

Name KEY

Date _____

Due Date _____

Mark _____/33

Correct and Hand in Again by _____

Chemistry 11**Hand In Assignment # 5 – Summary of Mole Conversions****This Assignment will be marked and you are allowed to do one set of corrections.**

1. Make the following conversions, clearly showing your steps. Include proper units in all of your work and in your answer. Express all molar masses to 1 decimal place.

- a. 239.76 g of SeO_2 = ? molecules (4 marks) *g → mol → molec.*

$$239.76 \text{ g SeO}_2 \times \frac{1 \text{ mol}}{111.0 \text{ g}} \times \frac{6.02 \times 10^{23} \text{ molec.}}{1 \text{ mol}} = \underline{1.30 \times 10^{24} \text{ molecules}}$$

Answer 1.30×10^{24} molecules

- b. 0.6048 L of NO_2 (STP) = ? molecules (4 marks)

$$0.6048 \text{ L NO}_2 \times \frac{1 \text{ mol}}{22.4 \text{ L}} \times \frac{6.02 \times 10^{23} \text{ molec.}}{1 \text{ mol}} = \underline{1.63 \times 10^{22} \text{ molecules}}$$

Answer 1.63×10^{22} molecules

- c. 7.826×10^{21} molecules of CH_4 = ? L (STP) (4 marks) *molec. → mol → L*

$$7.826 \times 10^{21} \text{ molec.} \times \frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ molec.}} \times \frac{22.4 \text{ L}}{1 \text{ mole}} = \underline{0.291 \text{ L}}$$

Answer 0.291 L

d. 28.732 g of C_3H_8 = ? "H" atoms (4 marks) $g \rightarrow mol \rightarrow molec \rightarrow$ "H" atoms

$$28.732 \text{ g } C_3H_8 \times \frac{1 \text{ mol } C_3H_8}{44.0 \text{ g } C_3H_8} \times \frac{6.02 \times 10^{23} \text{ molec } C_3H_8}{1 \text{ mol } C_3H_8} \times \frac{8 \text{ "H" atoms}}{1 \text{ molec. } C_3H_8}$$

Answer = 3.14×10^{24} "H" atoms

2. Calculate the density of PCl_3 gas at STP. (4 marks)

$$MM = 31.0 + 3(35.5) = 137.5 \text{ g/mol} \quad D_{STP} = \frac{MM(\text{g/mol})}{22.4(\text{L/mol})}$$

$$D_{STP} = \frac{137.5 \text{ g/mol}}{22.4 \text{ L/mol}} = 6.14 \text{ g/L}$$

Answer $D_{STP} = 6.14 \text{ g/L}$

3. The density of a gas is 2.589 g/L at STP. Calculate the molar mass of the gas. (4 marks)

$$MM = D_{STP} \times 22.4 \text{ L/mol} \\ = 2.589 \text{ g/L} \times 22.4 \text{ L/mol} = 58.0 \text{ g/mol}$$

Answer 58.0 g/mol

4. What is the volume occupied by 0.2625 moles of solid silver if it has a density of 10.5 g/mL? (4 marks)

$$0.2625 \text{ mol Ag} \times \frac{107.9 \text{ g Ag}}{1 \text{ mol Ag}} = 28.32375 \text{ g} \quad V = \frac{M}{D} = \frac{28.32375 \text{ g}}{10.5 \text{ g/mL}} = 2.70 \text{ mL}$$

Answer $\text{Volume} = 2.70 \text{ mL (or } 0.00270 \text{ L)}$

5. An oxide of nitrogen is known to be either NO , N_2O , NO_2 or N_2O_4 . The mass of 0.800 L of this gas at STP is found to be 1.643 g.

a. Determine the molar mass of the gas. (4 marks)

$$\text{First calculate density. } D = M/V = 1.643 \text{ g} / 0.800 \text{ L} = 2.05375 \text{ g/L} \\ \text{Then use } MM = D \times 22.4 = 2.05375 \text{ g/L} \times 22.4 \text{ L/mol} = 46.0 \text{ g/mol}$$

Answer $MM = 46.0 \text{ g/mol}$

b. Give the molecular formula for the gas. (1 mark)

Answer NO_2

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$$NO_2 \text{ is a match} \\ 14.0 + 2(16.0) = 46.0 \text{ g/mol}$$