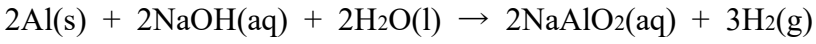
Name _____ Block: _____ Date: _____

Chemistry 11

Stoichiometry with Molarity

1. A student wants to put 50.0 L of hydrogen gas at STP into a plastic bag by reacting excess aluminum metal with 3.00 M sodium hydroxide solution according to the reaction:

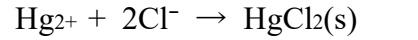


$$2Al(s) + 2NaOH(aq) + 2H_2O(l) \rightarrow 2NaAlO_2(aq) + 3H_2(g)$$

   What volume of NaOH solution is required?

2. What volume of 0.250 M HCl is required to completely neutralize 25.0 mL of 0.318 M NaOH? (Start by writing the balanced equation.)

3. A technician analyzes a sample of water from the "tailings" pond of a mine for the presence of mercury. After treating and concentrating the water sample, the technician carries out the titration reaction:



$$Hg^{2+} + 2Cl^- \rightarrow HgCl_2(s)$$

   A 25.0 mL sample of water containing mercury reacts with 15.4 mL of 0.0148 M Cl^- (as NaCl).

   a. What is the molar concentration of the mercury in the water sample?

   b. What mass of $HgCl_2$ is formed in the reaction?

4. A 10.0 mL sample of a saturated solution of $Ca(OH)_2$ is titrated with 23.5 mL of 0.0156 M HCl.
    a. Write the balanced reaction for the titration.

    b. What is the molarity of the $Ca(OH)_2$ in the saturated solution?

    c. What mass of $Ca(OH)_2$ is dissolved in 250.0 mL of saturated $Ca(OH)_2$?

5. A 1.00 mL sample of pure phosphoric acid is titrated with 43.8 mL of 0.853 M NaOH according to the reaction:

$$2NaOH + H_3PO_4 \rightarrow Na_2HPO_4 + 2H_2O$$

    a. What is the molar concentration of pure H_3PO_4?

    b. Calculate the density of pure H_3PO_4.

6. The iron present in a sample of iron ore is converted to Fe2+ and titrated with dichromate ion

$$Cr_2O_{7}^{2-} + 6Fe^{2+} + 14H^{+} \rightarrow 2Cr^{3+} + 6Fe^{3+} + 7H_2O$$

If 17.6 mL of 0.125 M dichromate ion is required to titrate a 25.0 mL sample of Fe^{2+} solution,
    a. what is the molarity of the Fe^{2+}?

    b. what mass of iron is present in the 25.0 mL sample?