

## **Paper 1**

**Questions are applicable for both core and extended candidates**

- 1 Which statement about a solid, a liquid or a gas is correct?
- A A solid has a fixed shape and can be compressed.
  - B A liquid takes the shape of the container it is in and can be compressed.
  - C A solid has no fixed shape and cannot be compressed.
  - D A gas takes the shape of the container it is in and can be compressed.

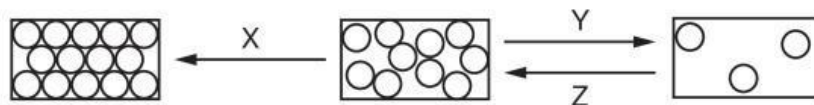
- 2 The arrangements of particles in solids, liquids and gases are different.

Which statement about the molecules in ice, water or steam is correct?

- A The H<sub>2</sub>O molecules are on average closest together in steam.
  - B The H<sub>2</sub>O molecules are on average furthest apart in water.
  - C The H<sub>2</sub>O molecules in steam have the second highest average velocity.
  - D The H<sub>2</sub>O molecules in ice are able to vibrate.
- 3 Which statement about liquids and gases is correct?
- A 1 cm<sup>3</sup> of gas contains more particles than 1 cm<sup>3</sup> of liquid.
  - B A given mass of liquid has a fixed volume at room temperature.
  - C Particles in a liquid can easily be forced closer together.
  - D Particles in a liquid have fixed positions.

- 4 The three rectangles show the arrangements of the particles in each of the three states of matter.

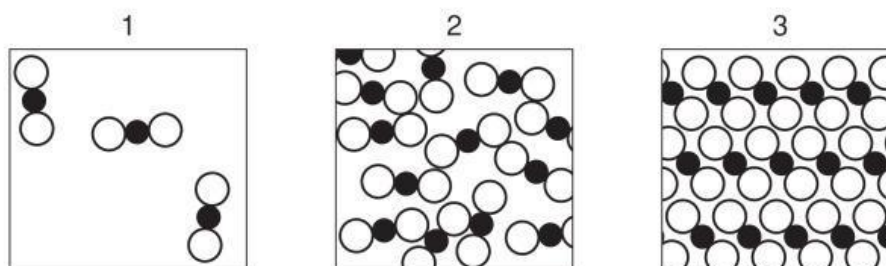
X, Y and Z represent the processes needed to change from one state to another.



What are the processes X, Y and Z?

|          | X           | Y           | Z           |
|----------|-------------|-------------|-------------|
| <b>A</b> | melting     | condensing  | evaporating |
| <b>B</b> | evaporating | melting     | freezing    |
| <b>C</b> | melting     | freezing    | condensing  |
| <b>D</b> | freezing    | evaporating | condensing  |

- 5 Diagrams of the three states of matter for carbon dioxide are shown.



Which two diagrams show the states of matter before and after the sublimation of carbon dioxide?

- A** 2 to 1      **B** 2 to 3      **C** 3 to 1      **D** 3 to 2

- 6 Which row describes the spacing and arrangement of particles in a solid, a liquid and a gas?

|          | solid                                 | liquid                                | gas                                  |
|----------|---------------------------------------|---------------------------------------|--------------------------------------|
| <b>A</b> | close together and randomly arranged  | close together and regularly arranged | far apart and randomly arranged      |
| <b>B</b> | close together and randomly arranged  | far apart and randomly arranged       | close together and randomly arranged |
| <b>C</b> | close together and regularly arranged | close together and randomly arranged  | far apart and randomly arranged      |
| <b>D</b> | close together and regularly arranged | close together and regularly arranged | close together and randomly arranged |

- 7 The melting points and boiling points of three elements, at 1 atm pressure, are shown.

|          | melting point<br>/°C | boiling point<br>/°C |
|----------|----------------------|----------------------|
| argon    | −189                 | −186                 |
| nitrogen | −210                 | −196                 |
| oxygen   | −218                 | −183                 |

Separate samples of argon, nitrogen and oxygen are stored at −200 °C and at 1 atm pressure.

How many samples are liquids?

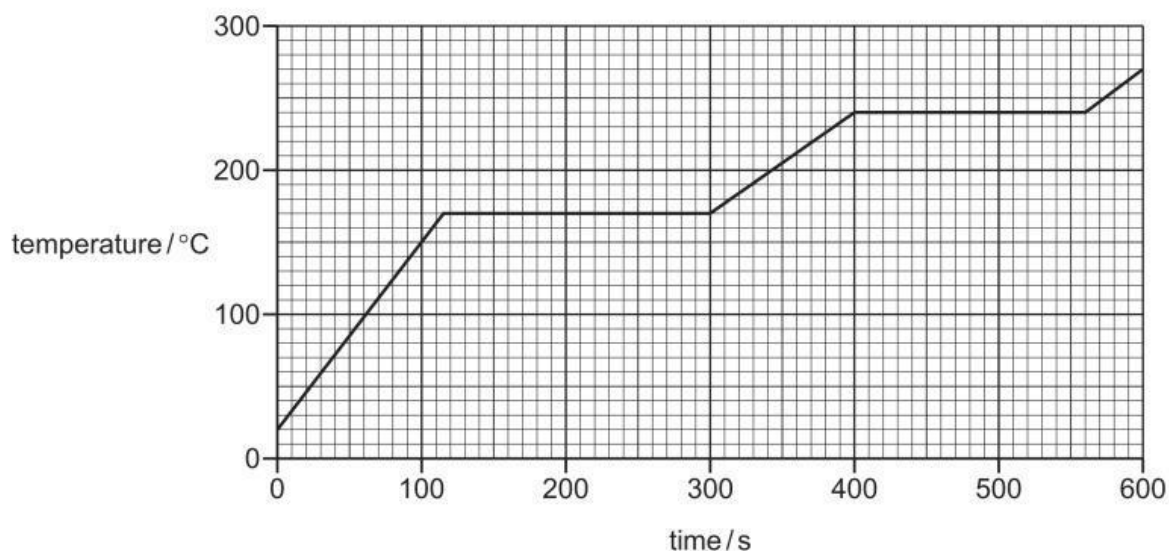
- A** 0                      **B** 1                      **C** 2                      **D** 3

**Paper 2**

Questions are applicable for both core and extended candidates  
unless indicated in the question

- 8 Solid X is heated for 600 seconds.

The graph shows the heating curve that is obtained. (extended only)



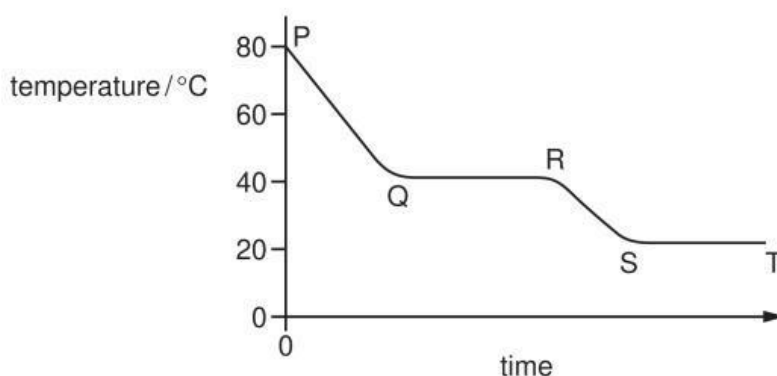
What is the melting point of X? (extended only)

- A 20 °C      B 170 °C      C 240 °C      D 270 °C

- 9 Substance M is a solid at 30 °C. (extended only)

The substance is heated to 80 °C and its temperature measured as it cools down to room temperature.

The cooling curve is shown.



Between which times is substance M freezing? (extended only)

- A P to Q      B Q to R      C R to S      D S to T

- 10 A gas is placed in a sealed container. The gas has a pressure of one atmosphere and a temperature of  $50^{\circ}\text{C}$ .

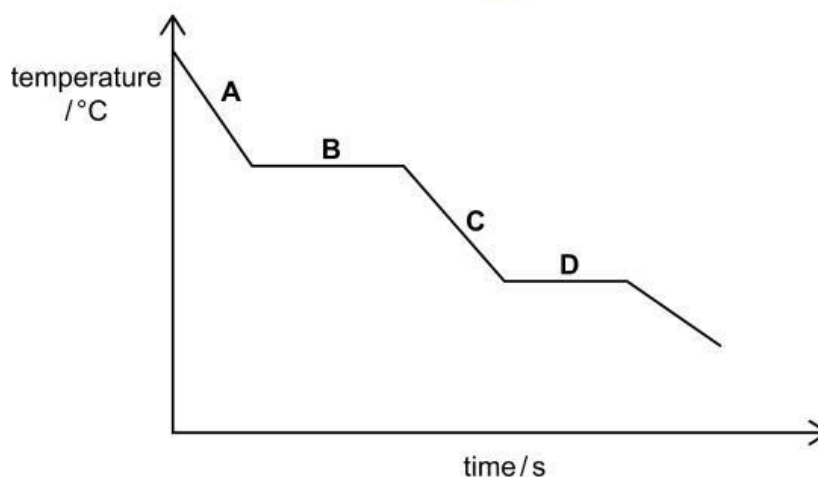
It is heated to  $100^{\circ}\text{C}$ .

Which row describes the cause of the pressure of the gas and the effect of increasing the temperature of the gas? **(extended only)**

|          | cause of gas pressure                              | the effect of increased temperature of the gas   |
|----------|----------------------------------------------------|--------------------------------------------------|
| <b>A</b> | collisions between gas particles                   | collisions become less frequent                  |
| <b>B</b> | collisions between gas particles                   | the average speed of the gas particles increases |
| <b>C</b> | collisions between gas particles and the container | collisions become less frequent                  |
| <b>D</b> | collisions between gas particles and the container | the average speed of the gas particles increases |

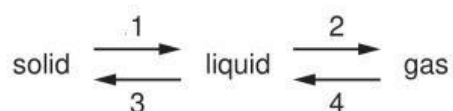
- 11 A gaseous substance is slowly cooled and the temperature recorded every second.

The results are shown on the graph. **(extended only)**



At which point is the substance a solid? **(extended only)**

- 12** The diagram shows the changes of state between a solid, a liquid and a gas.



In which changes of state is energy being given out?

- A** 1 and 2      **B** 1 and 4      **C** 2 and 3      **D** 3 and 4