

Name:

Date:

P3 - Test 3
PARTICLE MODEL OF MATTER
Intermediate

GCSE

PHYSICS

AQA - Triple Science

Mark

Grade

Materials

For this paper you must have:

- Ruler
- Pencil and Rubber
- Scientific calculator, which you are expected to use when appropriate

Instructions

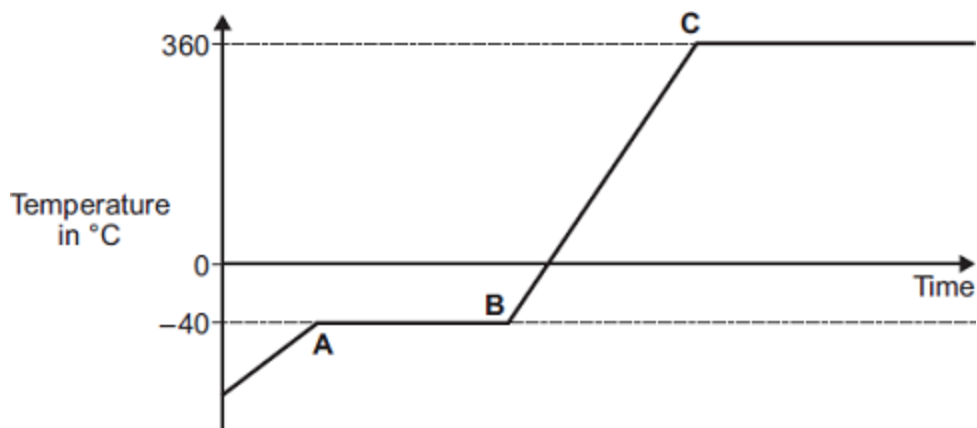
- Answer all questions
- Answer questions in the space provided
- All working must be shown

Information

- The marks for the questions are shown in brackets

(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** _____

Section **BC** _____

(4)
(Total 12 marks)

2.

(a) A company is developing a system which can heat up and melt ice on roads in the winter. This system is called 'energy storage'.

During the summer, the black surface of the road will heat up in the sunshine.

This energy will be stored in a large amount of soil deep under the road surface. Pipes will run through the soil. In winter, cold water entering the pipes will be warmed and brought to the surface to melt ice.

The system could work well because the road surface is black.

Suggest why.

(1)

(b) (i) What is meant by specific latent heat of fusion?

(2)

(ii) Calculate the amount of energy required to melt 15 kg of ice at 0 °C.

Specific latent heat of fusion of ice = 3.4×10^5 J/kg.

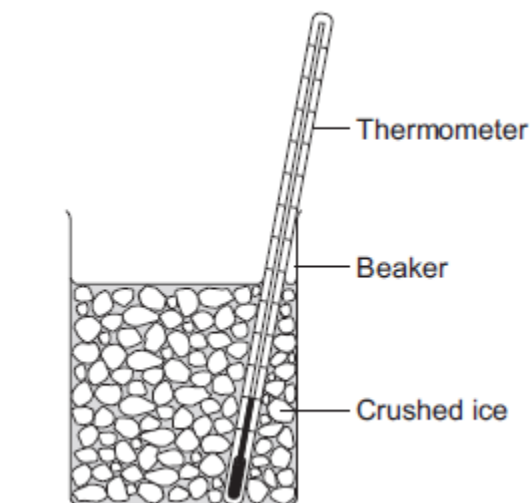
Energy = _____ J

(2)

- (c) Another way to keep roads clear of ice is to spread salt on them. When salt is added to ice, the melting point of the ice changes.

A student investigated how the melting point of ice varies with the mass of salt added.

The figure below shows the equipment that she used.



The student added salt to crushed ice and measured the temperature at which the ice melted.

- (i) State **one** variable that the student should have controlled.

(1)

- (ii) During the investigation the student stirred the crushed ice.

Suggest **two** reasons why.

Tick (✓) **two** boxes.

	Tick (✓)
To raise the melting point of the ice	
To lower the melting point of the ice	
To distribute the salt throughout the ice	
To keep all the ice at the same temperature	
To reduce energy transfer from the surroundings to the ice	

(2)

(iii) The table below shows the data that the student obtained.

Mass of salt added in grams	0	10	20
Melting point of ice in °C	0	-6	-16

Describe the pattern shown in the table.

(1)

(d) Undersoil electrical heating systems are used in greenhouses. This system could also be used under a road.

A cable just below the ground carries an electric current. One greenhouse system has a power output of 0.50 kW.

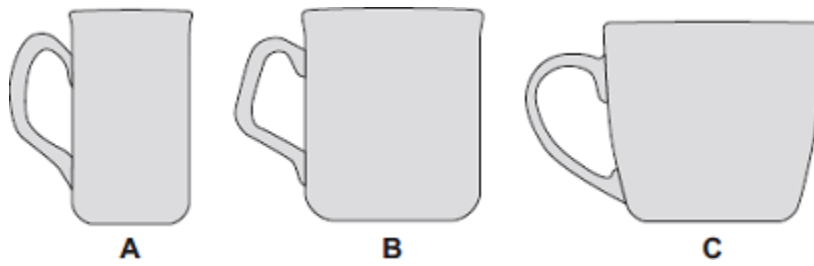
Calculate the energy transferred in 2 minutes.

Energy transferred = _____ J

(3)

3.

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

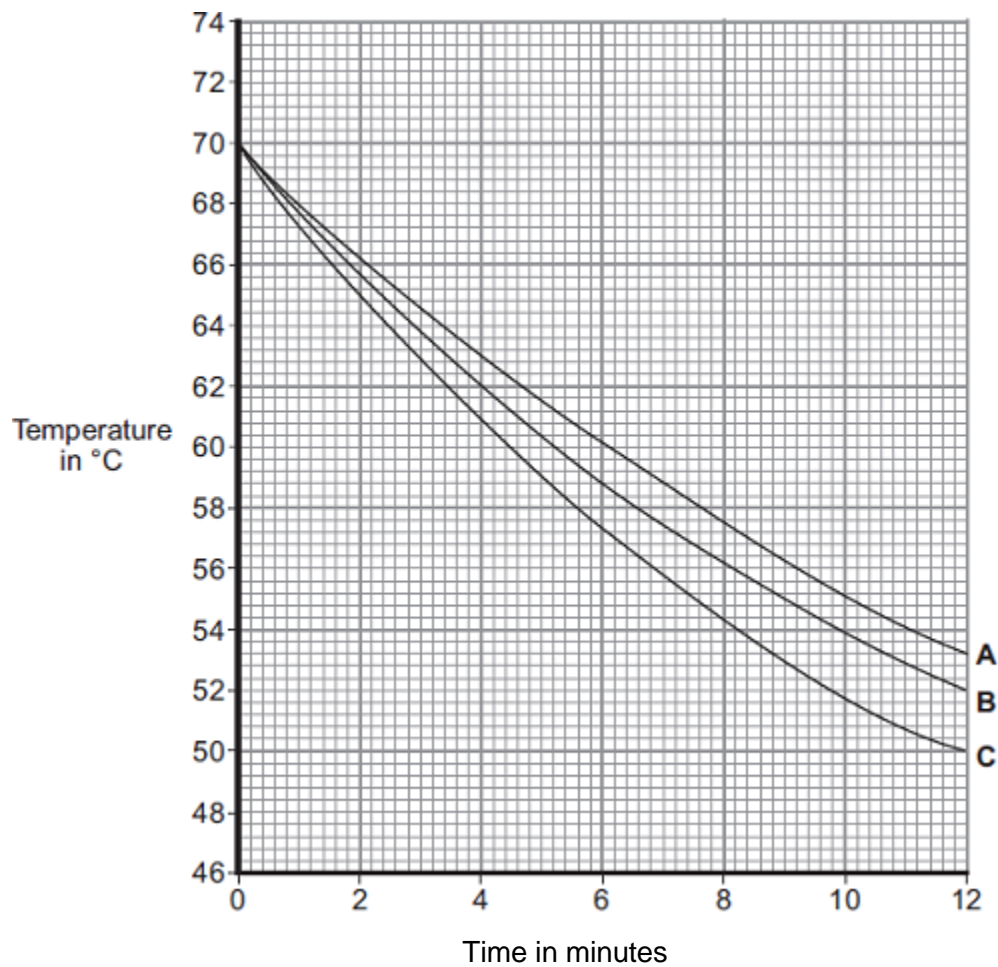


Energy is transferred from hot water in the cups to the surroundings.

- (a) 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.

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.

(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.

(1)

- (b) (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 J / kg°C.

Energy transferred = _____ J

(3)

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

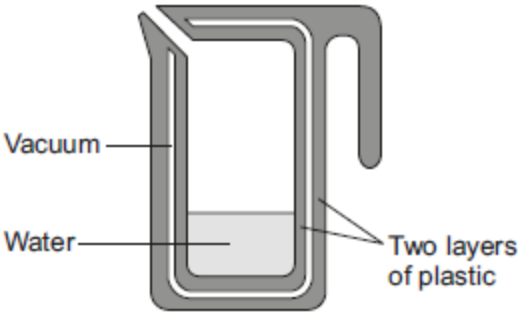
(4)

(Total 14 marks)

4.

A new design for a kettle is made from two layers of plastic separated by a vacuum. After the water in the kettle has boiled, the water stays hot for at least 2 hours.

The new kettle is shown below.



- (a) The energy transferred from the water in the kettle to the surroundings in 2 hours is 46 200 J.

The mass of water in the kettle is 0.50 kg.

The specific heat capacity of water is 4200 J/kg °C.

The initial temperature of the water is 100 °C.

Calculate the temperature of the water in the kettle after 2 hours.

Temperature after 2 hours = _____ °C

(3)

- (b) Calculate the average power output from the water in the kettle to the surroundings in 2 hours.

Average power output = _____ W

(2)

(Total 5 marks)