

1. What is inert pair effect?

- ❖ The reluctance of the valence s- electrons or ns² electrons of heavier elements of p-block to take part in bond formation is called inert pair effect.
- ❖ This happens because of ineffective shielding of these electrons by inner orbital electrons.
- ❖ As a result these valence s - electrons are more exposed to the nucleus than p- electrons.
- ❖ Therefore these s-electrons remains paired and are not available for bond formation. the stability of higher oxidation state decreases and the stability of lower oxidation state increases on moving down the group or in heavier elements.
- ❖ For example:
- ❖ In 13th group, thallium can exhibit +1 and +3 oxidation states but it is stable in +1 oxidation state only due to inert pair effect

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

- ❖ Elements belonging group 16 are called chalcogens or ore forming elements as most of the ores are oxides or sulphides.
- ❖ The general electronic configuration is ns² np⁶.
- ❖ The electrons enters into p-orbitals, so they are belongs to p-block elements.

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

- ❖ Fluorine always exhibit - 1 oxidation state due to high electron affinity and high electro negativity.
- ❖ Due to smaller size of fluorine atom, it only attracts one electron to attain stability.
- ❖ They don't lose electrons to other element in bonding.

4. Give the oxidation state of halogen in the following.

a) OF ₂	b) O ₂ F ₂	c) Cl ₂ O ₃	d) I ₂ O ₄
(+2) + 2x = 0	(+2) + 2x = 0	2x + 3(-2) = 0	2x + 4(-2) = 0
2x = -2	2x = -2	2x - 6 = 0	2x - 8 = 0
x = -1	x = -1	2x = +6 => x = +3	2x = +8 => x = +4
Ox. No of F is -1	Ox. No of F is -1	Ox. No of Cl is +3	Ox. No of I is +4

5. What are interhalogen compounds? Give examples.

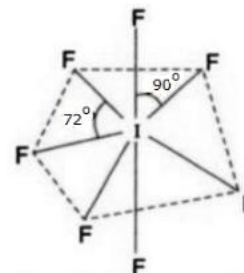
Each halogen combines with other halogens to form a series of compounds called inter halogen compounds.

Type	AB	AB ₃	AB ₅	AB ₇
Examples	ClF	ClF ₃	IF ₅	IF ₇

6. Why fluorine is more reactive than other halogens?

- ❖ Fluorine atom has very small size and just needs one electron to get itself into a stable configuration to that of noble gases.
- ❖ They have low dissociation energy and they react spontaneously with other elements.
- ❖ So fluorine is more reactive than other halogens.

- ❖ Helium and oxygen mixture is used by divers in place of air oxygen mixture. This prevents the painful dangerous condition called bends.
- ❖ Helium is used to provide inert atmosphere in electric arc welding of metals
- ❖ Helium has lowest boiling point hence used in cryogenics.
- ❖ It is much less denser than air and hence used for filling air balloons.



8. What is the hybridisation of iodine in IF_7 ? Give its structure.

The hybridisation of Iodine in IF_7 is $sp^3 d^3$.

Structure: Pentagonal bipyramidal

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

Chlorine reacts with cold dilute alkali to give chloride and hypochlorite while with hot concentrated alkali chlorides and chlorates are formed.

Cold Dilute



Hot Concentrated



10. How will you prepare chlorine in the laboratory?

Chlorine is prepared by the action of conc. sulphuric acid on chlorides in presence of manganese dioxide.

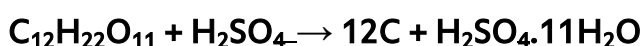


11. Give the uses of sulphuric acid.

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

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
- ❖ So it can be used as a dehydrating agent.
- ❖ When dissolved in water, it forms mono ($H_2SO_4 \cdot H_2O$) and dihydrates ($H_2SO_4 \cdot 2H_2O$) and the reaction is exothermic.



13. Write the reason for the anomalous behavior of Nitrogen.

- ❖ Small size
- ❖ High ionization energy
- ❖ High electro negativity
- ❖ Absence of d-orbital in the valence shell.

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

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

s.no	Name	Formula	Structure
a)	Nitric acid	HNO ₃	
b)	Dinitrogen pentoxide	N ₂ O ₅	
c)	Phosphoric acid	H ₃ PO ₄	
d)	Phosphine	PH ₃	

15. Give the uses of argon.

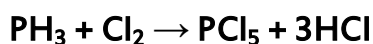
Argon prevents the oxidation of hot filament and prolongs the life in filament bulbs

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

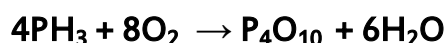
ELEMENT	SYMBOL	ELECTRONIC CONFIGURATION
Nitrogen	N	[He]2s ² 2p ³
Phosphorus	P	[Ne]3s ² 3p ³
Arsenic	As	[Ar] 3d ¹⁰ 4s ² 4p ³
Antimony	Sb	[Kr] 4d ¹⁰ 5s ² 5p ³
Bismuth	Bi	[Xe] 4f ¹⁴ 5d ¹⁰ 6s ² 6p ³

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

❖ It reacts with halogens to give phosphorus penta halides.

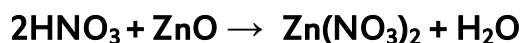


❖ When phosphine is heated with air or oxygen it burns to give meta phosphoric acid.



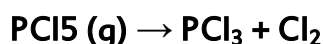
18. Give a reaction between nitric acid and a basic oxide.

It reacts with bases and basic oxides to form salts and water



19. What happens when PCl₅ is heated?

Phosphorus pentachloride (PCl₅) will decompose when heated into phosphorus trichloride (PCl₃) and chlorine gas (Cl₂).



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

- ❖ Because of strong affinity of fluorine for hydrogen in HF, it strongly holds hydrogen and don't loose it very easily.
- ❖ The other halogen acids like hychloric ,hydrobromic and hydroiodic completely ionize and they are known as strong acids.
- ❖ But HF is a weak acid i.e. 0.1mM solution is only 10% ionized due to the presence of strong hydrogen bond.

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

Fluorine does not react form oxoacid hypofluorous acid because fluorine is more electronegative than oxygen

Ox.No of HOF : $(+ 1) + x + 1 = 0 \Rightarrow x = -2$

22. What type of hybridisation occur in a) BrF₅ b) BrF₃

	Inter Halogen compound	Hybridization
a)	BrF ₅	sp ³ d ²
b)	BrF ₃	sp ³ d

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