

# Gas Laws: Charles' and Boyle's Laws

Mrs. Cronin

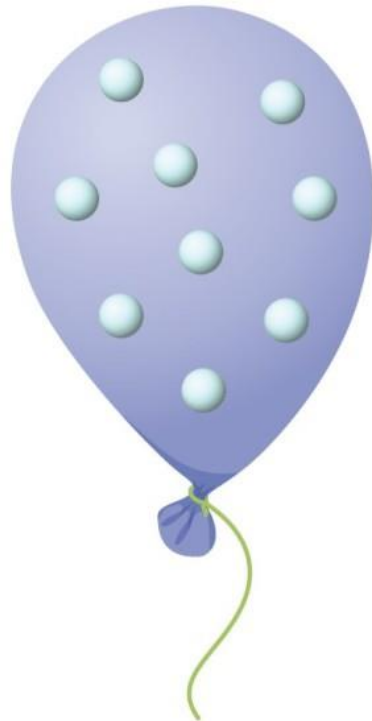
November 18, 2019

(What do I write down? Write everything underlined)

- This is an interactive lesson.
- You will be getting participation points: Please participate when asked to work in your groups.
- There is no penalty for being wrong. So.... no sitting around, waiting 😊

# Vocabulary Refresher

- **Volume:** The amount of space that matter fills. In gases, the volume of the gas = volume of its container (gases expand and fill the container).



He (4 g)



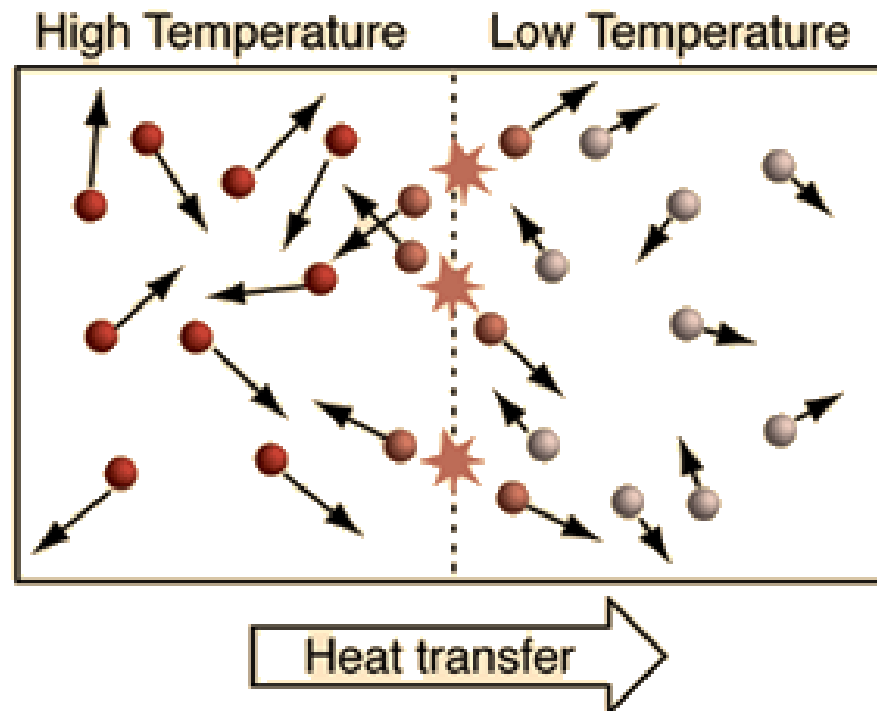
NH<sub>3</sub> (15 g)



O<sub>2</sub> (32 g)

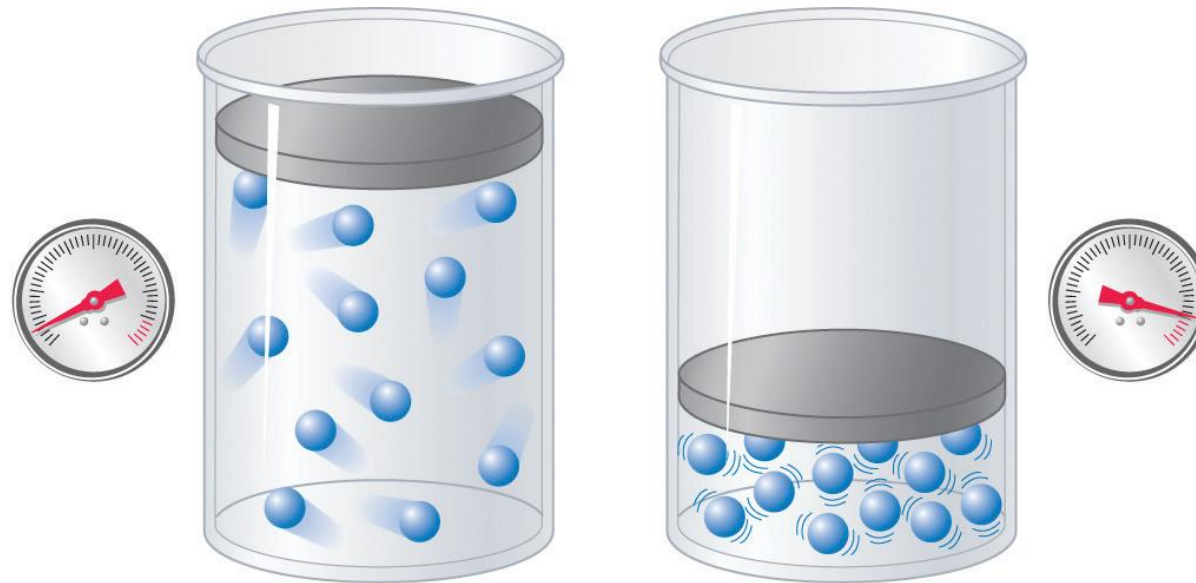
# Vocabulary Refresher

- **Temperature:** You're familiar with temperature as a measure of heat.
  - Temperature is the measure of average energy of particles in matter. Faster moving particles have more energy and a higher temperature.



# Vocabulary Refresher

- Gas Pressure: Force of the gas' outward push divided by area of the walls of the container.



(a) Low pressure

(b) High pressure

# Who was Robert Boyle?

- Scientist from the 1600s
- Working on improving air pumps and discovered a relationship between pressure and volume.



# Boyle's Law

- When the pressure of a gas at constant temperature (when temperature stays the same) is increased (goes up), the volume of the gas decreases (goes down).

- Pressure Up



- Volume down



At Constant Temperature

# Participation time!

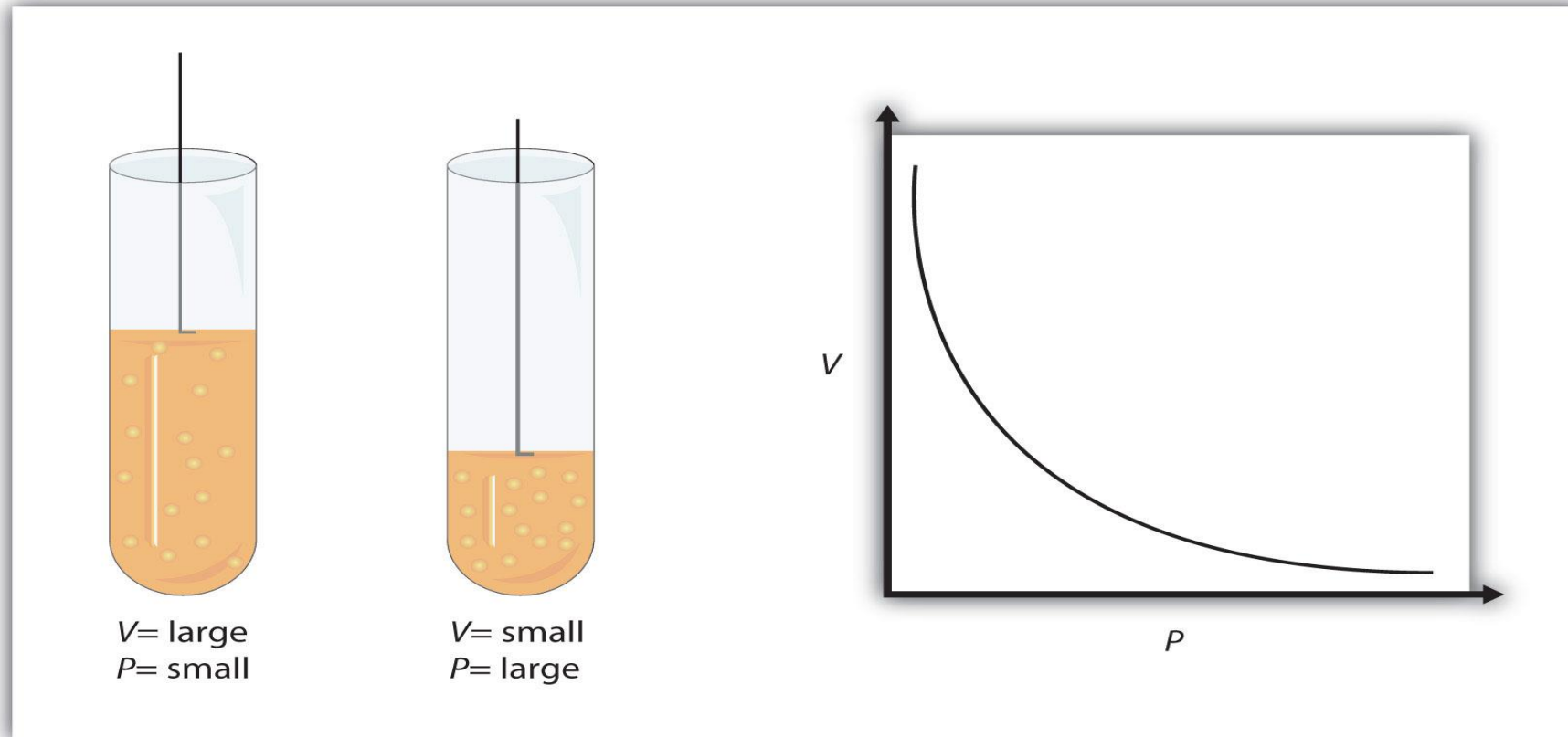
## Look back at your notes, on Boyle's Law

1. Which variables would you graph if you were graphing Boyle's law?
2. What kind of relationship would you expect to see if you graph the variables according to Boyle's Law . Why?

2 minutes to discuss with table group.



# Boyle's Law Graphically: Yes, you need to draw the graph!



$P = \text{pressure}$  and  $V = \text{Volume}$

Which is the dependent and which is the independent variable?

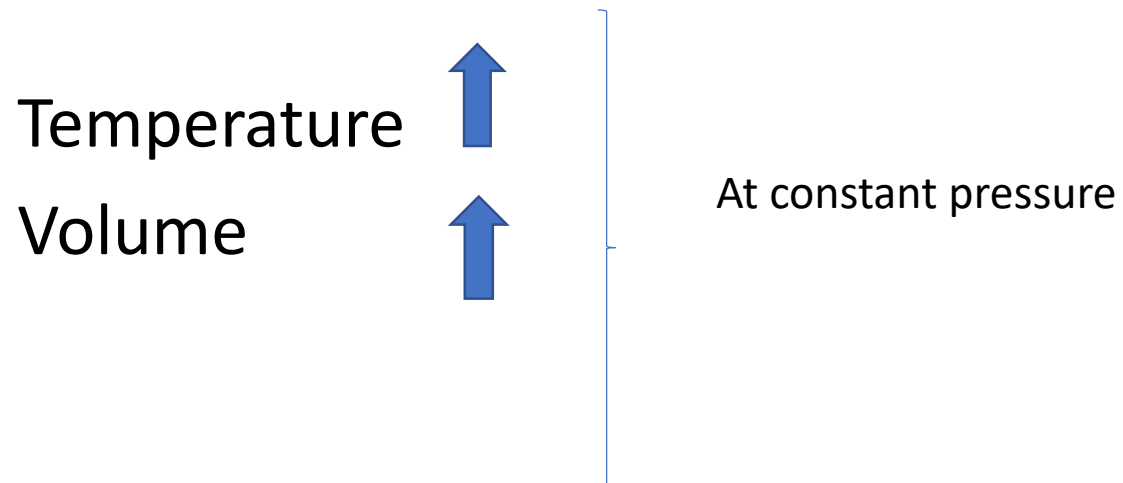
# Who was Jacque Charles?

- French inventor, scientist, mathematician, and balloonist!
- Often wrongly credited for mathematics work associated with another person with the same name.
- He is famous for the first hydrogen-filled balloon flight in the late 1700s.
- He's also famous for Charles law!



# Charles' Law

- Also known as “law of volumes”
- When the temperature of a gas is increase at constant pressure, the volume also increases.



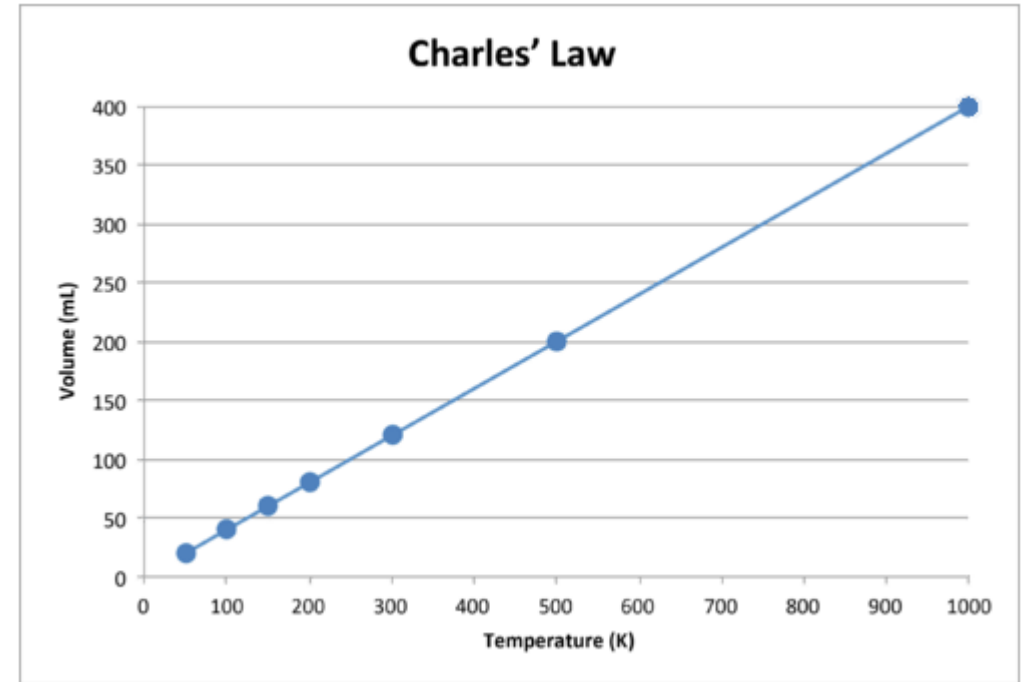
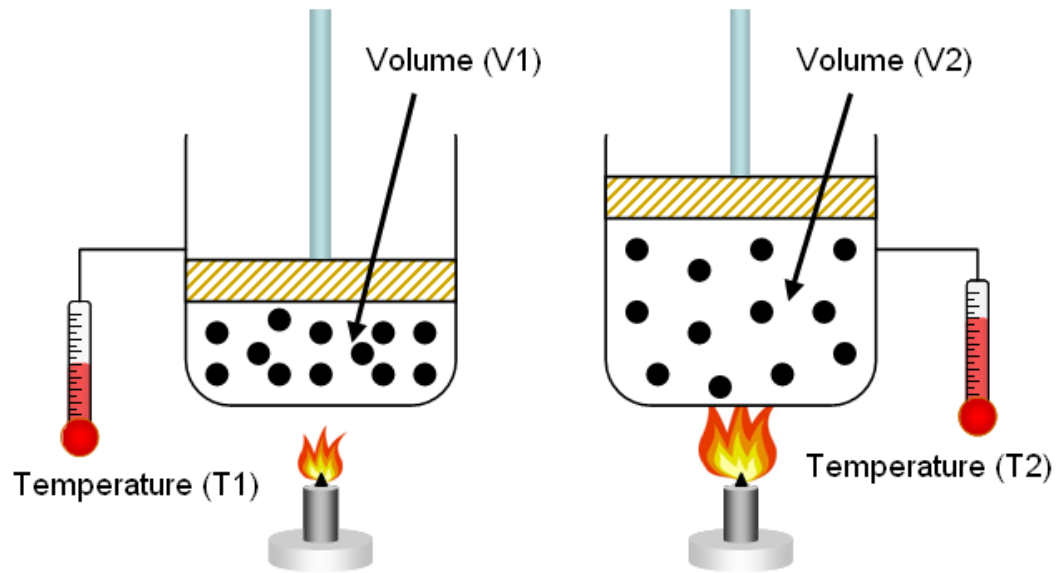
# Participation time!

## Look back at your notes, on Charles' Law

1. Which variables would you graph if you were graphing Charles' law?
2. What kind of relationship would you expect to see if you graph the variables according to Charles'. Why?

# Charles' Law Graphically

## Yes, you need to draw the graph!



# The Laws Mathematically: Honors Only (we will practice!)

- Boyle's Law:

- $P_1V_1 = P_2V_2$

- Charles' Law:

- $V_1/T_1 = V_2/T_2$

- Combined Gas Law: Combines Boyle and Charles' Laws

- $P_1V_1/T_1 = P_2V_2/T_2$

P = pressure

V = Volume

T = Temperature (in Kelvin)

$$T_{(K)} = (T_{(°F)} + 459.67) \times 5/9$$

$$T_{(K)} = C + 273$$