

Ashtree Primary School and Nursery Medium Term Plan for Science

Year 4 Spring Term – Materials Unit – States of Matter

Prior Knowledge – Y3 Rocks and Soils

- Step 1** - understand that there are **rocks** under the Earth's surface
- Step 2** - observe the **characteristics** of a variety of rocks
name and describe the characteristics of several rocks
classify rocks from the evidence of investigations
- Step 3** - explain that different types of rock react differently to physical forces (e.g. water, rubbing)
explain that rocks are used for different purposes dependent on their physical properties
- Step 4** - identify **fossils** in rocks
explain why we do not see the soft parts of animals in fossils
- Step 5** - recognise that soil is a mixture of different materials and living things
recognise that soil contains dead plants and animals
- Step 6** - recognise that there is rock under all surfaces and that soils come from rocks

Prior Skills – beginning to make systematic and careful observation, sets up simple practical enquiries, comparative and fair tests with support, asks relevant questions and uses, with support, different types of scientific enquiries to answer them, **with support, records and presents findings using drawings, labelled diagrams, keys, tally charts, Carroll diagrams, Venn diagrams, bar charts and tables, reports on findings from enquiries, in simple scientific language, using oral and written explanations, Using model frames for support, gathers and records data in a variety of ways to help in answering questions**, begins to make decisions about what observations to make and how long to make them for, with help, looks for changes, patterns, and relationships in their data

Key Vocabulary - Water, air, ice, milk, lemonade, juice, metal, solid, liquid, gas, pour, flow, change shape, squash, heat, cool, grain/granular, temperature, thermometer, freeze, melt, boil, evaporate, condense, steam, smoke, sea water, properties, melting point, degrees Celsius,

Key Knowledge

- Step 1 - name some **solids and liquids**, state that air is a **gas**
- Step 2 - state some differences between **solids, liquids and gases**
- Step 3 - recognise everyday substances as mixtures of **solids, liquids and/or gases**
- Step 4 - recognise that **air is a material** and that it is one of a range of gases which have important uses, recognise that gases flow from place to place, know that **gases** can be easily **compressed**, recognise that for a substance to be detected by smell, some of it must be in the **gas state**
- Step 5 - describe the differences between solids and liquids, compares simple solids and liquids (e.g. in terms of ease of squashing or pouring)
- Step 6 - observe what happens to a variety of **materials** when they are **heated** (e.g. chocolate, ice cream, butter, water)
- Step 7 - identify a wide range of contexts in which **changes of state** take place, describe a few examples where these changes occur
- Step 8 - state that **ice, water and steam** are the same material, identify the processes of **melting, freezing, evaporation and condensation**,
- Step 9 - describe what happens to water when it is heated and cooled, recognise that these **processes can be reversed**
- Step 10 - describe how when ice melts it turns to liquid and how when water freezes it becomes ice, describe how these **processes can be reversed**
- Step 11 - describe how **liquids evaporate** to form gases and how **gases condense** to form liquids
- Step 12 - sequence the changes that happen in **the water cycle**, describe the water cycle in terms of these processes
- Step 13 - explain the relationship between liquids and solids in terms of melting and freezing, explain the relationship between liquids and gases in terms of **evaporation and condensation**
- Step 14 - know that **temperature** can affect the rate of evaporation or condensation, describe the effect of temperature on evaporation, explain how changing conditions affects processes such as evaporation and condensation, identify a range of contexts in which changes take place (e.g. evaporation of puddles in the school playground or from clothes on a washing line, condensation in the bathroom)

Key Skills

- Step 1 - asks relevant questions and uses different types of scientific enquiries to answer them
- Step 2 - makes systematic and careful observation
- Step 3 - uses observable and other criteria to group, sort and classify in different ways
- Step 4 - makes systematic and careful observation
- Step 5 - identifies differences, similarities or changes related to simple scientific ideas and processes
- Step 6 - makes systematic and careful observation
- Step 7 - asks relevant questions and uses different types of scientific enquiries to answer them
- Step 8 - sets up simple practical enquiries, comparative and fair tests
- Step 9 - makes decisions about what observations to make and how long to make them for
- Step 10 - makes decisions about what observations to make and how long to make them for
- Step 11 - records and presents findings using drawings, labelled diagrams, keys
- Step 12 - records and presents findings using drawings, labelled diagrams, keys
- Step 13 - uses straightforward scientific evidence to answer questions or to support their findings
- Step 14 - sets up simple practical enquiries, comparative and fair tests

Curriculum Enhancements

Have a range of materials in class.

Create the water cycle in a zip lock bag



Suggested Activities

Step 1 - Observe closely and classify a range of solids. Observe closely and classify a range of liquids.

Step 2 - Classify materials according to whether they are solids, liquids and gases.

Step 3 – use a hoop Venn diagram on the floor to sort materials into whether they are solid, liquid or gas.

Step 4 - Explore making gases visible e.g. squeezing sponges under water to see bubbles, and showing their effect e.g. using straws to blow objects, trees moving in the wind.

Step 5 – Compare the differences not only between solids and liquids but also between different solids and different liquids.

Step 6 - Observe a range of materials melting e.g. ice, chocolate, butter.

Step 7 – List where we see different changes of state in every day life – cooking, weather, summer, etc

Step 8 - Observe water evaporating and condensing e.g. on cups of icy water and hot water.

Step 9 - Observe water evaporating and condensing e.g. on cups of icy water and hot water.

Step 10 - Investigate how to melt ice more quickly.

Step 11 – Create a diagram to show either evaporation or condensation.

Step 12 - Use secondary sources to find out about the water cycle.

Step 13 - Investigate the melting point of different materials e.g. ice, margarine, butter and chocolate.

Step 14 - Use a thermometer to measure temperatures e.g. icy water (melting), tap water, hot water, boiling water (demonstration).

Step 14 - Set up investigations to explore changing the rate of evaporation e.g. washing, puddles, handprints on paper towels, liquids in containers.

Possible Misconceptions Some children may think:

- 'solid' is another word for hard or opaque
- solids are hard and cannot break or change shape easily and are often in one piece
- substances made of very small particles like sugar or sand cannot be solids
- particles in liquids are further apart than in solids and they take up more space
- when air is pumped into balloons, they become lighter
- water in different forms – steam, water, ice – are all different substances
- all liquids boil at the same temperature as water (100 degrees)
- melting, as a change of state, is the same as dissolving
- steam is visible water vapour (only the condensing water droplets can be seen)
- clouds are made of water vapour or steam
- the substance on windows etc. is condensation rather than water
- the changing states of water (illustrated by the water cycle) are irreversible
- evaporating or boiling water makes it vanish
- evaporation is when the Sun sucks up the water, or when water is absorbed into a surface/material.

This will lead to . . . Y5 – Change of State

Step 1 - observe and explore the properties of materials (e.g. **hardness, transparency, magnetism, electrical and thermal conductivity**), suggest why particular materials are used for different jobs depending on their properties

Step 2 - identify some materials that are good **thermal insulators** and some everyday uses of these

Step 3 - recognise that metals are both good **thermal** and good **electrical conductors**

Step 4 - name some materials that will and some that will not **dissolve** in water, recognise that salt or sugar dissolves in water but sand won't

Step 5 - describe **melting** and **dissolving** and give everyday examples of each

Step 6 - identify and explore factors that affect the rate at which a **solid dissolves**

Step 7 - recognise that an **undissolved** solid can be separated from a liquid by **filtering**, describe the properties of mixtures which can be separated by filtration

Step 8 - recognise that a solid can be recovered from a solution by **evaporation**, explain that when solids **dissolve** they break up so small they can pass through the holes in the filter paper

Step 9 - describe some methods that are used to separate simple **mixtures**, use knowledge about how a specific mixture can be separated to suggest ways in which other similar mixtures might be separated

Step 10 - recognise that **dissolving** is a **reversible** change, recognise that some changes can be reversed and some cannot, recognise that changes of state are reversible

Step 11 - observe and explore a variety of chemical changes (e.g. burning), identify whether some changes are **reversible** or not

Step 12 - classify some changes as **reversible** (e.g. *dissolving*) and others as **irreversible** (e.g. *burning*)

Step 13 - recognise that **irreversible** changes often make new and useful **materials**, explain that in some cases the new materials made are gases and identify some evidence for the production of gases (e.g. vigorous bubbling)