1. How many valence electrons do the following atoms or ions have?
   a) Nitrogen atom \( \frac{5}{4} \)  
   b) Silicon atom \( \frac{4}{4} \)  
   d) Sodium ion (\( \text{Na}^{+} \)) \( \text{O} \)  
   e) Oxide ion (\( \text{O}^{2-} \)) \( \text{O} \)

2. Draw the Lewis structure of ammonia.
   \[
   \text{H} \quad \text{N} \quad \text{H}
   \]

3. Draw the Lewis structure of 1,2-dichloroethane.
   \[
   \text{Cl} \quad \text{H} \quad \text{Cl} \\
   \text{H} \quad \text{C} \quad \text{H} \quad \text{Cl} \quad \text{Cl}
   \]

4. The pK\(_a\) of methanol (\( \text{CH}_3\text{OH} \)) is 16 and the pK\(_a\) of ammonia (\( \text{NH}_3 \)) is 35. Which is a stronger base methoxide (\( \text{CH}_3\text{O}^- \)) or amide (\( \text{NH}_2^- \))?
   \[
   \text{H}_3\text{N} \quad \text{H}_2
   \]

5. Give an example of a carbon compound containing \( \sigma \) (sigma) bonds. Circle a sigma bond. What kind of orbitals are used in \( \sigma \) bonding by carbon?
   \[
   \text{H} \quad \text{C} \quad \text{H} \quad \text{P} \quad \text{H}
   \]

6. What is the oxidation number of \( \text{Cr} \) in \( \text{K}_2\text{Cr}_2\text{O}_7 \)?
   \( \text{Cr} \) is \( +6 \)

7. Complete the following acid-base equations.
   a) \( \text{HF} + \text{LiOH} \rightarrow \text{H}_2\text{O} + \text{Li}^+ + \text{F}^- \) or (\( \text{LiF} \))
   b) \( \text{NaHCO}_3 + \text{HNO}_3 \rightarrow \text{Na}^+ + \text{NO}_3^- + \text{H}_2\text{CO}_3 \) or (\( \text{NaNO}_3 \))

8. What is the pH of 0.01 M NaOH solution in water?
   \[
   \text{[H}^+\text{]} = 10^{-14} \quad \text{and} \quad \text{[OH}^-\text{]} = 10^{-2} \quad \text{pH} = -\log 10^{-12}, \quad \text{pH} = 12
   \]

9. The equilibrium constant for the following reaction is 9. What is the percentage of \( \text{A} \) present at equilibrium?
   \[
   \frac{\text{B}}{\text{A}} = \frac{9}{1}
   \]
   \[
   \% \text{A} = \frac{1}{9+1} \times 100\% = 10\%
   \]