Ideal Gasses

TOPIC QUESTIONS

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

Time Allowed : 25min

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 J kg^{-1} 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 themicrowave 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 J kg^{-1} 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 $P = \frac{1}{3} Nm\,(c_{\text{rms}})^2$ in the simple kinetic theory of gases?

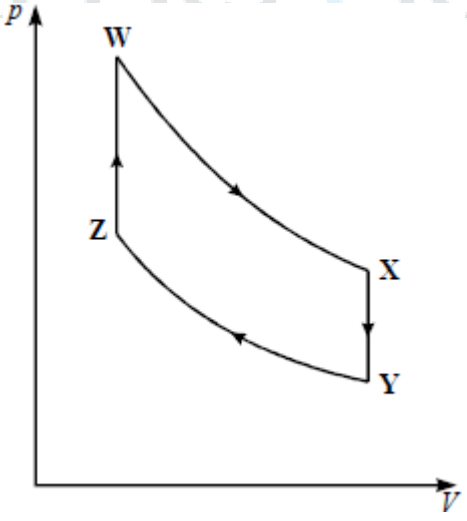
A	The molecules suffer negligible change of momentumon collision with the walls of the container.
B	Attractive forces between molecules are negligible.
C	The duration of a collision is negligible compared withthe time between collisions.
D	The volume of the molecules is negligible comparedwith the volume 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 enteringthe 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 ineach part of the cycle?

	WX	XY	YZ	ZW

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 theroom increases by a factor of

A 1.02

B 1.04

C 1.41

D 2.00

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 simplekinetic theory?

A ^{2} > 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 spentbetween 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 6.0×10^{-21} J

B 1.4×10^{-20} J

C 4.5×10^{2} J

D 8.6×10^{3} J

12. The composition of a carbon dioxide (CO_2) molecule is one atom of $^{12}_{6}C$ and two atoms of $^{16}_{8}O$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}

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**?

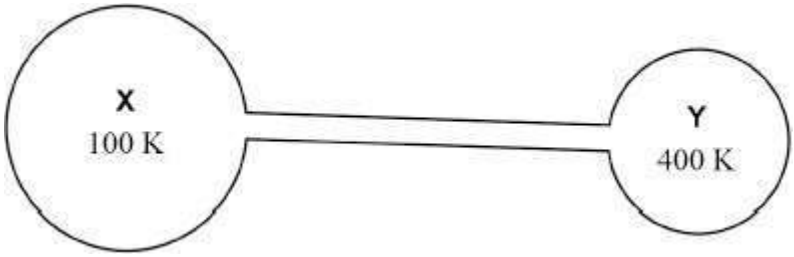
A $\frac{2}{3}E$

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 atemperature 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 $8m$