

## AP Chemistry – Loads of Fun!!! – 52

Name \_\_\_\_\_ Per \_\_\_\_

1. A beaker contains 100. mL of a solution of hypochlorous acid HOCl of unknown concentration. The solution was titrated with 0.100 M NaOH solution and the equivalence point was reached when 40.0 mL of NaOH was added. (a) What was the original concentration of the HOCl solution?

(b) If the original HOCl solution had a pH of 4.46, what is the value of  $K_a$  for HOCl?

(c) What percent of the HOCl molecules were ionized in the original solution?

2. The carbonate ion is formed when carbon dioxide reacts with water. (a) Draw a Lewis structure for the carbonate ion.

(b) What is the hybridization of the carbon atom?

(c) Describe the relative lengths of the bonds in the carbonate ion.

(d) Compare the lengths of the bonds in the carbonate ion to those in carbon dioxide.

3. A gaseous hydrocarbon sample is completely burned in air producing 1.80 L of carbon dioxide at STP and 2.16 g of water. (a) What is the empirical formula for the hydrocarbon?

(b) What was the mass of the hydrocarbon sample?

(c) The hydrocarbon was initially contained in a closed 1.00 L vessel at a temperature of 32°C and 760 mm of Hg. What is the molecular formula of the hydrocarbon?

(d) Write the balanced chemical equation for the combustion of the hydrocarbon in air.

4. Energy is released when glucose is oxidized in the following reaction which is a part of metabolism that takes place in the body:  $C_6H_{12}O_{6(s)} + 6O_{2(g)} \rightarrow 6CO_{2(g)} + 6H_2O_{(l)}$ . (a) Calculate the standard enthalpy change for this reaction.

(b) Calculate the standard entropy change for this reaction.

(c) Calculate the standard free energy change for this reaction at 298K.

(d) Calculate the value of  $K_{eq}$  for this reaction.

(e) How much energy is given off by the oxidation of 1.00 gram of glucose?