

Changes of State & Particle Model

Question Paper

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.3 Particle Model of Matter
Sub-Topic	Changes of State & Particle Model
Difficulty Level	Silver Level
Booklet	Question Paper

Time Allowed: 34 minutes

Score: /34

Percentage: /100

Grade Boundaries:

Q1. Solid, liquid and gas are three different states of matter.

- (a) Describe the difference between the solid and gas states, in terms of the arrangement and movement of their particles.

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(4)

- (b) What is meant by 'specific latent heat of vaporisation'?

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(2)

- (c) While a kettle boils, 0.018 kg of water changes to steam.

Calculate the amount of energy required for this change.

Specific latent heat of vaporisation of water = 2.3×10^6 J / kg.

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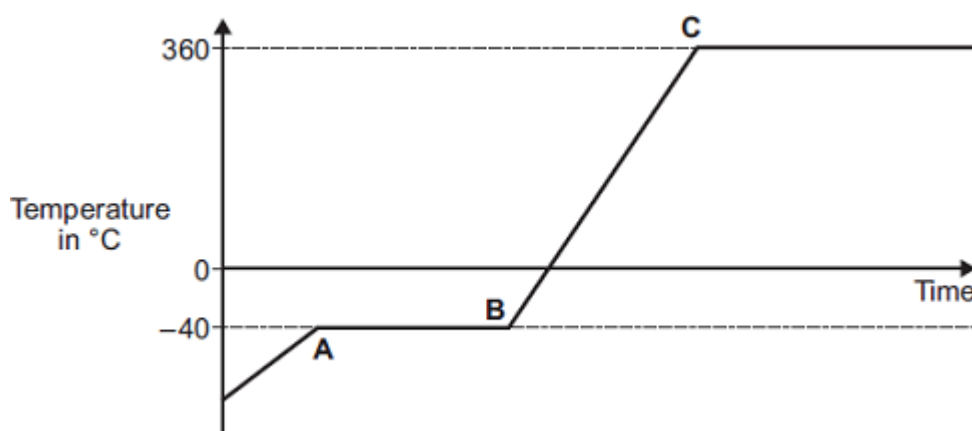
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Energy required = J

(2)

- (d) The graph shows how temperature varies with time for a substance as it is heated.

The graph is **not** drawn to scale.



Explain what is happening to the substance in sections **AB** and **BC** of the graph.

Section **AB**

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Section **BC**

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(4)

(Total 12 marks)

Q2. In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.

The information in the box is about the properties of solids and gases.

Solids:

- have a fixed shape
- are difficult to compress (to squash).

Gases:

- will spread and fill the entire container
- are easy to compress (to squash).

Use your knowledge of kinetic theory to explain the information given in the box.

You should consider:

- the spacing between the particles
- the movement of individual particles
- the forces between the particles.

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Extra space

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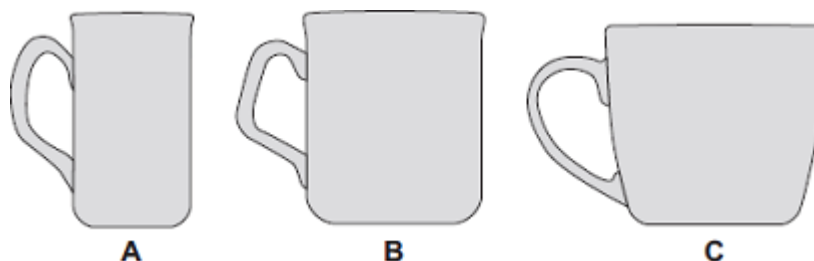
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(Total 6 marks)

Q3. The diagram shows three cups **A**, **B** and **C**.



Energy is transferred from hot water in the cups to the surroundings.

(a) Use the correct answer from the box to complete each sentence.

condensation

conduction

convection

Energy is transferred through the walls of the cup by

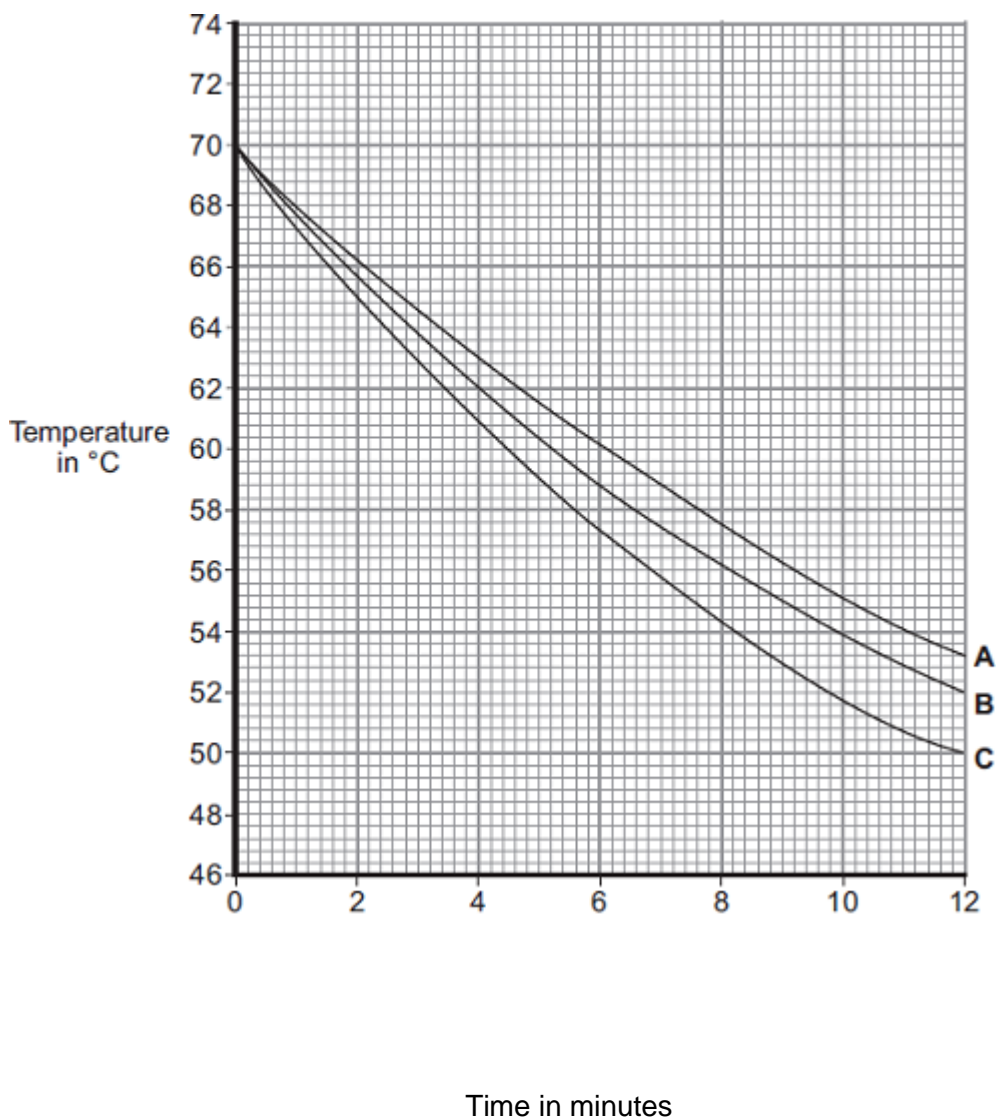
In the air around the cup, energy is transferred by

(2)

- (b) Some students investigated how the rate of cooling of water in a cup depends on the surface area of the water in contact with the air.

They used cups **A**, **B** and **C**. They poured the same volume of hot water into each cup and recorded the temperature of the water at regular time intervals.

The results are shown on the graph.



- (i) What was the starting temperature of the water for each cup?

Starting temperature = °C

(1)

- (ii) Calculate the temperature fall of the water in cup **B** in the first 9 minutes.

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Temperature fall = °C

(2)

(iii) Which cup, **A**, **B** or **C**, has the greatest rate of cooling?

Using the graph, give a reason for your answer.

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(2)

(iv) The investigation was repeated using the bowl shown in the diagram.

The same starting temperature and volume of water were used.



Draw on the graph in part **(b)** another line to show the expected result.

(1)

(v) After 4 hours, the temperature of the water in each of the cups and the bowl was 20°C.

Suggest why the temperature does **not** fall below 20°C.

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(1)

- (c) (i) The mass of water in each cup is 200 g.

Calculate the energy, in joules, transferred from the water in a cup when the temperature of the water falls by 8°C .

Specific heat capacity of water = $4200 \text{ J / kg}^{\circ}\text{C}$.

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Energy transferred = J

(3)

- (ii) Explain, in terms of particles, how evaporation causes the cooling of water.

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(4)

(Total 16 marks)