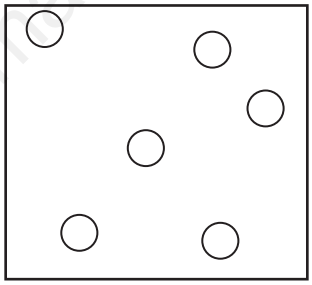
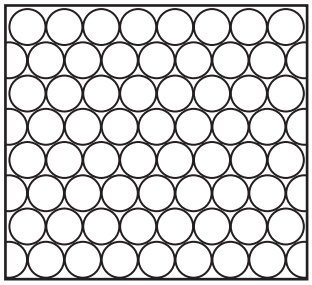
Stage 7 Subject: Chemistry

Topic : States of Matter-Set-1

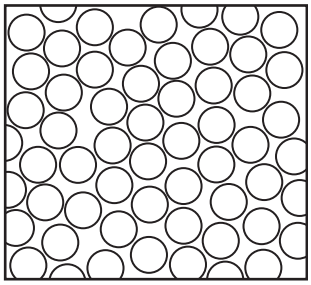
1 The diagram shows the arrangement of particles in the three different states of water.



A



B



C

Which of these diagrams, **A**, **B** or **C**, shows water in a solid state?

..... [1]

MARKING SCHEME:

(a) B [1]

2 Aluminium and gallium are in Group III of the Periodic Table.

(a) The heat from your hand is sufficient to melt gallium.
Describe the change in state from solid to liquid in terms of the kinetic particle theory.
In your answer include

- the difference in arrangement and closeness of the particles in a solid and a liquid,
- the difference in the motion of the particles in a solid and a liquid.

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..... [5]

MARKING SCHEME:

(a) Any four of: [4]

- **in solid, particles are arranged regularly (or are ordered)/ in a lattice**
- **in solid, particles are close together**
- **in solid, particles are not moving/only vibrate/ are in fixed position**
- **in liquid, particles randomly arranged/disordered/ have random motion**
- **in liquid, particles slide over each other/ move slowly**
- **in liquid, particles are close together**

IGNORE: particles are closer together

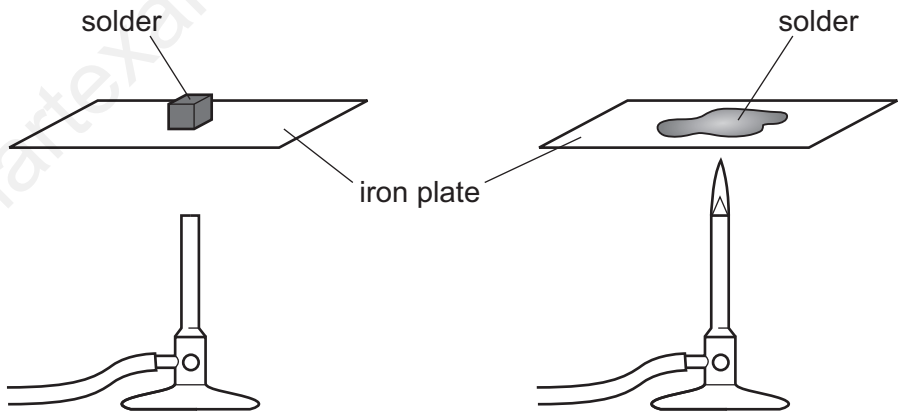
Any one of: [1]

- **during melting, particles become less ordered**
- **during melting, particles start moving/ move more/ move faster IGNORE: during melting, particles get further apart**

NOTE: there must be a reference to particles to score marks

3 Solder is an alloy of lead and tin.

(a) A student heated a piece of solder carefully.
The diagram shows what happens to the solder.



Use the kinetic particle theory to describe and explain what happens to the solder as it changes state.

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..... [4]

(b) When heated above 1744 °C, lead forms a vapour.

Describe a general property of a vapour (gas) which is not shown by a solid.

..... [1]

MARKING SCHEME:

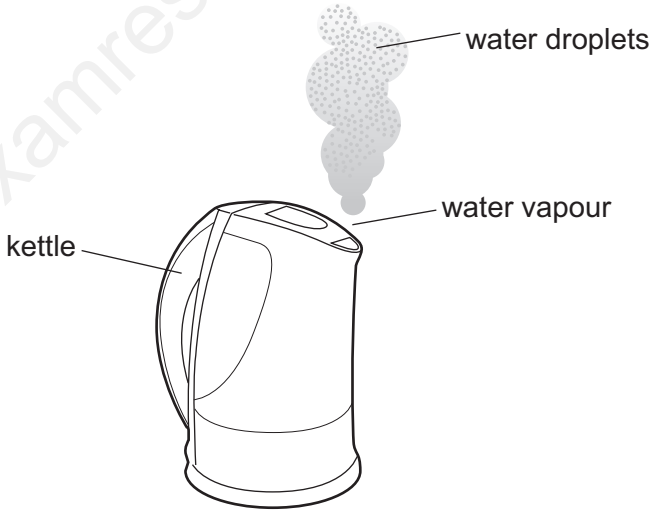
(a)any 4 from:

- **solder has melted;**
- **atoms in solid (only) vibrate;**
- **atoms in solid are regularly arranged/touching/ close to each other;**
- **atoms start to vibrate more;**
- **atoms in liquid are irregularly arranged/ close together/touching;**
- **atoms in liquids slide over each other/atoms in liquids move slowly;**
- **atoms move more during melting;**
- **atoms become less regularly arranged during melting;**

(b)vapour spreads everywhere/ vapour does not stay in one place;

Expert solution:
(a) As the solder changes state, it gets melted. The atoms in the solid are only able to vibrate as they are regularly arranged..
In the liquid solder, the atoms are irregularly arranged and are able to slide past over each other. During melting, the atoms are less regularly arranged and are able to move more
(b)The vapour spreads everywhere [or] The vapour does not stay in one place

4 The diagram shows a kettle of boiling water.



As the water vapour cools it turns back to water droplets.

(a) Describe this change of state in terms of the kinetic particle theory.
In your answer, include

- the difference in the closeness of the water molecules as the water vapour changes to water,
- the difference in the motion of the water molecules as the water vapour changes to water.

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..... [4]

MARKING SCHEME:

Any 4 of: [4]
in steam, molecules are far apart
in water, molecules are close together
in steam, molecules are moving very fast
in water, molecules are moving slowly / sliding over each other
in steam more randomness in arrangement of molecules
NOTE: molecules are further apart in steam (than in water) = 2 marks NOTE: molecules move faster in steam (than in water) = 2 marks NOTE: for molecules the word particles can be used
NOT: implication of particles 'apart' in liquids

5 **(a)** Use ideas about the movement and arrangement of particles to explain why:

- solids have a definite volume and shape,
- liquids have a definite volume but no definite shape,
- gases have no definite volume or shape.

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MARK SCHEME:

(a) Any four from: [4]
solids: particles close together/ no space between particles / particles arranged regularly / particles touching
solids: particles only vibrate
allow: particles cannot move/ particles in fixed positions
liquids particles can slide over each other/particles have limited movement
ignore: particles can move unqualified
liquids: particles close together/ particles not arranged regularly / particles arranged randomly / particles not in fixed positions
ignore: particles further apart than in solids
gases: particles far apart/ particles arranged randomly
gases: particles can move everywhere/ particles move anywhere/ particles move randomly
note: It must be clear which state is being referred to
note: there must be reference to particles (or atoms / molecules / ions) in the answer to gain marks

6 A student left a cube of ice on a plate in a warm room. The diagrams below show what happened to the ice.

at the start | after 10 minutes | after 30 minutes

(a) Describe and explain what happened to the ice. In your answer,

- describe and explain the change of state which occurs,
- explain this change using the kinetic particle theory.

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..... [5]

MARK SCHEME:

melting/ ice melts / ice goes from solid to liquid; any four from:

- **in solid particles regularly arranged;**
- **in solid particles arranged in fixed position / cannot move;**
- **particles in solid absorb energy;**
- **particles (in solid) vibrate more / particles start to move when heated;**
- **forces between particles (in solid) broken;**
- **particles in liquid slide over each other / move;**
- **particles in liquid not regularly arranged;**

Expert answer:

The change of state is melting. In solid ice, the particles are regularly arranged. They absorb energy and vibrate more when heated. This forces the particles in the solids apart and the forces between the particles is broken and the particles are no more regularly arranged when they turn into a liquid.