

Name:

Date:

P3 - Test 4  
PARTICLE MODEL OF MATTER  
Intermediate

**GCSE**

**PHYSICS**

**AQA - Triple Science**

Mark

Grade

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### Materials

For this paper you must have:

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

### Instructions

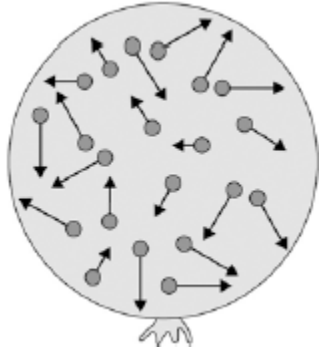
- Answer all questions
- Answer questions in the space provided
- All working must be shown

### Information

- The marks for the questions are shown in brackets

1.

The figure below shows a balloon filled with helium gas.



(a) Describe the movement of the particles of helium gas inside the balloon.

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(2)

(b) What name is given to the total kinetic energy and potential energy of all the particles of helium gas in the balloon?

Tick **one** box.

External energy	<input type="checkbox"/>
Internal energy	<input type="checkbox"/>
Movement energy	<input type="checkbox"/>

(1)

(c) Write down the equation which links density, mass and volume.

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(1)

(d) The helium in the balloon has a mass of 0.00254 kg.

The balloon has a volume of 0.0141 m<sup>3</sup>.

Calculate the density of helium. Choose the correct unit from the box.

<b>m<sup>3</sup> / kg</b>	<b>kg / m<sup>3</sup></b>	<b>kg m<sup>3</sup></b>
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Density = \_\_\_\_\_ Unit \_\_\_\_\_

**(3)**  
**(Total 7 marks)**

2.

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.

<p>Solids:</p> <ul style="list-style-type: none"><li>• have a fixed shape</li><li>• are difficult to compress (to squash).</li></ul> <p>Gases:</p> <ul style="list-style-type: none"><li>• will spread and fill the entire container</li><li>• are easy to compress (to squash).</li></ul>
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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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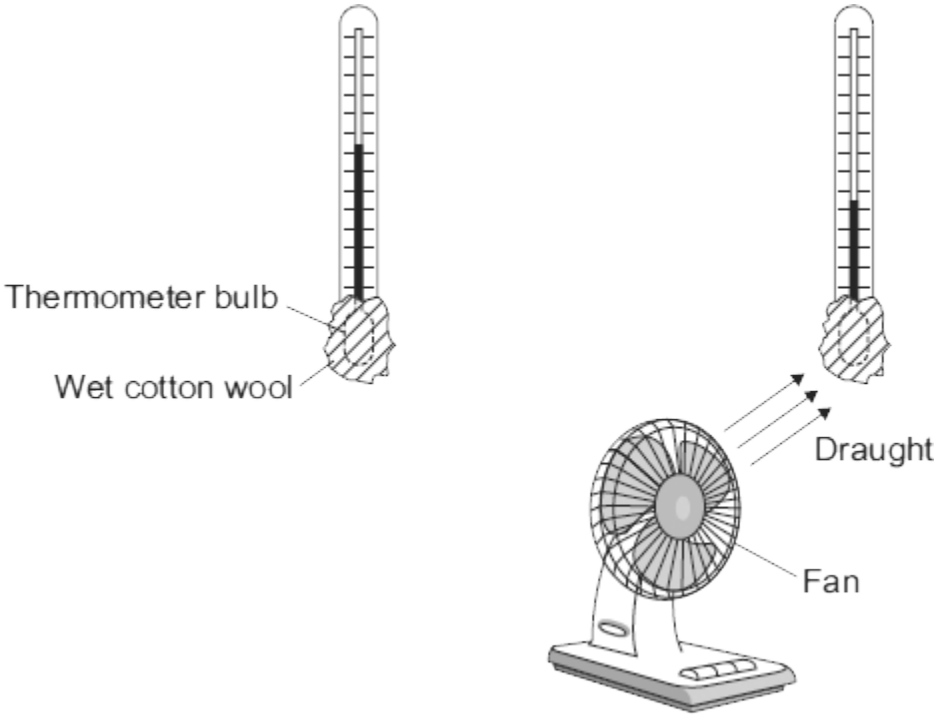
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Extra space \_\_\_\_\_  
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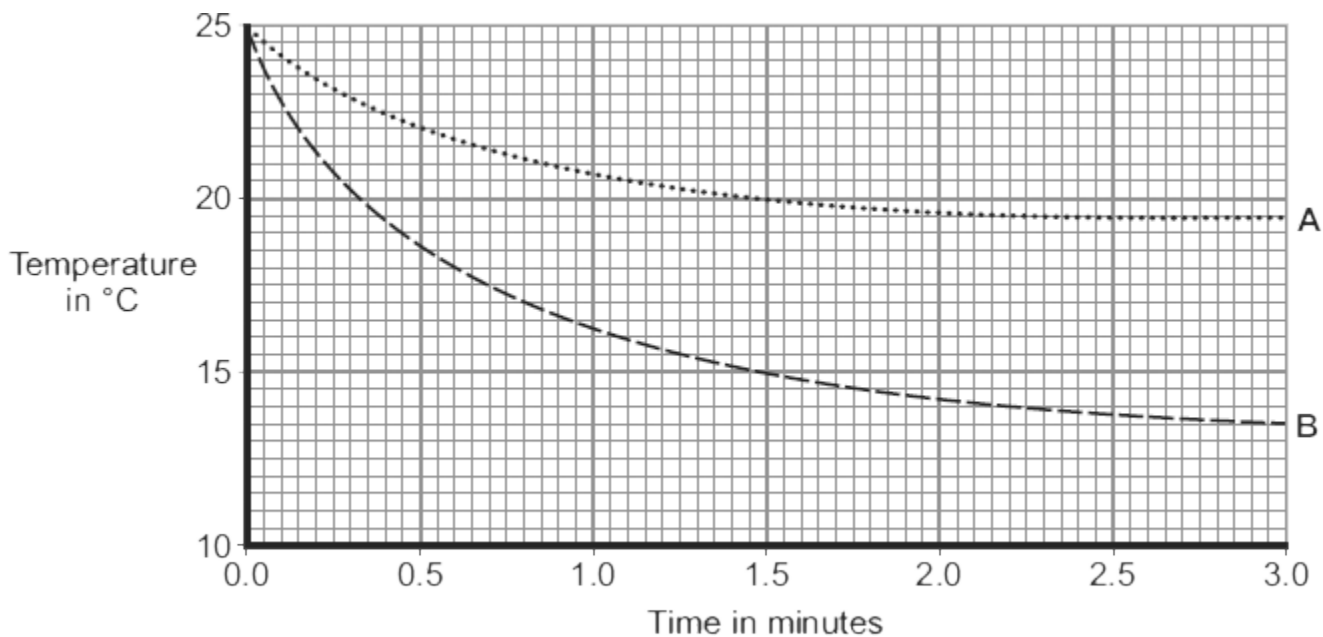
(Total 6 marks)

3.

The diagram shows two thermometers. The bulb of each thermometer is covered with a piece of wet cotton wool. One of the thermometers is placed in the draught from a fan.



The graph shows how the temperature of each thermometer changes with time.



- (a) Which of the graph lines, **A** or **B**, shows the temperature of the thermometer placed in the draught?

Write the correct answer in the box.

Explain, in terms of evaporation, the reason for your answer.

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(3)

- (b) A wet towel spread out and hung outside on a day without wind dries faster than an identical wet towel left rolled up in a plastic bag.

Explain why.

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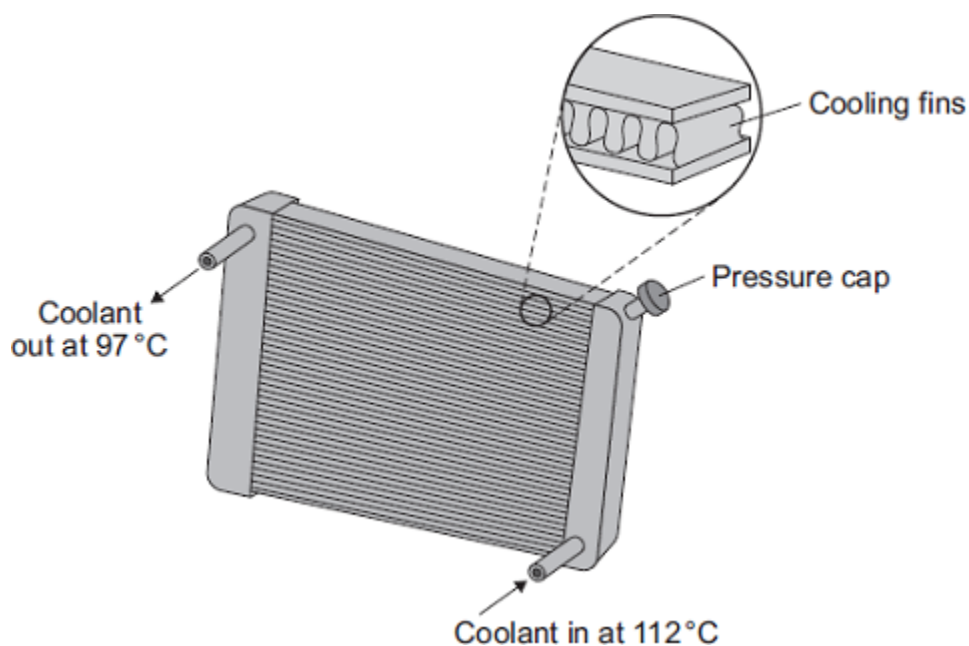
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(2)  
(Total 5 marks)

4.

The diagram shows a car radiator. The radiator is part of the engine cooling system.



Liquid coolant, heated by the car engine, enters the radiator. As the coolant passes through the radiator, the radiator transfers energy to the surroundings and the temperature of the coolant falls.

- (a) Why is the radiator painted black?

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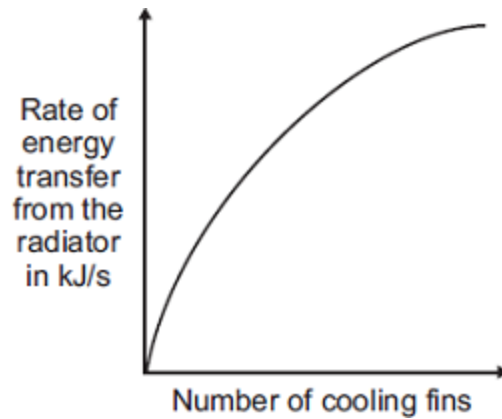
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(2)

- (b) Different radiators have different numbers of cooling fins along the length of the radiator.

The sketch graph shows how the number of cooling fins affects the rate of energy transfer from the radiator.



The number of cooling fins affects the rate of energy transfer from the radiator.

Explain how.

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(2)

- (c) When the car engine is working normally, 2 kg of coolant passes through the radiator each second. The temperature of the coolant falls from 112 °C to 97 °C.

Calculate the energy transferred each second from the coolant.

Specific heat capacity of the coolant = 3800 J/kg °C.

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Energy transferred each second = \_\_\_\_\_ J

(3)



- (d) On cold days, some of the energy transferred from a hot car engine is used to warm the air inside the car. This is a useful energy transfer.

What effect, if any, does this energy transfer have on the overall efficiency of the car engine?

Draw a ring around the correct answer.

**decreases the efficiency**

**does not change the efficiency**

**increases the efficiency**

Give a reason for your answer.

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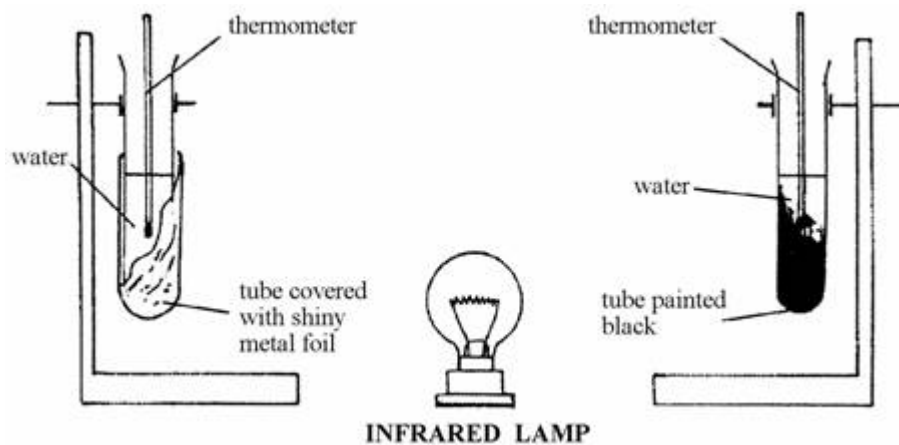
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(2)

(Total 9 marks)

5.

The diagram shows an experiment to find out what happens to infrared waves when they strike different surfaces.



- (a) The water in the black tube gets hotter than the water in the shiny tube. Choose words from the list to complete the sentences below.

**absorbs   conducts   convects   radiates   reflects**

The infrared lamp \_\_\_\_\_ energy to the tubes of water.

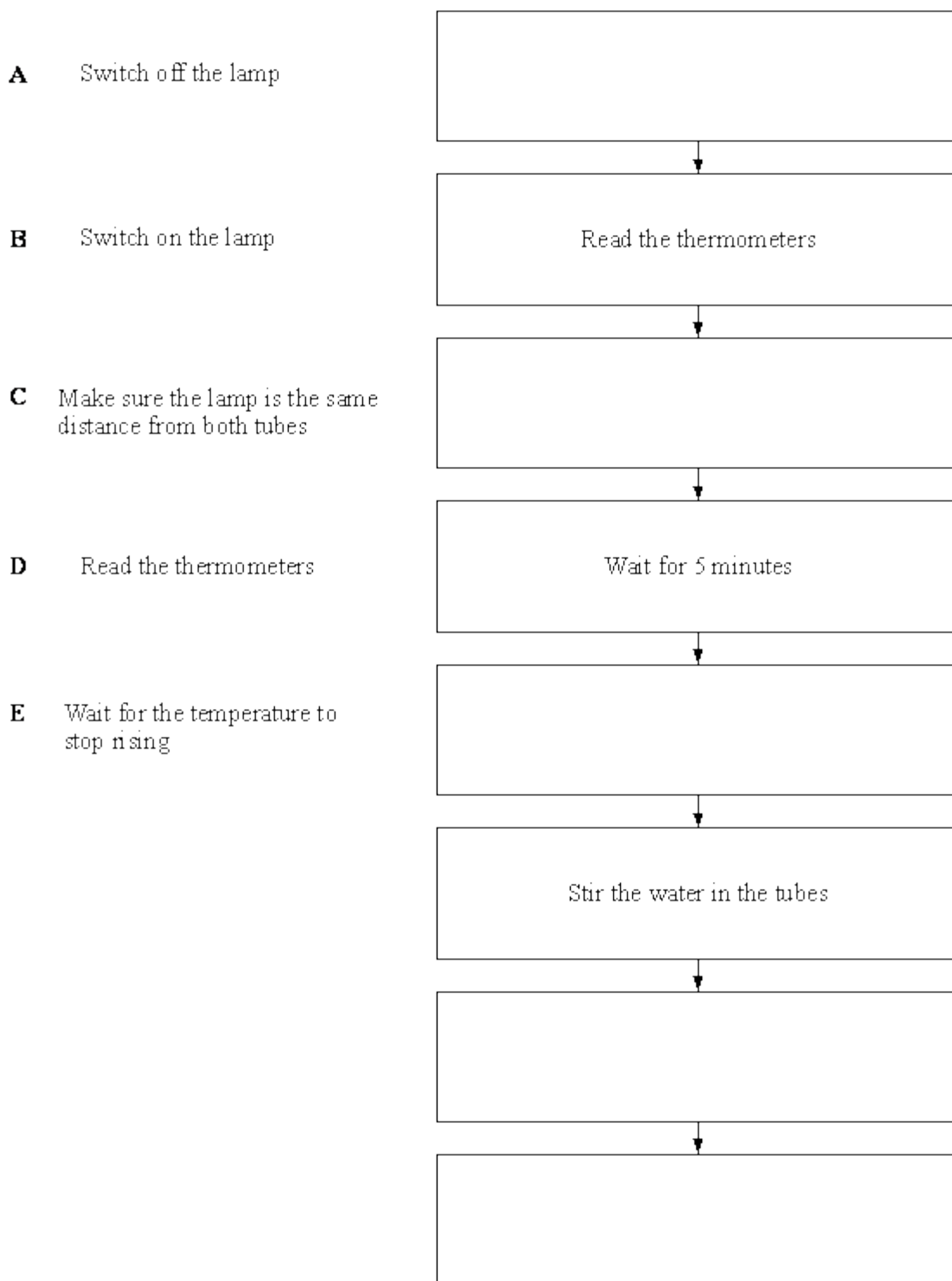
The black surface \_\_\_\_\_ most of the energy that reaches it.

The shiny surface \_\_\_\_\_ most of the energy that reaches it.

(3)

(b) Put the sentences A- E below into the correct boxes on the flow diagram so that they tell you how to do the experiment

(You may use just the letters if you want to.)



(5)  
(Total 8 marks)

6.

A wood burning stove is used to heat a room.



Photograph supplied by iStockphoto/Thinkstock

The fire in the stove uses wood as a fuel. The fire heats the matt black metal case of the stove.

(a) The air next to the stove is warmed by infrared radiation.

How does the design of the stove help to improve the rate of energy transfer by infrared radiation?

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(2)

- (b) Burning 1 kg of wood transfers 15 MJ of energy to the stove. The stove then transfers 13.5 MJ of energy to the room.

Calculate the efficiency of the stove.

Show clearly how you work out your answer.

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Efficiency = \_\_\_\_\_

(2)

- (c) Some of the energy from the burning wood is wasted as the hot gases leave the chimney and warm the air outside the house.

Name **one** other way energy is wasted by the stove.

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(1)

- (d) Some people heat their homes using electric heaters. Other people heat their homes using a wood burning stove.

Give **two** environmental advantages of using a wood burning stove to heat a home rather than heaters that use electricity generated from fossil fuels.

1. \_\_\_\_\_

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2. \_\_\_\_\_

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(2)

(e) The metal case of the stove gets hot when the fire is lit.

Here is some information about the stove.

Mass of metal case	100 kg
Starting temperature of metal case	20 °C
Final temperature of metal case	70 °C
Specific heat capacity of metal case	510 J/kg °C

Calculate the energy required to raise the temperature of the metal case to 70 °C.

Show clearly how you work out your answer and give the unit.

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Energy required = \_\_\_\_\_

**(3)**  
**(Total 10 marks)**