# States of matter

**There are three States of matter**

- **SOLID**
- **Liquid**
- **gas**

**Which state are substance is in depend upon how strong the forces of attraction are between its particle**

**The strength of these forces depends upon three things**

- **Type of material**
- **the temperature**
- **the pressure**

**The particles in material can be atoms, ions or molecules**

- **We can use the particle theory to explain how particles behave in solids liquids and in gases**
- **In this model we think of each particle as small solids sphere**

## Solid:

- **There are strong forces of attraction between the particles**
- **The particles are closed to each other in a fixed regular arrangement called lattice**
- **The particles vibrate about their fix positions but don't move**

- Solids have a definite shape and volume they do not flow like liquids
- When solids are heated the particles vibrate more and the solid expends slightly

## Liquids

- The forces of attraction between the particles are weaker than in solids
- The particles are closed together but not in a regular pattern
- they can move past Each Other freely which is why liquid flow
- Liquids have definite volume but no fixed shape, they take the shape of the container
- The particles move in random motion
- when the liquid is heated particles move faster so liquid expands likely

## Gases

- The forces of attraction between particles are very weak
- the particles are far apart and move freely in random directions
- Gases have no fixed shape or volume they fill in any container
- The particles move quickly in straight lines

- when heated they move even faster and either expand on their pressure increases

## Particle theory limitations

- Particle theory is useful but its not perfect
- The particles are not really solid spheres
- The model does not show forces between particle so we can't tell how strong they are

## Changes of state

- A substance can change from one state to another state these are called physical changes
- In physical changes the particles themselves do not change only their energy changes

Melting;

- When a solid is heated its particle gain more energy
- they vibrate faster weakening the forces holding them together
- At a certain temperature called the melting point the particles have enough energy to break free from their positions

This is melting and solid becomes a liquid

**Boiling/ Evaporation;**

- **When a liquid is heated the particles gain even more energy**
- **they move faster and break the bonds holding them together**
- **at the boiling point the particles have enough energy to escape into the air this is boiling or evaporating**

**The liquid becomes a gas**

**Condensing;**

- **When a gas cools the particles lose energy**
- **They move slowly and the forces of attraction pull them closer together**
- **when enough Bond form the gas turns into a liquid and this is called condencing**

**Freezing;**

- **When are liquid cools further The particles have less energy and they move less**
- **More bonds form between particles holding them in place**
- **at the freezing point so many bonds form that the substance becomes a solid again**

**Energy and the change of state**

**The amount of energy needed for a substance to change state depends on how strong the forces between its particle are**

**Strong forces means more energy needed and higher boiling point and melting point**
**State symbols in equations**
**in simple equation. state symbols show physical state of heat sub**
**Solid (s)**
**Liquid (l)**
**Gas (g)**
**Aqueous (aq)**

**Predicting the state of the substance**

- **you can predict the state of substance if you know it's melting and boiling points**
- **if the temperature is below the melting point the substance is a solid**
- **if the temperature is between melting and boiling point its a liquid**
- **if its above the boiling point it will be a gas**

**Physical changes are reversible**

- **When a substance changes state no new substances formed**
- **you can reverse the process by changing the temperature**

## MOCK SHEET QUESTIONS

## Name the three States of matter and the physical changes that occur between them

- there are three States of matter solid liquid and gas
- a solid can change into liquid when it is heated this process is called melting
- when a liquid cool down and becomes solid this process is called Freezing
- a liquid can also change into gas when it is heated Enough this process is called Boiling or evaporation
- when a gas schools down and turn back into a liquid this process is called condensing

## Describe the arrangement and movement of particles in different state of matter

- In solid the particles are very close to each other and are arranged in regular pattern
- they cannot move from their fix position but only vibrate about their fixed places
- because of this solid have a definite shape and fixed volume the forces between them are very strong which hold them tightly together

Do it from above notes for liquid and gas

**Use the information to predict the state of matter**

**You can  predict weather a substances solid liquid or gas at a certain temperature if you know it's melting and boiling point**

- **if a temperature is below the  melting point the substance is a solid**
- **if the temperature is between the melting point and boiling point the substances will liquid**
- **If the temperature is above the boiling point the substance is a gas**

**Ethanol melts at -114 degree Celsius and boils at 78 degree Celsius, at -150 degree Celsius it will be solid because its below the melting point**

**Describe the relative energies of particles in different states of matter**

- **The particles in a solid have the least amount of energy**
- **They only vibrate in their fixed positions and cannot move around**
- **The particles in dequates have more energy does in solids**
- **this extra energy allow them to move past Each Other which is while liquids can flow**

- the particles in gas have most energy they move very fast and are spread for apart so they can easily feel any container

**Explain why the movement and arrangement of particles changes during change of state**

- When substance is heated It's particle gain more energy
- this extra energy makes the particle move faster and push further apart which can weaken or break the forces holding them together
- for example when solid is heated its particles vibrate more until they break free from their fixed position, this is how it melts into a liquid
- when a liquid is heated further the particles moves so fast that they break away completely
- this is boiling and the liquid becomes a gas
- when a substance cools down the opposite happens the particles will lose energy and come close together the forces between them becomes stronger so a gas condenses into a liquid and a liquid freezes into a solid

**Explain why the energy of particles changes during changes of state**

**When a substance changes its state the energy of it particle also changes because energy is transferred as heat**

- **During heating particles gain energy from the heat**
- **during cooling particles lose energy to the surrounding**