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

MISCONCEPTION

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., \( p=cT=0.0037 \times 10 \)

b. correct answer from \( pV=nRT \) or \( p_1/T_1=p_2/T_2 \)

c. correct answer only