**Let's Get Stoiched!** Multiple Choice Practice

1. Which of the following particulate diagrams best shows the formation of water vapor from hydrogen gas and oxygen gas in a rigid container at 125°C?
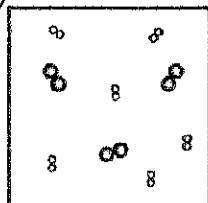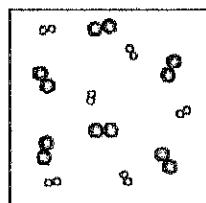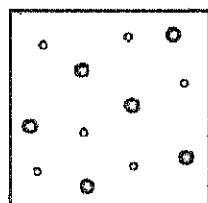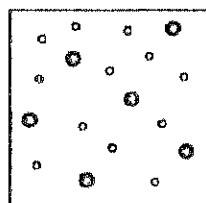
2. A sample of 9.00 grams of aluminum metal is added to an excess of hydrochloric acid. The volume of hydrogen gas produced at standard temperature and pressure is:

    a. 22.4 L   (b.) 11.2 L   c. 7.46 L   d. 5.60 L

$$9\ g\ Al \times \frac{1\ mol\ Al}{27\ g\ Al} \times \frac{3\ mol\ H_2}{2\ mol\ Al} \times \frac{22.4\ L\ H_2}{1\ mol\ H_2} = \frac{22.4}{2} = 11.2$$

$$2\ Al_{(s)} + 6HCl_{(aq)} \rightarrow 2AlCl_{3(aq)} + 3\ H_{2(g)}$$
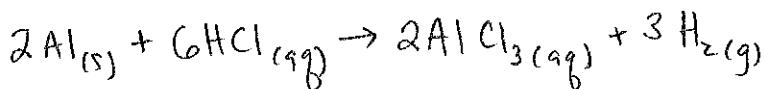
3. Upon combustion, a 30. g sample of a compound containing only carbon, hydrogen, and oxygen produces 44.0 g of carbon dioxide and 18.0 g of water. Find the empirical formula of the compound.

    a. CHO   (b.) CH_2O c. C_2HO_2 d. CH_2O_2

$$CO_2 \rightarrow C:\ 44.0\ g\ CO_2 \times \frac{1\ mol\ CO_2}{44\ g\ CO_2} \times \frac{1\ mol\ C}{1\ mol\ CO_2} = 1\ mol\ C \times \frac{12g}{1\ mol} = 12\ g\ C$$

$$H_2O \rightarrow H:\ 18.0\ g\ H_2O \times \frac{1\ mol\ H_2O}{18\ g\ H_2O} \times \frac{2\ mol\ H}{1\ mol\ H_2O} = 2\ mol\ H \times \frac{1g}{1\ mol} = 2\ g\ H$$

$$O:\ 30\ g - 12 - 2 = \frac{16\ g}{16\ g/mol} = 1\ mol\ O$$

C: 1 mol
H: 2 mol
O: 1 mol

4. A student titrates 20.0 mL of 1.0 M <u>NaOH</u> with 2.0 M formic acid, HCO_2H ($K_a = 1.8 \times 10^{-4}$). Formic acid is a <u>monoprotic acid</u> (it only donates 1 H^+ ion). How much formic acid is needed to completely neutralize the NaOH?

    (a.) 10.0 mL   b. 20.0 mL   c. 30.0 mL   d. 40.0 mL

$$M_1 V_1 = M_2 V_2$$

$$(1.0\,M)(20.0\,mL) = (2.0\,M)V$$

$$V = \frac{1 \times 20}{2} = 10$$

Use the following information to answer #5-6: When heated in a closed container in the presence of a catalyst, 1.2×10^{23} formula units of potassium chlorate decompose into potassium chloride and oxygen gas via the following reaction:

$$2\,KClO_3(s) \rightarrow 2\,KCl(s) + 3\,O_2(g)$$
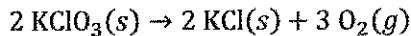
5. How many grams of oxygen gas will be generated?

     a. 1.60 g   b. 4.80 g   (c.) 9.60 g   d. 18.37 g

$$1.2\,E23\,f.u.\,K_2ClO_3 \times \frac{1\,mol}{6\,E23\,f.u.} \times \frac{3\,O_2}{2\,KClO_3} \times \frac{32\,g\,O_2}{1\,mol\,O_2} = 9.6\,g$$
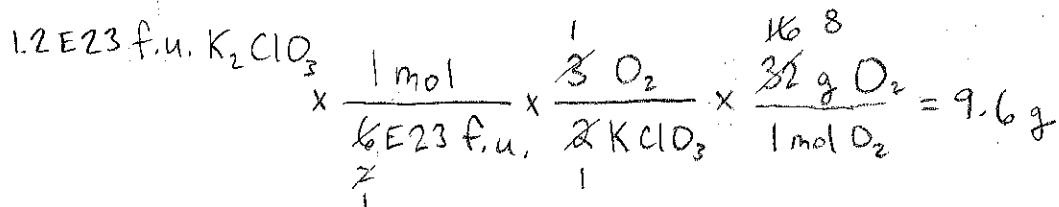
6. Approximately how many liters of oxygen gas will be evolved at STP?

     a. 1.24 L   b. 3.36 L   (c.) 6.72 L   d. 22.4 L

$$9.6\,g\,O_2 \times \frac{1\,mol\,O_2}{32\,g\,O_2} \times \frac{22.4\,L}{1\,mol} \approx \frac{10 \cdot 20}{30} = \frac{200}{30}$$