G12 Chemistry: Class 7 Homework

1. Write Lewis structures for the following ions. Show formal charges. **[12 marks]**

   a. O_2^{2-}

   b. SnO_2

   c. HCOF

   d. NF_3

   e. NO^+

   f. NH_4^+

3. Use VSEPR theory to predict the molecular shape for each of the following: **[16 marks]**

   a. HCN

   b. SO_2

   c. SO_3^{2-}

   d. SO_4^{2-}

e. CH_2F_2

f. $AsCl_5$

g. NH_4^+

h. BF_4^-

4. Draw Lewis structures for the following molecules and ions, and use VSEPR theory to predict the molecular shape. **[12 marks]**

a. XeI_2

b. PF_6^-

c. AsF_3

d. AlF_4^-

e. ClO_4^-

f. $OSCl_2$

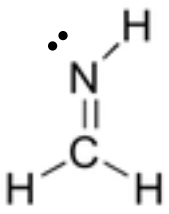
5. CH_3CFCl_2 (dichlorofluoroethane) has been proposed as a replacement for chlorofluorocarbons (CFCs). The presence of hydrogen in CH_3CFCl_2 markedly reduces the ozone-depleting ability of this compound. **[5 marks]**

    a. Draw a Lewis structure for this molecule and use VSEPR theory to predict the molecular shape.

    b. Draw the molecule using valence bond theory

6. Draw chloroform, $CHCl_3$ using valence bond theory. **[2 marks]**

7. Draw imine (shown below) using valence bond theory. **[3 marks]**



8. What are the hybrid orbitals of the carbon atoms in the following molecules? **[6 marks]**

   (a) $H_3C{-}CH_3$ (b) $H_3C{-}CH{=}CH_2$

   (c) $H_3C{-}C{\equiv}C{-}CH_2OH$ (d) $CH_3CH{=}O$

   (e) CH_3COOH (f) $H_3C{-}CH_2{-}C{\equiv}C{-}CH_2OH$

9. The allene molecule ($H_2C{=}C{=}CH_2$) is linear. What are the hybridization states of the carbon atoms? Draw diagrams to show the formation of sigma and pi bonds in allene. **[6 marks]**

10. How many pi bonds and sigma bonds are there in the tetracyanoethylene molecule? **[2 marks]**