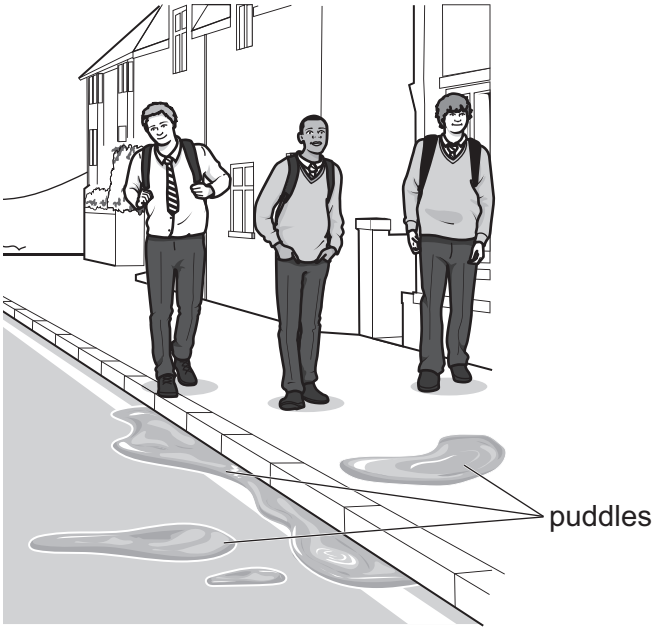
1 The diagram shows students walking to school. There are puddles of water on the ground.



After school, the puddles have disappeared and the ground is dry.

(a) State the name of the process that causes the puddles to disappear.

..... [1]

(b) Describe the process that causes the puddles to disappear.
Use your ideas about molecules.

.....

.....

..... [3]

[Total: 4]

2 Some gas is trapped in a cylinder fitted with a moveable piston. Diagram A shows the arrangement.

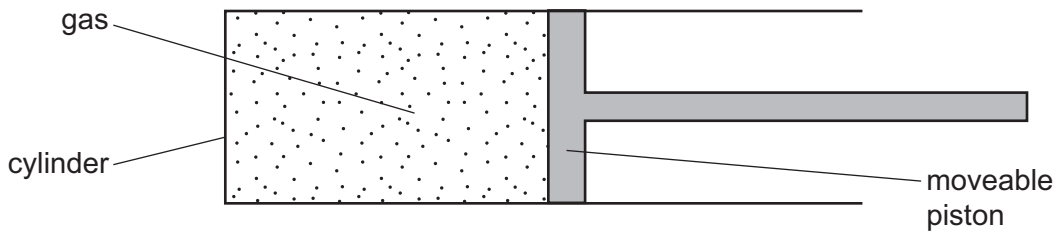


Diagram A

The piston moves and increases the volume occupied by the gas. The temperature of the gas remains constant. Diagram B shows the new position of the piston.

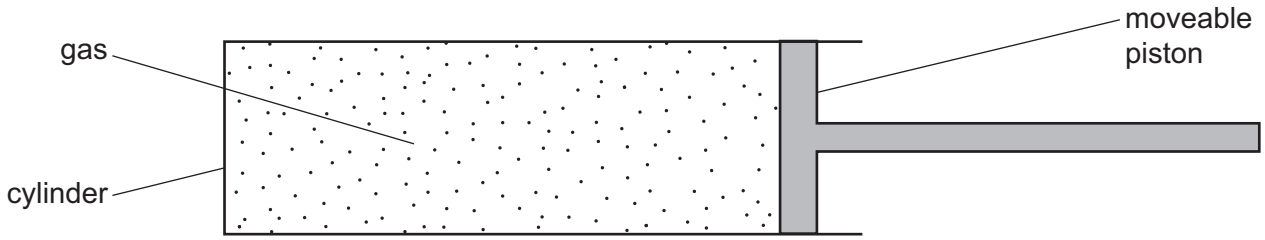


Diagram B

State and explain what happens to the pressure of the gas on the cylinder.

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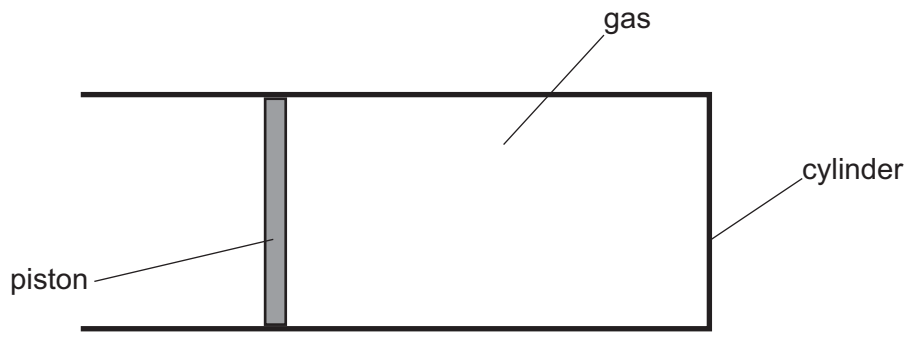
..... [2]

[Total: 2]

3 A quantity of gas is trapped by a piston in a cylinder with thin metal walls. The piston is free to move without friction within the cylinder.

The diagram shows the cylinder and piston.



The cylinder is placed inside a freezer.

When the temperature reaches −18 °C, the pressure of the gas in the cylinder is still equal to that of the atmosphere.

Explain, in terms of the particles of the gas, how the pressure remains equal to its original value.

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.....

.....

..... [3]

[Total: 3]

4 A fixed mass of gas of volume V_1 is at a pressure p_1. It is compressed to a volume V_2.

(a) Complete the equation for the final pressure p_2 of the gas when the gas is compressed at constant temperature.

$p_2 =$

[2]

(b) State and explain how the final pressure compares with p_2 when the temperature of the gas increases during compression.

statement.....

explanation.....

.....

.....

..... [3]

[Total: 5]

5 A large test-tube contains a liquid at room temperature. An electric heater is immersed in the liquid and is switched on. Thermal energy is supplied to the liquid by the heater. The temperature of the liquid increases until it reaches its boiling point. The liquid then starts to change into gas.

Describe what happens to molecules of the liquid as its temperature begins to increase.

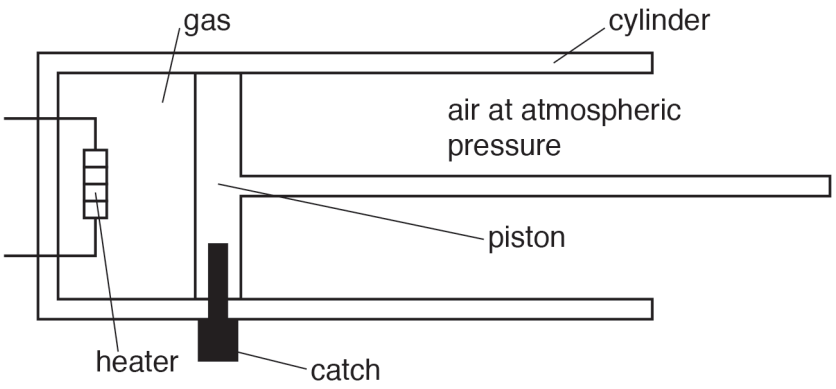
.....

.....

..... [2]

[Total: 2]

6 Gas of mass 0.23 g is trapped in a cylinder by a piston. The gas is at atmospheric pressure which is 1.0×10^5 Pa. The diagram shows the piston held in position by a catch.



The volume of the trapped gas is 1.9×10^{-4} m^3.

An electrical heater is used to increase the temperature of the trapped gas by 550 °C.

(a) The specific heat capacity of the gas is 0.72 J / (g °C).

Calculate the energy required to increase the temperature of the trapped gas by 550 °C.

energy = ... [2]

(b) The power of the heater is 2.4 W.

Calculate how long it takes for the heater to supply the energy calculated in **(a)**.

time = ... [2]

(c) In practice, it takes much longer to increase the temperature of the gas by 550 °C using the heater.

Suggest **one** reason for this.

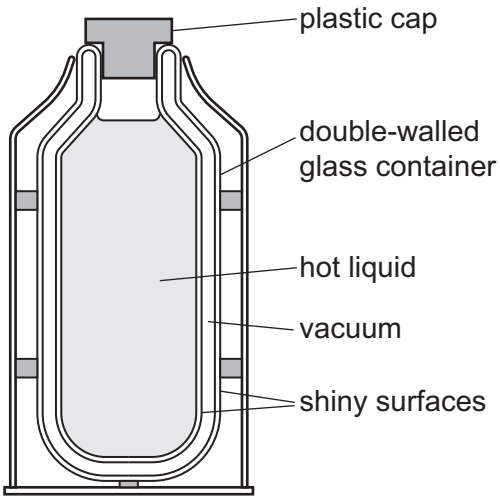
.....

.....

..... [1]

[Total: 5]

7 The diagram shows a cross-section of a flask. The flask is used to keep a liquid hot. The flask has two glass walls with a vacuum between them. The surfaces of the glass walls are shiny.



Explain how the shiny surfaces reduce the transfer of thermal energy from the hot liquid.

.....

..... [2]

[Total: 2]

8 A metal container is used to cook food. The metal container has thick walls. Hot cooking oil at a temperature of 120 °C is poured into the container.

The outside surface of the container gets hot. Some thermal energy passes through the metal because vibrating atoms in the metal collide with neighbouring atoms and transfer energy to them.

Explain how the rest of the thermal energy is conducted through the metal container to the outside surface by another process.

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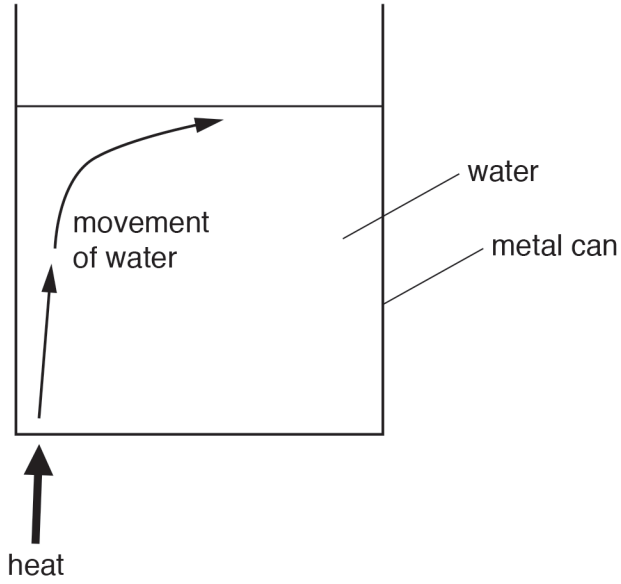
..... [3]

[Total: 3]

9 A student heats some water in a metal can, as shown in the diagram.



Describe how thermal energy is transferred throughout the water. Include your ideas about density changes.

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..... [3]

[Total: 3]

10 The diagram shows a road next to the sea on a sunny day.

The temperature of the road is greater than the temperature of the sea.

The surface of the road is black.

Suggest **one** reason why the temperature of the road is greater than that of the sea.

.....

..... [1]

[Total: 1]