Materials and Matter (Chemistry)

Year 2

End Points:

- Everyday materials include wood, metal, plastic, glass, brick, rock, paper and cardboard.
- Every material has its own properties – these can include being hard, soft, opaque, shiny, bendy.
- Materials are used for a purpose depending on their properties.
- Inventors need to think about the best materials to use for their inventions.
- Scientists use a microscope to look closely at very small things.
- Sometimes, materials look very different when we look at using a microscope.
- Everything around us is made from tiny building blocks we cannot see called particles.
- Solids have a definite shape.
- The shape of some solids can be changed by squashing, bending, twisting and stretching.
- The particles in a solid are tightly packed together and have a strong bond.
- Liquids can be poured.
- The shape of a liquid depends on the container it is being held in.
- Water can be a solid and can also be a liquid.

This unit builds on directly from Year 1 – Materials and Magnets. In Year One, pupils learned about the names of everyday materials. They began to consider simple properties of everyday materials and learned about John Dunlop and his work on developing a suitable material for wheels. This unit offers another opportunity to reinforce the names and uses of every day materials, developing the conceptual understanding that all materials are used for a purpose based on their properties. In this unit, building on their knowledge of John Dunlop and his work, pupils will study George de Mestral and will find out how he developed Velcro after noticing how the shape of burdock seeds allowed them to grip onto his clothes and his dog's fur whilst out walking. Pupils will learn how he needed to test the properties of materials in order to find something suitable for his invention. They will look at images of Velcro under a microscope.

Building on their understanding of materials and their properties, pupils will be introduced to the idea that everything we can see is made from many tiny things we cannot see, called atoms. The reason this lesson has been included here is to plant a seed of understanding for pupils that will be useful later in their science education when they study atoms more closely. They will learn that scientists cannot see atoms using a microscope, but that scientists long ago saw strange movements when looking at coal dust and pollen grains under a microscope, and they developed a theory that helped them explain what they saw. This is important disciplinary knowledge that will help children to think scientifically. They will learn that scientists use microscopes to look closely at things our eyes cannot see, but that scientists know there are even smaller things that microscopes cannot see.

Moving on from the understanding that atoms are tiny building blocks that everything around us is made from, children will study how we can change solid objects through actions such as bending, twisting and squeezing. In this lesson, we recommend explaining that the atoms within solids have strong bonds that enable the object to hold its shape. This may be something pupils have a fuller understanding of later in the curriculum, but again we are planting a seed and providing challenge for those who are ready for it. Pupils will look at the properties of solids, recognising that the shape of some, but not all, solids can be changed.

To offer a comparison with solids and how we can, or cannot, change their shape, pupils will then study the properties of liquids. This lesson has been included to extend children's knowledge of matter beyond solids. They will learn more about solids, liquids and gases in Year 4. This lesson pre-teaches some of the knowledge required for that unit creating some background knowledge for children to draw upon later in the curriculum. Pupils will learn that it is difficult for us to hold a liquid in our hands. The atoms in a liquid still maintain bonds between each other, but the bonds are much weaker than in a solid. The weaker bonds between the atoms allow them to move around. This means that liquids can be poured, and liquids take on the shape of the container they are placed into.

Finally, as an assessment task, pupils will design a garden area for their school with a water feature. This builds on from the assessment in Year 1 they completed; designing a playground. This task has been designed to encourage children to think about materials and their properties and also how solids and liquids behave. Their knowledge will be built upon in Year 4 when they study the Water Cycle.

Lesson Sequencing:

In lesson one, children will learn that materials have specific uses based on their properties, looking specifically at everyday materials they will be familiar with. This knowledge will be built upon in lesson two when they look at how George de Mestral created Velcro. In lesson three, children will learn that everything is made up from particles and that scientists use microscopes to study materials. Lesson four will explore solids, how the particles in them are structured and how they can sometimes be manipulated. Lesson five will build on this knowledge by looking at the structure of liquids. In the assessment lesson, pupils will apply the knowledge learnt to design a garden for their school.

Misconceptions:

- A materials is only used for building, clothing or stationery.
- The word rock is an object rather than a material.
- Solid is another word for hard.
- Solids made of small pieces that can be poured are liquids.

Working Scientifically criteria met in this unit:

- Asking simple questions and recognising that they can be answered in different ways
- Observing closely, using simple equipment
- Performing simple tests
- Identifying and classifying
- Using their observations and ideas to suggest answers to questions
- Gathering and recording data to help in answering questions