

Example: You need 1.75 moles of iron. What mass of iron do you need to weigh out on the balance?

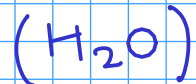
Use ATOMIC WEIGHT as a conversion factor. It relates MASS and MOLES.

$$55.85 \text{ g Fe} = 1 \text{ mol Fe}$$

$$1.75 \text{ mol Fe} \times \frac{55.85 \text{ g Fe}}{1 \text{ mol Fe}} = 97.7 \text{ g Fe}$$

WHAT ABOUT COMPOUNDS? FORMULA WEIGHT

Example: 25.0 g of WATER contain how many MOLES of water molecules?



H₂O H: 2 × 1.008 = 2.016

 O: 1 × 16.00 = 16.00

 18.016

FORMULA WEIGHT of water

Formula weight = mass of one mole of either an element OR a compound!

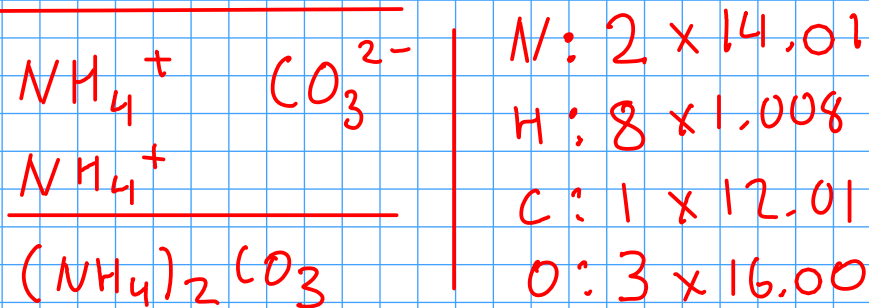
18.016 g H₂O = 1 mol H₂O

25.0 g H₂O × $\frac{1 \text{ mol H}_2\text{O}}{18.016 \text{ g H}_2\text{O}}$ = 1.39 mol H₂O

Formula weight goes by several names:

- For atoms, it's the same thing as ATOMIC WEIGHT
- For molecules, it's called MOLECULAR WEIGHT
- Also called "MOLAR MASS"

Example: How many grams of ammonium carbonate do we need to weigh out to get 3.65 moles of ammonium carbonate?



96.094 Formula weight of ammonium carbonate!

Use the formula weight as a conversion factor.

$$96.094 \text{ g } (\text{NH}_4)_2\text{CO}_3 = 1 \text{ mol } (\text{NH}_4)_2\text{CO}_3$$

$$3.65 \text{ mol } (\text{NH}_4)_2\text{CO}_3 \times \frac{96.094 \text{ g } (\text{NH}_4)_2\text{CO}_3}{1 \text{ mol } (\text{NH}_4)_2\text{CO}_3} = \boxed{351 \text{ g } (\text{NH}_4)_2\text{CO}_3}$$

To solve this problem, you need to first find out what the formula of the compound is!

PERCENTAGE COMPOSITION

- sometimes called "percent composition" or "percent composition by mass"
- the percentage of each element in a compound, expressed in terms of mass

Example: Find the percentage composition of ammonium nitrate.

$$\underline{\text{NH}_4\text{NO}_3} : \text{N} : 2 \times 14.01 = 28.02$$

$$\text{H} : 4 \times 1.008 = 4.032$$

$$\text{O} : 3 \times 16.00 = 48.00$$

$$\underline{80.052 \text{ g NH}_4\text{NO}_3 = 1 \text{ mol NH}_4\text{NO}_3}$$

$$\% \text{ N} = \frac{28.02 \text{ g N}}{80.052 \text{ g NH}_4\text{NO}_3} \times 100\% = 35.0\% \text{ N}$$

$$\% \text{ H} = \frac{4.032 \text{ g H}}{80.052 \text{ g NH}_4\text{NO}_3} \times 100\% = 5.0\% \text{ H}$$

$$\% \text{ O} = \frac{48.00 \text{ g O}}{80.052 \text{ g NH}_4\text{NO}_3} \times 100\% = 60.0\% \text{ O}$$

The percentages of all elements in the compound should sum to 100% (within rounding error)