

# Particulate nature of matter

All matter is made up of mostly three types of particles namely: solids, liquids and gases

## Distinguishing properties of solids, liquids and gases:

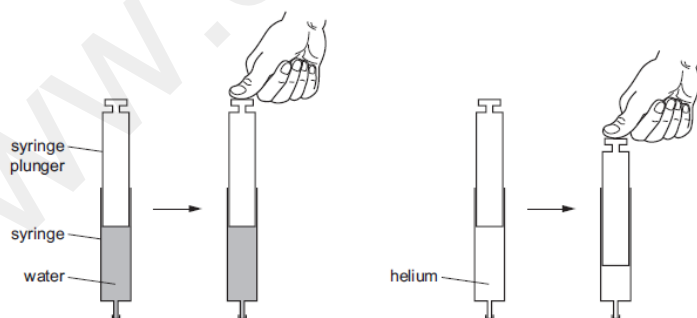
	Solids	Liquids	Gases
Arrangement	The particles in a solid are arranged in a fixed pattern	The particles in a liquid are not arranged in any fixed pattern	The particles in a gas are arranged in a random manner
Proximity	The particles of a solid are very close to each other	The particles in a liquid are close to each other	The particles of a gas are further apart from each other
Motion	The solid particles can only vibrate in their fixed( mean) positions	The liquid particles can slide past over each other	The gas particles are free to move everywhere rapidly

## Compressing gases:

Applying equal force on 2 syringes, one containing gas and the other containing liquid

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- 7 (a) A student took two identical syringes. He filled one with water and the other with helium gas and sealed the end of both syringes. He then pushed the syringe plungers with equal force. The diagram shows what happened.



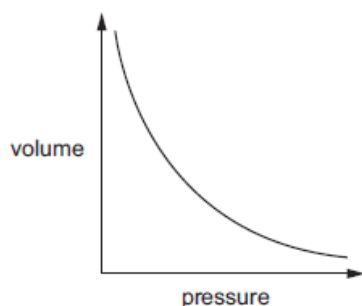
Describe and explain these results using ideas about particles in liquids and gases.

The gas particles are far apart, while the liquid particles are close to each other. When equal force is applied on the syringe plungers, the liquid does not get squeezed so the plunger does not move. But the gas gets compressed as the plunger is moved inwards as the gas

particles come closer. Hence the volume of the gas in the syringe decreases.

### Graph of the effect of increase in pressure on the volume of a gas

- 8 The graph shows how increasing the pressure at constant temperature changes the volume of a fixed mass of carbon dioxide gas.



#### Describing the graph:

The volume of the gas decreases rapidly at first, as the pressure on it is increased. Then the volume almost reaches a constant.

#### Describing the volume changes of the gas:

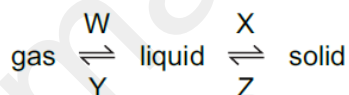
The gas molecules are squashed together and hit the walls of the container. They come closer and the volume of the gas decreases.

### Application based questions:

#### MCQ:

- 1 In which changes do the particles move further apart?

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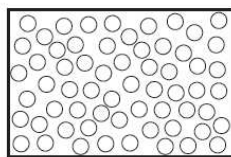
- A W and X      B W and Z      C X and Y      D Y and Z

- 1 In which substance are the particles close together and slowly moving past each other?

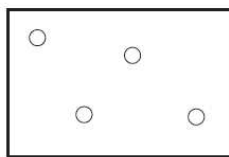
- A air  
B ice  
C steam  
D water

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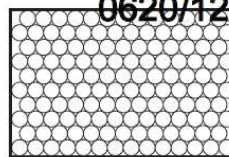
1 The diagrams show the arrangement of particles in three different physical states of substance X.



state 1



state 2



state 3

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Which statement about the physical states of substance X is correct?

- A Particles in state 1 vibrate about fixed positions.
- B State 1 changes to state 2 by diffusion.
- C State 2 changes directly to state 3 by condensation.
- D The substance in stage 3 has a fixed volume.

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1 In which change of state do the particles become more widely separated?

- A gas to liquid
- B gas to solid
- C liquid to gas
- D liquid to solid

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1 In which process do particles move closer together but remain in motion?

- A condensation
- B diffusion
- C evaporation
- D freezing

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