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	Bronze Level
Booklet	Question Paper

Time Allowed: **24 minutes**

Score: **/23**

Percentage: **/100**

Grade Boundaries:

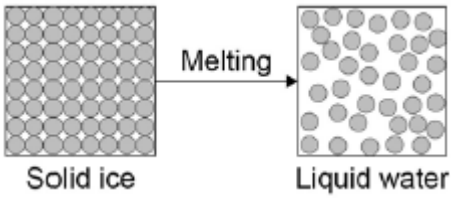
Q1.Figure 1 shows solid ice on a car's rear window.

Figure 1

The glass window contains an electrical heating element.

(a) Use the particle model in **Figure 2** to describe how the heating element causes the arrangement of the ice particles to change as the ice melts.

Figure 2



You should include a description of how the particles are arranged in the solid ice and in the water.

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(6)

(b) A car manufacturer tests different heating elements by measuring how long it takes ice to melt.

During the test some variables must be controlled.

Identify **two** control variables in the car manufacturer's test.

Tick **two** boxes.

The colour of the car	☐
The current in the heating element	☐
The mass of ice	☐
The size of the car	☐
The time taken for the ice to melt	☐

(2)

(c) Some of the energy supplied by the heater causes the ice to melt without the temperature of the ice increasing.

What is the name given to this energy supplied by the heater?

Tick **one** box.

Latent heat of freezing ☐

Latent heat of fusion ☐

Latent heat of vaporisation ☐

(1)

(d) When the heater is supplied with 120 J of energy each second, the internal energy of the ice increases by 45 J each second.

Use the following equation to calculate the efficiency of the heater.

$$\text{Efficiency} = \frac{\text{Output energy transfer}}{\text{input energy transfer}}$$

Give your answer to two decimal places.

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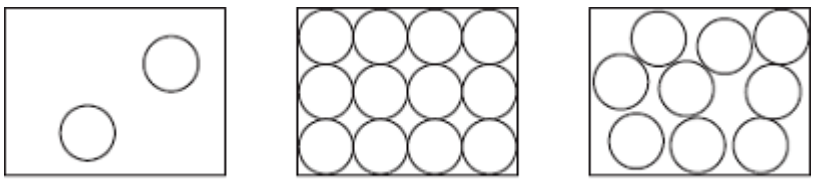
Efficiency = ...

(2)
(Total 11 marks)

Q2.(a) The diagrams, **X**, **Y** and **Z**, show how the particles are arranged in the three states of matter.



X **Y** **Z**

(i) Which **one** of the diagrams, **X**, **Y** or **Z**, shows the arrangement of particles in a liquid?

Write the correct answer in the box. ☐

(1)

(ii) Which **one** of the diagrams, **X**, **Y** or **Z**, shows the arrangement of particles in a gas?

Write the correct answer in the box. ☐

(1)

(b) Draw a ring around the correct answer in each box to complete each sentence.

(i) In a gas, the particles are

vibrating in fixed positions.
moving randomly.
not moving.

(1)

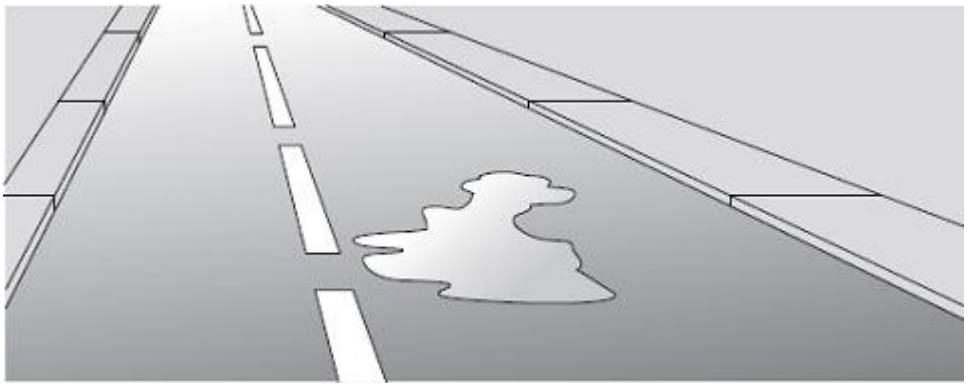
(ii) In a solid, the forces between the particles are

stronger than
equal to
weaker than

the forces between the particles in a liquid.

(1)

(c) The picture shows a puddle of water in a road, after a rain shower.



(i) During the day, the puddle of water dries up and disappears. This happens because the water particles move from the puddle into the air.

What process causes water particles to move from the puddle into the air?

Draw a ring around the correct answer.

condensation **evaporation** **radiation**

(1)

(ii) Describe **one** change in the weather which would cause the puddle of water to dry up faster.

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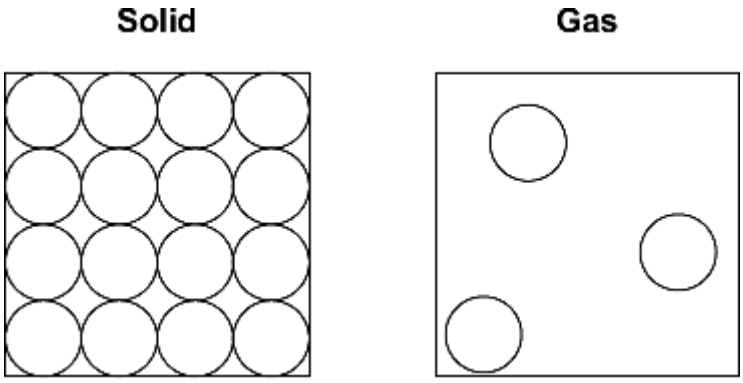
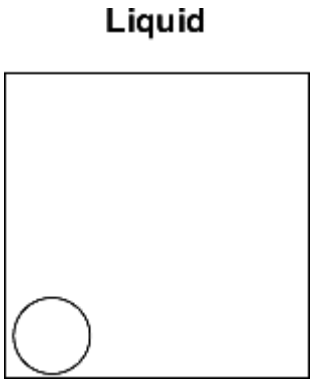
(1)
(Total 6 marks)

Q3. (a) The diagrams show the arrangement of the particles in a solid and in a gas.

Each circle represents one particle.



(i) Complete the diagram below to show the arrangement of the particles in a liquid.



(2)

(ii) Explain, in terms of the particles, why gases are easy to compress.

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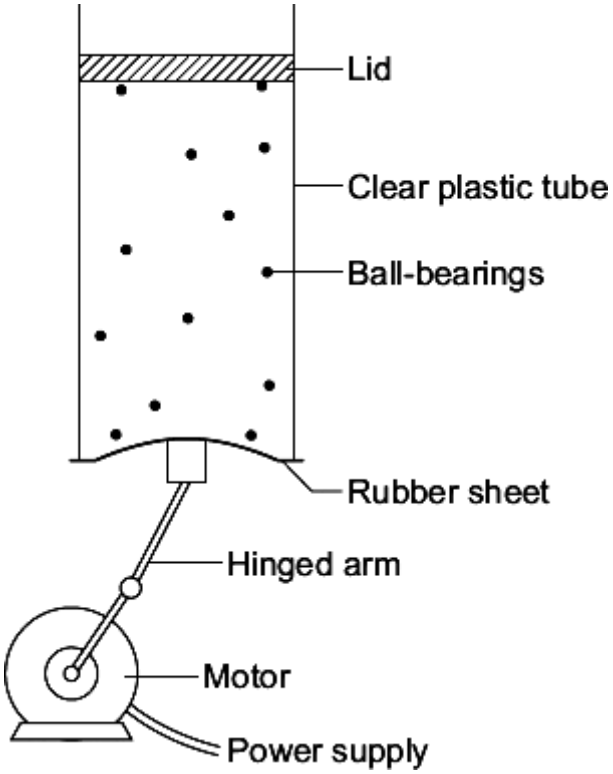
(2)

(b) The diagram below shows the model that a science teacher used to show her students that there is a link between the temperature of a gas and the speed of the gas particles.

The ball-bearings represent the gas particles. Switching the motor on makes the ball-bearings move around in all directions.



(i) How is the motion of the ball-bearings similar to the motion of the gas particles?

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(1)

(ii) The faster the motor runs, the faster the ball-bearings move. Increasing the speed of the motor is like increasing the temperature of a gas.

Use the model to predict what happens to the speed of the gas particles when the temperature of a gas is increased.

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(1)

(Total 6 marks)