

Gas Law Simulation B Criteria

I. Data Collection

A. 1=m, 2=n, 3=o, 4=p. [Particles, atoms, molecules], [collisions, crash], [velocity, speed], [energy, force].

- a. particles are moving in straight lines
- b. particles are colliding with walls
- c. particles are colliding with each other
- d. particles collide or crash
- e. speeds of particles are not the same
- f. speed(s) of particle(s) change(s)
- g. force or energy of collision influences speed of particles.

B.

OBSERVATION (graph)

- a. straight line
- b. angle of collision with walls

EXPLANATION:

- c. speed changes as a result of collision with other particles
- d. direction changes

MISCONCEPTION:

- e. speed changes as a result of collision with wall

C.

- a. organized

LABELS (incl. correct units)

- b. 1.01 atm (pressure)
- c. 22.4 L (volume)
- d. 275.25 K (temp.)

D. (pt. 1)

- a. different particles have different speeds
- b. speed(s) of particle(s) change(s)
- c. average speed is constant

D. (pt. 2)

- a. draw graph
- b. label axis (x: speed, y: number of particles)
- c. label line (average speed)
- d. label blocks (number of particles in a particular speed)

E.

OBSERVATION

- a. as temperature increases, pressure increases, or vice versa
- b. velocity distribution shift

EXPLANATION

- _____ c. average speed increases as temperature increases
- _____ d. number of collisions (per unit time) with each other increases as temperature increases
- _____ e. number of collisions (per unit time) with walls of container increases as temp. increases

MISCONCEPTION

- _____ f. pressure increases because collision between particles increases
- _____ g. speeds don't change as temperatures change

II. Data Analysis

- _____ a. correct graph
- _____ b. temp. and pressure are directly proportional (in word)
- _____ c. $p/T = \text{Constant}$ or $p \propto T$

MISCONCEPTION

- _____ d. wrong graph
- _____ e. $p = T$
- _____ f. $y = ax + b$

III. Interpretation and Conclusions

A.

- _____ a. Temp. and pressure are directly proportional, or $p/T = \text{Constant}$ or $p \propto T$

B.

- _____ a. show two situations with same volumes and same number of particles
- _____ b. explain speed difference between two situations
- _____ c. (because) average speeds are different

C.

- _____ a. correct answer (e.g. 0.037 atm at 22.4 L) extrapolated from graph that $p/T = c = 0.0037$ (at 22.4 L). e.g., $p = cT = 0.0037 * 10$
- _____ b. correct answer from $pV = nRT$ or $p_1/T_1 = p_2/T_2$
- _____ c. correct answer only