



Density and pressure — answers

Keep separate from the learner worksheet. Accept equivalent scientifically accurate wording.

1 QUICK RECAP

Solid: fixed shape and volume; particles close together, vibrating about fixed positions.

Liquid: container's shape; fixed volume; particles close together, moving past one another.

Gas: container's shape; no fixed volume, fills its container; particles far apart, moving in all directions.

An ordered solid drawing represents one possible arrangement, not every solid.

2 SAME GAS, LESS ROOM

Gaps decrease; particle size and count stay the same. Density increases: the same mass occupies less volume. Pressure increases: with temperature unchanged, average particle speed stays the same, but wall collisions are more frequent.

3 CALCULATE DENSITY

Density = mass $\div$ volume. A: $24 \text{ g} \div 8 \text{ cm}^3 = 3 \text{ g/cm}^3$. B: $30 \text{ g} \div 30 \text{ cm}^3 = 1 \text{ g/cm}^3$. A is denser; require correct units.

4 PRESSURE WHEN A GAS IS WARMED

Same amount, sealed rigid container, fixed volume. Warming increases average kinetic energy: faster particles make more frequent and forceful wall collisions, increasing force per unit area and pressure. Density is unchanged. Particles do not grow. This model question is not an instruction to heat a sealed container.

5 CHECK THE MODEL

Sam is wrong. A valid drawing keeps particle count and dot size unchanged, while the container volume and gaps decrease. Dots are symbols, not drawn to scale.

6 COMPARE TWO GAS CHANGES

A: density doubles; pressure rises. At fixed temperature, particle speed is unchanged; the smaller container gives more frequent wall collisions.

B: density stays the same; pressure rises. At fixed volume, particles move faster on average and wall collisions become more frequent and forceful.

Both pressures rise for different reasons. Do not require a pressure ratio.

MARKING NOTES

Distinguish particle movement, force on the wall and pressure. Reject "particles get bigger" or "gas particles have no mass". Density alone does not identify a state or substance.