

10 • Orbital Hybridization & Molecular Orbitals

PRACTICE TEST

- Which hybridization is associated with a steric number of 3?
a) sp d) sp^3d
b) sp^2 e) sp^3d^2
c) sp^3
- The molecule BrF_3 has a steric number of ____ on the central atom?
a) 3 b) 4 c) 5 d) 6
- What is the hybridization of Br in BrF_3 ?
a) sp d) sp^3d
b) sp^2 e) sp^3d^2
c) sp^3
- How many equivalent sp^3d orbitals are there?
a) 3 b) 1 c) 5 d) 6
- What type of hybridization is associated with a square planar molecular shape?
a) sp^3 d) sp^3d
b) sp^2 e) sp^3d^2
c) sp
- What shape for electron pairs is associated with sp^3d^2 hybridization?
a) linear d) tetrahedral
b) square planar e) octahedral
c) bent
- What hybridization is predicted for phosphorus in the PCl_3 molecule?
a) sp^2 c) sp
b) sp^3 d) sp^3d^2
- A double bond contains ____ sigma bond(s) and ____ pi bond(s).
a) 0, 2 b) 1, 2 c) 2, 0 d) 1, 1
- What angle exists between orbitals in sp^3d^2 hybrid orbitals?
a) 90.0° d) 120.0°
b) 180.0° e) 78.5°
c) 109.5°
- Which of the following elements is most likely to display sp^3d hybridization?
a) oxygen d) carbon
b) nitrogen e) boron
c) phosphorus
- How many sigma (σ) and pi (π) electrons pairs are in a carbon dioxide molecule?
a) four σ and zero π d) two σ and four π
b) three σ and two π e) one σ and three π
c) two σ and two π
- What is the hybridization of the oxygen atoms in CH_3OH and CO_2 , respectively?
a) sp^3 , sp^3 d) sp^2 , sp^2
b) sp^3 , sp^2 e) sp^3 , sp
c) sp^2 , sp^3
- All of the following species contain two π -bonds EXCEPT
a) SCN^- d) OCS
b) CO e) NO^-
c) H_2CCO

14. Which response contains all the characteristics that should apply to BF_3 ?

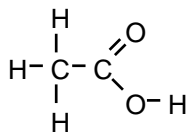
1. trigonal planar
2. one unshared pair of electrons on B
3. sp^2 hybridized boron atom
4. polar molecule
5. polar bonds

- a) 2, 4, and 5 d) 1, 3, and 5
b) 1, 3, and 4 e) 3, 4, and 5
c) 1, 2, and 3

18. Briefly explain why carbon as graphite (a non-metal) can conduct electricity?

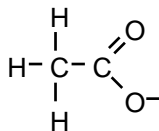
Short Answer:

15. Consider the structural formula for acetic acid, $\text{HC}_2\text{H}_3\text{O}_2$ or CH_3COOH . Indicate the type of hybridization used by each of the carbon and oxygen atoms.



19. When $\text{BF}_3 + \text{NH}_3 \rightarrow \text{BF}_3\text{NH}_3$, how does the hybridization of the boron atom change, if at all?

16. Consider the structural formula for the acetate ion, $\text{C}_2\text{H}_3\text{O}_2^-$ or CH_3COO^- . Indicate the hybridization used by each of the carbon and oxygen atoms.



17. What shape of π bond is formed in the above ion?
