Cycle 7 Chemistry 2 Lesson 2

Agenda: Define and Use Boyle's Law – Relationship between Pressure & Volume of a Gas

Lab day is THURSDAY (unless rescheduled)
Bring Clean, Empty, Aluminum Soda Cans!

Vocab: "Gas Law", "Boyle's Law"
Demonstration: Marshmallow in a syringe
Classwork:
Boyle's Law WS

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Gas Laws

- Gases are described by their measurable properties.

- A **gas law** is a mathematical rule which relates 2 or more properties of a gas.

- *P* = pressure exerted by the gas
- *V* = total volume occupied by the gas
- *T* = temperature in kelvins of the gas
- *n* = number of moles of the gas

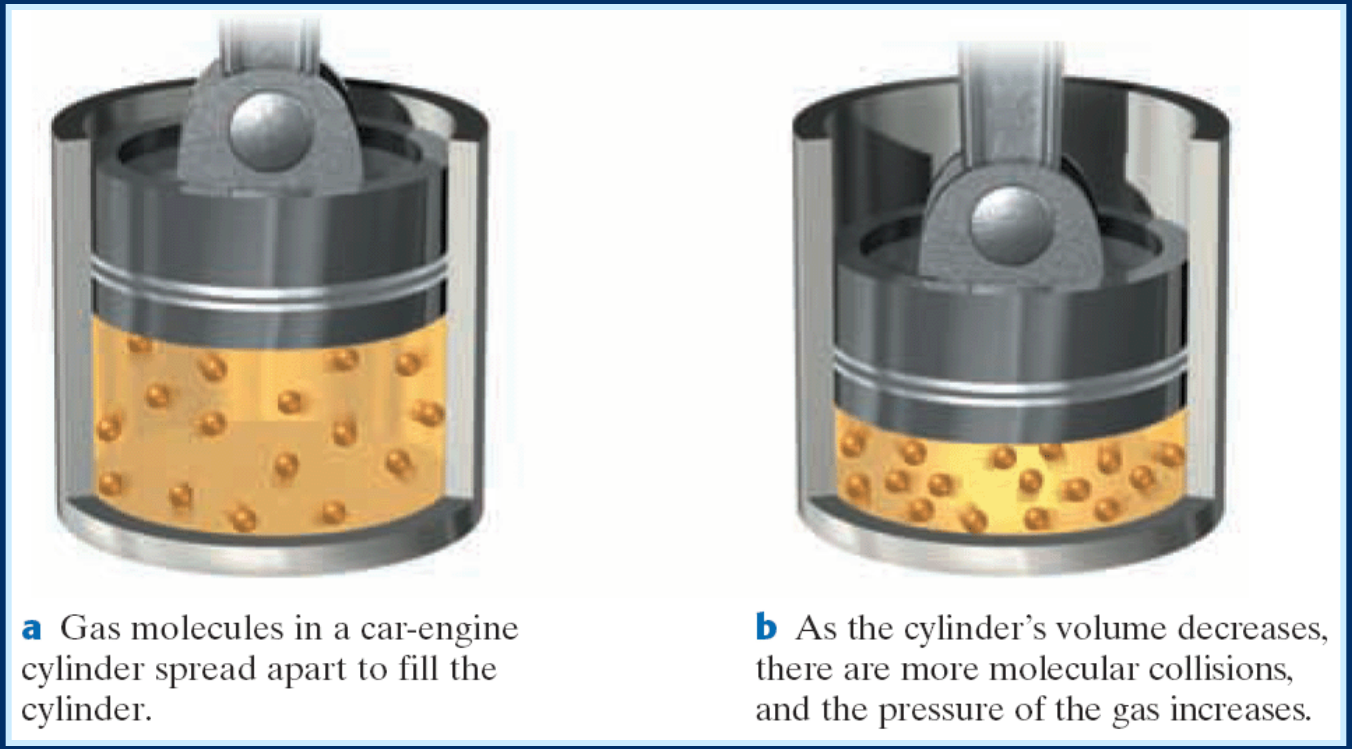
Boyle's Law

- **Boyle's law** states that, for a fixed amount of gas at a constant temperature, the volume and pressure have an inverse relationship: their product is constant **(PV = K)**

- If pressure changes, so must volume:
  - $P_1V_1 = P_2V_2$

Boyle's Law

Gas molecules in a car-engine cylinder



a Gas molecules in a car-engine cylinder spread apart to fill the cylinder.

b As the cylinder's volume decreases, there are more molecular collisions, and the pressure of the gas increases.

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Marshmallow in a Syringe

Why does the marshmallow grow and shrink when the plunger is pulled out and pushed in?

Pulling out the plunger decreases the pressure inside the syringe!

Pushing in the plunger increases the pressure inside the syringe!

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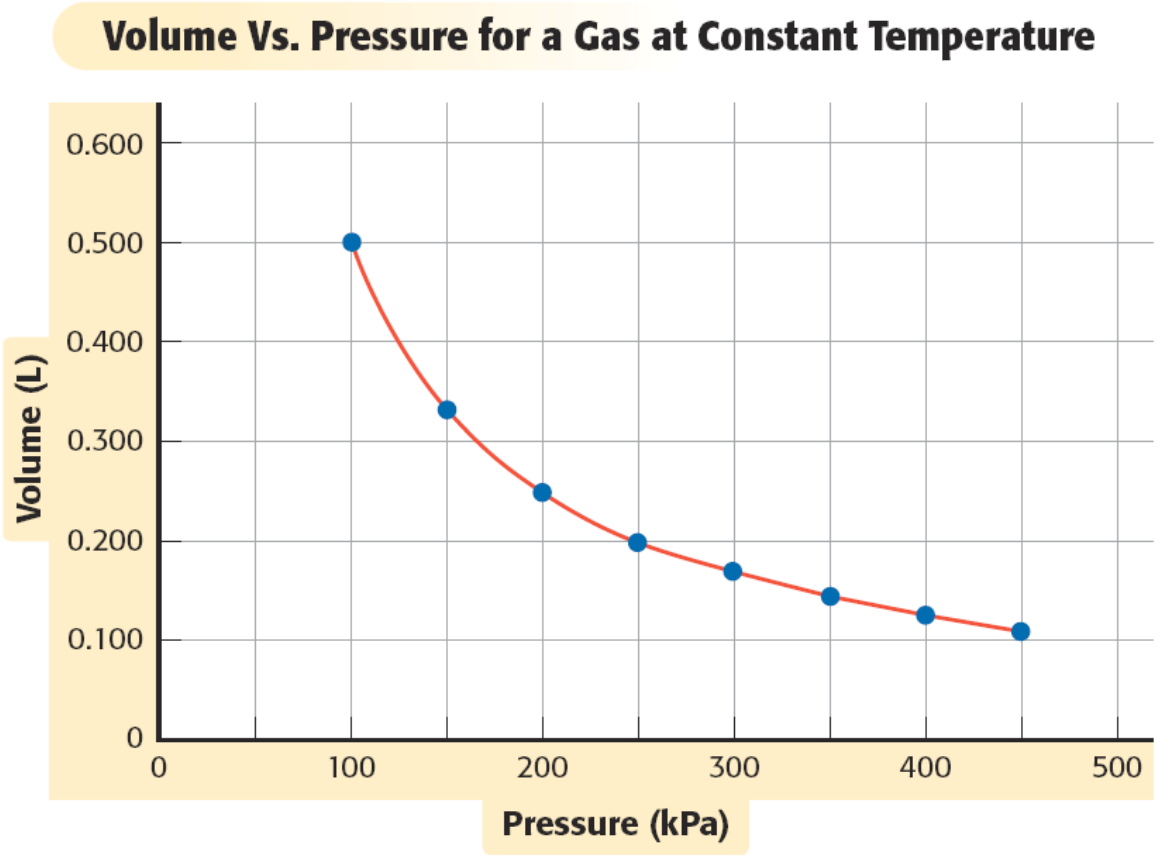
Volume Versus Pressure for a Gas at Constant Temperature



Solving Pressure-Volume Problems

Sample Problem B

A given sample of gas occupies 523 mL at 1.00 atm. The pressure is increased to 1.97 atm, while the temperature remains the same. What is the new volume of the gas?

Solving Pressure-Volume Problems, *continued*

Sample Problem B Solution

$P_1 = 1.00$ atm $\qquad V_1 = 523$ mL

$P_2 = 1.97$ atm $\qquad V_2 = ?$

$$P_1V_1 = P_2V_2$$

$$(1.00 \text{ atm})(523 \text{ mL}) = (1.97 \text{ atm})V_2$$

$$V_2 = \frac{(1.00 \text{ atm})(523 \text{ mL})}{1.97 \text{ atm}} =$$

265 mL

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