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QUANTUM BRAIN TUTORING LTD.
"TURNING BRAINS QUANTUM"

AQA GCSE Physics Answer Sheet – Particle Model and Pressure

Model Answers and Mark Schemes | Total Marks: 30

Quick Check

Question 1 (2 marks)

> *1. (2 marks) Describe the motion of particles in a gas.*

MODEL ANSWER

Particles in a gas are in constant random motion. They move in all directions at a range of speeds.

MARK SCHEME

- ✓ Constant/continuous motion [1 mark]
- ✓ Random motion / move in all directions [1 mark]

Question 2 (1 mark)

> *2. (1 mark) State what happens to the average kinetic energy of gas particles when the temperature increases.*

MODEL ANSWER

The average kinetic energy of the particles increases.

MARK SCHEME

- ✓ Average kinetic energy increases [1 mark]

Question 3 (3 marks)

> *3. (3 marks) Explain, in terms of particles, how a gas exerts pressure on the walls of its container.*

MODEL ANSWER

Gas particles are in constant random motion. They collide with the walls of the container. Each collision exerts a force on the wall. The total force of many collisions per unit area is the gas pressure.

MARK SCHEME

- ✓ Particles collide with the walls [1 mark]
- ✓ Collisions exert a force on the walls [1 mark]
- ✓ Pressure is force per unit area / many collisions create the overall pressure [1 mark]

Question 4 (2 marks)

> *4. (2 marks) State the temperature at which particles would have zero kinetic energy. Give your answer in both degrees C and K.*

MODEL ANSWER

-273 degrees C (absolute zero) = 0 K

MARK SCHEME

- ✓ -273 degrees C [1 mark]
- ✓ 0 K [1 mark]

Apply Your Knowledge

Question 5 (3 marks)

5. (3 marks) A gas has a volume of 0.80 m cubed at a pressure of 150 kPa. The gas is compressed at constant temperature to a volume of 0.40 m cubed. Calculate the new pressure. (HT only)

MODEL ANSWER

$p_2 = 300$ kPa

STEP-BY-STEP WORKING

Step 1: $p_1V_1 = p_2V_2$
Step 2: $150 \times 0.80 = p_2 \times 0.40$
Step 3: $p_2 = 120 / 0.40 = 300$ kPa

MARK SCHEME

- ✓ Correct use of $p_1V_1 = p_2V_2$ [1 mark]
- ✓ Correct substitution [1 mark]
- ✓ Correct answer of 300 kPa [1 mark]

Question 6 (3 marks)

6. (3 marks) A sealed syringe contains 40 cm cubed of gas at a pressure of 1.0 x 10 to the power 5 Pa. The plunger is pushed in until the pressure is 2.5 x 10 to the power 5 Pa. Calculate the new volume of gas. Assume the temperature stays constant. (HT only)

MODEL ANSWER

$V_2 = 16$ cm^3

STEP-BY-STEP WORKING

Step 1: $p_1V_1 = p_2V_2$
Step 2: $1.0 \times 10^5 \times 40 = 2.5 \times 10^5 \times V_2$
Step 3: $V_2 = (1.0 \times 10^5 \times 40) / (2.5 \times 10^5) = 16$ cm^3

MARK SCHEME

- ✓ Correct use of $p_1V_1 = p_2V_2$ [1 mark]
- ✓ Correct substitution [1 mark]
- ✓ Correct answer of 16 cm^3 [1 mark]

Question 7 (3 marks)

> *7. (3 marks) Explain why a bicycle pump gets warm when air is compressed inside it.*

MODEL ANSWER

When the air is compressed, work is done on the gas. This transfers energy to the kinetic energy store of the gas particles. The particles move faster, so the temperature of the gas increases, making the pump feel warm.

MARK SCHEME

- ✓ Work is done on the gas [1 mark]
- ✓ Energy transferred to kinetic energy of particles [1 mark]
- ✓ Particles move faster / temperature increases [1 mark]

Extended Practice

Question 8 (4 marks)

> *8. (4 marks) A sealed container of gas is heated. The volume of the container cannot change. Explain, in terms of particles, why the pressure inside the container increases.*

MODEL ANSWER

When the gas is heated, the particles gain kinetic energy and move faster. The particles collide with the walls of the container more frequently. Each collision also involves a greater force because the particles are moving faster. Since the volume is fixed, the more frequent and more forceful collisions result in a higher pressure.

MARK SCHEME

- ✓ Particles gain kinetic energy / move faster [1 mark]
- ✓ Particles collide with walls more frequently [1 mark]
- ✓ Each collision involves a greater force [1 mark]
- ✓ More frequent and forceful collisions increase pressure [1 mark]

Question 9 (6 marks)

> *9. (6 marks) Aerosol cans carry a warning: 'Do not expose to temperatures above 50 degrees C.' Explain why this warning is necessary. In your answer, refer to particle motion, collisions, and pressure.*

MODEL ANSWER

An aerosol can contains gas under pressure in a sealed container with a fixed volume. If the can is heated, the gas particles gain kinetic energy and move faster. The faster-moving particles collide with the walls of the can more frequently. Each collision also exerts a greater force on the walls. Since the volume of the can is fixed, the increased frequency and force of collisions causes the pressure inside the can to increase. If the pressure becomes too high, the can could burst or explode, which is dangerous. This is why the warning advises against exposing the can to high temperatures.

MARK SCHEME

- ✓ The can is sealed / fixed volume [1 mark]
- ✓ Heating causes particles to gain kinetic energy / move faster [1 mark]
- ✓ Particles collide with walls more frequently [1 mark]
- ✓ Collisions exert greater force [1 mark]
- ✓ Pressure increases because of more frequent and forceful collisions [1 mark]
- ✓ Can could burst / explode if pressure is too high [1 mark]