Warm Up

$Na^+ \quad PO_4^{3-}$

Calculate the mass of 0.905 moles of sodium phosphate.

Na_3PO_4

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

$Na_3PO_4 \rightarrow (3 \times 22.99) + (1 \times 30.97) + (4 \times 16.00)$

$= 163.94 \text{ g/mol}$

Homework

(8) $7.05 \text{ mol } O_2 \times \frac{6.02 \times 10^{23} \text{ molecules } O_2}{1 \text{ mol } O_2} = 4.24 \times 10^{24} \text{ molecules } O_2$

(13) $1000. \text{ g } Br_2 \times \frac{1 \text{ mol } Br_2}{159.80 \text{ g } Br_2} = 6.26 \text{ mol } Br_2$

$Br_2 : (2 \times 79.90)$

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

Mole-Volume Relationship

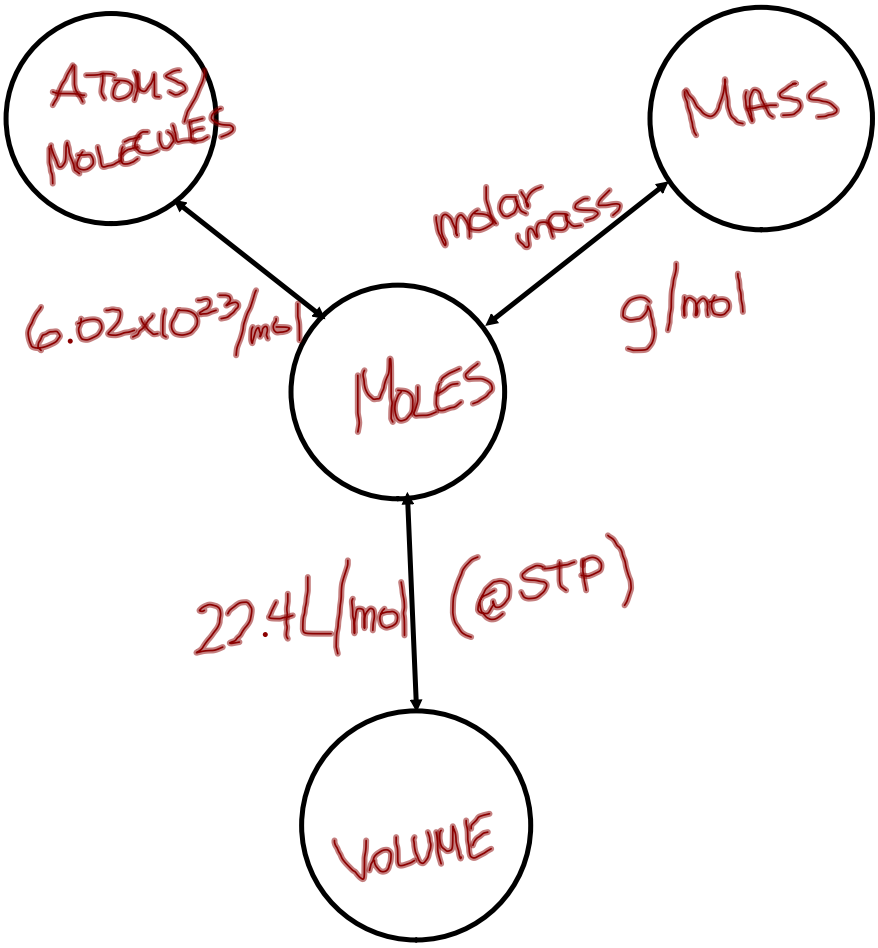
Avagadro's Hypothesis
Equal volumes of gases at the same temperature and pressure contain equal number of particles.

22.4 L/mol

Standard temperature and pressure (STP)
0.^{o}C and 101.3kPa

At STP, 1 mol (6.02 x10^{23} representative particles) of any gas contains 22.4 L.

V_m @ STP = 22.4 L/mol


ATOMS/
MOLECULES
MASS
molar mass
6.02x10^23/mol
g/mol
MOLES
22.4L/mol (@STP)
VOLUME

Calculating Volume at STP

Ex. Determine the volume of oxygen gas that 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.

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

Homework

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p. 303 #24-28, 31