Worksheet: Solution Stoichiometry, Dilution

Key

1. Start with 5.0L of 7M acetic acid. Dilute to 20.L, what is new molarity?

$M_iV_i = M_fV_f$

$(5.0)(7) = (20.)(M_f)$

$M_f = \boxed{1.75\ M}$

2. $PbCl_2(s) + 2NaOH(aq) \rightarrow 2NaCl(aq) + Pb(OH)_2(s)$

79g $PbCl_2$, 13M NaOH, how many mL of NaOH will react with $PbCl_2$?

$$79\,g\ PbCl_2 \times \frac{1\ mol\ PbCl_2}{278.1\ g\ PbCl_2} = 0.284\ mol\ PbCl_2 \times \frac{2\ mol\ NaOH}{1\ mol\ PbCl_2} = 0.568\ mol\ NaOH$$

$$\frac{0.568\ mol\ NaOH}{13\ M\ NaOH} = 0.0437\ L \times \frac{1000\ mL}{1\ L} = \boxed{43.7\ mL\ NaOH}$$

3. A bottle of 12.0M HCl has only 35.7mL left in it. What will the HCl concentration be if the solution is diluted to 250.0mL?

$M_iV_i = M_fV_f$

$(12.0)(0.0357) = (M_f)(0.2500)$

$M_f = \boxed{1.71\ M}$

4. $2KMnO_4 + 5H_2C_2O_4 + 3H_2SO_4 \rightarrow 2MnSO_4 + 10CO_2 + 8H_2O + K_2SO_4$

How many mL of a 0.250M KMnO4 solution are needed to react completely with 3.225g of oxalic acid?

$$3.225\,g\ H_2C_2O_4 \times \frac{1\ mol\ H_2C_2O_4}{90.04\ g\ H_2C_2O_4} = 0.0358\ mol\ H_2C_2O_4 \times \frac{2\ mol\ KMnO_4}{5\ mol\ H_2C_2O_4} = 0.0143\ mol\ KMnO_4$$

$$\frac{0.0143\ mol\ KMnO_4}{0.250\ M} = 0.0573\ L\ KMnO_4 \times \frac{1000\ mL}{1\ L} = \boxed{57.3\ mL\ KMnO_4}$$