The Mole

→ used to measure the amount of substance (that contains 6.02×10^{23} particles "Avogadro's Number")

→ symbol/unit "mol"

Molar Mass / Formula Mass

→ this is the mass of one mole of an element or compound

→ use periodic table to find sum; units are "g/mol"

E.g. Table ($NaCl$) Salt

Na - 23×1

Cl - 35.5×1

58.5 g/mol

Ibuprofen ($C_{13}H_{18}O_2$) Painkiller

C - 12.0×13 156

H - 1.0×18 18

O - 16.0×2 32

206 g/mol

Acetaminophen ($C_8H_9NO_2$)

151 g/mol

Finding # of Moles From Grams

→ just divide! Eg. How many moles are in 4.7 g of potassium (the daily dietary requirement according to the USDA)?

$$\frac{4.7\text{ g}}{39.1\text{ g/mol}} = 0.12\text{ mol}$$ ← watch sd.

Finding # Grams from Moles

→ multiply! $0.12 \text{ mol K} \times \frac{39.1\text{ g}}{1\text{ mol K}} = 4.7\text{ g K}$

Molarity

$$\text{Molarity (M)} = \frac{\text{moles of solute (mol)}}{\text{volume of solution (L)}}$$

Eg. Sea water contains roughly 28.0 g of NaCl per liter. What is the molarity of sodium chloride in sea water?

Molarity = $\frac{\text{moles}}{\text{L}}$ ← need first

① $\frac{28.0\text{ g NaCl}}{53.5\text{ g/mol}} = 0.479\text{ mol}$ ↑ molar mass

② $= \frac{0.479\text{ mol}}{1\text{ L}}$

$= 0.479\text{ M}$

Eg. How many grams of Al_2O_3 must be dissolved to make 250 mL of 0.500 M solution?

$M = \frac{\text{mol}}{\text{L}}$ ← need

must convert to L

① $\text{mol} = M \cdot L$

$= 0.500 \cdot 0.250\text{ L}$

$= 0.125\text{ mol}$

② $0.125\text{ mol} \times \frac{102\text{ g}}{\text{mol } Al_2O_3} = 12.75\text{ g} = 13\text{ g}$ ← watch sd.