Ashtree Primary School and Nursery Medium Term Plan for Science

Year 5 Spring Term – Materials Unit – Properties of Materials

Prior Knowledge – Y4 States of Matter

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)

Prior Skills – asks relevant questions and uses different types of scientific enquiries to answer them, makes systematic and careful observation, uses observable and other criteria to group, sort and classify in different ways, identifies differences, similarities or changes related to simple scientific ideas and processes, asks relevant questions and uses different types of scientific enquiries to answer them, sets up simple practical enquiries, comparative and fair tests, makes decisions about what observations to make and how long to make them for, records and presents findings using drawings, labelled diagrams, keys
uses straightforward scientific evidence to answer questions or to support their findings

Key Vocabulary - Hardness, solubility, transparency, conductivity, thermal, insulation, dissolve, solution, separation, polymers, reversible, irreversible, evaporating, melting, evaporation, filtering, sieving, , dissolving, burning, rusting, vinegar, bicarbonate of soda, magnetism, insulators, conductors, soluble, insoluble

Key Knowledge

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)

Key Skills

Step 1 - uses their scientific experiences to explore ideas and raise different types of questions
Step 2 - beginning to select and **plan different types of scientific enquiries to answer question**
Step 3 - beginning to recognise the applications of specific scientific ideas
Step 4 - makes decisions about what observations to make, what measurements to use, how long to make them for and whether to repeat them
Step 5 - beginning to recognise the applications of specific scientific ideas
Step 6 - beginning to select and **plan different types of scientific enquiries to answer question**
Step 7 - reports on findings from enquiries, using relevant scientific language and conventions**,**
Step 8 - reports on findings from enquiries, using relevant scientific language and conventions**,**
Step 9 - beginning to recognise the applications of specific scientific ideas
Step 10 - reports on findings from enquiries, using relevant scientific language and conventions**,**
Step 11 - makes decisions about what observations to make, what measurements to use, how long to make them for and whether to repeat them
Step 12 - records and presents findings using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
Step 13 - beginning to recognise the applications of specific scientific ideas

Curriculum Enhancements

Have a range of materials in class for exploration and investigation.

Bake bread

Suggested Activities

Step 1 – Sort a range of materials according to their properties. Use a Venn diagram if appropriate.
Step 2 – Identify what a thermal insulator is and what it does (refer to misconceptions). What materials would be good to use as a thermal insulator?
Step 3 – Investigate why metal is a good thermal insulator and electrical conductor (Y4 prior knowledge)
Step 4 - Explore adding a range of solids to water and other liquids e.g. cooking oil, as appropriate.
Step 5 – List objects which melt and which dissolve. What is the difference between melting and dissolving? (melting – Y4 prior knowledge)
Step 6 - Investigate rates of dissolving by carrying out comparative and fair test.
Step 7 – Create an investigation into filtering and which solids it works with and which it doesn't.
Step 8 – Explore why some solids (e.g. sugar, salt) cannot be filtered and how they can be retrieved from a liquid.
Step 9 - Separate mixtures by sieving, filtering and evaporation, choosing the most suitable method and equipment for each mixture.
Step 10 – Refer to prior knowledge of states of matter. Refer back to dissolving enquiry. Introduce the terms reversible and irreversible changes.
Step 11 - Explore a range of non-reversible changes e.g. rusting, adding fizzy tablets to water, burning.
Step 12 – Sort changes conducted into reversible and irreversible. Step 13 – Explore how irreversible changes can often make new materials e.g. with vinegar and bicarbonate of soda

Possible Misconceptions Some children may think:

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.

Some children may think: • thermal insulators keep cold in or out • thermal insulators warm things up • solids dissolved in liquids have vanished and so you cannot get them back • lit candles only melt, which is a reversible change.

This will lead to . . . KS3

Chemical reactions as the rearrangement of atoms. (KS3)
Representing chemical reactions using formulae and using equations. (KS3)
Combustion, thermal decomposition, oxidation and displacement reactions. (KS3)
Defining acids and alkalis in terms of neutralisation reactions. (KS3)
The pH scale for measuring acidity/alkalinity; and indicators. (KS3)