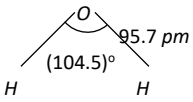
Hybridisation

1. (d) H_2O is not linear because oxygen is sp^3 hybridised in H_2O.

2. (d)



3. (d) **Trigonal planar**

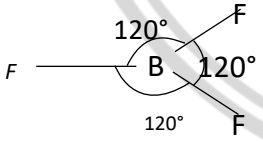
Explanation:

- **sp² hybridization** involves the mixing of **one s orbital and two p orbitals**, forming **three equivalent sp² hybrid orbitals**.
- These orbitals lie in **one plane**, directed at **120°** to each other.
- Hence, the resulting molecular geometry is **trigonal planar** — examples include **BF_3**, **SO_3**, and **C_2H_4**.

4. (c) CO_2 has *sp* – hybridization and is linear.

5. (d) *No. of e⁻ pair* $= 3 + \frac{1}{2}[3-3]$=0

No. of e⁻ pair $= 3$ +0



No. of atom bonded to the central atom $= 3$

In case of 3, 3 geometry is Trigonal planar.

6. (a) In sp^3 –hybridisation each sp^3 hybridised orbital has 1/4 *s*-character.

7. (d) **Trigonal pyramidal**

Explanation:

- In **ammonia (NH_3)**, the nitrogen atom is **sp³ hybridized**.

- It forms **three σ bonds** with hydrogen atoms and has **one lone pair** of electrons.
- The presence of the lone pair **distorts** the tetrahedral arrangement, resulting in a **trigonal pyramidal** shape with a bond angle of about **107°**

8. (b) In ethylene both Carbon atoms are sp^2- hybridised so 120^o.

9. (d) Structure of sp^3d hybridized compound is Trigonal bipyramidal.

10. (d) In $H-\overset{*}{C}(=O)-O-H$ the asterisked carbon has a valency of 5 and hence this formula is not correct.

11. (d) dsp^3 hybrid orbitals have bond angles $120^o, 90^o$.

12. (a) **sp**

Explanation:

- The **s-character** in hybrid orbitals follows the order:
  sp (50%) > sp² (33.3%) > sp³ (25%).
- Greater s-character means the electrons are held **closer to the nucleus**, making the bond **shorter and stronger**.
- Hence, **sp hybridization** has the **maximum s-character**, so the correct answer is **sp**

13. (a) In BeF_3^-, *Be* is not sp^3–hybridised it is sp^2 hybridised.

14. (b) **sp³d**

Explanation:

- In **xenon difluoride (XeF_2)**, xenon uses **one s, three p, and one d orbital** for hybridisation → **sp³d**.

- The resulting shape is **linear**, with **three lone pairs** and **two bond pairs** arranged in a **trigonal bipyramidal** electron geometry.

15. (a) **sp^3**

Explanation:

- **sp^3 hybridisation** produces **four equivalent orbitals** directed toward the corners of a **tetrahedron**, which is a **non-planar** (three-dimensional) geometry.
- In contrast, **sp^2** and **dsp^2** hybridisations lead to **planar** structures.

16. (b) **sp^3d^2**

Explanation:

- **sp^3d^2 hybridisation** involves **one s, three p, and two d orbitals**, forming **six hybrid orbitals**.
- These orbitals are oriented toward the corners of an **octahedron**, as seen in molecules like **SF_6** and **$[Co(NH_3)_6]^{3+}$**.

17. (c) In molecule OF_2 oxygen is sp^3 hybridised.

18. (a) In sp^3 hybrid orbitals *s*-character is 1/4th means 25%.

19. (d) XeF_4 molecule has '*Xe*' sp^3d^2 hybridised and its shape is square planar.

20. (b) The bond angle is maximum for *sp* hybridisation because two *sp* hybridised orbitals lies at angle of 180^o.