CHM 1020-01 **QUIZ 8 KEY** **October 27, 2000**

This quiz is take-home and open book, and it is intended that all members of the group contribute to completing it. It is a violation of the Academic Honor Code to sign a quiz that you did not work on. **The quiz is due at the end of class on Thursday, November 2.**

List names in alphabetical order, and print them clearly!
Put names on all pages, and staple pages together

Points

1. **Sucrose** is table sugar. It has the formula $C_{12}H_{22}O_{11}$.

(1.5) (a) How many grams of sucrose would be required to make 0.250 moles?

molecular weight of sucrose = 12 x 12.0 + 22 x 1.0 + 11 x 16.0 = 342.0 g/mol

$$\frac{342.0\ g}{1\ mol} \times 0.250 = 85.5\ g$$

(1.5) (b) How many **moles** of carbon atoms are there in 4.0 moles of sucrose?

$$4.0\ \text{moles sucrose} \times \frac{12\ \text{moles carbon}}{1\ \text{mole sucrose}} = 48\ \text{moles carbon}$$

(1.5) (c) How many carbon atoms are there in 4.0 moles of sucrose?

$$48\ \text{moles carbon (from part b)} \times \frac{6.02 \times 10^{23}\ \text{atoms}}{\text{mol}} = 2.89 \times 10^{25}\ \text{atoms (or 2.9)}$$

(1.5) (d) If you dissolved 1.2 grams of sucrose in your coffee, how many moles of sucrose would that be?

$$1.2\ \text{grams sucrose} \times \frac{1\ \text{mole}}{342.0\ \text{g}} = 3.5 \times 10^{-3}\ \text{moles}$$

(2) (e) Write and balance the equation for the complete combustion of sucrose.

$$C_{12}H_{22}O_{11} + 12\ O_2 \rightarrow 12\ CO_2 + 11\ H_2O$$

List names in alphabetical order. **Be sure to staple pages together!**

(1.5) 2. What is the density of CO_2 gas measured at STP?

molecular weight of CO_2 = 12.0 + 2 x 16.0 = 44.0 g/mol

$$\frac{44.0 \text{ g/mol}}{22.4 \text{ L/mol}} = 1.96 \text{ g/L}$$

(1.5) 3. You collect a sample of a gas from your propane tank and measure its density to be 1.96 g/L at STP. What is the molecular weight of propane?

1.96 g/L x 22.4 L/mol = 43.9 g/mol

4. When iron rusts, it reacts with oxygen to form iron (III) oxide.

(2) (a) Write and balance the chemical equation for the rusting process.

$$4\ Fe + 3\ O_2 \rightarrow 2\ Fe_2O_3$$

(2) (b) Calculated the mass of iron (III) oxide that would be produced from a nail weighing 21.5 grams if the nail were completely rusted.

(1 pt. correct FW, 1 pt. correct conversion; 0.2 pt if too many sig. fig.)

$$\text{FW } Fe_2O_3 = 2(55.8) + 3(16.0) = 159.6 \frac{\text{g}}{\text{mol}}$$

$$21.5 \text{ g Fe} \times \frac{1 \text{ mol Fe}}{55.8 \text{ g Fe}} \times \frac{2 \text{ mol } Fe_2O_3}{4 \text{ mol Fe}} \times \frac{159.6 \text{ g } Fe_2O_3}{1 \text{ mol}} = 30.7 \text{ g } Fe_2O_3$$