

Ideal Gas Law-

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$$R = 0.0821 \frac{\text{atm} \cdot \text{L}}{\text{mol} \cdot \text{K}} = 8.315 \frac{\text{kPa} \cdot \text{L}}{\text{mol} \cdot \text{K}} = 62.4 \frac{\text{mmHg} \cdot \text{L}}{\text{mol} \cdot \text{K}} \quad \begin{array}{l} n= \\ R= \end{array}$$

To determine which R to use in your equation you have to look at the _____.

Examples:

1. Calculate the volume of 2.30 mol of dinitrogen tetroxide at 45.0°C and 3.4 atm.

List all variables. *Convert temp to K	Write the formula of the appropriate Gas Law Plug & Chug	Final Answer
Known:		
Unknown:		

2. What is the temperature in Kelvin of 0.299 mol of oxygen that has a volume of 50.0L at 0.974atm?

List all variables. *Convert temp to K	Write the formula of the appropriate Gas Law Plug & Chug	Final Answer
Known:		
Unknown:		

Ideal Gas Law Continued (involves conversions)

1. A balloon has a volume of 2.34L, and is at 47.5°C, at 98.2kPa.

a. How many moles of Helium are contained?

List all variables. *Convert temp to K	Write the formula of the appropriate Gas Law Plug & Chug	Final Answer
Known:		
Unknown:		

b. How many grams of Helium are contained?

2. At 28 °C and 0.974 atm, 1.00L of a gas has a mass of 5.16g.

a. How many moles of gas are present?

List all variables. *Convert temp to K	Write the formula of the appropriate Gas Law Plug & Chug	Final Answer
Known:		
Unknown:		

b. What is the molar mass of this gas?

Gas Stoichiometry

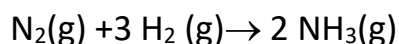
Part 1: Volume to volume at same temperature & pressure

According to Avogadro's law, the mole ratio is the same as the volume ratio.

Complete the table below:

Chemical Reaction	$\text{Br}_2 (\text{g}) + \text{H}_2 (\text{g}) \rightarrow 2 \text{HBr} (\text{g})$	$\text{C}_2\text{H}_4 (\text{g}) + 3 \text{O}_2 (\text{g}) \rightarrow 2 \text{CO}_2 (\text{g}) + 2 \text{H}_2\text{O} (\text{g})$
Mole ratio	_____ mole Br_2 = _____ mole HBr	_____ mole C_2H_4 = _____ mole H_2O
Volume ratio	_____ L Br_2 = _____ L HBr	_____ L C_2H_4 = _____ L H_2O

For the following reaction:



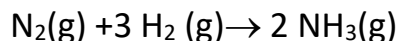
- What volume of nitrogen at STP would be required to react with 3.5 L of hydrogen?
- What volume of hydrogen is required to produce 2.75L of ammonia?

Part 2: Gases at STP

One mol of any gas at STP occupies a volume of _____ L .

How do you write this as an equivalence statement?

For the following reaction:



- What volume of nitrogen at STP would be required to react with 0.100 mol of hydrogen?
- What volume of nitrogen at STP would be required to react with 0.100 g of hydrogen to produce ammonia?

Part 3: Gases not at STP

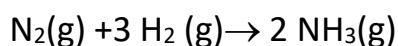
If reactions do not occur at STP, then you will need to use the ideal gas law.

Ideal gas law equation is:

If you are given _____ in problem, then you must find _____ first using the ideal gas law and then do the stoichiometric math.

If you are given _____ in the problem, then you must find _____ first by doing the stoichiometric math and then the ideal gas law.

For the following reaction:



- e. What volume of nitrogen at 215°C and 715 mmHg would be required to react with 0.100 mol of hydrogen?

- f. What volume of nitrogen at 215°C and 4.56 atm would be required to produce 75.3 g of ammonia?

- g. What is the mass of ammonia produced at 215°C and 101 kPa if 5.00L of nitrogen gas is used in the reaction?

