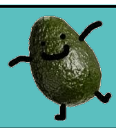
AVOGADRO'S PRINCIPLE



Definition: Equal volumes of gas at the same temperature and pressure contain an equal number of particles.

MOLAR VOLUME: (of a gas) is the volume that one mole occupies at 0 °C and 1 atm ***(STP)***

273K

--- **22.4 L / 1 mole** of gas *at STP*

--- referred to as molar volume

** **Can be used as a conversion factor in dimensional analysis** **

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MOLAR VOLUME PRACTICE

1. Calculate the volume of 0.881 mole of gas at STP.

$0.881 \text{ mol} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = 19.7 \text{ L gas}$

2. Calculate the volume that 2.0 kg CH_4 will occupy at STP.

$2.0 \text{ kg} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ mol } CH_4}{16 \text{ g } CH_4} \times \frac{22.4 \text{ L } CH_4}{1 \text{ mol } CH_4} = 2800 \text{ L } CH_4$

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MOLAR VOLUME PRACTICE

1. How many moles of gas are contained in 37.86 L of gas at STP.

$37.86\,L \times \frac{1\,mol}{22.4\,L} = 1.690\,mol$ gas

2. How many grams of nitrogen are present in 16.34 L at STP.

$16.34\,L\,N_2 \times \frac{1\,mol\,N_2}{22.4\,L\,N_2} \times \frac{28\,g\,N_2}{1\,mol\,N_2} = 20.43\,g\,N_2$

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MOLAR VOLUME PRACTICE

1. Calculate the volume of 4.76 g of oxygen present at STP.

$\frac{1000\,mL}{1\,L}$

$4.76\,g\,O_2 \times \frac{1\,mol\,O_2}{32\,g\,O_2} \times \frac{22.4\,L}{1\,mol\,O_2} = 3.33\,L\,O_2$

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