Moles & Mass

Outcome:

Solve problems requiring inter-conversions between moles, mass, volume, and number of particles.

Moles & Mass

Recall that the **MOLAR MASS** of a substance is how many **GRAMS** one **MOLE** will **WEIGH**.

We can calculate the moles of a known substance given its mass, and vice versa using the molar mass.

We can think of molar mass as a **CONVERSION** factor.

Ex. The molar mass of carbon is 12 g/mol, which means it takes 12g of carbon to have a mole (6.02×10^{23} atoms)

24 g of carbon would contain 2 moles 3 moles of carbon would weigh 36 grams

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Instead of memorizing formulas, we can use units to help us do calculations…

Ex) $12\ g/mol \rightarrow \frac{12\ g}{1\ mol}$ or $\frac{1\ mol}{12\ g}$

$$mol \times \frac{g}{mol} = g$$

$$g \times \frac{mol}{g} = mol$$

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Examples:

Calculate the number moles of CO_2 in 6.4g.

Step 1: find the molar mass of CO_2

$12 + (2 \times 16) = 44\ g/mol$

$\frac{44\ g}{1\ mol}$

$\frac{1\ mol}{44\ g}$

Step 2: find the moles of CO_2

$6.4\ g \times \frac{1\ mol}{44\ g} = \boxed{0.145\ mol}$

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Examples:

Calculate the mass of 0.48 moles of silver nitrate.

Step 1: find the molar mass of $AgNO_3$

$$107.9 + 14 + (3 \times 16) = 169.9\ g/mol$$

Step 2: find the mass of $AgNO_3$

$$0.48\ mol \times \frac{169.9\ g}{1\ mol} = \boxed{81.55\ g}$$

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Try this one…

Calculate the mass of 2.5 moles of oxygen gas.

$O_2 = 32\ g/mol$

$$2.5\ mol \times \frac{32\ g}{1\ mol} = \boxed{80\ g}$$