1. If 3.18 g of BaCl$_2$ is dissolved in enough solvent to make 500.0 mL of solution, what is the molarity? (2 points)

FW(BaCl$_2$) = 208.23 g/mol

\[
\frac{3.18 \text{ g BaCl}_2 \cdot 1 \text{ mol BaCl}_2}{208.23 \text{ g BaCl}_2} = 0.01527 \text{ mol BaCl}_2
\]

\[
\frac{0.01527 \text{ mol BaCl}_2}{0.500 \text{ L solution}} = 0.031 \text{ mol/L} = 0.031 \text{ M BaCl}_2
\]

2. Calculate the w/v percentage of each of these solutes: (2 points each):

a. 623 mg of casein in 15.0 mL of milk

\[
%(w/v) = \left( \frac{623 \text{ mg casein}}{15.0 \text{ mL sol}} \right) \left( \frac{1 \text{ g casein}}{1000 \text{ mg casein}} \right) \times 100\% = 4.15\% \text{ w/v casein}
\]

b. 3.25 g of sucrose in 186 mL of coffee

\[
%(w/v) = \left( \frac{3.25 \text{ g sucrose}}{186 \text{ mL sol}} \right) \times 100\% = 1.75\% \text{ w/v sucrose}
\]

3. The following reaction is exothermic:

\[
2\text{NO(g)} + \text{Br}_2(g) \leftrightarrow 2\text{NOBr(g)}
\]

After it reaches equilibrium, we add a few drops of Br$_2$.

a. What will happen to the equilibrium? (1 point)

The equilibrium shifts to the right, or products, because reactant was added.

b. What will happen to the equilibrium constant? (1 point)

The equilibrium constant is not affected, it stays unchanged.

4. Which of the following molecules cannot engage in hydrogen bonding: (1 point, circle one answer only.)

a. H$_2$O  

b. CH$_4$  

c. NH$_3$  

d. HCl  

e. HI

5. For the reaction below, what is the expression for K? (1 point, circle one answer only.)

\[
2\text{H}_2(\text{g}) + 2\text{FeO(s)} \leftrightarrow 2\text{Fe(s)} + 2\text{H}_2\text{O(}\text{g})
\]

a. \(K = [\text{Fe}]^2[\text{H}_2\text{O}]^2/[\text{H}_2]^2[\text{FeO}]^2\)

b. \(K = [\text{H}_2\text{O}]^2/[\text{H}_2]^2[\text{FeO}]^2\)

c. \(K = [\text{Fe}]^2/[\text{H}_2]^2[\text{FeO}]^2\)

d. \(K = [\text{H}_2\text{O}]^2/[\text{H}_2]^2\)

e. \(K = [2\text{Fe}]^2[2\text{H}_2\text{O}]^2/[2\text{H}_2]^2[2\text{FeO}]^2\)

POINTS:_________( of 10)