

Be sure to show all work, use the correct number of significant figures, circle final answers and use correct units in all problems.

- For the equilibrium $2 \text{CO}_{(g)} + \text{O}_{2(g)} \rightleftharpoons 2 \text{CO}_{2(g)}$ where $\Delta H < 0$, how will each of the following affect the equilibrium? Circle the correct answer. (4 points)
 - Oxygen is added to the system. **right left no change**
 - The reaction mixture is heated. **right left no change**
 - The pressure of the reaction mixture is increased. **right left no change**
 - CO_2 is removed from the system. **right left no change**
- Complete and balance the following acid-base reactions. Identify the acid, base, conjugate acid and conjugate base in each reaction. Predict whether the equilibrium lies predominantly to the left or the right. (6 points)
 - $\text{HBr} + \text{NH}_3 \rightarrow$

 - $\text{HOCl} + \text{H}_2\text{O} \rightarrow$
- What is the pH of a 0.116 M $\text{Mg}(\text{OH})_2$ solution? Assume $\text{Mg}(\text{OH})_2$ is a strong base. (3 points)
- My soft drink has a pH of 6.22. Is the soft drink acidic, alkaline or neutral? Calculate the hydronium and hydroxide ion concentration in the soft drink. (3 points)
- Benzoic acid, $\text{C}_6\text{H}_5\text{COOH}$, is a weak acid ($K_a = 6.28 \times 10^{-5}$). If I dissolve 1.22 g of $\text{C}_6\text{H}_5\text{COOH}$ in enough water to make 500. mL of solution, what is the resulting pH of the solution? (4 points)