

1. (10) Calculate the pH of a 5.0 M H_3PO_4 solution and determine equilibrium concentrations of the species H_3PO_4 , H_2PO_4^- , $\text{H}_2\text{PO}_4^{2-}$, PO_4^{3-} .
2. (10) Calculate the pH of a buffered solution containing 3.0×10^{-4} M HOCl ($K_a = 3.5 \times 10^{-8}$) and 1.0×10^{-4} M NaOCl .
3. (12) What are differences between thermodynamics and kinetics? What parameters can be used to determine the equilibrium position and the reaction rate of a chemical reaction?
4. (9) Describe the first, the second, and the third law of thermodynamics.
5. (10) Describe the differences between galvanic cell and electrolytic cell?
6. (12) Describe the differences between molecular solid and ionic solid. Provide one example for each.
7. (10) Draw all resonance structures and select the most stable one for SCN^- .
8. (12) Use molecular orbital (MO) theory to describe the bonding and stability of H_2^{2-} and H_2^+ ions.
9. (15) Draw the structural isomers for the alkane C_6H_{14} and give the systematic name for each one.