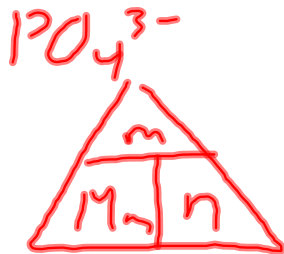


# Warm Up

Calculate the mass of 0.905 moles of sodium phosphate.



$$m = ?$$

$$n = 0.905$$



$$1 \text{ Na} \rightarrow 3 \times 22.99$$

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

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

$$\underline{163.94 \text{ g/mol}}$$

$$m = (M_m)(n)$$

$$= (163.94 \text{ g/mol})(0.905)$$

$$= 148.37 \text{ g}$$

# Homework

## Mole-Volume Relationship

### Avagadro's Hypothesis

Equal volumes of gases at the same temperature and pressure contain equal number of particles.

### Standard temperature and pressure (STP)

0.°C and 101.3kPa

SATP

| \* At STP, 1 mol ( $6.02 \times 10^{23}$  representative particles) of any \*  
gas contains 22.4 L.

$V_m @ \text{STP} = 22.4 \text{ L/mol}$

## Calculating Volume at STP

Ex. Determine the volume of oxygen gas 0.375 mol will occupy at STP.

$$n = 0.375 \text{ mol}$$

$$V = ?$$

$$0.375 \text{ mol} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 8.4 \text{ L}$$

Ex. Determine the number of moles of helium gas found in 21.8 L at STP.

$$V = 21.8 \text{ L}$$

$$n = ?$$

$$0.973 \text{ mol}$$

$$21.8 \cancel{\text{L}} \times \frac{1 \text{ mol}}{22.4 \cancel{\text{L}}} = \frac{21.8}{22.4} \text{ mol}$$
$$= 0.973 \text{ mol}$$

$\text{Cl}_2$   
A sample of chlorine gas has a mass of 0.756 kg. What volume will this mass of gas occupy at STP?

$$m = 0.756 \text{ kg} = 756 \text{ g}$$
$$V = ?$$

2 steps: mass  $\rightarrow$  mol  
mol  $\rightarrow$  V

$$\textcircled{1} 756 \text{ g} \times \frac{1 \text{ mol}}{70.90 \text{ g}} = 10.7 \text{ mol}$$

$$\text{Cl}_2$$
$$2 \times 35.45$$
$$= 70.90 \text{ g/mol}$$

$$\textcircled{2} 10.7 \text{ mol} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 240. \text{ L}$$

## Molar calculations worksheet

1.  $8.97 \times 10^{-3}$  mol
2.  $1.49 \times 10^{25}$  atoms
3.  $5.42 \times 10^{24}$  atoms
4. 46.01 g/mol
5. 14 300 mol
6. 342.34 g/mol
7. 159.70 g/mol
8.  $4.24 \times 10^{24}$  molecules
9.  $1.79 \times 10^{25}$  atoms
10. 643 g
11. 0.266 mol
12. 10 900 g
13. 6.26 mol