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.

$$55.85\ g\ Fe = 1\ mol\ Fe$$

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

WHAT ABOUT COMPOUNDS? FORMULA WEIGHT

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

(H_2O)

H_2O

H: $2 \times 1.008 = 2.016$

O: $1 \times 16.00 = 16.00$

18.016 — FORMULA WEIGHT of water

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

$18.016\ g\ H_2O = 1\ mol\ H_2O$

$$25.0\ g\ H_2O \times \frac{1\ mol\ H_2O}{18.016\ g\ H_2O} = 1.39\ mol\ H_2O$$

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?

NH_4^+ CO_3^{2-}

NH_4^+

$(NH_4)_2CO_3$

N: 2×14.01

H: 8×1.008

C: 1×12.01

O: 3×16.00

96.094 Formula weight of ammonium carbonate!

Use the formula weight as a conversion factor.

$$96.094\ g\ (NH_4)_2CO_3 = 1\ mol\ (NH_4)_2CO_3$$

$$3.65\ mol\ (NH_4)_2CO_3 \times \frac{96.094\ g\ (NH_4)_2CO_3}{1\ mol\ (NH_4)_2CO_3} = \boxed{351\ g\ (NH_4)_2CO_3}$$

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.

NH_4NO_3 :

N: $2 \times 14.01 = 28.02$

H: $4 \times 1.008 = 4.032$

O: $3 \times 16.00 = 48.00$

$80.052\ g\ NH_4NO_3 = 1\ mol\ NH_4NO_3$

$$\%N = \frac{28.02\ g\ N}{80.052\ g\ NH_4NO_3} \times 100\% = 35.0\ \%N$$

$$\%H = \frac{4.032\ g\ H}{80.052\ g\ NH_4NO_3} \times 100\% = 5.0\ \%H$$

$$\%O = \frac{48.00\ g\ O}{80.052\ g\ NH_4NO_3} \times 100\% = 60.0\ \%O$$

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