

# Molar Mass Worksheet

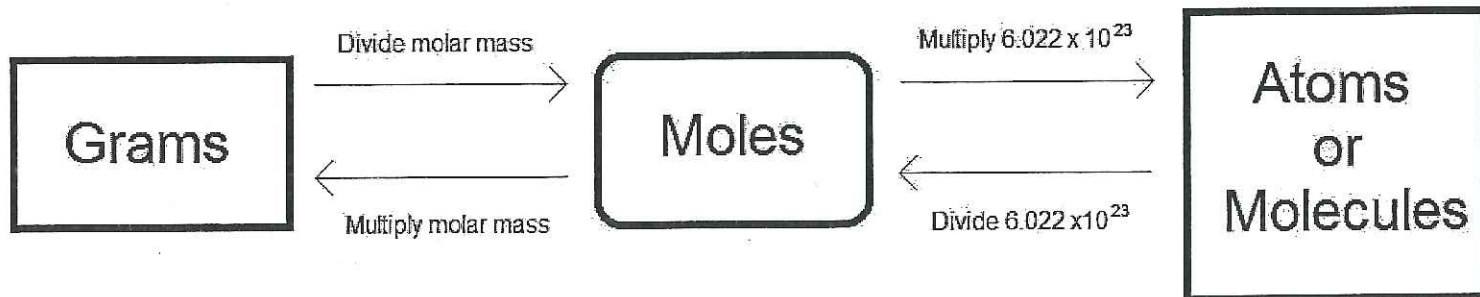
**Directions:** Find the molar masses of the following elements. Round your answers to ONE decimal place and be sure to include the proper units!!!

- 1) Chlorine: 35.5 g/mol  $\rightarrow$   $\frac{35.5 \text{ g Cl}}{1 \text{ mol Cl}}$
- 2) Potassium: 39.1 g/mol
- 3) Beryllium: 9.0 g/mol
- 4) Iron: 55.8 g/mol
- 5) Boron: 10.8 g/mol
- 6) Carbon: 12.0 g/mol
- 7) Magnesium: 24.3 g/mol
- 8) Uranium: 238.0 g/mol
- 9) Sulfur: 32.1 g/mol
- 10) Hydrogen: 1.0 g/mol

$$MM = \frac{\# \text{ grams}}{1 \text{ mol}}$$

$$\text{Avogadro's } \# = \frac{6.022 \times 10^{23} \text{ atoms}}{1 \text{ mol}}$$

## Examples: Molar Mass and Conversions



Example Calculations (with dimensional analysis):

### 1. Grams → Moles

Find the number of moles in 92.2 g iron.

$$\frac{92.2 \text{ g Fe}}{55.8 \text{ g Fe}} \times \frac{1 \text{ mol Fe}}{1 \text{ mol Fe}} = 1.65 \text{ mol Fe}$$

(molar mass) →

### 2. Moles → Grams

Calculate the mass, in grams, of 0.250 moles of sodium.

$$\frac{0.250 \text{ mol Na}}{1 \text{ mol Na}} \times \frac{23 \text{ g Na}}{1 \text{ mol Na}} = 5.75 \text{ g Na}$$

(molar mass) →

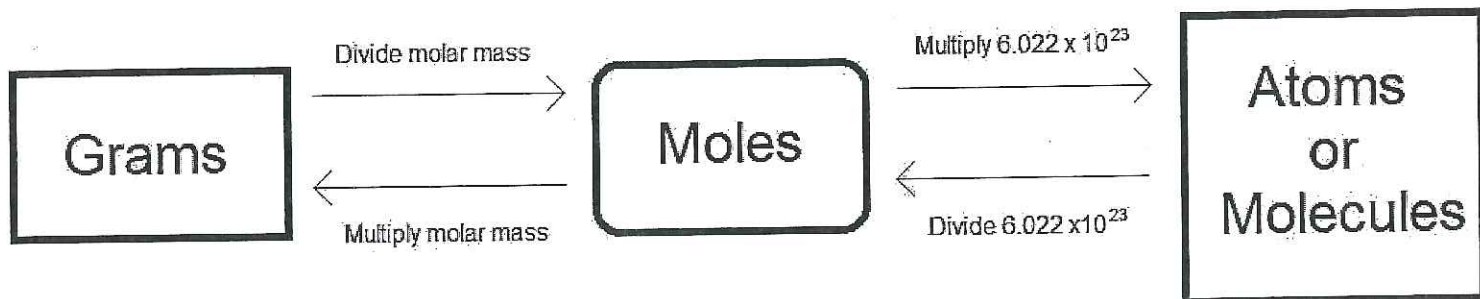
### 3. Moles → Atoms

Calculate the number of atoms in 3.2 moles of carbon.

$$\frac{3.2 \text{ mol C}}{1 \text{ mol C}} \times \frac{6.022 \times 10^{23} \text{ atoms C}}{1 \text{ mol C}} = 1.93 \times 10^{24} \text{ atoms C}$$

(Avogadro's #) →

# Examples: Molar Mass and Conversions



**Directions:** Complete the following calculations (with dimensional analysis) using the examples on the previous page as your guide:

## 4. Atoms → Moles

Find the number of moles in  $1.25 \times 10^{23}$  atoms of magnesium.

$$\frac{1.25 \times 10^{23} \text{ atoms Mg}}{6.022 \times 10^{23} \text{ atoms Mg}} \times \frac{1 \text{ mol Mg}}{1 \text{ mol Mg}} = 0.21 \text{ mol Mg}$$

## 5. Grams → Atoms

Calculate the number of atoms in 60.0 g of neon.

$$\frac{60.0 \text{ g Ne}}{20.2 \text{ g Ne}} \times \frac{1 \text{ mol Ne}}{1 \text{ mol Ne}} \times \frac{6.022 \times 10^{23} \text{ atoms Ne}}{1 \text{ mol Ne}} = 1.79 \times 10^{24} \text{ atoms Ne}$$

## 6. Atoms → Grams

Calculate the mass, in grams, of  $3.24 \times 10^{22}$  atoms of aluminum.

$$\frac{3.24 \times 10^{22} \text{ atoms Al}}{6.022 \times 10^{23} \text{ atoms Al}} \times \frac{1 \text{ mol Al}}{1 \text{ mol Al}} \times \frac{27 \text{ g Al}}{1 \text{ mol Al}} = 1.45 \text{ g Al}$$

# Moles, Atoms, and Grams WS

Directions: Complete the following calculations (with dimensional analysis).

1. How many moles are there in 450 grams of Na?

$$\frac{450 \text{ g Na}}{23.0 \text{ g Na}} \times \frac{1 \text{ mol Na}}{1} = 19.57 \text{ mol Na}$$

(molar mass) →

2. How many moles are there in  $7.5 \times 10^{23}$  atoms of S?

$$\frac{7.5 \times 10^{23} \text{ atoms S}}{6.022 \times 10^{23} \text{ atoms S}} \times \frac{1 \text{ mol S}}{1} = 1.25 \text{ mol S}$$

(Avogadro's #) →

3. How many grams are there in 1.3 moles of Cu?

$$1.3 \text{ mol Cu} \times \frac{63.5 \text{ g Cu}}{1 \text{ mol Cu}} = 82.55 \text{ g Cu}$$

(molar mass) →

4. How many moles are there in  $2.3 \times 10^{12}$  atoms of P?

$$\frac{2.3 \times 10^{12} \text{ atoms P}}{6.022 \times 10^{23} \text{ atoms P}} \times \frac{1 \text{ mol P}}{1} = 3.82 \times 10^{-12} \text{ mol P}$$

(Avogadro's #) →

$$= 3.82 \times 10^{-12} \text{ mol P}$$

## 2 Step Conversions: Moles, Atoms, and Grams

**Directions:** Complete the following calculations (with dimensional analysis).

*Note:* All conversions must go through the mole – it is the only way to connect atoms and grams!

1. How many atoms are there in 24 grams of K?

$$\frac{24 \text{ g K}}{39.1 \text{ g K}} \times \frac{1 \text{ mol K}}{1 \text{ mol K}} \times \frac{6.022 \times 10^{23} \text{ atoms K}}{1 \text{ mol K}} = 3.70 \times 10^{23} \text{ atoms K}$$

(molar mass) → (Avogadro's #) →

2. How many grams are there in  $2.3 \times 10^{24}$  atoms of silver?

$$\frac{2.3 \times 10^{24} \text{ atoms Ag}}{6.022 \times 10^{23} \text{ atoms Ag}} \times \frac{1 \text{ mol Ag}}{1 \text{ mol Ag}} \times \frac{107.9 \text{ g Ag}}{1 \text{ mol Ag}} = 412.11 \text{ g Ag}$$

(Avogadro's #) → (molar mass)

3. How many grams are there in  $7.4 \times 10^{23}$  atoms of Li?

$$\frac{7.4 \times 10^{23} \text{ atoms Li}}{6.022 \times 10^{23} \text{ atoms Li}} \times \frac{1 \text{ mol Li}}{1 \text{ mol Li}} \times \frac{6.9 \text{ g Li}}{1 \text{ mol Li}} = 8.48 \text{ g Li}$$

(Avogadro's #) → (molar mass)

4. How many atoms are there in 48 grams of boron?

$$\frac{48 \text{ g B}}{10.8 \text{ g B}} \times \frac{1 \text{ mol B}}{1 \text{ mol B}} \times \frac{6.022 \times 10^{23} \text{ atoms B}}{1 \text{ mol B}} = 2.67 \times 10^{24} \text{ atoms B}$$

(molar mass) → (Avogadro's #)