## CH1010 Practice Final Exam

1. a. Name all reactants and products in the equation below:

b. Calculate the percent carbon in product C .
c. If you start with 72 g of reactant A , calculate the amount of product C you expect.
d. Draw the 3 dimensional structure of product C
2. Write the electronic configuration for the following atoms or ions:
a. ${ }_{7} \mathrm{~N}$ b. ${ }_{17} \mathrm{Cl}^{-}$c. ${ }_{13} \mathrm{Al}$
d. What is the name of the ion that has $1 s^{2} 2 s^{2} 2 p^{6}$ and a charge of +2 ?
3. a. $\mathrm{CH}_{3} \mathrm{NH}_{2}$ is a base. Write the equation for its acid-base reaction with water. Identify all acids and bases.
b. Write the expression for the $\mathrm{K}_{\mathrm{b}}$ of $\mathrm{CH}_{3} \mathrm{NH}_{2}$
c. If the $\mathrm{K}_{\mathrm{b}}$ of $\mathrm{CH}_{3} \mathrm{NH}_{2}$ is $1.32 \times 10^{-5}$ calculate the $\mathrm{pK}_{\mathrm{b}}$.
d. $\mathrm{CH}_{3} \mathrm{NH}_{3}+$ is an acid. Write the equation for its acid-base reaction with water. Identify all acids and bases.
e. Calculate the $\mathrm{K}_{\mathrm{a}}$ of $\mathrm{CH}_{3} \mathrm{NH}_{3}{ }^{+}$.
4. a. Calculate the molarity of -OH ions when 0.79 g of $\mathrm{Mg}(\mathrm{OH})_{2}$ is dissolved in 400 mL water.
b. Calculate the $\mathrm{H}_{3} \mathrm{O}^{+}$concentration of the above solution.
c. Calculate the pH of the above solution.
5. a. The density of ethanol is $0.79 \mathrm{~g} / \mathrm{mL}$. What is the $\mathrm{w} / \mathrm{w} \%$ if 6 g of ethanol is dissolved in 50 mL of water?
b. Calculate the molarity of the above solution.
c. Ethanol is an alcohol. Draw its extended structure.
6. a. Draw the 3-dimensional structure of chloromethane.
b. Chloromethane is a gas. Calculate the volume of 26.0 g of chloromethane at STP.
c. If 200 ml chloromethane has a pressure of 750 torr at $25^{\circ} \mathrm{C}$, what will its pressure (in torr) be at $250{ }^{\circ} \mathrm{C}$ ?
7. a. Draw extended structures of all alkenes having the formula $\mathrm{C}_{3} \mathrm{H}_{5} \mathrm{Cl}$.
b. Name each of the above alkenes.
8. Complete the following equations. Name reactants and products.
a. $\mathrm{CH}_{3}-\mathrm{CH}_{2}-\mathrm{CH}_{2}-\mathrm{CH}_{3}+\mathrm{Br}_{2} \xrightarrow{\mathrm{~h} \nu}$
b. $\mathrm{CH}_{2}=\mathrm{CH}-\mathrm{CH}_{2}-\mathrm{CH}_{3}+\mathrm{H}_{2} \xrightarrow{\mathrm{Ni}}$
c.

d.

9. Identify the missing components in the nuclear reactions below.
a. ${ }_{6}^{11} \mathrm{C} \longrightarrow{ }_{1}^{0} \mathrm{e}+? \quad$ b. $\quad ?+{ }_{0}^{1} \mathrm{n} \longrightarrow{ }_{26}^{59} \mathrm{Fe}$
c. Selenium-75 $\longrightarrow{ }_{-1}^{0} \mathrm{e}+$ ?
d. Gold $(\mathrm{Au})-198$ decays to mercury-198 with a half-life of 64.8 hr .

Write the equation for this nuclear reaction.
e. If you start with a sample of Au-198 weighing 2 ng , calculate the weight of the sample after 24 hrs .
f. Briefly explain how the reaction below can be used to generate energy.

10. The $\mathrm{pK}_{\mathrm{a}}$ of $\mathrm{H}_{2} \mathrm{PO}_{4}{ }^{-}$is 7.2 ., 0.72 g of $\mathrm{NaH}_{2} \mathrm{PO}_{4}$ and $0.29 \mathrm{~K}_{2} \mathrm{HPO}_{4}$ are dissolved in 750 mL water.
a. Calculate the molarity of $\mathrm{H}_{2} \mathrm{PO}_{4}^{-}$
b. Calculate the molarity of $\mathrm{HPO}_{4}^{-2}$ (pay attention to stoichiometry).
c. Calculate the pH of the solution (this is a buffer problem).

