

Warm Up

How many atoms are in 3.76 moles of nitrogen?

$$3.76 \text{ mol } \cancel{\text{N}_2} \times \frac{6.02 \times 10^{23} \text{ molecules } \text{N}_2}{1 \cancel{\text{ mol } \text{N}_2}} \times \frac{2 \text{ atoms}}{1 \text{ molecules } \text{N}_2}$$

$$= 4.53 \times 10^{24} \text{ atoms}$$

#3-6 p. 291-292

$$\textcircled{6} 4.65 \times 10^{24} \text{ molecules NO}_2 \times \frac{1 \text{ mol NO}_2}{6.02 \times 10^{23} \text{ molecules NO}_2}$$

$$= 7.72 \text{ mol NO}_2$$

$$\textcircled{5} 1.14 \text{ mol SO}_3 \times \frac{6.02 \times 10^{23} \text{ molecules SO}_3}{1 \text{ mol SO}_3} \times \frac{4 \text{ atoms}}{1 \text{ molecules SO}_3}$$

$$= 2.75 \times 10^{24} \text{ atoms}$$

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 $(\text{NH}_4)_3\text{PO}_4$?

$$\text{N} \rightarrow 3 \times 14.01 = 42.03$$

$$\text{H} \rightarrow 12 \times 1.01 = 12.12$$

$$\text{P} \rightarrow 1 \times 30.97 = 30.97$$

$$\text{O} \rightarrow 4 \times 16.00 = 64.00$$

$$\underline{149.12 \text{ g/mol}}$$

Find the molar mass of:



$$(1 \times 40.08) + (2 \times 14.01) + (6 \times 16.00) = 164.10 \frac{\text{g}}{\text{mol}}$$



Once molar mass is established, a conversion can be made from grams to moles or moles to grams (depending on the measurement of the sample)

$$Mm = \frac{m}{n}$$

← mass (g)
← # of moles

Ex. How many moles are found in 100.g of NaCl?

$$100.\text{g NaCl} \times \frac{1 \text{ mol NaCl}}{58.44 \text{ g NaCl}} = 1.71 \text{ mol NaCl}$$

$$\text{NaCl} \rightarrow (1 \times 22.99) + (1 \times 35.45) = 58.44 \text{ g/mol}$$

Ex. What is the mass of 5.00 mol of NaCl?

$$5.00 \text{ mol NaCl} \times \frac{58.44 \text{ g NaCl}}{1 \text{ mol NaCl}} = 292 \text{ g NaCl}$$

#7,8, 13-15 p. 295

$$1.75 \text{ mol CHCl}_3 \times \frac{6.02 \times 10^{23} \text{ molecules CHCl}_3}{1 \text{ mol CHCl}_3} \times \frac{5 \text{ atoms}}{1 \text{ molecule}}$$