

PHYSICAL SCIENCES

GR 10 RESOURCE

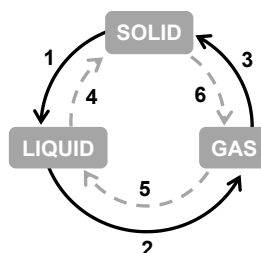


EXERCISE 1.4

QUESTION 1

The diagram alongside indicates different state/phase changes of matter.

- 1.1 Identify the state changes indicated by the numbers 1 to 6 on the diagram.
- 1.2 During which state changes will energy be released to the environment?
- 1.3 Which term is used for the heat that is absorbed or released during a state change?
- 1.4 Will energy be absorbed or released during winter when the snow on the mountains is melting? What influence will this change have on the environment?
- 1.5 For state change 5, determine whether each of the following properties of the particles will *increase*, *decrease* or *remain the same*:
 - 1.5.1 distance
 - 1.5.2 strength of the intermolecular forces

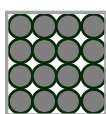


QUESTION 2

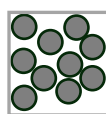
The table below shows the boiling and melting points of substances P to S.

Substance	Boiling point (°C)	Melting point (°C)
P	78	-117
Q	801	97,8
R	-34,7	-101
S	444,7	112,8

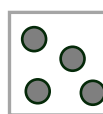
- 2.1 Define the term *boiling point*.
- 2.2 Use the table to write down the LETTER (P to S) that represents the substance which is a:
 - 2.2.1 liquid at 100°C
 - 2.2.2 solid at 100°C
 - 2.2.3 gas at 100°C
- 2.3 Describe what happens to the particles of substance R if it is heated from -40°C to 0°C.
- 2.4 Give the NUMBER (1 to 3) of the diagram below which represents the particle arrangement of substance P at 25°C?



1



2



3

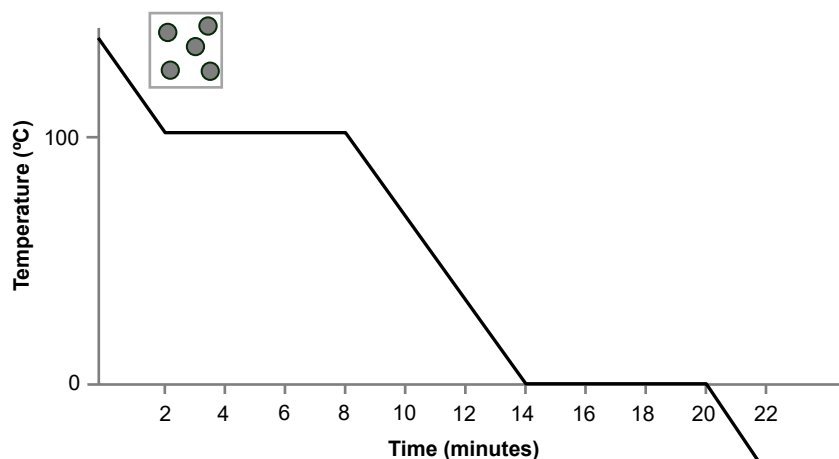
QUESTION 3

At atmospheric pressure the boiling point of propane is -42°C and the melting point is -188°C .

Write down the corresponding physical state of propane at the following temperatures: 0°C , -50°C , -200°C .

QUESTION 4

The graph below represents the cooling curve of water and illustrates how the initial physical state of water changes as the temperature decreases.



4.1 What is the condensation point of water.

4.2 Explain the shape of the graph between 2 and 8 minutes. Mention any changes that are taking place in terms of 1) the energy of and 2) the distance between the water molecules.

4.3 For the time interval 8 to 14 minutes:

4.3.1 explain why the temperature decreases during the time

4.3.2 explain the physical changes that are taking place in the water

4.4 What is the state of the water at a room temperature of 25°C ?

4.5 Explain why the temperature stays the same between 14 and 20 minutes.

4.6 Draw a simple diagram to represent the state of the water at:

4.6.1 16 min

4.6.2 22 min

EXERCISE ANSWERS

QUESTION 1

- 1.1 1: melting 2: evaporation 3: deposition
4: freezing 5: condensation 6: sublimation
- 1.2 during stages 3, 4, and 5 1.3 latent heat
- 1.4 absorbed; the day and night temperature of the environment will decrease,
it will become colder
- 1.5.1 decrease 1.5.2 increase

QUESTION 2

- 2.1 Boiling point is the temperature of a liquid at which its vapour pressure equals the external (atmospheric) pressure.
- 2.2.1 Q 2.2.2 S 2.2.3 P, R
- 2.3
- The liquid particles will gain kinetic energy (E_k) as the temperature increases from -40°C to $-34,7^{\circ}\text{C}$.
 - With further heating the temperature remains at $-34,7^{\circ}\text{C}$, and the average E_k of the particles remains the same, but the state of the substance changes from a liquid to a gas (the particles move further away from one another and their potential energy (E_p) increases.)
 - After the change of state, with further heating, the gas particles gain E_k and the temperature increases to 0°C .
- 2.3 diagram 2 (substance P melts at -117°C and only evaporates at 78°C)

QUESTION 3

- 0°C : gas -50°C : liquid -200°C : solid

QUESTION 4

- 4.1 100°C
- 4.2 Between 2 and 8 minutes a change of state from water vapour to liquid water takes place. The temperature remains the same and the graph is a horizontal line, parallel to the time-axis. 1) The average kinetic energy (E_k) of the water molecules remains the same and 2) the distance between the water molecules and the E_p decrease during this change of state.
- 4.3.1 The change of state is now complete and with further cooling, the speed and the average E_k of the particles decrease, therefore the temperature decreases.
- 4.3.2 The temperature and the average E_k of the water molecules decrease, the water molecules move more slowly, and come closer together, causing the water to contract slightly.
- 4.4 liquid
- 4.5 Between 14 and 20 minutes a change of state from liquid water to ice takes place. The temperature and the average speed and E_k of the particles remain the same. The heat transferred during a change of state is latent heat and is not displayed on a thermometer.

