

- 1 Energy is supplied to a fixed mass of gas in a container and the absolute temperature of the gas doubles.

The mean square speed of the gas molecules

- A remains constant.
- B increases by a factor of $\sqrt{2}$.
- C increases by a factor of 2.
- D increases by a factor of 4.

(Total for Question = 1 mark)

- 2 When the absolute temperature of an ideal gas is doubled, the internal energy of the gas changes by a factor of

- A 1
- B $\sqrt{2}$
- C 2
- D 4

(Total for Question = 1 mark)

- 3 When an ideal gas reaches the absolute zero of temperature, the gas

- A becomes a superfluid.
- B condenses to a liquid.
- C has maximum molecular potential energy.
- D exerts no pressure.

(Total for Question = 1 mark)

- 4 When energy is supplied to a substance, changes in the average molecular kinetic energy (E_k) and the average molecular potential energy (E_p) can occur.

When energy is supplied to an ideal gas

- A both E_k and E_p increase.
- B E_k may increase.
- C E_p may increase.
- D E_k increases but E_p decreases.

(Total for Question = 1 mark)

- 5 Air is a mixture of mostly nitrogen and oxygen molecules. The mass of an oxygen molecule is slightly greater than the mass of a nitrogen molecule.

On average, in a sample of air at a given temperature

- A the nitrogen and oxygen molecules have the same speed.
- B the nitrogen molecules are travelling more slowly than the oxygen molecules.
- C the oxygen molecules are travelling more slowly than the nitrogen molecules.
- D the molecules have relative speeds that depend upon the amount of each gas present.

(Total for Question = 1 mark)

- 6 A sealed gas jar contains a mixture of different gases. At a given temperature, the mean kinetic energy of the molecules of each gas

- A depends upon how much of each gas is present.
- B is greater for the gas with less massive molecules.
- C is greater for the gas with more massive molecules.
- D is the same for each gas in the mixture.

(Total for Question = 1 mark)

7 Samples of nitrogen gas and helium gas are at the same temperature. Compared with the helium molecules, the nitrogen molecules have

- A a lower mean square speed.
- B the same mean square speed.
- C a higher mean square speed.
- D a mean square speed dependent upon the amount of each gas.

(Total for Question = 1 mark)

8 The relative masses of oxygen and hydrogen molecules are 32 and 2 respectively. For any given temperature, the ratio

$\frac{\text{root mean square speed of oxygen molecules}}{\text{root mean square speed of hydrogen molecules}}$ is given by

- A $\frac{1}{16}$
- B $\frac{1}{4}$
- C 4
- D 16

(Total for Question = 1 mark)

9 The average kinetic energy of the molecules in a gas is proportional to

- A the number of molecules in the gas.
- B the specific heat capacity of the gas.
- C the temperature of the gas.
- D the total mass of the gas.

(Total for Question = 1 mark)

10

The molecules in a material may possess kinetic energy E_k and potential energy E_p .

The internal energy is equal to

- A ΣE_k
- B $\Sigma E_k - \Sigma E_p$
- C $\Sigma E_k + \Sigma E_p$
- D ΣE_p

(Total for Question 1 mark)

11 In the equation $\frac{1}{2} m \langle c^2 \rangle = \frac{3}{2} kT$, the term $\langle c^2 \rangle$ represents

- A the mean speed of the molecules.
- B the mean speed of the molecules squared.
- C the mean square speed of the molecules.
- D the mean velocity of the molecules.

(Total for Question 1 mark)

12 The pressure exerted by an ideal gas, maintained at a constant temperature, is inversely proportional to the volume occupied by the gas.

Which of the following statements is **not** true?

- A The average molecular kinetic energy remains constant.
- B The gas must consist of identical molecules.
- C The mass of gas is fixed.
- D The number of molecules in the gas doesn't change.

(Total for Question 1 mark)

13 Two different sized boxes, P and Q, both contain the same number of nitrogen molecules. The molecules in box P have twice the root mean square speed of those in box Q. Which of the following must be correct?

- A The density of the gas in box P is greater than that in box Q.
- B The mean momentum of the molecules in box P is greater than those in box Q.
- C The pressure exerted by the gas in box P is greater than that in box Q.
- D The temperature of the gas in box P is greater than that in box Q.

(Total for Question 1 mark)

14 The average kinetic energy of the molecules in an ideal gas is

- A directly proportional to the square root of the absolute temperature.
- B directly proportional to the absolute temperature.
- C independent of the absolute temperature.
- D inversely proportional to the absolute temperature.

(Total for Question = 1 mark)

15 A sample of an ideal gas at $27\text{ }^{\circ}\text{C}$ is placed in a sealed container. The gas is heated at constant volume to a temperature of $324\text{ }^{\circ}\text{C}$.

The ratio of the final pressure to the initial pressure exerted by the gas is approximately

- A 1
- B 2
- C 4
- D 12

(Total for Question = 1 mark)

16 Water at $100\text{ }^{\circ}\text{C}$ turns into steam at $100\text{ }^{\circ}\text{C}$.

Which of the following statements is true?

- A The internal energy is unchanged, but the kinetic energy of the molecules increases.
- B The internal energy is unchanged, but the potential energy of the molecules increases.
- C Both the internal energy and the kinetic energy of the molecules increase
- D Both the internal energy and the potential energy of the molecules increase

(Total for Question = 1 mark)

17 The absolute temperature scale is a theoretical scale proposed by Lord Kelvin.

On this scale, zero is the temperature at which

- A all gases become liquids.
- B an ideal gas would exert no pressure.
- C the Celsius temperature is $-373\text{ }^{\circ}\text{C}$.
- D water freezes.

(Total for Question = 1 mark)