write equation for the reaction of Cl_2 with hot and cold NaOH.
22. Why iodine has metallic lusture?
23. Write two uses of Bleaching Powder.