Polarisation and Fajan's rule

1. (d) BF_3 is planar while NF_3 is pyramidal due to the presence of lone pair of electron on nitrogen in NF_3.

2. (c) H_2O is a polar molecule due to electronegativity difference of hydrogen and oxygen.

3. (b) When electronegativity difference is more between two joined atoms then covalent bond becomes polar and electron pair forming a bond don't remain in the centre.

4. (d) Hexane has symmetrical structure so does not have polarity.

5. (c) When two identical atoms form a bond, bond is non-polar.

6. (a) According to Fajan's rule, polarisation of anion is influenced by charge and size of cation more is the charge on cation, more is polarisation of anion.

7. (b) **Covalent with some ionic character**

Explanation:

- In **phosphorus pentachloride (PCl_5)**, the **P–Cl bonds** are mainly **covalent** because electrons are **shared** between phosphorus and chlorine atoms.
- However, since chlorine is more **electronegative** than phosphorus, there is **partial charge separation**, giving the bond **some ionic character**.
- Thus, the P–Cl bond is **predominantly covalent** but **polar in nature**.

8. (a) When two atoms shares two electrons it is an example of covalent bond. This covalent bond may be polar or may be non-polar depends on the electronegativity difference. In given example formula is *AB*. So it is polar.

9. (c) *HCl* is most polar due to high electronegativity of *Cl*.

10. (b) NH_3 has sp^3 hybridised central atom so it is non planar.

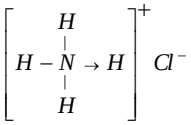
11. (d) *p*-dichloro benzene have highest melting point.

12. (c) **CH_2Cl_2**

Explanation:

- **CH_2Cl_2 (dichloromethane)** is a **polar molecule** because the molecule is **asymmetrical** — the dipole moments of the two C–Cl and two C–H bonds do **not cancel each other**.
- **CCl_4** and **CO_2** are **non-polar** due to their **symmetrical structures**, which cause dipole moments to cancel out.
- **$CH_2=CH_2$ (ethylene)** is also **non-polar**, as the molecule is **symmetrical** with equal electron distribution.

13. (b) NH_4Cl has both types of bonds polar and non polar



14. (b) Greater the charge of cation more will be its polarising power (according to Fajan's rule).

15. (d) AlI_3 Aluminiumtriiodide shows covalent character. According to Fajan's rule.

16. (d) As the size of anion increases, polarity character increases.

17. (c) **Small cation and large anion**

Explanation:

- According to **Fajan's rule**, **small, highly charged cations** have strong polarizing power, and **large, easily polarizable anions** have greater tendency to get distorted.
- This distortion increases the **covalent character** of the bond.

18. (a) **SF_4 is polar and non-reactive**

Explanation:

- **SF_4** has a **see-saw shape** (due to one lone pair on sulphur), making it **polar**.
- It is **less reactive** because of **strong S–F bonds** and a **stable structure**.
- **SF_6**, on the other hand, is **non-polar and very stable (not reactive)** due to its **octahedral symmetry**.

19. (a) **Anion polarization is more pronounced by highly charged cation**

Explanation:

- A **highly charged and small cation** exerts a **strong electrostatic field**, distorting the electron cloud of the anion — this is called **polarization**.
- **Greater polarization → greater covalent character**.
- (b) and (c) are incorrect because **small cations** have *maximum* (not minimum) polarizing power, and **large anions** (not small) are *more* polarizable.

20. (d) Due to the electronegativity difference.

21. (a) We know that greater the difference in electronegativity of two atoms forming a covalent bond. More is its polar nature. In *HF* there is a much difference in the electronegatives of hydrogen and flourine. Therefore (*HF*) is a polar compound.

22. (c) Silicon tetrafloride has a centre of symmetry.

23. (d) BF_3 have zero dipole moment.

24. (a) **Polarity of bonds in molecules**

Explanation:

- **Pauling's electronegativity scale** measures the tendency of an atom to attract shared electrons in a chemical bond.
- The **difference in electronegativity** between two bonded atoms helps predict the **type and polarity of the bond**:
  - Small difference → **Covalent bond**
  - Large difference → **Ionic bond**
- Hence, Pauling's values are mainly used to determine **bond polarity**, not coordination number or dipole moment directly

25. (b) According to Fajan's rule largest cation and smallest anion form ionic bond.

26. (b) Polarity character is due to the difference in electronegativity of two atoms or molecule.