Non Sibi High School

Andover's Chem 250: Introductory/Basic Chemistry

Chapter 6, Review Quiz 1 Answers

1

Calculate the molarity of a solution containing 2.0 grams of $CO(NH_2)_2$ 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 $C_6H_{12}O_6$?

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

3

Given the unbalanced equation $AgNO_3(aq) + Na_2CrO_4(aq) \longrightarrow Ag_2CrO_4(s) + NaNO_3(aq)$, if 255 mL of 0.114 M $AgNO_3$ react, how many grams of Ag_2CrO_4 will be produced?

$$2AgNO_3(aq) + Na_2CrO_4(aq) \longrightarrow Ag_2CrO_4(s) + 2NaNO_3(aq)$$

$$255\,\text{mL}\left(\frac{1\,\text{L}}{1000\,\text{mL}}\right)\left(\frac{0.144\,\text{mol}\,AgNO_3}{1\,\text{L}}\right)\left(\frac{1\,\text{mol}\,Ag_2CrO_4}{2\,\text{mol}\,AgNO_3}\right)\left(\frac{331.8\,\text{g}\,Ag_2CrO_4}{1\,\text{mol}\,Ag_2CrO_4}\right) = 4.82\,\text{g}\,Ag_2CrO_4$$

4

Given the unbalanced equation $KHCO_3(s) + H_2SO_4(aq) \longrightarrow K_2SO_4(aq) + CO_2(g) + H_2O(l)$, 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?

$$2KHCO_3(s) + H_2SO_4(aq) \longrightarrow K_2SO_4(aq) + 2CO_2(g) + 2H_2O(l)$$

$$10.7\,\mathrm{g\,KHCO_3}\left(\frac{1\,\mathrm{mol\,KHCO_3}}{100.1\,\mathrm{g\,KHCO_3}}\right)\left(\frac{2\,\mathrm{mol\,CO_2}}{2\,\mathrm{mol\,KHCO_3}}\right) = 0.1069\,\mathrm{mol\,CO_2}$$

$$22.5\,\mathrm{mL}\left(\frac{1\,\mathrm{L}}{1000\,\mathrm{mL}}\right)\left(\frac{1.64\,\mathrm{mol\,H_2SO_4}}{1\,\mathrm{L}}\right)\left(\frac{2\,\mathrm{mol\,CO_2}}{1\,\mathrm{mol\,H_2SO_4}}\right) = 0.07380\,\mathrm{mol\,CO_2}$$

H_2SO_4 produces less CO_2, so H_2SO_4 is the limiting reagent.

$$\frac{0.07380\,\mathrm{mol} \times 0.0821\,\frac{\mathrm{L{\cdot}atm}}{\mathrm{mol{\cdot}K}} \times 273\,\mathrm{K}}{1.00\,\mathrm{atm}} = 1.65\,\mathrm{L\,CO_2\ can\ form}$$

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

$$0.07380\,\mathrm{mol\,CO_2}\left(\frac{2\,\mathrm{mol\,KHCO_3}}{2\,\mathrm{mol\,CO_2}}\right)\left(\frac{100.1\,\mathrm{g\,KHCO_3}}{1\,\mathrm{mol\,KHCO_3}}\right) = 7.39\,\mathrm{g\,KHCO_3\ used\ up}$$

$$10.7\,\mathrm{g} - 7.39\,\mathrm{g} = 3.3\,\mathrm{g\,KHCO_3\ excess}$$

5

Given the unbalanced equation $\mathrm{Al(s)} + \mathrm{HBr(aq)} \longrightarrow \mathrm{AlBr_3(aq)} + \mathrm{H_2(g)}$, if 54.6 mL of 0.222 M HBr react with an excess of solid aluminum and then 0.0118 grams of H_2 gas are actually collected, what is the percent yield of the reaction?

$$\mathrm{2Al(s)} + \mathrm{6HBr(aq)} \longrightarrow \mathrm{2AlBr_3(aq)} + \mathrm{3H_2(g)}$$

$$54.6\,\mathrm{mL}\left(\frac{1\,\mathrm{L}}{1000\,\mathrm{mL}}\right)\left(\frac{0.222\,\mathrm{mol\,HBr}}{1\,\mathrm{L}}\right)\left(\frac{3\,\mathrm{mol\,H_2}}{6\,\mathrm{mol\,HBr}}\right)\left(\frac{2.016\,\mathrm{g\,H_2}}{1\,\mathrm{mol\,H_2}}\right) = 0.0122\,\mathrm{g\,H_2\ theoretical}$$

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

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?

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

7

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

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

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