Meden School Curriculum Planning							
Subject	Physics	**Year Group**	7	**Sequence No.**	4	**Topic**	Particles

Retrieval	Core Knowledge	Student Thinking
What do teachers need **retrieve** from students before they start teaching **new content**?	What **specific ambitious knowledge** do teachers need teach students in this sequence of learning?	What real life examples can be applied to this sequence of learning to **development of our students thinking, encouraging them to see the inequalities around them** and 'do something about them!'
KS2 States of Matter. Properties of solid, liquids and gases, changing state and temperature, including boiling points and melting points. Boiling point of water is 100oC and melting point is 0oC. Solids have a fixed shape and volume, liquids have a fixed volume but take the shape of the container, gases have no fixed volume or shape, they take the volume and shape of the container they are in. Temperature is a measure of how hot or cold something is.	**L1: States of matter.** All matter is made of **particles,** the particles are different for each substance. Matter comes in three different states: **solids, liquids and gases**. Some scientists say that there is a fourth state called **plasma** but this is really a **sub-set of gases**. Solids liquids and gases have different **physical properties** which is linked to how strongly the particles stick together. Solids and liquids have a fixed volume, gases have an infinite **volume**. The volume of a gas is stated as the volume of the container it is in. Solids have a definite shape and is not defined by its container, liquids and gases take the shape of the container. Solids usually have a high density; liquids have a medium density and gases have a low density. Density is a measure of the mass of an object compared to its volume. Solids and liquids are not easily compressed, gases are easy to compress. Solids don't flow but may appear to in their powdered form. Liquids and gases flow. **L2 Kinetic Theory of State Changes. Kinetic energy** is the name given to the **energy stored** in moving objects. Particles as always moving and so have kinetic energy. The particles in a material stay the same regardless of the state, only the arrangement of particles and the amount of energy they have are different. Solids have particles that are held tightly together, they have **strong forces of attraction** between the particles, Particles are held together in a fixed position in a very regular arrangement. The particles are not free to move which is why solids have a fixed shape. The particles are not stationary but vibrate about a fixed position. Solids are not **compressible** because the particles are already closely packed together. Solids are dense because there are a lot of particles in a small volume. Liquids have some **forces of attraction** between particles, the particles are close together but are free to move, this explains why liquids have a fixed volume but variable shape. It also explains why liquids cannot be compressed. Liquids flow because particles are free to move. Liquids are usually less dense than solids. Gases have very **weak forces of attraction** or none. The parts are not touching and are free to move. The particles are moving very quickly and in random directions. Gases are **compressible** because of the spaces between particles. Gases do not have a fixed volume or shape because the particles are moving all of the time. **L3/4 Expansion and Contraction.** Materials expand when heated because particles gain energy and move more. Solids expand when particles vibrate more, or liquids and gases move more. An increase in temperature means	When Britain enjoys a summer heatwave, **rails** in direct sunshine can be as much as

	the particles move around more and so the spaces between the particles increase. If you heat a gas or liquid inside a closed container the pressure will increase. Material expansion is a problem for material scientists and engineers. Contraction due to cooling also needs to be factored into engineering designs. **L5 Density; Density** is a measure of how many particles are present per **unit volume**. The regular arrangement of solid particles mean that solids are usually the denser material. Objects will only float is they are less dense than water. You can change the density of an object by hollowing it out, this means the volume stays the same but the mass goes down. **L6 Ice.** Water is one of a few special materials that expands when it freezes. The water particles line up in such a way as occupying more space. This only happens at freezing point. Liquid water does not expand as it cools. The expansion means there are less particles per unit volume in ice than in liquid water which means ice is less dense than water. **L7 Brownian Motion:** In 1827 a scientist called Robert Brown noticed that pollen grains, in a water droplet, he was observing under a microscope seemed to move about randomly. He concluded that there must be smaller, invisible particles colliding with the pollen grains causing them to move. The random movement of particles suspended in a liquid, or a gas is called **Brownian motion**. Large, heavy particles can be moved by collisions of smaller, lighter molecules. **L8 Movement of Gases. Gas pressure** is due to the **collision** of gas particles with a surface. More collisions mean a higher **pressure**. There are three ways to increase the pressure of a gas: 1 add more gas so that there are more collisions, 2 Heat the gas so that the particles are moving quicker which means more and harder collisions or 3 squash a gas into a smaller volume. **L9 Diffusion. Diffusion** is the random spread out of particles, this means it can only happen in liquids and gases as these have particles that are free to move. Diffusion happens between areas of high particle concentration and areas of low particle concentrate. The net movement of particles stop when the particles are evenly distributed. **L10 revision** **L11 EOTT** **L12 GPA**	20°C hotter than air temperature. Because **rails** are made from steel, they expand as they get hotter, and can start to curve this is known as 'buckling'. Most of the network can operate when **track** temperatures heat up to 46°C – roughly equivalent to air temperature of around 30°C – but **rails** have been recorded at temperatures as high as 51°C. Why do water pipes split in frozen?