Key

Volume of a Mole of Gas

- For solids & liquids, a mole of 1 substance can look entirely different than 1 mole of another
  - ex) 1 mole of eggs is larger than 1 mole of staples
    - particles are different sizes

- Volume of a gas is much more similar

We usually measure gasses @ STP, which means the gas is exposed to 0°C temp @ 1 atmosphere of pressure

@ STP the volume of 1 mole of any gas is 22.4 L.
- This is known as the Molar Volume of a gas

- Since 1 mole = 6.02×10^{23} particles, 22.4 L of any gas contains 6.02×10^{23} particles of that substance.

- This means that 22.4 L of any gas won't have the same mass, but will have the same # of particles.

Use this to determine the volume of moles.

Key

ex) Determine the volume, in liters, of .70 moles of O_2 gas @ STP.

$$\frac{0.7 \text{ moles } O_2}{} \times \frac{22.4 \text{ L } O_2}{1 \text{ mol } O_2} = \boxed{15.68 \text{ L}}$$

ex) Determine the volume, in liters, of 5.25 moles of CO_2 gas @ STP.

$$\frac{5.25 \text{ moles}}{} \times \frac{22.4 \text{ L}}{1 \text{ mol}} = \boxed{117.6 \text{ L}}$$

Calculate moles from volume

ex) How many moles occupy a volume of 10 L of SO_2 @ STP?

$$\frac{10 \text{ L}}{} \times \frac{1 \text{ mole}}{22.4 \text{ L}} = \boxed{0.45 \text{ mol}}$$

ex) How many moles occupy a volume of 50 L of Br_2 gas @ STP?

$$\frac{50 \text{ L}}{} \times \frac{1 \text{ mole}}{22.4 \text{ L}} = \boxed{2.23 \text{ mol}}$$