

11-1 Volume-Mass of Gases

STP - Standard Temperature and Pressure

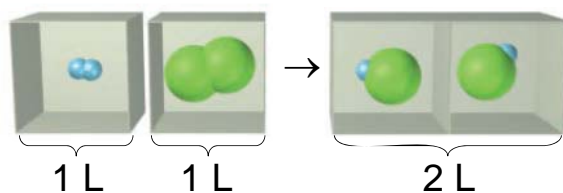
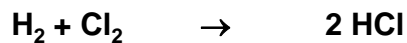
STP = 1 atm at 0°C (273 K)

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Gay Lussac's Law of combining volumes of gases

Volumes of gaseous reactants and products are whole number ratios



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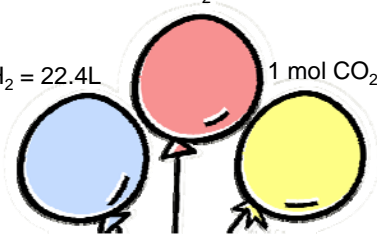
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Avogadro's Law - Equal volumes of gases have an equal number of molecules

1 mol O₂ = 22.4 L

1 mol H₂ = 22.4 L

1 mol CO₂ = 22.4 L



1 atm at 0°C

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Avogadro's Law - Volume varies directly with mole (n)

$$V = k n$$

$n \uparrow \quad V \uparrow$ and $n \downarrow \quad V \downarrow$



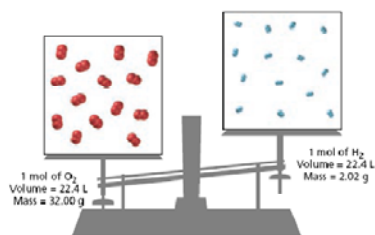
$$\frac{n_1}{V_1} = \frac{n_2}{V_2}$$

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Standard Molar Volume – volume of 1 mole of a gas at STP is 22.4 L

For all gases at 1 atm and 0°C (273 K) → **22.4 L / mole**



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Using Standard Molar Volume

A chemical reaction produced 0.0680 moles of oxygen gas. What volume in liters is occupied by this gas at STP?

$$0.068 \text{ mol O}_2 \left(\frac{22.4 \text{ L}}{\text{Mol}} \right) = 1.52 \text{ L O}_2$$

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