

Name Answer Key Per _____

**Unit 4 – Benchmark #1: Gram/Mole/Volume
Conversions – Practice!**

You may use a periodic table, but NOT a calculator. SHOW YOUR WORK!

Problems 1 - 3

Assume that you have an 11 gram sample of methane gas, CO_2 at standard conditions

1. How many moles of CO_2 do you have?

$$\frac{11 \text{ g } \text{CO}_2}{44 \text{ g}} \left| \frac{1 \text{ mol}}{44 \text{ g}} \right. = 0.25 \text{ mol } \text{CO}_2$$

2. How many molecules of CO_2 do you have?

$$\frac{0.25 \text{ mol}}{1 \text{ mol}} \left| \frac{6 \times 10^{23} \text{ molecules}}{1 \text{ mol}} \right. = 1.5 \times 10^{23} \text{ molecules}$$

3. What volume (in liters) should the sample occupy?

$$\frac{0.25 \text{ mol } \text{CO}_2}{1 \text{ mol}} \left| \frac{22.4 \text{ L}}{1 \text{ mol}} \right. = 5.6 \text{ L}$$

Problems 4 - 6

Assume that you have a sample of propane gas, C_3H_8 that occupies 11.2 liters at standard conditions.

4. How many moles of propane are contained in the sample?

$$\frac{11.2 \text{ L}}{22.4 \text{ L}} \left| \frac{1 \text{ mol}}{22.4 \text{ L}} \right. = 0.5 \text{ mol}$$

5. What is the mass in grams of the sample?

$$\frac{0.5 \text{ mol}}{1 \text{ mol}} \left| \frac{44 \text{ g}}{1 \text{ mol}} \right. = 22 \text{ g}$$

6. How many molecules of propane are in the sample?

$$\frac{0.5 \text{ mol}}{1 \text{ mol}} \left| \frac{6 \times 10^{23} \text{ molecules}}{1 \text{ mol}} \right. = 3 \times 10^{23} \text{ molecules}$$

Problems 7 - 8

You have a sample of calcium that contains 0.25 moles of calcium atoms.

7. What is the mass, in grams, of the sample of calcium?

$$\frac{0.25 \text{ mol}}{1 \text{ mol}} \left| \frac{40 \text{ g}}{1 \text{ mol}} \right. = 10 \text{ g}$$

8. How many atoms of calcium does the sample contain?

$$\frac{0.25 \text{ mol}}{1 \text{ mol}} \left| \frac{6 \times 10^{23} \text{ atoms}}{1 \text{ mol}} \right. = 1.5 \times 10^{23} \text{ atoms}$$

Problems 9 - 10

You have a sample of aluminum that contains 2×10^{23} atoms of aluminum.

9. How many moles of aluminum atoms do you have?

$$\frac{2 \times 10^{23} \text{ atoms}}{6 \times 10^{23} \text{ atoms}} \left| \frac{1 \text{ mol}}{6 \times 10^{23} \text{ atoms}} \right. = 0.33 \text{ mol}$$

10. What is the mass, in grams, of your sample of aluminum?

$$\frac{0.33 \text{ mol}}{1 \text{ mol}} \left| \frac{27 \text{ g}}{1 \text{ mol}} \right. = 9 \text{ g}$$

Problems 11 - 12

You have an 5.6 liter sample of nitrogen gas, N_2 , at standard conditions.

11. How many moles of nitrogen are contained in the sample?

$$\frac{5.6 \text{ L } \text{N}_2}{22.4 \text{ L}} \left| \frac{1 \text{ mol}}{22.4 \text{ L}} \right. = 0.25 \text{ mol}$$

12. What is the mass, in grams, of the sample?

$$\frac{0.25 \text{ mol}}{1 \text{ mol}} \left| \frac{28 \text{ g}}{1 \text{ mol}} \right. = 7 \text{ g}$$