## **Mole Conversions Worksheet Working with Moles and Particles**

There are three mole equalities. They are:

 $1 \text{ mol} = 6.02 \text{ x } 10^{23} \text{ particles (atom, molecule or ion)}$ 

1 mol = gram formula mass of a substance

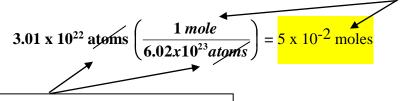
1 mol = 22.4 L for a gas at STP

The equality for moles and particles can be written as a set of two conversion factors:

$$\left(\frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ particles}}\right) \quad \text{OR} \qquad \left(\frac{6.02 \times 10^{23} \text{ particles}}{1 \text{ mole}}\right)$$

Mole-Particle Conversion Calculations: Using the Factor-Label Method

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



You are left with the desired unit you are converting **TO**.

When the units are set up properly, the unit you are converting **FROM** will cancel out.

2. How many molecules are there in 4.00 moles of glucose, C<sub>6</sub>H<sub>12</sub>O<sub>6</sub>?

4.00 moles 
$$\left(\frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mole}}\right) = \frac{2.41 \times 10^{24} \text{ molecules}}{1 \times 10^{24} \text{ molecules}}$$

- 3. How many moles are  $1.20 \times 10^{25}$  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<sub>2</sub>O<sub>5</sub>?

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- 6. How many atoms are in 0.340 moles of sodium?
- 7. How many moles are in  $1.204 \times 10^{24}$  molecules of Bromine?
- 8. How many molecules are in 0.75 moles of oxygen gas?
- 9. How many moles are present in 2.45 x 10<sup>23</sup> molecules of CH<sub>4</sub>?
- 10. How many moles are there in 3.4 x 10<sup>24</sup> molecules of NH<sub>3</sub>?

## Multi-Step Mixed Mole Conversions- Using the Factor Label Method and Moles Formula

## Given unit $\rightarrow$ Moles $\rightarrow$ Desired unit

11. Find the mass in grams of  $2.00 \times 10^{23}$  molecules of  $F_2$ .

$$2.00 \times 10^{23} \text{ molecules} \left( \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ partietes}} \right) = 0.332 \text{ moles } F_2$$

**Gram-formula-mass**  $F_2$ : F: 2 (19.0 g) = 38.0 g/mol; therefore 1 mole  $F_2$  = 38.0 g  $F_2$ 

# of moles = 
$$\frac{\text{given mass}}{\text{gram formula mass}}$$
; given mass = (# of moles)(gram formula mass) given mass = (0.332 moles)(38.0 g F<sub>2</sub>) =  $\frac{12.616 \text{ g F}_2}{12.616 \text{ g F}_2}$ 

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12. Find the mass, in grams, of $1.00 \times 10^{23}$ molecular molecular mass.	ales of N <sub>2</sub> .
13. How many particles are there in 1.43 g of a con-	mpound with a gram formula mass of 233 g?
14. How many grams are there in $3.4 \times 10^{24}$ molecular molecular many grams are there in $3.4 \times 10^{24}$ molecular molecul	ules of NH <sub>3</sub> ?
15. Aspartame is an artificial sweetener that is 160 sugar) when dissolved in water. It is marketed by C molecular formula of aspartame is $C_{14}H_{18}N_2O_5$ .  a) Calculate the gram-formula-mass of asparance.	G.D. Searle as <i>Nutra Sweet</i> . The
b) How many molecules are in 10 g of aspa	artame?
c) What is the mass in grams of 1.56 moles	of aspartame?
d) How many atoms of nitrogen are in 1 mo	ole of aspartame?