

**ON SEPARATE PAPER**, work each of the following problems. SHOW ALL WORK in **neat** form TO RECEIVE CREDIT! Due: Day/Time of final (Mon. Dec. 12th).

- Ethyl alcohol has a density of  $0.789 \text{ g/cm}^3$ . What volume of ethyl alcohol must be poured into a graduated cylinder to give  $19.8 \text{ g}$  of alcohol?
- Write net ionic equations for the following molecular equations. Be Careful on **WEAK ACIDS**.
  - $\text{HF(aq)} + \text{KOH(aq)} \rightarrow \text{KF(aq)} + \text{H}_2\text{O(l)}$
  - $\text{AgNO}_3\text{(aq)} + \text{NaBr(aq)} \rightarrow \text{AgBr(s)} + \text{NaNO}_3\text{(aq)}$
  - $\text{CaS(s)} + 2\text{HBr(aq)} \rightarrow \text{CaBr}_2\text{(aq)} + \text{H}_2\text{S(g)}$
  - $\text{NaOH(aq)} + \text{NH}_4\text{Br(aq)} \rightarrow \text{NaBr(aq)} + \text{NH}_3\text{(g)} + \text{H}_2\text{O(l)}$
  - $\text{H}_2\text{SO}_4\text{(aq)} + \text{NaOH(aq)} \rightarrow$
- Seawater contains  $0.00065\%$  (by mass) of bromine. How many grams of bromine are there in  $1.00 \text{ L}$  of seawater? The density of seawater is  $1.025 \text{ g/cm}^3$ .
- Titanium, which is used to make airplane engines and frames, can be obtained from titanium tetrachloride, which in turn is obtained from titanium dioxide by the following process:
 
$$3\text{TiO}_2\text{(s)} + 4\text{C(s)} + 6\text{Cl}_2\text{(g)} \rightarrow 3\text{TiCl}_4\text{(g)} + 2\text{CO}_2\text{(g)} + 2\text{CO(g)}$$
 A vessel contains  $4.15 \text{ g TiO}_2$ ,  $5.67 \text{ g C}$ , and  $6.78 \text{ g Cl}_2$ . Suppose the reaction goes to completion as written. How many grams of titanium tetrachloride can be produced.
- How many grams of sodium dichromate,  $\text{Na}_2\text{Cr}_2\text{O}_7$ , should be added to a  $50.0\text{-mL}$  volumetric flask to prepare  $0.025 \text{ M Na}_2\text{Cr}_2\text{O}_7$  when the flask is filled to the mark with water? What are the Molarities of the  $\text{Na}^+$  ion and the  $\text{Cr}_2\text{O}_7^{2-}$  ion in the solution?
- How many milliliters of  $0.238 \text{ M KMnO}_4$  are needed to react with  $3.36 \text{ g}$  of iron(II) sulfate,  $\text{FeSO}_4$ ? The reaction is as follows:
 
$$10\text{FeSO}_4\text{(aq)} + 2\text{KMnO}_4\text{(aq)} + 8\text{H}_2\text{SO}_4\text{(aq)} \rightarrow 5\text{Fe}_2\text{(SO}_4)_3\text{(aq)} + 2\text{MnSO}_4\text{(aq)} + \text{K}_2\text{SO}_4\text{(aq)} + 8\text{H}_2\text{O(l)}$$
- A  $1.28\text{-g}$  sample of a colorless liquid was vaporized in a  $250\text{-mL}$  flask at  $121^\circ\text{C}$  and  $786 \text{ mmHg}$ . What is the molecular weight of this substance?
- Small amounts of hydrogen are conveniently prepared by reacting zinc with hydrochloric acid.
 
$$\text{Zn(s)} + 2\text{HCl(aq)} \rightarrow \text{ZnCl}_2\text{(aq)} + \text{H}_2\text{(g)}$$
 How many grams of zinc are required to prepare  $2.50 \text{ L H}_2$  gas at  $765 \text{ mmHg}$  and  $22^\circ\text{C}$ ?
- The atmosphere in a sealed diving bell contained oxygen and helium. If the gas mixture has  $0.200 \text{ atm}$  of oxygen and a total pressure of  $3.00 \text{ atm}$ , what is the pressure due to He? Calculate the mass of helium in  $1.00 \text{ L}$  of the gas mixture at  $20^\circ\text{C}$ .
- Determine the amount of heat needed to raise  $20.0 \text{ g}$  of ice at  $0^\circ\text{C}$  to steam at  $100^\circ\text{C}$ .
 
$$(\Delta H_{\text{fusion}} = 334 \text{ J/g}; \text{SpHt}_{\text{(H}_2\text{O)}} = 4.18 \text{ J/gc}; \Delta H_{\text{vap}} = 2.25 \text{ kJ/g})$$