

# Changes of State & Particle Model

## Mark Scheme

<b>Level</b>	GCSE (9-1)
<b>Subject</b>	Combined Science: Trilogy - Physics
<b>Exam Board</b>	AQA
<b>Topic</b>	6.3 Particle Model of Matter
<b>Sub-Topic</b>	Changes of State & Particle Model
<b>Difficulty Level</b>	Silver Level
<b>Booklet</b>	Mark Scheme

**Time Allowed:** 34 minutes

**Score:** /34

**Percentage:** /100

**Grade Boundaries:**

- M1.(a) solid**  
particles vibrate about fixed positions 1
- closely packed  
*accept regular* 1
- gas**  
particles move randomly  
*accept particles move faster*  
*accept freely for randomly* 1
- far apart 1
- (b) amount of energy required to change the state of a substance from liquid to gas (vapour) 1
- unit mass / 1 kg  
*dependent on first marking point* 1
- (c) 41000 **or**  $4.1 \times 10^4$  (J)  
*accept*  
*41400 or  $4.14 \times 10^4$*   
*correct substitution of*  
 *$0.018 \times 2.3 \times 10^6$  gains 1 mark* 2
- (d) **AB**

changing state from solid to liquid / melting

1

at steady temperature

*dependent on first **AB** mark*

1

**BC**

temperature of liquid rises

1

until it reaches boiling point

*dependent on first **BC** mark*

1

[12]

**M2.** Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also apply a 'best-fit' approach to the marking.

**0 marks**

No relevant content.

**Level 1 (1–2 marks)**

Considers either solid or gas and describes at least one aspect of the particles.

**or**

Considers both solids and gases and describes an aspect of each.

**Level 2 (3–4 marks)**

Considers both solids and gases and describes aspects of the particles.

**or**

Considers one state and describes aspects of the particles and explains at least one of the properties.

**or**

Considers both states and describes an aspect of the particles for both and explains a property for solids or gases.

### Level 3 (5–6 marks)

Considers both states of matter and describes the spacing and movement / forces between the particles. Explains a property of both solids and gases.

#### examples of the points made in the response

##### *extra information*

#### Solids

- (particles) close together
- (so) no room for particles to move closer (so hard to compress)
- vibrate about fixed point
- strong forces of attraction (at a distance)
- the forces become repulsive if the particles get closer
- particles strongly held together / not free to move around (shape is fixed)

*any explanation of a property must match with the given aspect(s) of the particles.*

#### Gases

- (particles) far apart
- space between particles (so easy to compress)
- move randomly
- negligible / no forces of attraction
- spread out in all directions (to fill the container)

[6]

M3.(a) conduction

*must be in correct order*

1

convection

1

(b) (i) 70

*accept  $\pm$  half a square  
(69.8 to 70.2)*

1

(ii) 15

*accept 14.6 to 15.4 for 2 marks  
allow for 1 mark 70 – 55*

*ecf from (b)(i)  $\pm$  half a square*

2

(iii) C

1

biggest drop in temperature during a given time

*accept it has the steepest gradient this is a dependent*

1

(iv) starting at 70 °C and below graph for C  
must be a curve up to at least 8 minutes

1

(v) because 20 °C is room temperature

*accept same temperature as surroundings*

1

(c) (i) 6720

*correct answer with or without working gains 3 marks*

*6 720 000 gains 2 marks*

*correct substitution of  $E = 0.2 \times 4200 \times 8$  gains 2 marks*

*correct substitution of  $E = 200 \times 4200 \times 8$  gains 1 mark*

3

(ii) the fastest particles have enough energy

*accept molecules for particles*

1

to escape from the surface of the water

1

therefore the mean energy of the remaining particles decreases

*accept speed for energy*

1

the lower the mean energy of particles the lower the temperature (of the water)

*accept speed for energy*

1

[16]