

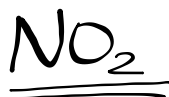
Warm Up

Calculate the mass of 0.905 moles of Na_3PO_4 .

$$0.905 \cancel{\text{mol Na}_3\text{PO}_4} \times \frac{163.94 \text{ g Na}_3\text{PO}_4}{1 \cancel{\text{mol Na}_3\text{PO}_4}} = 148 \text{ g Na}_3\text{PO}_4$$

$$\text{Na}_3\text{PO}_4 \rightarrow (3 \times 22.99) + (1 \times 30.97) + (4 \times 16.00) \\ = 163.94 \text{ g/mol}$$

Homework



$$(1 \times 14.01) + (2 \times 16.00) = 46.01 \text{ g/mol}$$

$$\#9. \quad 14.9 \text{ mol H}_2 \times \frac{6.02 \times 10^{23} \text{ molecules H}_2}{1 \text{ mol H}_2} \times \frac{2 \text{ atoms}}{1 \text{ molecules H}_2}$$

$$\boxed{1.79 \times 10^{25} \text{ atoms}}$$

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

At STP, 1 mol (6.02×10^{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.

$$0.375 \text{ mol } \text{O}_2 \times \frac{22.4 \text{ L } \text{O}_2}{1 \text{ mol } \text{O}_2} = \boxed{8.40 \text{ L } \text{O}_2}$$

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

Homework

p. 301 #20, 21

p. 303 #~~26~~28, 31

p. 306 # 32, 33

p. 307 # 34, 35

3.7

$$3.70 \times 10^3 = 3700$$

$$3.70 \times 10^{-3} = 0.00370$$

Percent Composition

The relative amounts of element in a compound are expressed as the percent composition (by mass) for each element within the compound.

Ex. K_2CrO_4

K - 40.3%

Cr - 26.8%

O - 32.9%

Percent Composition from Mass Data

When a 13.60 g sample containing only magnesium and oxygen is decomposed, 5.40 g of oxygen is obtained. What is the percent composition of this compound?

Mg
8.20g

O
5.40g

Mg and O
13.60g

$$\% \text{Mg} = \frac{\text{mass Mg}}{\text{total mass}} \times 100\%$$

$$\% \text{Mg} = \frac{8.20\text{g}}{13.60\text{g}} \times 100\%$$

$$\% \text{Mg} = 60.3\%$$

$$\% \text{O} = \frac{\text{mass O}}{\text{total mass}} \times 100\%$$

$$\% \text{O} = \frac{5.40\text{g}}{13.60\text{g}} \times 100\%$$

$$\% \text{O} = 39.7\%$$

Percent Composition from the Chemical Formula

Ex. Na_2CO_3

$$\begin{aligned} \hookrightarrow & (2 \times \overset{\text{Na}}{22.99}) + (1 \times \overset{\text{C}}{12.01}) + (3 \times \overset{\text{O}}{16.00}) \\ & = 105.99 \text{ g/mol} \end{aligned}$$

$$\% \text{Na} = \frac{(2 \times 22.99) \text{ g/mol}}{105.99 \text{ g/mol}} \times 100\%$$

$$\% \text{Na} = 43.4\%$$

$$\% \text{C} = \frac{(1 \times 12.01) \text{ g/mol}}{105.99 \text{ g/mol}} \times 100\%$$

$$\% \text{C} = 11.3\%$$

$$\% \text{O} = \frac{(3 \times 16.00) \text{ g/mol}}{105.99 \text{ g/mol}} \times 100\%$$

$$\% \text{O} = 45.3\%$$

Molar calculations worksheet

1. 8.97×10^3 mol
2. 1.49×10^{25} atoms
3. 1.30×10^{26} atoms
4. 46.01 g/mol
5. 14 300 mol
6. 342.34 g/mol
7. 159.70 g/mol
8. 4.24×10^{24} molecules
9. 1.79×10^{25} atoms
10. 643 g
11. 0.266 mol
12. 10 900 g
13. 6.26 mol

