KINETIC PARTICLE THEORY - 1

THE SCIENCE ACADEMY

A student investigates the condensation of nitrogen gas at low temperature.

Which of the following statements correctly describes the behaviour of the nitrogen gas molecules?

A The nitrogen molecules contract.

B The nitrogen molecules move freely but at a slower speed.

C The nitrogen molecules occupy a smaller space.

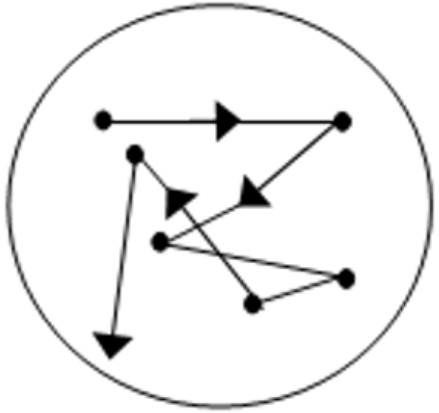
D The nitrogen molecules vibrate about a fixed position

KINETIC PARTICLE THEORY - 2

THE SCIENCE ACADEMY

Smoke particles in a transparent box are observed using a microscope. A small point of light is seen to move around as shown.

What does this experiment demonstrate about air molecules?



A They are in continuous random motion.

B They can be seen through a microscope.

C They move because of collisions with smoke particles.

D They move more slowly when they are heated.

KINETIC PARTICLE THEORY - 3

THE SCIENCE ACADEMY

A gas is heated in a sealed metal container. Which one of the following quantities will not increase?

A average force of collision of the particles on the container walls

B average kinetic energy of the particles

C frequency of the collision between particles

D intermolecular distance between particles

KINETIC PARTICLE THEORY - 4

THE SCIENCE ACADEMY

A diver deep underwater exhales an air bubble. The air bubble is observed to increase in size as it rises to the surface. Which of the following explanations may be used to describe this phenomenon?

1. The volume increases because the pressure underwater decreases with decreasing depth.
2. The volume increases because while there is no pressure underwater, there is atmospheric pressure at the surface of the water.
3. The pressure is constant regardless of depth because the temperature of the water is lower with greater depth.

A 1 only

B 1 and 2 only

C 2 and 3 only

D 3 only

TEMPERATURE - 1

THE SCIENCE ACADEMY

Which one of the following is not a suitable thermometric property?

A mass of a liquid at a constant volume

B pressure of a fixed mass of gas at a constant volume

C resistance of an electrical conductor

D volume of a fixed mass of liquid

TEMPERATURE - 2

THE SCIENCE ACADEMY

The length of the mercury thread in a liquid-in-glass thermometer is 1.0 cm and 10.0 cm when placed in pure melting ice and above pure boiling water.

What is the temperature when the length of mercury thread is 7.0 cm?

A 60°C

B 66.7°C

C 70°C

D 87.5°C

THERMAL TRANSFER - 1

THE SCIENCE ACADEMY

Water at 0 °C is mixed with ice at 0 °C. If energy is only exchanged between the water and ice, which of the following statements is correct?

A All the ice will melt.

B All the water will freeze.

C No ice will melt, and no water will freeze.

D Not enough information is known to make the correct deduction.

THERMAL TRANSFER - 2

THE SCIENCE ACADEMY

When one end of a rod is heated, thermal energy is transferred down the rod by

A hot molecules moving along the rod.

B hot molecules changing places with cool ones.

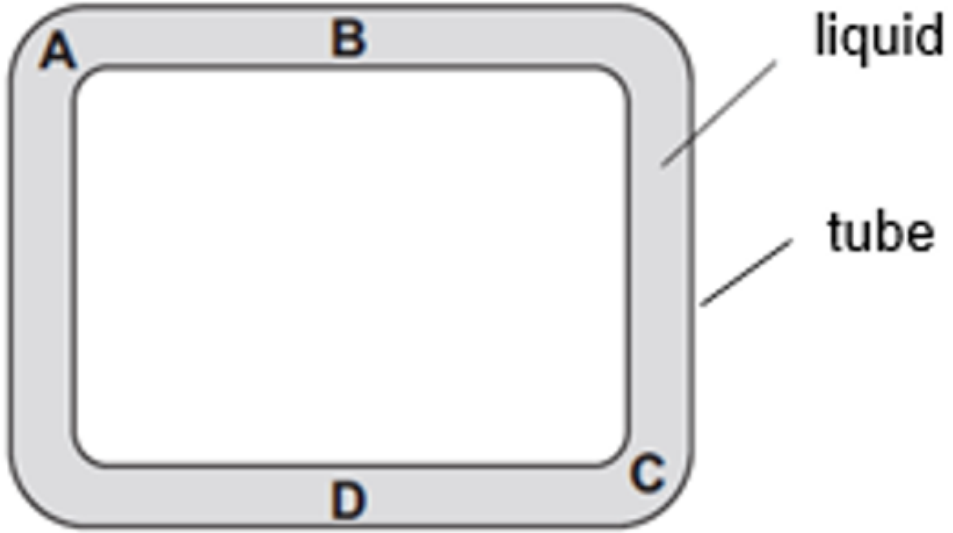
C the air around the rod, which moves after being heated.

D transfer of energy from one molecule to the next.

THERMAL TRANSFER - 3

THE SCIENCE ACADEMY

A heating element is to be positioned in a narrow, sealed tube of liquid.



Which would be the best place, A, B, C or D, to position the heating element in order to obtain the best circulation of the liquid throughout the tube?

THERMAL TRANSFER - 4

THE SCIENCE ACADEMY

Two cars, one painted dull black and the other a shiny white, were left in the sun.

When the two cars had reached the same temperature, they were driven into the shade.

Which car will be heated up faster and which car will cool down faster?

	In the Sun	***In the shade***
A	Black car heats up faster	Black car cools down faster
B	Black car heats up faster	White car cools down faster
C	White car heats up faster	Black car cools down faster
D	White car heats up faster	White car cools down faster

THERMAL PROPERTIES - 1

THE SCIENCE ACADEMY

An electric kettle contains 500 g of water at 15 °C. The specific heat capacity of water is 4.2×10^3 J kg^{-1} K^{-1}. The heating element of the kettle is rated at 2.2 kW. What is the minimum time needed to raise the temperature of the water to 100 °C?

A 22 s

B 81 s

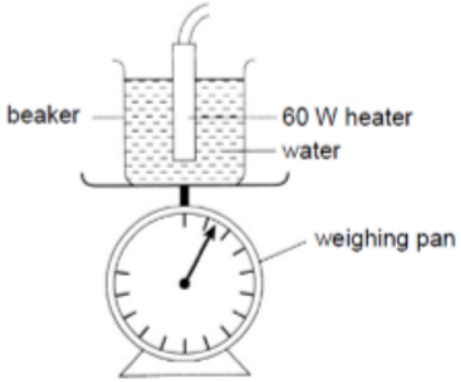
C 95 s

D 8.1×10^4 s

THERMAL PROPERTIES - 2

THE SCIENCE ACADEMY

The following set-up is used to measure the specific latent heat of vapourisation of water.



Three readings are taken by the weighing pan as shown below.

m_1 = reading before heating

m_2 = reading at 3 minutes after water boils

m_3 = reading at 8 minutes after water boils

Which calculation gives the best estimation of the specific latent heat of vaporisation of water in J/kg?

A $\frac{300}{m_2 - m_3}$ **B** $\frac{480}{m_1 - m_3}$ **C** $\frac{10800}{m_1 - m_2}$ **D** $\frac{18000}{m_2 - m_3}$

THERMAL PROPERTIES - 3

THE SCIENCE ACADEMY

A pupil adds 37 g of ice at 0 °C to 100 g of water at 30 °C. The final temperature of water and melted ice is 0 °C. No heat is lost to, or gained from, the surroundings.

The specific heat capacity of water is 4.2 J/(g °C).

What is the specific latent heat of ice?

A 47 J/g

B 341 J/g

C 4700 J/g

D 12600 J/g