

Non Sibi High School

Andover's Chem 550/580: Advanced Chemistry

Chapter 6, Review Quiz 1 Answers

1

Calculate the molarity of a solution containing 2.0 grams of $\text{CO}(\text{NH}_2)_2$ dissolved to make 135 mL of solution.

$$\frac{2.0 \text{ g} \left(\frac{1 \text{ mol}}{60.06 \text{ g}} \right)}{\frac{135}{1000} \text{ L}} = 0.25 \text{ M}$$

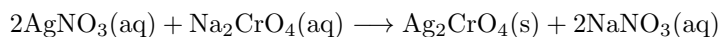
2

How many milliliters of 0.0915 M solution contain 0.30 grams of dissolved $\text{C}_6\text{H}_{12}\text{O}_6$?

$$0.30 \text{ g} \left(\frac{1 \text{ mol}}{180.2 \text{ g}} \right) \left(\frac{1 \text{ L}}{0.0915 \text{ mol}} \right) \left(\frac{1000 \text{ mL}}{1 \text{ L}} \right) = 18 \text{ mL}$$

3

Given the unbalanced equation $\text{AgNO}_3(\text{aq}) + \text{Na}_2\text{CrO}_4(\text{aq}) \rightarrow \text{Ag}_2\text{CrO}_4(\text{s}) + \text{NaNO}_3(\text{aq})$, if 255 mL of 0.114 M AgNO_3 react, how many grams of Ag_2CrO_4 will be produced?

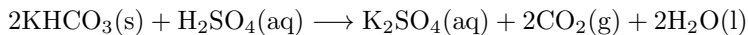


$$255 \text{ mL} \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right) \left(\frac{0.114 \text{ mol AgNO}_3}{1 \text{ L}} \right) \left(\frac{1 \text{ mol Ag}_2\text{CrO}_4}{2 \text{ mol AgNO}_3} \right) \left(\frac{331.8 \text{ g Ag}_2\text{CrO}_4}{1 \text{ mol Ag}_2\text{CrO}_4} \right) = 4.82 \text{ g Ag}_2\text{CrO}_4$$

4

Given the unbalanced equation $\text{KHCO}_3(\text{s}) + \text{H}_2\text{SO}_4(\text{aq}) \rightarrow \text{K}_2\text{SO}_4(\text{aq}) + \text{CO}_2(\text{g}) + \text{H}_2\text{O}(\text{l})$, if 10.7 grams of KHCO_3 is added to 22.5 mL of 1.64 M H_2SO_4 :

- a. Which is the limiting reagent and what maximum volume of CO_2 can form at STP?



$$10.7 \text{ g KHCO}_3 \left(\frac{1 \text{ mol KHCO}_3}{100.1 \text{ g KHCO}_3} \right) \left(\frac{2 \text{ mol CO}_2}{2 \text{ mol KHCO}_3} \right) = 0.1069 \text{ mol CO}_2$$

$$22.5 \text{ mL} \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right) \left(\frac{1.64 \text{ mol H}_2\text{SO}_4}{1 \text{ L}} \right) \left(\frac{2 \text{ mol CO}_2}{1 \text{ mol H}_2\text{SO}_4} \right) = 0.07380 \text{ mol CO}_2$$

H₂SO₄ produces less CO₂, so H₂SO₄ is the limiting reagent.

$$\frac{0.07380 \text{ mol} \times 0.0821 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}} \times 273 \text{ K}}{1.00 \text{ atm}} = 1.65 \text{ L CO}_2 \text{ can form}$$

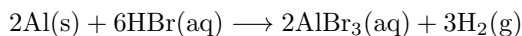
b. What mass of the excess reagent remains when the reaction is complete?

$$0.07380 \text{ mol CO}_2 \left(\frac{2 \text{ mol KHCO}_3}{2 \text{ mol CO}_2} \right) \left(\frac{100.1 \text{ g KHCO}_3}{1 \text{ mol KHCO}_3} \right) = 7.39 \text{ g KHCO}_3 \text{ used up}$$

$$10.7 \text{ g} - 7.39 \text{ g} = 3.3 \text{ g KHCO}_3 \text{ excess}$$

5

Given the unbalanced equation $\text{Al(s)} + \text{HBr(aq)} \rightarrow \text{AlBr}_3\text{(aq)} + \text{H}_2\text{(g)}$, if 54.6 mL of 0.222 M HBr react with an excess of solid aluminum and then 0.0118 grams of H₂ gas are actually collected, what is the percent yield of the reaction?



$$54.6 \text{ mL} \left(\frac{1 \text{ L}}{1000 \text{ mL}} \right) \left(\frac{0.222 \text{ mol HBr}}{1 \text{ L}} \right) \left(\frac{3 \text{ mol H}_2}{6 \text{ mol HBr}} \right) \left(\frac{2.016 \text{ g H}_2}{1 \text{ mol H}_2} \right) = 0.0122 \text{ g H}_2 \text{ theoretical}$$

$$\frac{0.0118 \text{ g}}{0.0122 \text{ g}} \times 100\% = 96.7\% \text{ yield}$$

6

If water is evaporated from 55 mL of 0.17 M NaOH solution until the volume is 11 mL, what will be the new molarity of the solution?

$$M_f = \frac{V_i}{V_f} \times M_i = \frac{55 \text{ mL}}{11 \text{ mL}} \times 0.17 \text{ M} = 0.85 \text{ M}$$

7

How many milliliters of 0.86 M KI must be diluted to obtain 250. mL of 0.28 M KI?

$$V_i = \frac{M_f}{M_i} \times V_f = \frac{0.28 \text{ M}}{0.86 \text{ M}} \times 250. \text{ mL} = 81 \text{ mL}$$



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