100 Practice Problems with Answers

Section A: Basic Geometry Identification (1–25)

1. Determine the geometry of CO_2.
   Answer: Linear
2. Shape of NH_3?
   Answer: Trigonal pyramidal
3. Geometry of CH_4?
   Answer: Tetrahedral
4. Shape of H_2O?
   Answer: Bent
5. Geometry of BF_3?
   Answer: Trigonal planar
6. Shape of PCl_5?
   Answer: Trigonal bipyramidal
7. Geometry of SF_6?
   Answer: Octahedral
8. Shape of SO_2?
   Answer: Bent
9. Geometry of $BeCl_2$?
   Answer: Linear
10. Shape of XeF_4?
    Answer: Square planar
11. Geometry of NO_2^-?
    Answer: Bent
12. Shape of NH_4^+?
    Answer: Tetrahedral
13. Geometry of ClF_3?
    Answer: T-shaped
14. Shape of ICl_2^-?
    Answer: Linear
15. Geometry of SF_4?
    Answer: Seesaw
16. Shape of BrF_5?
    Answer: Square pyramidal
17. Geometry of CO_3^{2-}?
    Answer: Trigonal planar
18. Shape of O_3?
    Answer: Bent
19. Geometry of HCN?
    Answer: Linear

20. Shape of CH_3Cl?
    Answer: Tetrahedral
21. Geometry of PF_3?
    Answer: Trigonal pyramidal
22. Shape of SO_3?
    Answer: Trigonal planar
23. Geometry of NO_3^-?
    Answer: Trigonal planar
24. Shape of XeF_2?
    Answer: Linear
25. Geometry of IF_5?
    Answer: Square pyramidal

Section B: Bond Angle Calculations (26–50)

26. Bond angle in CH_4?
    Answer: 109.5°
27. Bond angle in NH_3?
    Answer: 107°
28. Bond angle in H_2O?
    Answer: 104.5°
29. Bond angle in BF_3?
    Answer: 120°
30. Bond angle in CO_2?
    Answer: 180°
31. Bond angle in PCl_5 (equatorial)?
    Answer: 120°
32. Bond angle in PCl_5 (axial-equatorial)?
    Answer: 90°
33. Bond angle in SF_6?
    Answer: 90°
34. Bond angle in XeF_4?
    Answer: 90°
35. Bond angle in SO_2?
    Answer: ~119°
36. Bond angle in NO_2^-?
    Answer: ~115°
37. Bond angle in ClF_3?
    Answer: ~87°
38. Bond angle in SF_4?
    Answer: ~102°
39. Bond angle in BrF_5?
    Answer: ~90°

40. Bond angle in O_3?
    Answer: ~117°
41. Bond angle in CH_3Cl?
    Answer: ~109.5°
42. Bond angle in NH_4^+?
    Answer: 109.5°
43. Bond angle in CO_3^{2-}?
    Answer: 120°
44. Bond angle in NO_3^-?
    Answer: 120°
45. Bond angle in HCN?
    Answer: 180°
46. Bond angle in XeF_2?
    Answer: 180°
47. Bond angle in IF_5?
    Answer: ~90°
48. Bond angle in PF_3?
    Answer: ~97°
49. Bond angle in SO_3?
    Answer: 120°
50. Bond angle in ICl_2^-?
    Answer: 180°

Section C: Lone Pairs & Hybridization (51–75)

51. Hybridization of CH_4?
    Answer: sp^3
52. Hybridization of BF_3?
    Answer: sp^2
53. Hybridization of CO_2?
    Answer: sp
54. Hybridization of NH_3?
    Answer: sp^3
55. Hybridization of H_2O?
    Answer: sp^3
56. Hybridization of PCl_5?
    Answer: sp^3d
57. Hybridization of SF_6?
    Answer: sp^3d^2
58. Hybridization of SO_2?
    Answer: sp^2
59. Hybridization of NO_3^-?
    Answer: sp^2

60. Hybridization of CO_3^{2-}?
    Answer: sp^2
61. Lone pairs in NH_3?
    Answer: 1
62. Lone pairs in H_2O?
    Answer: 2
63. Lone pairs in XeF_4?
    Answer: 2
64. Lone pairs in ClF_3?
    Answer: 2
65. Lone pairs in SF_4?
    Answer: 1
66. Lone pairs in BrF_5?
    Answer: 1
67. Lone pairs in ICl_2^-?
    Answer: 3
68. Lone pairs in XeF_2?
    Answer: 3
69. Lone pairs in NO_2^-?
    Answer: 1
70. Lone pairs in SO_2?
    Answer: 1
71. Hybridization of XeF_4?
    Answer: sp^3d^2
72. Hybridization of ClF_3?
    Answer: sp^3d
73. Hybridization of SF_4?
    Answer: sp^3d
74. Hybridization of BrF_5?
    Answer: sp^3d^2
75. Hybridization of XeF_2?
    Answer: sp^3d

Section D: Advanced / Mixed Problems (76–100)

76. Predict geometry of molecule with 2 bonding pairs, 0 lone pairs.
    Answer: Linear
77. Predict geometry with 3 bonding pairs, 0 lone pairs.
    Answer: Trigonal planar
78. Predict geometry with 4 bonding pairs, 0 lone pairs.
    Answer: Tetrahedral
79. Predict geometry with 3 bonding pairs, 1 lone pair.
    Answer: Trigonal pyramidal

80. Predict geometry with 2 bonding pairs, 2 lone pairs.
Answer: Bent
81. Predict geometry with 5 bonding pairs.
Answer: Trigonal bipyramidal
82. Predict geometry with 6 bonding pairs.
Answer: Octahedral
83. Geometry with 4 bonding pairs, 2 lone pairs.
Answer: Square planar
84. Geometry with 3 bonding pairs, 2 lone pairs.
Answer: T-shaped
85. Geometry with 4 bonding pairs, 1 lone pair.
Answer: Seesaw
86. Which has larger bond angle: NH_3 or H_2O?
Answer: NH_3
87. Which is linear: CO_2 or SO_2?
Answer: CO_2
88. Which has no lone pairs: BF_3 or NH_3?
Answer: BF_3
89. Which is polar: CO_2 or H_2O?
Answer: H_2O
90. Which has trigonal planar geometry: SO_3 or NH_3?
Answer: SO_3
91. Which has tetrahedral geometry: CH_4 or BF_3?
Answer: CH_4
92. Which has highest bond angle: CH_4 or NH_3?
Answer: CH_4
93. Which has more lone pairs: H_2O or NH_3?
Answer: H_2O
94. Which has octahedral geometry: SF_6 or PCl_5?
Answer: SF_6
95. Which is bent: CO_2 or O_3?
Answer: O_3
96. Which has sp hybridization: CO_2 or CH_4?
Answer: CO_2
97. Which has sp^2 hybridization: BF_3 or NH_3?
Answer: BF_3
98. Which has sp^3 hybridization: CH_4 or CO_2?
Answer: CH_4
99. Which is nonpolar: CO_2 or H_2O?
Answer: CO_2
100. Which has square planar geometry: XeF_4 or SF_4?
Answer: XeF_4