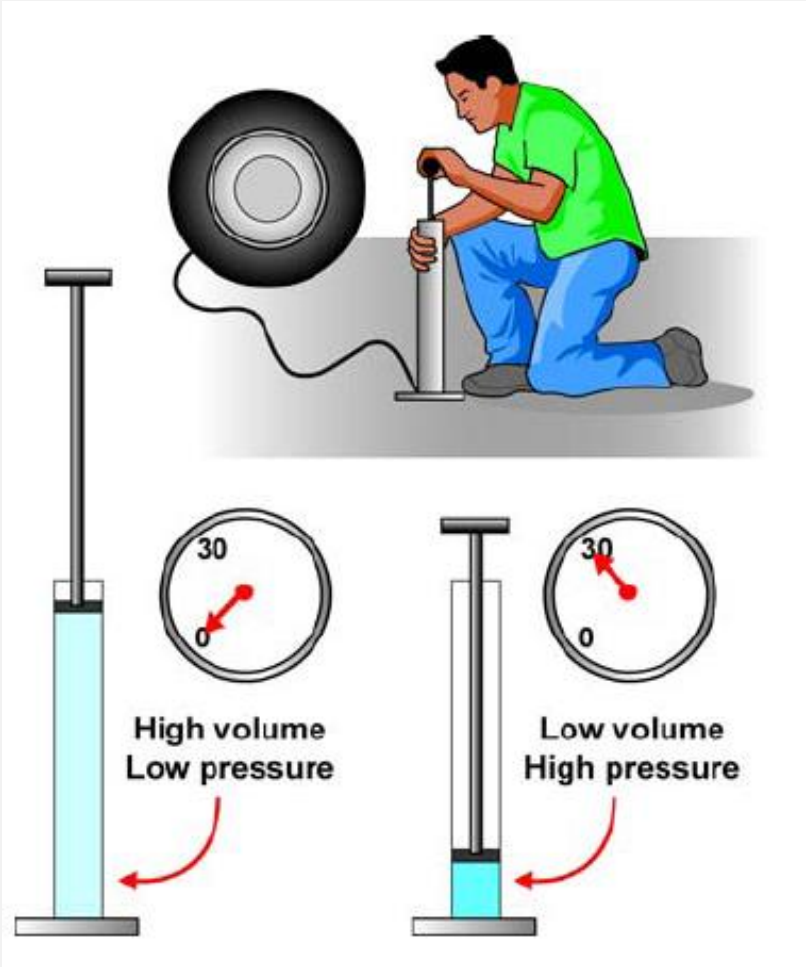
GAS LAWS

BOYLE'S LAW

- When you squeeze a fixed quantity of gas into a smaller volume the pressure goes up.

- This rule is known as *Boyle's law*.



Solving Problems:
Boyle's Law

BOYLE'S LAW

Initial volume (L) — New pressure (atm)

Initial pressure (atm) — $P_1V_1 = P_2V_2$ — New volume (L)

Mass and temperature remain constant

Pressure can also be measured in kilopascal (**kPa**)

SOLVING PROBLEMS

- A kit used to fix flat tires consists of an aerosol can containing compressed air and a patch to seal the hole in the tire.

- Suppose 5 liters of air at atmospheric pressure (1 atm) is compressed into a 0.5 liter aerosol can. What is the pressure of the compressed air in the can?

- Assume no change in temperature or mass.

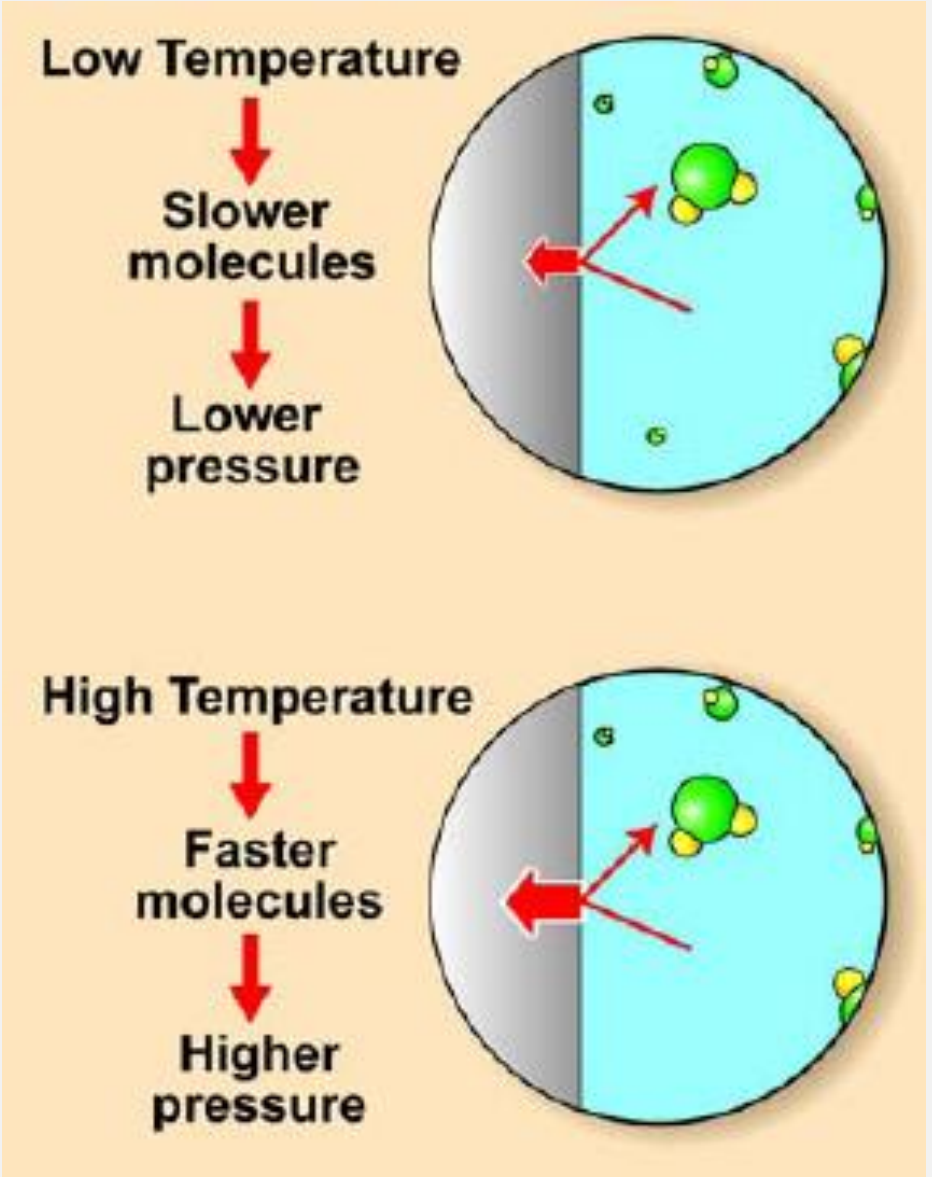
SOLVING PROBLEMS

1. Looking for:
   - …final pressure in atmospheres (P_2)
2. Given
   - …V_1 = 5 L , P_1= 1 atm, V_2 = .5 L
3. Relationships:
   - Boyle's Law: $P_1V_1 = P_2V_2$
4. Solution
   - Rearrange equation so $P_2 = P_1V_1 / V_2$
   - P_2 = 1atm x 5.0 L/ 0.5 L =

GAY-LUSSAC'S LAW (PRESSURE-TEMPERATURE)

- The pressure of a gas is affected by temperature changes.

- If the mass and volume are kept constant, the pressure goes up when the temperature goes up, and down when the temperature goes down.



GAY-LUSSAC'S LAW

PRESSURE-TEMPERATURE RELATIONSHIP

Initial pressure — P_1 / T_1 = P_2 / T_2 — *New pressure*

Initial temperature (K) — T_1 — *New temperature*

Volume and mass constant

- A tank of helium is stored at 273K and 10 atm of pressure. The tank is moved to a room that has a temperature of 293K. What is the new pressure of the helium?

- Temperature is directly proportional to pressure if other things are kept constant.

- $T1/P1 = T2/P2$

- $P2 = T2*P1/T1 = 293*10/273 =$

13.2 PRESSURE AND TEMPERATURE

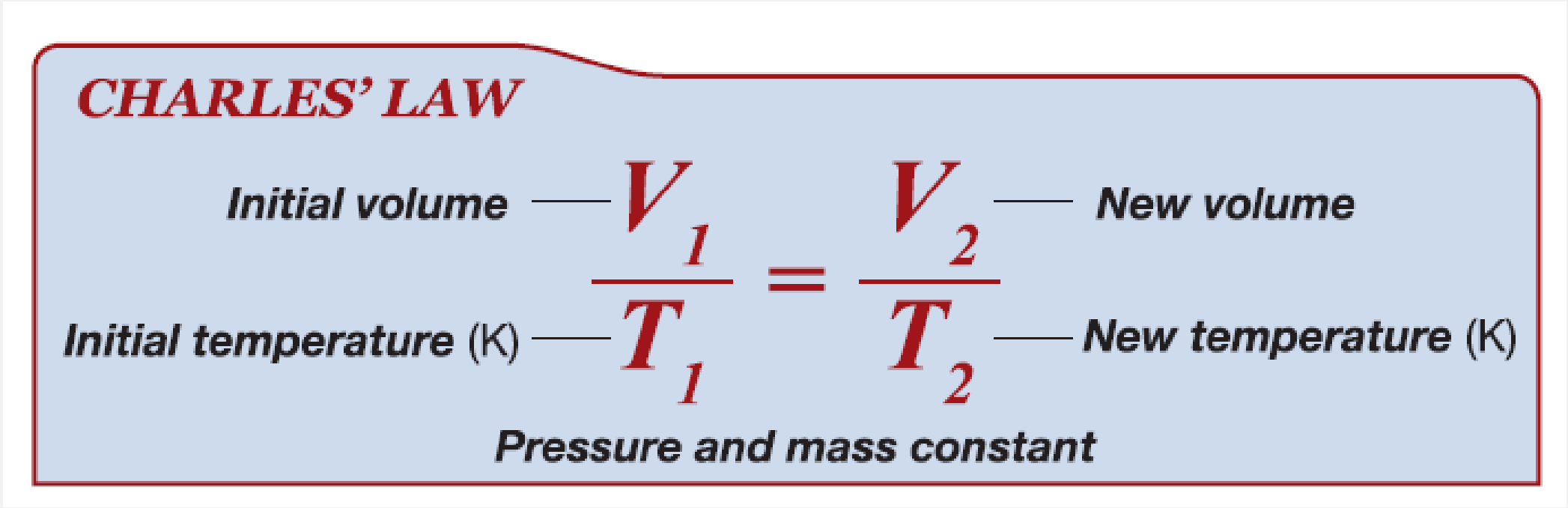
- Any time we apply gas laws, **the the temperature MUST be in Kelvin.**
- Only the Kelvin scale starts from absolute zero, when energy of particles is theoretically zero.

CONVERTING CELSIUS TO KELVIN

$$T_{Kelvin} = T_{Celsius} + 273$$

CHARLES' LAW

- According to *Charles' law*, the volume of a gas increases with increasing temperature.
- Volume decreases with decreasing temperature.



SOLVING PROBLEMS

- A can of hair spray has a volume of 300 L at room temperature 21°C.
- The can is moved close to a fire and its temperature increases to 295°C.
- What is the final volume in the can? (Round answer to nearest whole number.)

SOLVING PROBLEMS

1. Looking for:
   - …final volume in Liters (V_2)
2. Given
   - …V_1 = 300 L, T_1 = 21 °C , T_2 = 295 °C
3. Relationships:
   - Convert temps using K = °C + 273
   - Charles' Law: $V_1/T_1 = V_2/T_2$
4. Solution
   - Rearrange equation so $V_2 = V_1 x T_2 / T_1$
   - V_2 = 300 L x 568K / 294K =

COMBINED GAS LAW

$$\frac{P_1 \cdot V_1}{T_1} = \frac{P_2 \cdot V_2}{T_2}$$

COLE'S LAW

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REMINDERS

- One Note is due today
  - Check and make sure the Date Complete column is filled out for all completed activities
- SSA Study Guide will be due at the BEGINNING of class Tuesday, May 7th