Boyle's Law: Volume + Pressure

① A balloon at 2.3 atm has a volume of 28 L. What will volume be at 1.0 atm? (Assume constant temp)

② A gas at 740 mm Hg has volume 720 L. What pressure in atm is needed to reduce the volume to 175 L? (Assume constant temp)

③ The volume of a gas increases from 3.0 → 9.0 L. If the original pressure was 3 atm, what is the final pressure?

Charles' Law Volume + Temp

① What is the volume if 75.0 L of gas is heated from 20°C → 100°C?

Avogadro's Law Volume + Moles

② A container with 1.0 mol of $CO_2(g)$ has a volume of 22.4 L. What will be the

a) volume if 2 more moles is added?

b) If one mole of $N_2(g)$ is added?

c) If 0.5 mol escapes through a leak?

③ A balloon with 12 g of $CO_2(g)$ would have what volume?

④ with 12g of $CH_4(g)$?

The Combined Law Volume, Pressure, & Temp

① What is the final volume if 10L of gas at 222 mm Hg and 27°C is warmed to 127°C at 444 mm Hg?

The Ideal Gas Law

① What is volume for 12g of N_2 at 1.2 atm and 25°C?

② How many moles are in a 4.0 L sample of gas at 600 mm Hg and 25°C?
- Note: does it matter which gas?

STP: Standard Temperature + Pressure

273°K = 0°C	1.00 atm

memorize!!

① Calculate the volume of one mole of gas (any gas!) at STP.

At STP, all gases have the same volume per mole ____ L/mol

Key Conversion Factor: 1 mol = ____ L

② What is the <u>mass</u> of 12.2 L of N_2 at STP?

③ What is the volume of 1.6 mol of O_2 at STP?
What is the volume of 16 g of O_2 at STP?

More Ideal Gas Law

① What is pressure of 14g Ar(g) (39.9 g/mol) at 52°C in a 4.6 L container?

② What is the temperature (in °C) of 14g neon gas (20.2 g/mol) in a 12L container at 726 mm Hg pressure?

10.6,7 Using Gas Laws to Calculate Other Things

A. Gas Mass (from Volume)

① How many grams in a 6.3 L sample of CO_2 (44 g/mol) at STP?

② How many grams of O_2 (32 g/mol) in 11.4 L container at 30°C and 0.800 atm?

B. Gas Density + Molar Mass at STP

$$\text{density} = \frac{g}{L} \qquad \text{molar mass} = \frac{g}{mol}$$

① What is the density of Ar (40 g/mol) at STP?

② What is the density of O_2 (32 g/mol) at STP?

③ What is the molar mass of a gas whose density is 0.714 g/L at STP?

④ What is molar mass if density is 1.96 g/L at STP?

C. Gases + Stoichiometry

$H_2(g) + Cl_2(g) \longrightarrow 2\,HCl(g)$

① How many liters of $Cl_2(g)$ are needed to react with 12 L of H_2?
6.3 L H_2? 14.8 L H_2?

② How many liters of $H_2(g)$ are needed to produce 12 L of HCl?

$C_4H_8 + 6O_2 \longrightarrow 4\,CO_2 + 4\,H_2O$

③ How many liters of CO_2 are produced from 16 g C_4H_8 (56 g/md) at STP?

④ If 36 L of O_2 react, how many grams of C_4H_8 were burned?