

Moles \leftrightarrow Volume of a Gas @ STP Standard Temp & Pressure

$1 \text{ mol} = 22.4 \text{ L}$

Ex (1) How many moles are in 26.0 L given of O₃ gas at STP?

$$\frac{26.0 \cancel{\text{L}} \text{ O}_3}{22.4 \cancel{\text{L}}} \times \frac{1 \text{ mol}}{1} = 1.160714286 \text{ mol O}_3 = 1.16 \text{ mol O}_3$$

(2) what is the volume, in L, of 13.3 moles given of dinitrogen monoxide gas at STP?

$$13.3 \text{ mol N}_2\text{O} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 297.92 \text{ L N}_2\text{O} = 298 \text{ L N}_2\text{O}$$

(3) How many moles are in 400.0 mL of given carbon monoxide gas at STP?

1000 mL = 1 L

$$\frac{400.0 \cancel{\text{mL}} \text{ CO}}{1000 \cancel{\text{mL}}} \times \frac{1 \text{ mol}}{22.4 \cancel{\text{L}}} = 0.017857142 \text{ mol CO} = 1.786 \times 10^{-2} \text{ mol CO}$$

Warm Up

$$1 \text{ mol} = 6.02 \times 10^{23} \text{ particles}$$

(atoms, molecules, formula units)

(1) How many moles are in 1.30×10^{13} formula units of $\text{Sn}(\text{SO}_4)_2$?

$$\frac{1.30 \times 10^{13} \text{ formula units}}{6.02 \times 10^{23} \text{ formula units/mol}}$$

$$\frac{1 \text{ mol}}{6.02 \times 10^{23} \text{ formula units}} = 2.15948439 \times 10^{-11} \text{ mol Sn}(\text{SO}_4)_2$$

$$= 2.16 \times 10^{-11} \text{ mol Sn}(\text{SO}_4)_2$$

(2) How many molecules are in .863 moles of cinnamaldehyde, $\text{C}_9\text{H}_8\text{O}$?

$$\frac{.863 \text{ mol C}_9\text{H}_8\text{O}}{1 \text{ mol}} \times 6.02 \times 10^{23} \text{ molecules/mol} = 5.19526 \times 10^{23} \text{ molecules C}_9\text{H}_8\text{O}$$

$$5.20 \times 10^{23} \text{ molecules C}_9\text{H}_8\text{O}$$

How many atoms of C are in .863 moles of $\text{C}_9\text{H}_8\text{O}$?

$$1 \text{ molecule C}_9\text{H}_8\text{O} = 9 \text{ atoms C}$$

$$\frac{5.20 \times 10^{23} \text{ molecules C}_9\text{H}_8\text{O}}{1 \text{ molecule C}_9\text{H}_8\text{O}}$$

$$9 \text{ atoms C} = 4.68 \times 10^{24} \text{ atoms C}$$

How many atoms of H are in the .863 moles of $\text{C}_9\text{H}_8\text{O}$?

$$\frac{5.20 \times 10^{23} \text{ molecules C}_9\text{H}_8\text{O}}{1 \text{ molecule C}_9\text{H}_8\text{O}}$$

$$8 \text{ atoms H} = 4.16 \times 10^{24} \text{ atoms H}$$

$$1 \text{ molecule C}_9\text{H}_8\text{O} = 8 \text{ atoms H}$$

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