Mole to Grams, Grams to Moles Conversions Worksheet

What are the molecular weights of the following compounds? (all masses must be to nearest hundredth)

1) NaOH
2) H₃PO₄
3) H₂O
4) Mn₂Se₇
5) MgCl₂
6) (NH₄)₂SO₄

There are three definitions (equalities) of mole. They are:
1 mole = 6.02 x 10²³ particles
1 mole = molar mass (could be atomic mass from periodic table or molecular mass)
1 mole = 22.4 L of a gas at STP (You do not need to worry about this yet)

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

1 mole = molar mass (g) can be written as
\[ \frac{1 \text{ mole}}{\text{molar mass (g)}} \quad \text{OR} \quad \frac{\text{molar mass (g)}}{1 \text{ mole}} \]

1 mole = 6.02 x 10²³ particles can be written as
\[ \frac{1 \text{ mole}}{6.02 \times 10^{23}} \quad \text{OR} \quad \frac{6.02 \times 10^{23}}{1 \text{ mole}} \]

Solve the following:

1) How many moles are in 15 grams of lithium? (molar mass of lithium is 6.94 g/mole)
   \[
   15 \text{ grams} \times \frac{1 \text{ mole}}{6.94 \text{ grams}} = 2.1614 \text{ moles lithium} = \boxed{2.2 \text{ moles Li}}
   \]

2) How many grams are in 2.4 moles of sulfur? (molar mass of sulfur is 32.07 g/mole)
   \[
   2.4 \text{ moles} \times \frac{32.07 \text{ grams}}{1 \text{ mole}} = 76.97 \text{ grams sulfur} = \boxed{77 \text{ g Sulfur}}
   \]

3) How many moles are in 22 grams of argon?

4) How many grams are in 88.1 moles of magnesium?

5) How many moles are in 2.3 grams of phosphorus?
6) How many grams are in 11.9 moles of chromium?

7) How many moles are in 9.8 grams of calcium?

8) How many grams are in 238 moles of arsenic?

Solve the following:

9) How many grams are in 4.5 moles of sodium fluoride, NaF?
   (molar mass of NaF is 22.99 + 19.00 = 41.99 g/mole)
   \[ 4.5 \text{ moles} \times \frac{41.99 \text{ grams}}{1 \text{ mole}} = 188.955 \text{ g NaF} = 190 \text{ g NaF} \]

10) How many moles are in 98.3 grams of aluminum hydroxide, Al(OH)₃?
    (molar mass of Al(OH)₃ is 26.98 + (3 \times 16.00) + (3 \times 1.01) = 78.01 g/mole)
    \[ 98.3 \text{ grams} \times \frac{1 \text{ mole}}{78.01 \text{ grams}} = 1.2601 \text{ moles Al(OH)₃} = 1.26 \text{ moles Al(OH)₃} \]

11) How many grams are in 0.02 moles of beryllium iodide, BeI₂?

12) How many moles are in 68 grams of copper (II) hydroxide, Cu(OH)₂?

13) How many grams are in 3.3 moles of potassium sulfide, K₂S?

14) How many moles are in 1.2 \times 10³ grams of ammonia, NH₃?

15) How many grams are in 2.3 \times 10⁻⁴ moles of calcium phosphate, Ca₃(PO₃)₂?

16) How many moles are in 3.4 \times 10⁻⁷ grams of silicon dioxide, SiO₂?
Mole Calculation Worksheet – Answer Key

What are the molecular weights of the following compounds?

1) NaOH \( 22.99 + 16.00 + 1.01 = 40.00 \text{ grams/mol} \)
2) H₃PO₄ \( 3(1.01) + 30.97 + 4(16.00) = 98.00 \text{ grams} \)
3) H₂O \( 2(1.01) + 16.00 = 18.02 \text{ grams} \)
4) Mn₂Se₇ \( 2(54.94) + 7(78.96) = 662.60 \text{ grams} \)
5) MgCl₂ = \( 24.31 + 2(35.45) = 95.21 \text{ grams} \)
6) (NH₄)₂SO₄ \( 2(14.01) + 8(1.01) + 32.07 + 4(16.00) = 132.17 \text{ grams} \)

Solve the following:

1) How many moles are in 15 grams of lithium? \( \frac{15}{2.161} = 2.2 \text{ moles} \)
2) How many grams are in 2.4 moles of sulfur? \( 76.968 \times 2.4 = 77 \text{ grams} \)
3) How many moles are in 22 grams of argon? \( \frac{22}{0.550688} = 0.55 \text{ moles} \)
4) How many grams are in 88.1 moles of magnesium? \( 2141.711 \times 88.1 = 2140 \text{ g} \)
5) How many moles are in 2.3 grams of phosphorus? \( \frac{2.3}{0.074265} = 0.074 \text{ moles} \)
6) How many grams are in 11.9 moles of chromium? \( 618.8 \times 11.9 = 619 \text{ g} \)
7) How many moles are in 9.8 grams of calcium? \( \frac{9.8}{0.24451} = 0.24 \text{ moles} \)
8) How many grams are in 238 moles of arsenic? \( 17,830.96 \times 238 = 17,800 \text{ g} \)
9) How many grams are in 4.5 moles of sodium fluoride, NaF? \( 188.955 \times 4.5 = 190 \text{ g} \)
10) How many moles are in 98.3 grams of aluminum hydroxide, Al(OH)₃? \( \frac{98.3}{1.2601} = 1.26 \text{ moles} \)
11) How many grams are in 0.02 moles of beryllium iodide, BeI₂? \( 5.2562 \times 0.02 = 5 \text{ g} \)
12) How many moles are in 68 grams of copper (II) hydroxide, Cu(OH)₂? \( \frac{68}{0.6969} = 0.70 \text{ moles} \)
13) How many grams are in 3.3 moles of potassium sulfide, K₂S? \( 363.891 \times 3.3 = 360 \text{ g} \)
14) How many moles are in 1.2 x 10³ grams of ammonia, NH₃? \( \frac{1.2 \times 10³}{70.5882} = 71 \text{ moles} \)
15) How many grams are in 2.3 x 10⁻⁴ moles of calcium phosphate, Ca₃(PO₄)₂? \( 0.06398 \times 2.3 \times 10⁻⁴ = 0.064 \text{ g} \)
16) How many moles are in 3.4 x 10⁻⁷ grams of silicon dioxide, SiO₂? \( 5.6582 \times 10⁻⁹ \times 3.4 \times 10⁻⁷ = 5.7 \times 10⁻⁹ \text{ moles} \)
17) How many grams are in 1.11 moles of manganese sulfate, Mn₃(SO₄)₂? \( 1.11 \times 837 = 929.07 \text{ g} \)

Bad formula