Converting Number of Particles to Moles

$$\text{moles} = \text{representative particles} \times \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ representative particles}}$$

Ex.   How many moles are found in 1.60×10^{18} atoms of silicon?

Ex.   How many molecules are found in 3.40 mol of sugar? $(C_6H_{12}O_6)$

$$3.40 \, \cancel{\text{mol } C_6H_{12}O_6} \times \frac{6.02\times10^{23} \text{ molecules } C_6H_{12}O_6}{1 \, \cancel{\text{mol } C_6H_{12}O_6}}$$

$$= 2.05\times10^{24} \text{ molecules } C_6H_{12}O_6$$

Ex.   How many atoms are found in 4.17 mol of propane (C_3H_8)?

$$4.17 \, \cancel{\text{mol } C_3H_8} \times \frac{6.02\times10^{23} \, \cancel{\text{molecules } C_3H_8}}{1 \, \cancel{\text{mol } C_3H_8}} \times \frac{11 \text{ atoms}}{1 \, \cancel{\text{molecules } C_3H_8}}$$

$$= 2.76\times10^{25} \text{ atoms}$$

$$1 \text{ mol} = 6.02 \times 10^{23} \text{ atoms } (Fe)$$

$$1 \text{ mol} = 6.02 \times 10^{23} \text{ molecules } (O_2)$$

$$CO_2$$

$$H_2O$$

How many moles are in 2.14 x 10^{24} molecules of NO_2?

2.14×10^{24} molecules NO_2 x $\dfrac{1 \text{ mol } NO_2}{6.02 \times 10^{23} \text{ molecules } NO_2}$ = $\boxed{3.55 \text{ mol } NO_2}$

How many atoms are in 8.08 moles of H_2O_2?

8.08 mol H_2O_2 x $\dfrac{6.02 \times 10^{23} \text{ molecules } H_2O_2}{1 \text{ mol } H_2O_2}$ x $\dfrac{4 \text{ atoms}}{1 \text{ molecules } H_2O_2}$

$= \boxed{1.95 \times 10^{25} \text{ atoms}}$

Molar Mass

-     the molar mass of a substance represents the mass of one mole of the substance
    - it is expressed in grams per mol (g/mol)

To determine the molar mass of a substance:
- make sure the formula is written properly
- determine the number of atoms of each element
- use the atomic molar masses of each atom from the periodic table and multiply this by the number of atoms
- add the mass of the atoms together so as to represent the total mass of the substance in grams per mole

Ex. What is the molar mass of $(NH_4)_3PO_4$?

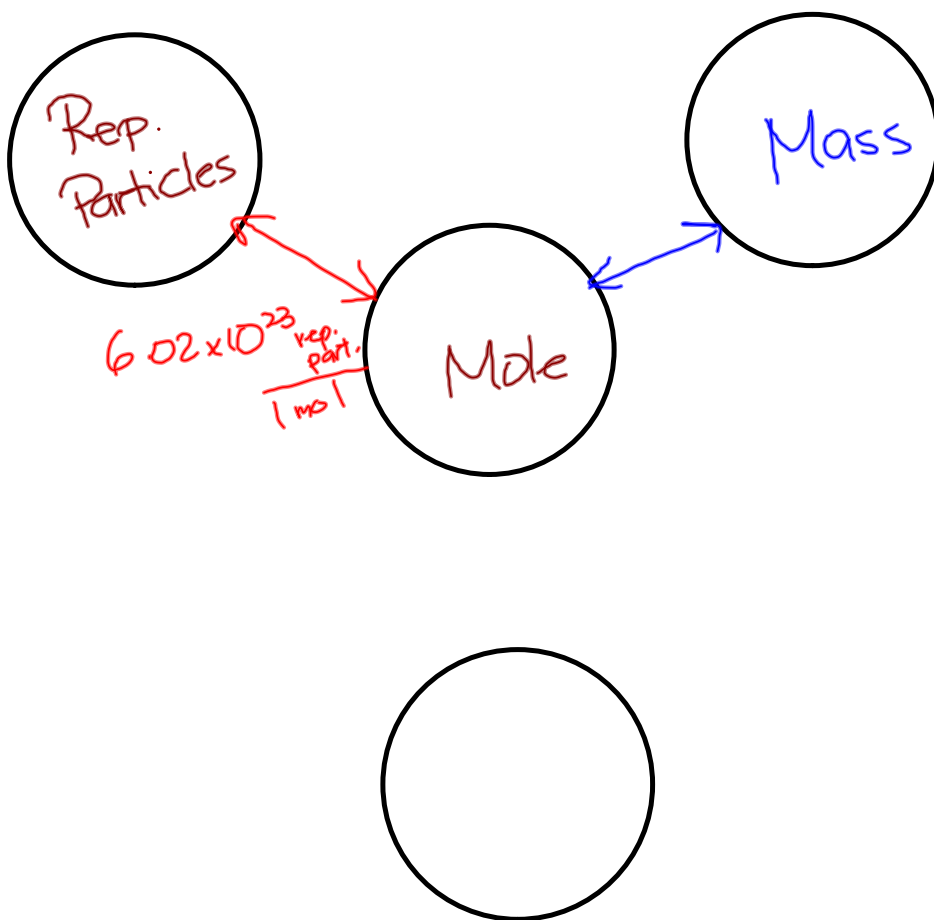$$(3 \times 14.01) + (12 \times 1.01) + (1 \times 30.97) + (4 \times 16.00)$$

$$N \rightarrow 3 \times 14.01 = 42.03$$

$$H \rightarrow 12 \times 1.01 = 12.12$$

$$P \rightarrow 1 \times 30.97 = 30.97$$

$$O \rightarrow 4 \times 16.00 = 64.00$$

$$\boxed{149.12 \ g/mol}$$

Rep.
Particles

Mass

$$\frac{6.02 \times 10^{23} \text{ rep. part.}}{1 \text{ mol}}$$

Mole

<u>Homework</u>

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