Warm Up

Calculate the mass of 0.905 moles of Na_3PO_4.

$$0.905\,\text{mol}\ Na_3PO_4 \times \frac{163.94\ \text{g}\ Na_3PO_4}{1\ \text{mol}\ Na_3PO_4} = \boxed{148\ \text{g}\ Na_3PO_4}$$

$$Na_3PO_4 \rightarrow (3 \times 22.99) + (1 \times 30.97) + (4 \times 16.00)$$
$$= 163.94\ \text{g/mol}$$

Homework

NO_2

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

#9. $14.9 \text{ mol } H_2 \times \frac{6.02 \times 10^{23} \text{ molecules } H_2}{1 \text{ mol } H_2} \times \frac{2 \text{ atoms}}{1 \text{ molecules } H_2}$

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

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^{o}C and 101.3kPa

At STP, 1 mol (6.02×10^{23} representative particles) of any gas contains 22.4 L.

V_m @ STP = 22.4 L/mol

Calculating Volume at STP

"L"

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

$$0.375\ \text{mol}\ O_2 \times \frac{22.4\ \text{L}\ O_2}{1\ \text{mol}\ O_2} = \boxed{8.40\ \text{L}\ O_2}$$

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

Homework

p. 301 #20, 21

p. 303 #2~~4~~6-28, 31

p. 306 # 32, 33

p. 307 # 34, 35

3.700

$3.70 \times 10^3 = 3700$

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

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

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

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

% Mg = 60.3%

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

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

% O = 39.7%

Percent Composition from the Chemical Formula

Ex. Na_2CO_3

$\rightarrow (2 \times 22.99) + (1 \times 12.01) + (3 \times 16.00)$ (Na, C, O)

$= 105.99\ g/mol$

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

$\%Na = 43.4\%$

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

$\%C = 11.3\%$

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

$\%O = 45.3\%$

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