CHM 106 Quiz I

Rank the following compounds in order of increasing melting and boiling points and explain your answer.

Compound	Structure
Chlorobenzene	C <sub>6</sub> H <sub>5</sub> Cl
Phenol	C <sub>6</sub> H <sub>5</sub> OH
Toluene	$C_6H_5CH_3$

CHM 102 Quiz 2

Concentrated phosphoric acid contains 1437.1 g of  $H_3PO_4$  per liter of aqueous solution. The density of phosphoric acid is 1.70 g / mL and the molar mass of  $H_3PO_4$  is 97.10 g / mol.

1. What is the molarity of concentrated phosphoric acid?

2. In order to perform an experiment, 0.10  $\underline{M}$  phosphoric acid is needed. What volume of concentrated H<sub>3</sub>PO<sub>4</sub> is required to make 5.00 L of 0.10  $\underline{M}$  phosphoric acid solution?

CHM 102 Quiz III

Sulfuric acid reacts with sodium hydroxide.

1. Write a balanced chemical equation for this reaction.

2. Identify which species reacts as an acid, which species reacts as a base, which species is the conjugate acid, and which species is the conjugate base.

3. A 25.00 mL sample of sulfuric acid of unknown concentration is titrated with 37.41 mL of standard 0.1000 M sodium hydroxide. What is the concentration of the sulfuric acid sample?

CHM 106 Quiz IV

Suppose you have a solution of 0.0050 M nitric acid.

1. What is the concentration of  $[H^+]$  in this solution? How do you know this?

2. What is the concentration of  $[OH^-]$  in this solution? Recall that  $K_w = 1.00 \times 10^{-14}$ .

3. What is the pH of 0.0050 <u>M</u> nitric acid?

4. Would you expect the pH of 0.0050  $\underline{M}$  nitrous acid (HNO<sub>2</sub>), a weak acid, to be higher or lower than the pH of 0.0050  $\underline{M}$  nitric acid? Explain.

CHM 102 Quiz V

In the gas phase, nitrogen dioxide is in equilibrium with dinitrogen tetroxide:

$$2 \operatorname{NO}_2(g) \rightleftharpoons \operatorname{N}_2\operatorname{O}_4(g)$$

1. Write an equilibrium expression that relates the concentrations of reactants and products to the equilibrium constant.

2. At 400 K, the equilibrium constant for this reaction is  $K_{eq} = 1.92 \times 10^{-2} \text{ L} / \text{mol.}$  What does this tell you about the position of the equilibrium?

3. At equilibrium, the reaction vessel contains  $[NO_2] = 0.012 \text{ M}$ . What is the concentration of  $N_2O_4(g)$ ?

CHM 102 Quiz VI

In acidic solution, chlorate reacts with tin (II) ions to produce chloride and tin (IV) ions:

$$\operatorname{ClO}_{3}^{-}(aq) + \operatorname{Sn}^{2+}(aq) \rightarrow \operatorname{Cl}^{-}(aq) + \operatorname{Sn}^{4+}(aq)$$

1. Assign oxidations states to all atoms.

2. What atom is getting reduced? What atom is getting oxidized?

3. Using the method of half-reactions, write a balanced chemical equation for this reaction.

CHM 102 Quiz VII

Permanganate reacts with formaldehyde to produce manganese (IV) oxide and carbon dioxide:

$$\operatorname{MnO}_{4}^{-}(aq) + \operatorname{CH}_{2}\operatorname{O}(aq) \rightarrow \operatorname{MnO}_{2}(s) + \operatorname{CO}_{2}(g)$$

1. Assign oxidation states to all atoms.

2. Identify which reagent reacts as an oxidizing agent and which reagent reacts as a reducing agent.

3. Using the method of half-reactions, balance this equation.

4. How many moles of permanganate are necessary to produce 100.0 g of  $CO_2(g)$ ? The molecular weight of  $CO_2$  is 44.00 g / mol.

CHM 102 Quiz VIII

1. Provide an unambiguous, systematic name for the following compound, shown as both a lineangle drawing and a structural formula:

 $\begin{array}{c} \begin{array}{c} \mathsf{CH}_3\mathsf{C} = \mathsf{CH} - \mathsf{CHCH}_3 \\ & \downarrow & \downarrow \\ \mathsf{CH}_3\mathsf{CH}_2 & \mathsf{CH}_3 \end{array}$ 

2. Using a line-angle drawing or structural formula, draw 3-ethyl-2,2-dimethyl-4-heptyne.

CHM 102 Quiz IX

For each question, draw the structure of an organic molecule with the desired functional group that has *exactly* five carbon atoms. Provide an unambiguous, systematic name for each molecule.

1. Ketone

2. Carboxylic acid

3. Alcohol

CHM 102 Quiz X

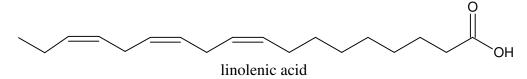
1. Draw the structure of the compound 1-amino-4-bromobenzene.

2. Provide an unambiguous, systematic name of the following compound, shown as both a lineangle drawing and a structural formula.

О || СН<sub>3</sub>СН<sub>2</sub>СН<sub>2</sub>—С—О—СН<sub>2</sub>СН<sub>3</sub>

CHM 102 Quiz 11

Linolenic acid is an 18-carbon long commonly occurring fatty acid.



1. Draw the structure of the triglyceride formed from glycerol (1,2,3-propanetriol) and three molecules of linolenic acid.

2. Is this lipid saturated or unsaturated? How can you tell?

3. Would you expect this lipid to be a solid (fat) or liquid (oil)? Explain.