CST:
Chem 4a, c, e, f, g

Human Gas Demo

179

ChemCatalyst:

Q: Make the following predictions

- As volume decrease, pressure _____.
- As temperature increases, pressure _____.

Notes:

- What is pressure?
  - $P = \frac{\text{force}}{\text{area}}$
  - * for gases, pressure is the force due to fast-moving molecules colliding w/ each other & the walls of the container
- What are the units of pressure?
  - 1 atmosphere (atm) = 101.3 kPa (kilopascales)
    = 101,325 Pa (Pascales)
    = 760 mm Hg (mm Mercury)
    = 760 torr
    = 14.7 lb/in^2 (psi)
- What is proportionality?
  - Inversely proportional: opposite directions – one goes up, other down
  - Directly proportional: same direction – both go up or both go down
- Human Gas Demo Variables
  - students = gas particles
  - # collisions = P (pressure)
  - speed = T (temp)
  - #students = n (moles)

Activity:

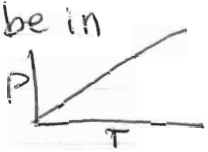
Description	Variables	Constants	# collisions (students)	avg. # collision (team)	avg. # (class)	Proportio
Base (full room, original speed)	—	n, T, P, V				n/a
½ room (½V)	V, P	n, T				inver
2x Speed (2T)	T, P	n, V				dire
Holes in the wall (Effusion)	n, P, V	T				n/a

- Diffusion: particles moving through the room
  vs.
  Effusion: gas particles escaping the room

Making Sense Notes:

- What variables are there in gas behavior?
  - 4 variables:
    1. # of moles / molecules = n
    2. Pressure (force of collisions) = P
    3. Temperature (speed of molecules) = T
    4. Volume gas is contained in = V

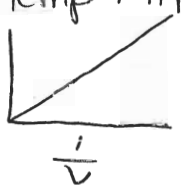
- What is Gay-Lussac's Law of gases?
  - Gay-Lussac's Law: pressure & temperature are directly proportional (related)
    - when T ↑, P ↑ or when T ↓, P ↓
    - holds true when volume & # moles are constant
    - $\frac{P_1}{T_1} = \frac{P_2}{T_2}$ * Temp. must be in Kelvin!



  - ex: A gas is in a flask w/a pressure of 2.0 atm @ 300. K. If the gas is heated to 600. K, what is the P?

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} = \frac{2.0\,atm}{300.K} = \frac{P_2}{600.K} \qquad P_2 = 4.0\,atm$$

- What is Boyle's law of gases?
  - Boyle's Law: pressure & volume are inversely proportional
    - when V ↑, P ↓ or when V ↓, P ↑
    - holds true when temp & #moles are constant
    - $P_1V_1 = P_2V_2$



  - ex: The P of a gas is 1.5 atm when the volume of its container is 50.0 mL. If the volume is decreased to 25.0 mL, what will the P be?

$P_1V_1 = P_2V_2$ ~~1.5 atm~~ $* (50.0\,mL) = P_2 * (25.0\,mL)$