

Ideal Gasses

TOPIC QUESTIONS

Level	AS Level
Subject	Physics
Exam Board	AQA
Paper Type	Multiple Choice

Time Allowed : 25min

EXAM PAPERS PRACTICE

1. A transparent illuminated box contains small smoke particles and air. The smoke particles are observed to move randomly when viewed through a microscope. What is the cause of this observation of Brownian motion?

- A Smoke particles gaining kinetic energy by the absorption of light.
- B Collisions between smoke particles and air molecules.
- C Smoke particles moving in convection currents caused by the air being heated by the light.

2. The smoke particles moving randomly due to their temperature.

A continuous stream of water falls through a vertical distance of 100 m. Assume no thermal energy is transferred to the surroundings. The specific heat capacity of water is $4200 \text{ J kg}^{-1} \text{ K}^{-1}$

What is the temperature difference of the water between the top and bottom of the waterfall?

- A 0.023 K
- B 0.23 K
- C 2.3 K
- D 4.3 K

3. A student measures the power of a microwave oven. He places 200 g of water at 23°C into the microwave and heats it on full power for 1 minute. When he removes it, the temperature of the water is 79°C .

The specific heat capacity of water is $4200 \text{ J kg}^{-1} \text{ K}^{-1}$.

What is the average rate at which thermal energy is gained by the water?

- A 780 W
- B 840 W
- C 1.1 kW
- D 4.6 Kw

4. Which of the following is **not** used as valid assumption when deriving the equation

$$P = \frac{1}{3} Nm (c_{rms})^2$$

in the simple kinetic theory of gases?

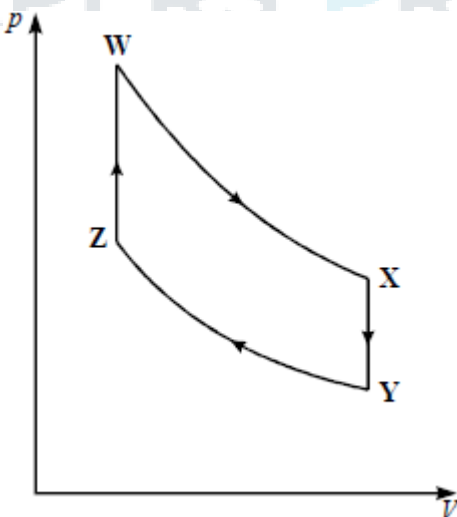
- A The molecules suffer negligible change of momentum collision with the walls of the container.
- B Attractive forces between molecules are negligible.
- C The duration of a collision is negligible compared with the time between collisions.
- D The volume of the molecules is negligible compared with the volume of the gas.

5. A liquid flows continuously through a chamber that contains an electric heater. When the steady state is reached, the liquid leaving the chamber is at a higher temperature than the liquid entering the chamber. The difference in temperature is Δt .

Which of the following will increase Δt with no other change?

- A Increasing the volume flow rate of the liquid
- B Changing the liquid to one with a lower specific heat capacity
- C Using a heating element with a higher resistance
- D Changing the liquid to one that has a higher density

6. The diagram shows the p - V diagram of an ideal hot-air engine. **WX** and **YZ** are isothermal changes.



Which line of the table below correctly indicates the nature of the work done **on** or **by** the air in each part of the cycle?

	WX	XY	YZ	ZW
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A	zero	by	zero	on
B	by	zero	on	zero
C	zero	on	zero	by
D	on	zero	by	zero

7. The temperature of a room increases from 283K to 293K. The r.m.s. speed of the air molecules in the room increases by a factor of

- A 1.02
- B 1.04
- C 1.41
- D 2.00



EXAM PAPERS PRACTICE

8. A fixed mass of an ideal gas initially has a volume V and an absolute temperature T . Its initial pressure could be doubled by changing its volume and temperature to

- A $V/2$ and $4T$
- B $V/4$ and $T/2$
- C $2V$ and $T/4$
- D $4V$ and $2T$

9. A car of mass M travelling at speed V comes to rest using its brakes. Energy is dissipated in the brake discs of total mass m and specific heat capacity c . The rise in temperature of the brake discs can be estimated from

- A $\frac{mV^2}{2Mc}$
- B $\frac{2MV^2}{mc}$
- C $\frac{MV^2}{2mc}$
- D $\frac{2mc}{MV^2}$

10. Which one of the following is **not** an assumption about the properties of particles in the simple kinetic theory?

- A \bar{c} is the average speed of the particles
- B The forces between the particles are negligible except when particles collide
- C The time spent by particles in collision is negligible compared with the time spent between collisions
- D The volume of the particles is negligible compared to the volume of the container

11. What is the total internal energy of 2.4 mol of an ideal gas which has a temperature of 15°C ?

- A $6.0 \times 10^{-21} \text{ J}$
- B $1.4 \times 10^{-20} \text{ J}$
- C $4.5 \times 10^2 \text{ J}$
- D $8.6 \times 10^3 \text{ J}$

12. The composition of a carbon dioxide (CO_2) molecule is one atom of $^{12}_6\text{C}$ and two atoms of $^{16}_8\text{O}$. What is the number of molecules of CO_2 in 2.2 kg of the gas?

- A 1.0×10^{22}
- B 3.0×10^{22}
- C 3.0×10^{25}
- D 4.7×10^{25}

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13. Brownian motion

- A makes it possible to see the motion of air molecules.
- B is caused by the collisions of smoke particles.
- C is caused by collisions between air molecules and smoke particles.
- D occurs because air is a mixture of gases and the molecules have different masses.

14. A sample **P** of an ideal gas contains 1 mol at an absolute temperature T .

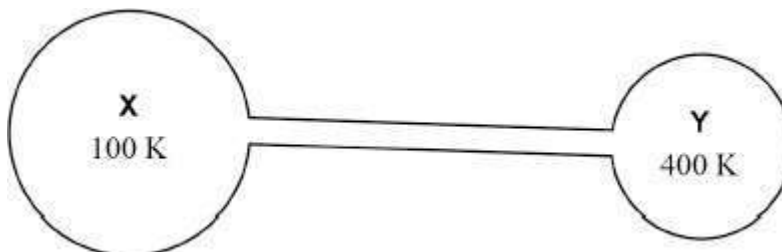
A second sample **Q** of an ideal gas contains $\frac{2}{3}$ mol at an absolute temperature $2T$.

The total molecular kinetic energy of **P** is E .

What is the total molecular kinetic energy of **Q**?

- A $\frac{2}{3}E$
- B $\frac{3}{4}E$
- C $\frac{4}{3}E$
- D $\frac{3}{2}E$

15. The diagram shows two flasks **X** and **Y** connected by a thin tube of negligible volume.



The flasks contain an ideal gas.

The volume of **X** is twice the volume of **Y**. When **X** is at a temperature of 100 K and **Y** is at a temperature of 400 K there is no net transfer of particles between the flasks.

X contains gas of mass m . What is the mass of gas in **Y**?

- A** $\frac{m}{8}$
- B** $\frac{m}{2}$
- C** $2m$
- D** $8m$