Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Thermal Physics

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Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

A 1000 W heater is 75% efficient. The heater is used to increase the temperature of some water from 10 °C to 85 °C in 7 hours.

What mass of water is heated?

specific heat capacity of water = 4200 $J\ kg^{-1}\ K^{-1}$

A 1.0 kg ⬭
B 13 kg ⬭
C 60 kg ⬭
D 110 kg ⬭

(Total 1 mark)

Q2.

Which can lead to a value for the absolute zero of temperature?

A Boyle's law ⬭
B Brownian motion ⬭
C Charles's law ⬭
D Rutherford scattering ⬭

(Total 1 mark)

Q3.

An ideal gas, initially at 300 K, is compressed to half its original volume. It is then cooled at constant volume until the pressure is restored to its initial value.

What is the final temperature of the gas?

A 150 K ⬭
B 200 K ⬭
C 300 K ⬭

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D 600 K ⬭

(Total 1 mark)

Q4.

A fixed volume of an ideal gas is heated.

Which row gives quantities that double when the kelvin temperature of the gas doubles?

A	rms speed of the molecules	pressure of the gas	⬭
B	density of the gas	rms speed of the molecules	⬭
C	internal energy of the gas	density of the gas	⬭
D	pressure of the gas	internal energy of the gas	⬭

(Total 1 mark)

Q5.

A solar panel transfers energy at a rate of 1.2 kW to liquid passing through it. The liquid has a specific heat capacity of 4.0 kJ kg^{-1} K^{-1}.

When the liquid flows through the solar panel, its temperature increases by 3.0 K.

The flow rate of the liquid is

A 0.10 kg s^{-1}. ⬭

B 1.1 kg s^{-1}. ⬭

C 10 kg s^{-1}. ⬭

D 100 kg s^{-1}. ⬭

(Total 1 mark)

Q6.

A gas occupies a volume V. Its particles have a root mean square speed (c_{rms}) of u.
The gas is compressed at constant temperature to a volume $0.5V$.

What is the root mean square speed of the gas particles after compression?

A $\frac{u}{2}$ ⬭

B u ⬭

C $2u$ ⬭

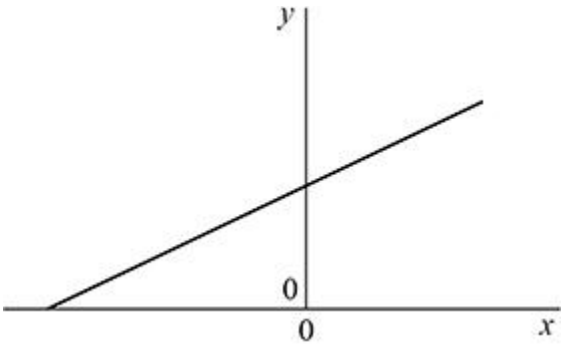
D $4u$ ⬭

(Total 1 mark)

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Q7.

A fixed mass of gas is heated at constant volume. The graph is drawn for this process.



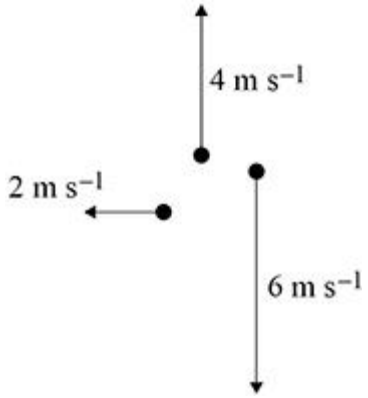
What do x and y represent?

	x	y	
A	pressure in Pa	temperature in ºC	⬭
B	temperature in ºC	pressure in Pa	⬭
C	pressure in Pa	temperature in K	⬭
D	temperature in K	pressure in Pa	⬭

(Total 1 mark)

Q8.

Three particles are travelling in the same plane with velocities as shown in the vector diagram.



What is the root mean square speed of the particles?

A 4.3 m s^{-1} ⬭

B 7.5 m s^{-1} ⬭

C 19 m s^{-1} ⬭

D 56 m s^{-1} ⬭

(Total 1 mark)

Q9.

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When an ideal gas at a temperature of 27 °C is suddenly compressed to one quarter of its volume, the pressure increases by a factor of 7

What is the new temperature of the gas?

A 15 °C ⬭

B 47 °C ⬭

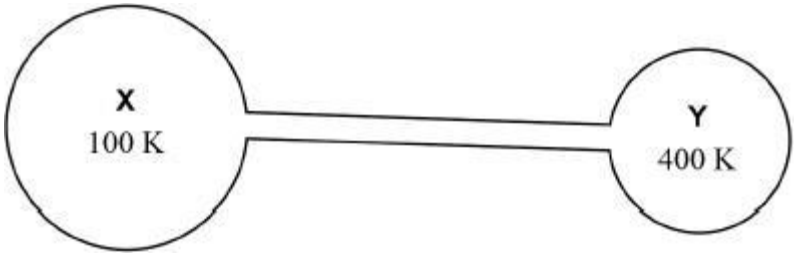
C 171 °C ⬭

D 252 °C ⬭

(Total 1 mark)

Q10.

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 $8m$ ⬭

(Total 1 mark)

Q11.

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**?

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A $\frac{2}{3}E$ ⬭

B $\frac{3}{4}E$ ⬭

C $\frac{4}{3}E$ ⬭

D $\frac{3}{2}E$ ⬭

(Total 1 mark)

Q12.

An ideal gas is contained in a cubical box of side length a. The gas has N molecules each of mass m.

What is the pressure exerted by the gas on the walls of the box?

A $\frac{mNa^3}{2} \times c_{rms}^2$ ⬭

B $\frac{mNa^2}{2} \times c_{rms}^2$ ⬭

C $\frac{mN}{3a^2} \times c_{rms}^2$ ⬭

D $\frac{mN}{3a^3} \times c_{rms}^2$ ⬭

(Total 1 mark)

Q13.

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. ⬭

(Total 1 mark)

Q14.

Which statement is true about an experiment where Brownian motion is demonstrated using smoke particles in air?

A The experiment makes it possible to see the motion of air molecules. ⬭

B The motion is caused by the collisions of smoke particles with each other. ⬭

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C The motion is caused by collisions between air molecules and smoke particles. ⬭

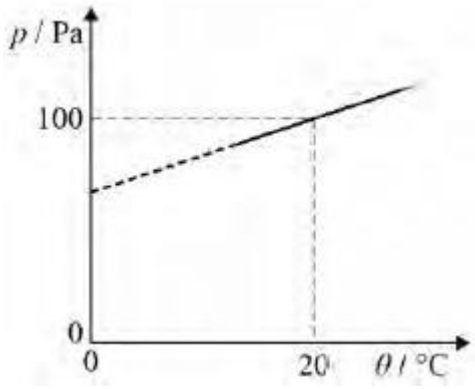
D The motion occurs because air is a mixture of gases and the molecules have different masses. ⬭

(Total 1 mark)

Q15.

The graph shows the variation of pressure p with temperature θ for a fixed mass of an ideal gas at constant volume.

What is the gradient of the graph?



A 0.341 ⬭

B 0.395 ⬭

C 2.93 ⬭

D 5.00 ⬭

(Total 1 mark)

Q16.

Which is **not** an assumption about gas particles in the kinetic theory model for a gas?

A They collide elastically with the container walls. ⬭

B They have negligible size compared to the distance between the container walls. ⬭

C They travel between the container walls in negligibly short times. ⬭

D They collide with the container walls in negligibly short times. ⬭

(Total 1 mark)

Q17.

Two flasks **X** and **Y** are filled with an ideal gas and are connected by a tube of negligible volume compared to that of the flasks. The volume of **X** is twice the volume of **Y**.

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X is held at a temperature of 150 K and **Y** is held at a temperature of 300 K

What is the ratio $\frac{\text{mass of gas in } \mathbf{X}}{\text{mass of gas in } \mathbf{Y}}$?

A 0.125 ⬭

B 0.25 ⬭

C 4 ⬭

D 8 ⬭

(Total 1 mark)

Q18.

The average mass of an air molecule is 4.8×10^{-26} kg

What is the mean square speed of an air molecule at 750 K?

A 3.3×10^5 m^2 s^{-2} ⬭

B 4.3×10^5 m^2 s^{-2} ⬭

C 6.5×10^5 m^2 s^{-2} ⬭

D 8.7×10^5 m^2 s^{-2} ⬭

(Total 1 mark)

Q19.

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. ⬭

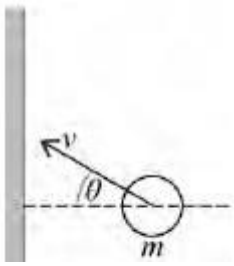
D The smoke particles moving randomly due to their temperature. ⬭

(Total 1 mark)

Q20.

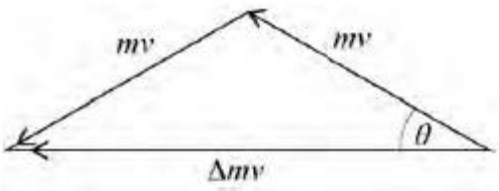
The diagram shows a gas particle about to collide elastically with a wall.

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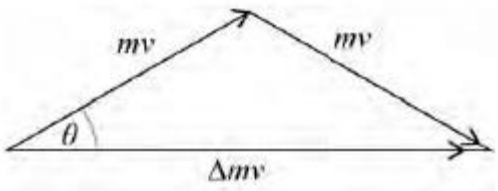


Which diagram shows the correct change in momentum Δmv that occurs during the collision?

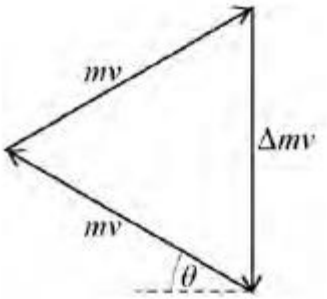
A



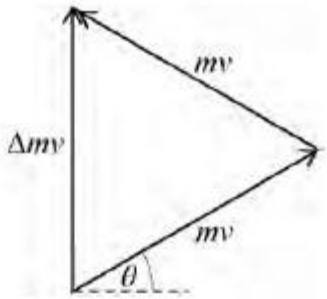
B



C



D



A ⬭

B ⬭

C ⬭

D ⬭

(Total 1 mark)

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