STOICHIOMETRY ON GASES

Lesson 5.6

WHAT IS STOICHIOMETRY ON GASES?

Stoichiometry on gases involves using the relationships between moles, volume, and the ideal gas law to determine the amounts of reactants and products in a chemical reaction.

FORMULA

Ideal Gas Law: $PV = nRT$

Where:

- P = Pressure (atm, kPa, mmHg, etc.)

- V = Volume (L)

- n = Number of moles (mol)

- R = Gas constant (0.0821 L·atm/mol·K or 8.314 J/mol·K)

- T = Temperature (K)

FORMULA

Standard Molar Volume at STP

At Standard Temperature and Pressure (STP):

- Temperature = 0°C (273 K)

- Pressure = 1 atm (101.3 kPa)

- Molar gas volume = 22.4 L/mol

WHAT IS THE VOLUME OF 2.5 MOLES OF ARGON GAS AT STP?

Step 1:
- Moles of Argon gas = 2.5 mol
- Molar volume at STP = 22.4 L/mol

Step 2:

$$2.5 \text{ mol} \times \frac{22.4 \text{ L}}{1 \text{ mol Ar}} = 56 \text{ L}$$

FINAL ANSWER:

56 L

PROBLEM #2:

7.45G OF SOLID MAGNESIUM CARBONATE IS HEATED UNTIL IT COMPLETELY DECOMPOSES INTO CARBON DIOXIDE AND MAGNESIUM OXIDE. WHAT VOLUME OF CO_2 GAS WILL BE PRODUCED AT STP?
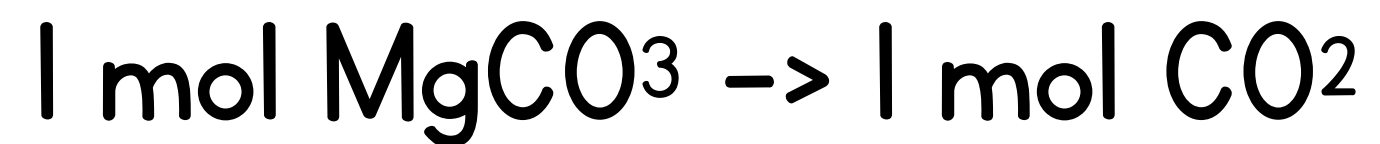
- Step 1:

  $1\ MgCO_3(s) \rightarrow 1\ CO_2(g) + 1\ MgO(s)$

- Step 2:

  Molar Mass of $MgCO_3$ = 84.315 g/mol

$$\frac{7.45g\ MgCO_3}{1} \times \frac{1\ mol\ MgCO_3}{84.315\ g\ MgCO_3}$$

- Step 3:

  $1 \text{ mol } MgCO_3 \rightarrow 1 \text{ mol } CO_2$

  $$\frac{1 \text{ mol } CO_2}{1 \text{ mol } MgCO_3}$$

- Step 4:

  $$\frac{22.4 \text{ L } CO_2}{1 \text{ mol } CO_2}$$

- Final Calculation

$$\frac{7.45g\ MgCO_3}{1} \times \frac{1\ mol\ MgCO_3}{84.315\ g\ MgCO_3} \times \frac{1\ mol\ CO_2}{1\ mol\ MgCO_3} \times \frac{22.4\ L\ CO_2}{1\ mol\ CO_2}$$

Solving:

= 7.45 / 84.315 x 22.4

= 1.9792445

FINAL ANSWER:

1.98 L CO_2

THANK YOU FOR LISTENING!

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