

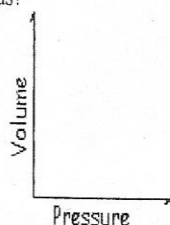
## Four Type Laws

### Boyle's Law Homework:

1) What does a graph of pressure versus volume look like for an ideal gas?  
Sketch it here.

2) What is the equation that describes the function you drew?

3) If you change the pressure or volume of a sample of gas at fixed temperature, what is the mathematical relationship of the starting pressure and volume to the final pressure and volume?



4) A sample of gas has an initial pressure of 2.00 atm and an initial volume of 1.50 L.

a. What will happen to the volume if the pressure rises to 3.00 atm?

INCREASE DECREASE

b. Calculate the final volume.

5) A sample of gas has an initial pressure of 750 Torr and an initial volume of 800 mL.

a. How will the pressure change if the volume is compressed to 600 mL?

INCREASE DECREASE

b. Calculate the final pressure.

6) A sample of gas has an initial pressure of 200 kPa and an initial volume of 120 L.

a. What will happen to the volume if the pressure is decreased to 60 kPa?

INCREASE DECREASE

b. Calculate the final volume.

7) A sample of gas has an initial pressure of 25 mmHg and an initial volume of 75 mL.

a. What will happen to the pressure if the volume is expanded to 250 mL?

INCREASE DECREASE

b. Calculate the final pressure.

## Four Types of Gas Laws

### Charles's Law Practice Problems

1) What does a graph of volume versus temperature look like for an ideal gas? Sketch it here.

2) What is the equation that describes the function you drew?

3) If you change the temperature or volume of a sample of gas at fixed pressure, what is the mathematical relationship of the starting temperature and volume to the final temperature and volume?

4) A sample of gas has a volume of 3.50 L at 25°C. What will its volume be at 100°C?

a. Should the volume increase or decrease? \_\_\_\_\_

b. Express the temperatures in Kelvin \_\_\_\_\_ and \_\_\_\_\_

c. Calculate the final volume

5) A balloon is taken from a warm room (30°C) into the bitter cold winter air (-10°C). If its initial volume is 5.00 L, what will its volume be in the cold air?

a. Should the volume increase or decrease? \_\_\_\_\_

b. Express the temperatures in Kelvin \_\_\_\_\_ and \_\_\_\_\_

c. Calculate the final volume

6) A cylinder with a piston has a volume of 35.0 mL at 0°C. At what temperature will the volume increase to 70.0 mL?

a. Should the temperature increase or decrease? \_\_\_\_\_

b. Express the initial temperature in Kelvin \_\_\_\_\_

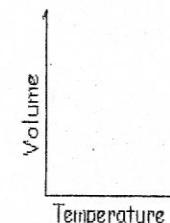
c. Calculate the final temperature

7) A balloon has a volume of 550 mL at 20°C. At what temperature will the balloon shrink to 400 mL?

a. Should the temperature increase or decrease? \_\_\_\_\_

b. Express the initial temperature in Kelvin \_\_\_\_\_

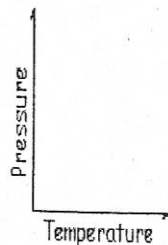
c. Calculate the final temperature



### Four Types of Gas Laws

#### Gay Lussac's Law Practice Problems:

- 1) What does a graph of pressure versus temperature look like for an ideal gas? Sketch it here.
- 2) What is the equation that describes the function you drew?
- 3) If you change the temperature or pressure of a sample of gas at fixed volume, what is the mathematical relationship of the starting temperature and pressure to the final temperature and pressure?
- 4) A sample of a gas in a rigid container has an initial temperature of 373 K and an initial pressure of 550 kPa. It is cooled to 298 K.
  - a. Will the pressure INCREASE or DECREASE?
  - b. What will the final pressure be?
- 5) A sample of gas in a rigid container has a pressure of 350 Torr at 25 °C. At what temperature will it have a pressure of 760 Torr?
  - a. Will the temperature have to INCREASE or DECREASE?
  - b. What will the final temperature be?
- 6) A canister of gas is heated from 23°C to 110°C. Its final pressure turns out to be 5.25 atm.
  - a. Was the initial pressure HIGHER or LOWER?
  - b. What was its initial pressure?
- 7) A sample of gas at 250 kPa is cooled until its pressure is 180 kPa. Its final temperature is -8°C.
  - a. Was its initial temperature HIGHER or LOWER?
  - b. What was its initial temperature?



### Four Types of Gas Laws

#### Combined Gas Law Problems:

- 1) Boyle's Law, Charles's Law, and Gay Lussac's Law can be written as an expression equal to a constant ( $PV = k$ ,  $\frac{V}{T} = k$ , and  $\frac{P}{T} = k$ ). Write one expression that combines all three but keeps the mathematical relations the same.
- 2) If you have a beginning temperature, volume, and pressure ( $P_1$ ,  $V_1$ , and  $T_1$ ) as well as an ending temperature, volume, and pressure ( $P_2$ ,  $V_2$ , and  $T_2$ ) what equation can you write that relates the two sets of conditions?
- 3) A 2.50-liter sample of gas at 300 Kelvin and 0.950 atm is heated until its temperature is 373 Kelvin. Its final volume is 2.80 liters. What is the final pressure of the gas?
- 4) A 3.65 L balloon at 30°C and 108 kPa is taken to a pressure of 3.25 atm and a temperature of 5°C. What is its final volume?
- 5) A 35 L sample of gas at 760 mm Hg and 20°C is compressed to 20 L and 800 mm Hg. What must its final temperature be?