

Practice Exam 2

1. **Balance** the following chemical equations:



2. 133.22 g of iron(III) acetate reacts with potassium sulfide to produce iron(III) sulfide and potassium acetate. Calculate the **number of grams of iron(III) sulfide** produced if there is a 96.10 % yield.



$$\begin{aligned} ? \text{ g Fe}_2\text{S}_3 &= 133.22 \text{ g Fe}(\text{C}_2\text{H}_3\text{O}_2)_3 \times \frac{1 \text{ mol Fe}(\text{C}_2\text{H}_3\text{O}_2)_3}{232.977 \text{ g Fe}(\text{C}_2\text{H}_3\text{O}_2)_3} \times \frac{1 \text{ mol Fe}_2\text{S}_3}{2 \text{ mol Fe}(\text{C}_2\text{H}_3\text{O}_2)_3} \times \frac{201.87 \text{ g Fe}_2\text{S}_3, \text{ theor.}}{1 \text{ mol Fe}_2\text{S}_3} \\ &\times \frac{96.10 \text{ g Fe}_2\text{S}_3, \text{ act.}}{100.00 \text{ g Fe}_2\text{S}_3, \text{ theor.}} = 57.11 \text{ g Fe}_2\text{S}_3, \text{ act.} \end{aligned}$$

3. Calculate the **mass of carbon dioxide produced** when 40.00 g of butanoic acid ( $\text{C}_2\text{H}_5\text{COOH}$ ) reacts with 30.00 g of oxygen gas. The products are carbon dioxide and water.



$$? \text{ g CO}_2 = 40.00 \text{ g C}_2\text{H}_5\text{COOH} \times \frac{1 \text{ mol C}_2\text{H}_5\text{COOH}}{74.079 \text{ g C}_2\text{H}_5\text{COOH}} \times \frac{6 \text{ mol CO}_2}{2 \text{ mol C}_2\text{H}_5\text{COOH}} \times \frac{44.010 \text{ g CO}_2}{1 \text{ mol CO}_2} = 71.29 \text{ g CO}_2$$

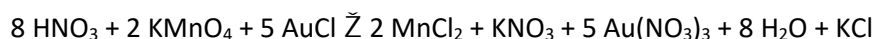
$$? \text{ g CO}_2 = 30.00 \text{ g O}_2 \times \frac{1 \text{ mol O}_2}{31.998 \text{ g O}_2} \times \frac{6 \text{ mol CO}_2}{7 \text{ mol O}_2} \times \frac{44.010 \text{ g CO}_2}{1 \text{ mol CO}_2} = 35.36 \text{ g CO}_2$$

35.36 g of carbon dioxide can be produced.

4. Calculate the **%(m/m) of a sodium carbonate solution** that is 1.26 M and has a density of 1.457 g/mL.

$$? \frac{\text{g Na}_2\text{CO}_3}{100 \text{ g sol'n}} = \frac{1.26 \text{ mol Na}_2\text{CO}_3}{1 \text{ L sol'n}} \times \frac{10^{-3} \text{ L sol'n}}{1 \text{ mL sol'n}} \times \frac{1 \text{ mL sol'n}}{1.457 \text{ g sol'n}} \times \frac{105.988 \text{ g Na}_2\text{CO}_3}{1 \text{ mol Na}_2\text{CO}_3} \times 100 = 9.17 \% \left( \frac{m}{m} \right)$$

5. 135.2 mL of a 0.436 M solution of gold(I) chloride reacts with an excess of an potassium permanganate solution. The balanced chemical equation is:



Calculate the **number of grams of the manganese(II) chloride** produced.

$$? \text{ g MnCl}_2 = 135.2 \text{ mL AuCl} \times \frac{0.436 \text{ mol AuCl}}{1000 \text{ mL AuCl sol'n}} \times \frac{2 \text{ mol MnCl}_2}{5 \text{ mol AuCl}} \times \frac{125.84 \text{ g MnCl}_2}{1 \text{ mol MnCl}_2} = 2.97 \text{ g MnCl}_2$$

6. What **volume, in mL**, of a 12.45 M solution of hydrochloric acid is needed to make 500.0 mL of a 0.1032 M solution of hydrochloric acid?

$$M_1 V_1 = M_2 V_2$$

$$V_1 = \frac{M_2 V_2}{M_1} = \frac{(0.1032 \text{ M})(500.0 \text{ mL})}{12.45 \text{ M}} = 4.145 \text{ mL}$$

7. What **mass, in g**, of aluminum sulfate is needed to make 150.0 mL of a 3.42 M solution of aluminum sulfate?

$$? \text{ g Al}_2(\text{SO}_4)_3 = 150.0 \text{ mL sol'n} \times \frac{3.42 \text{ mol Al}_2(\text{SO}_4)_3}{1000 \text{ mL sol'n}} \times \frac{342.13 \text{ g Al}_2(\text{SO}_4)_3}{1 \text{ mol Al}_2(\text{SO}_4)_3} = 176 \text{ g Al}_2(\text{SO}_4)_3$$