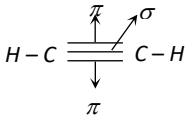
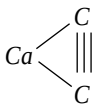
Overlaping- σ and π- bonds

1. (c) 

2. (c) In fluorine molecule formation *p-p* orbitals take part in bond formation.

3. (b) π-bond is formed by lateral overlapping of unhybridised *p-p* orbitals.

4. (b) 

1σ and 2π

5. (c) In a double bond connecting two atom sharing of 4 electrons take place as in $H_2C = CH_2$.

6. (c) $C = C$ is a multiple bond so it is strongest.

7. (c) **By sidewise overlapping of half–filled p–orbitals**

Explanation:

- A π **(pi) bond** is formed when **two parallel p–orbitals** overlap **sideways** (laterally) above and below the internuclear axis.
- It is weaker than a σ (sigma) bond because the overlapping is **less effective**.
- Option (a) describes σ **bond**, not π bond.

8. (b) **One sigma bond and one pi bond**

Explanation:

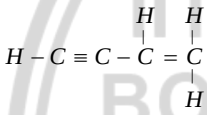
- In **ethylene (C_2H_4)**, each carbon atom is **sp^2 hybridized**.
- The σ **bond** is formed by **head–on overlap** of sp^2 orbitals, and the π **bond** is formed by **sidewise overlap** of unhybridized p orbitals.
- Thus, a double bond (C=C) consists of **one σ bond + one π bond**.

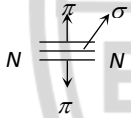
9. (d) As the bond order increases, $_{C-H}$ bond energy also increases so it will be greatest in acetylene because its B.O. is 3.

10. (c) **End–to–end overlap of orbitals takes place**

Explanation:

- A σ **(sigma) bond** is formed by the **head–on (end–to–end) overlap** of atomic orbitals along the **internuclear axis**.
- This overlap can occur between **s–s**, **s–p**, or **p–p** orbitals.
- The resulting σ bond is **stronger** than a π bond due to greater overlap of orbitals.

11. (b) 

12 

13. (a) **A sigma bond is weaker than a π bond**

Explanation:

- A σ **(sigma) bond** is formed by **head–on overlap**, resulting in a **stronger bond**.
- A π **(pi) bond** is formed by **sidewise overlap**, which is **weaker**.
- Therefore, statement (a) is **incorrect**.

14. (a) **Maximum overlap**

Explanation:

- **Bond strength** is directly proportional to the **extent of orbital overlap**.
- Greater overlap between orbitals leads to **stronger bonding** and **shorter bond length**

15. (d) **Chlorine**

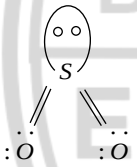
Explanation:

- In **Cl_2**, each chlorine atom has an **unpaired electron in a p–orbital**, and the **Cl–Cl bond** is formed by **p–p overlap**.
- In contrast, H_2, HCl, and HBr involve **s–s** or **s–p** overlaps.

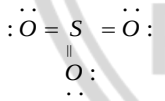
16. (a)

17. (d) We know that trisilylamine is sp^2 – hybridized therefore $p\pi - d\pi$ bonding is possible due to the availability of vacant *d*-orbitals with silicon.

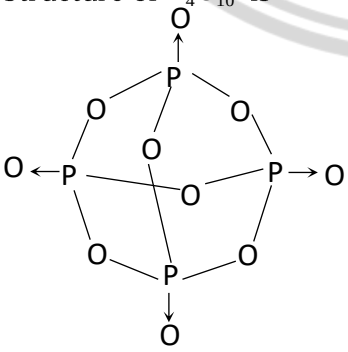
18. (c)



$2\sigma, 2\pi$ bond and one lone pair.

19. (d)  5 atoms has 12 electrons in its outermost shell. One $(S-O)\pi$ bond will be (*p*-*p*) π bond while two $(S-O)\pi$ bond will be (*p*-*d*) π bond.

20. (d) Structure of P_4O_{10} is



Each phosphorus is attached to 4 oxygen atoms.