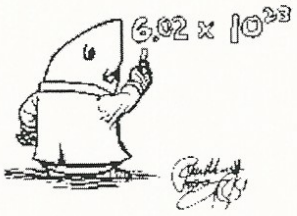
Mole Conversion Worksheet Name:_____



There are three mole equalities. They are:

1 mol = 6.02 x 10^{23} particles
1 mol = g-formula-mass (periodic table)
1 mol = 22.4 L for a gas at STP

Each equality can be written as a set of two conversion factors. They are:

$$\left(\frac{1\ mole}{6.02x10^{23}\ particles}\right) \qquad \left(\frac{6.02x10^{23}\ particles}{1\ mole}\right)$$

$$\left(\frac{1\ mole}{g-formula-mass}\right) \qquad \left(\frac{g-formula-mass}{1\ mole}\right)$$

$$\left(\frac{1\ mole}{22.4\ L}\right) \qquad \left(\frac{22.4\ L}{1\ mole}\right)$$

Step 1: Determine what you are solving for: moles or grams.
Step 2: Create a conversion factor by using your periodic table to find the atomic weight of the element/compound you are given.
Step 3: Write what you know, in a fraction, over 1.
Step 4: In a second fraction, place your labels so that the bottom label will cancel out the top label; whatever label you are trying to solve for should then go on the top.
Step 5: Cancel the label, then punch the numbers in on your calculator.

Example: You are massing a 24 K gold chain, and find that it weighs 400 grams. Determine how many moles of Gold atoms you have.

Steps 1: Obviously, you are solving for moles.
Step 2: Looking at the periodic table, you find that gold weighs 197 AMU, or 197 grams per mole. Your conversion factor is then 1 mole=197 grams.
Step 3: We know (or we are given) the weight of the chain, in grams. Write this over 1:

$$\frac{400\ g}{1}$$

Step 4: The second fraction, the label we are trying to get rid of must go on the bottom; this will tell us how to align our conversion factor:

$$\frac{1\ mole}{197\ g}$$

Step 5: Now our labels will cancel; this will give us an easy-to-solve multiplication problem.

$$\frac{400\cancel{g}}{1} \times \frac{1\ moles}{197\cancel{g}} = \frac{400 \times 1\ moles}{197} = 2.03\ mol\ Au$$

Mole-Particle Conversions

1. How many moles of magnesium is 3.01×10^{22} atoms of magnesium?

$$\mathbf{3.01 \times 10^{22}\ atoms} \left(\frac{1\ mole}{6.02 \times 10^{23}\ atoms} \right) = 5 \times 10^{-2}\ \text{moles}$$

2. How many molecules are there in 4.00 moles of glucose, $C_6H_{12}O_6$?

3. How many moles are 1.20×10^{25} atoms of phosphorous?

4. How many atoms are in 0.750 moles of zinc?

5. How many molecules are in 0.400 moles of N_2O_5?

Mole-Mass Conversions

1. How many moles in 28 grams of CO_2 ?

Gram-formula-mass of CO_2 1 C = 1 x 12.01 g = 12.01 g
2 O = 2 x 16.00 g = 32.00 g
64.00 g/mol

$$\mathbf{28\ g\ CO_2} \left(\frac{1\ mole}{44.00\ g} \right) = 0.64\ \text{moles}\ \ CO_2$$

2. What is the mass of 5 moles of Fe_2O_3 ?

3. Find the number of moles of argon in 452 g of argon.

4. Find the grams in 1.26×10^{-4} mol of $HC_2H_3O_2$.

5. Find the mass in 2.6 mol of lithium bromide.

Mole-Volume Conversions

1. Determine the volume, in liters, occupied by 0.030 moles of a gas at STP.

$$0.030 \text{ mol} \left(\frac{22.4\ L}{1\ mole} \right) = 0.67 \text{ L}$$

2. How many moles of argon atoms are present in 11.2 L of argon gas at STP?

3. What is the volume of 0.05 mol of neon gas at STP?

4. What is the volume of 1.2 moles of water vapor at STP?

Mixed Practice

1. You have 23 moles of Tantalum (Ta). How many grams is this?

2. You discover that the head of a match contains 1.6 grams of Sulfur, S. How many atoms of S does a match contain?

3. While cleaning a cut, you spill a bottle of Iodine. The label says that the bottle holds 500 grams of I. How many moles of I are there?

4. Your silver watchband masses out at 326 g. How many moles of Ag do you have?

5. EXTRA STEP HERE! Can you catch it? While dropping off you recycling, you are overcome by the urge to weigh the tin cans you brought in. You find that the mass of cans in the box you brought massed out at 23 Kg. How many moles do you have?

6. Water has a molar weight of 18 grams (that's 18 grams per mole...). You drink a 2-liter bottle of water everyday, and you are such a smarty that you know that 1-ml of H2O weighs 1 g. Can you tell me how many moles of water you consume a day?

7. You pick any element that comes *after* oxygen, and tell me the mass of 17 moles of that particular element would weigh.

8. Your toothpaste probably contains around 62 g of fluorine per tube. How many moles are in one tube of toothpaste?

9. The head of a golf club might contain 25o grams of titanium. How many moles is this?

10. The shaft of that same golf club probably contains around 35 moles of graphite, a natural form of carbon. How much might the shaft of the club weigh?

Multiple Variable Conversions

1. How many oxygen molecules are in 3.36 L of oxygen gas at STP?

$$3.36\ \text{L}\left(\frac{1\ \textit{mole}}{22.4\ \textit{L}}\right)\left(\frac{6.02x10^{23}\ \textit{molecules}}{1\ \textit{mole}}\right) = 9.03 \times 10^{22}\ \text{molecules}$$

2. Find the mass in grams of 2.00×10^{23} molecules of F_2.

3. Determine the volume in liters occupied by 14 g of nitrogen gas at STP.

4. Find the mass, in grams, of 1.00×10^{23} molecules of N_2.

5. How many particles are there in 1.43 g of a molecular compound with a gram