



Key Vocabulary

Solubility	degree to which a substance dissolves in a solvent to make a solution
Electrical conductivity	the measure of the amount of electrical current a material can carry or it's ability to carry a current
Thermal conductivity	A measure of the ability of a material to transfer heat
Buoyancy suspension	an upward force exerted by a fluid that opposes the weight of a partially or fully immersed object
Dissolve	the process where a solute in gaseous, liquid, or solid phase dissolves in a solvent to form a solution
Solution	A mixture of one or more solutes dissolved in a solvent
Soluble	capable of being dissolved or liquefied
Insoluble	incapable of being dissolved or liquefied
Solute	A substance that is dissolved in another substance (a solvent), forming a solution
Solvent	the substances that are used to dissolve the solutes used in the formulation
Burning	To be heated up or burnt
Rusting	an oxidation reaction between iron and water
Mixture	a substance made by mixing other substances together
Filtering	the process in which solid particles in a <u>liquid</u> or gaseous <u>fluid</u> are removed by the use of a filter medium that permits the fluid to pass through but retains the solid particles
Sieving	a physical mechanism of particle removal, where a particle is denied access through a pore or passageway that is smaller than the particle itself
Reversible change	a change that can be undone or reversed
Irreversible change	a change that cannot be undone or reversed
Combustion	a chemical reaction between substances and is usually accompanied by the generation of heat and light in the form of a flame
Oxidisation	A chemical reaction that takes place when a substance comes into contact with oxygen or another oxidizing substance
Chemical reaction	a process in which one or more substances, also called reactants, are converted to one or more different substances, known as products
Residue	The particles that are removed from the water by the filter
Filtrate	Fluid that has passed through a filter

Sticky Knowledge

1	Very hot and very cold materials can burn skin. Heating materials should be done safely.
2	Materials can be grouped according to their basic physical properties. Properties include hardness, solubility, transparency, conductivity (electrical and thermal) and magnetism.
3	Some materials (solutes) will dissolve in liquid (solvents) to form a solution. The solute can be recovered by evaporating off the solvent by heating.
4	Heating or cooling materials can bring about a change of state. This change of state can be reversible or irreversible
5	The temperature at which materials change state varies depends on the material. Water changes state from solid (ice) $\rightleftharpoons$ liquid (water) at 0°C and from liquid (water) $\rightleftharpoons$ gas (water vapour) at 100°C.
6	The process of changing from a solid to liquid is called melting. The reverse process of changing from a liquid to a solid is called freezing
7	The process of changing from a liquid to a gas is called evaporation. The reverse process of changing from a gas to a liquid is called condensation.
8	A material's properties dictate what it can be used for. For example, cooking pans are made from metal, which is a good thermal conductor, allowing heat to quickly transfer from the hob to the contents of the pan. Some mixtures can be separated by filtering, sieving and evaporating
9	Sieving can be used to separate large solids from liquids and some solids from other solids. Filtering can be used to separate small solids from liquids.
10	Evaporating can be used to separate dissolved solids from liquids.
11	Compare and group materials based on their properties, e.g. hardness, solubility, transparency, conductivity, [electrical & thermal], and response to magnets
12	Know and demonstrate how some materials can be separated, e.g. through filtering, sieving and evaporating
13	Some materials will dissolve in a liquid and form a solution while others are insoluble and form sediment.
14	Mixtures can be separated by filtering, sieving and evaporation.
15	Some changes to materials such as dissolving, mixing and changes of state are reversible, but some changes such as burning wood, rusting and mixing vinegar with bicarbonate of soda result in the formation of new materials and these are not reversible.
16	Reversible changes include heating, cooling, melting, dissolving and evaporating. Irreversible changes include burning, rusting, decaying and chemical reactions

Key Questions

1	Can they compare and group together everyday materials on the basis of their properties, including hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets?
2	Can they explain how some materials dissolve in liquid to form a solution?
3	Can they describe how to recover a substance from a solution?
4	Can they use their knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving, evaporating?
5	Can they give reasons, based on evidence for comparative and fair tests for the particular uses of everyday materials, including metals wood and plastic?
6	Can they describe changes using scientific words? (evaporation, condensation)
7	Can they demonstrate that dissolving, mixing and changes of state are reversible changes?
8	Can they explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda?
9	Can they use the terms 'reversible' and 'irreversible'?
10	Can they describe methods for separating mixtures? (filtration, distillation)
11	Can they work out which materials are most effective for keeping us warm or for keeping something cold?
12	Can they use their knowledge of materials to suggest ways to classify? (solids, liquids, gases)
13	Can they explore changes that are difficult to reverse, e.g. burning, rusting and reactions such as vinegar with bicarbonate of soda?
14	Can they explore the work of chemists who created new materials, e.g. Spencer Silver (glue on sticky notes) or Ruth Benerito (wrinkle free cotton)?



Prior Vocabulary

1	Air	the invisible gaseous substance surrounding the earth, a mixture mainly of oxygen and nitrogen
2	Oxygen	a colourless, odourless reactive gas, the chemical element of atomic number 8 and the life-supporting component of the air
3	Powder	fine, dry particles produced by the grinding, crushing, or disintegration of a solid substance.
5	Changes	process in which one or more substances are altered into one or more new and different substances/states
6	State	one of the distinct forms in which matter can exist – solid, liquid, gas, plasma
7	Gaseous	a substance or matter in a state in which it will expand freely to fill the whole of a container, having no fixed shape (unlike a solid) and no fixed volume (unlike a liquid).
8	Particles	A tiny portion of matter
10	Vapour	a visible gas, as fog, mist, steam, smoke, or noxious gas, diffused through or suspended in the air
11	Water cycle	the continuous movement of water within the Earth and atmosphere.
12	Heating/cooling	Changing the temperature of a material/object
13	Degrees Celsius	The unit that temperature is measured in
14	Melt	change of a solid into a liquid when heat is applied
15	Freeze	The process through which a substance changes from a liquid to a solid.
16	Boil	a phase transition from the liquid state to the gas state
17	Evaporation	a phase transition from the liquid state to the gas state below the temperature at which it boils
18	Condensation	the process in which water in its gas form becomes liquid
19	Energy transfer	the process by which energy is relocated from one system to another
20	Solidify	a phase change of matter that results in the production of a solid
21	Boiling point	the temperature at which a liquid boils and turns to vapour
22	Precipitation	A form of water, such as rain, snow, or sleet, that condenses from the atmosphere
23	Transpiration	a process that involves loss of water vapour through the stomata of plants
24	Forces of attraction	a force that pulls the body near due to its attraction

Prior Knowledge

1	Materials can be grouped according to whether they are solids, liquids or gases. Solids stay in one place and can be held. Some solids can be squashed, bent, twisted and stretched. Examples of solids include wood, metal, plastic and clay. Liquids move around (flow) easily and are difficult to hold. Liquids take the shape of the container in which they are held. Examples of liquids include water, juice and milk. Gases spread out to fill the available space and cannot be held. Air is a mixture of gases.
2	Know about and explore how some materials can change state e.g. water can become ice,
3	Granular and powdery solids like sand can be confused with liquids because they can be poured, but when poured they form a heap and they do not keep a level surface when tipped. Each individual grain demonstrates the properties of a solid
4	Melting is a state change from solid to liquid. Freezing is a state change from liquid to solid. The freezing point of water is 0oC. Boiling is a change of state from liquid to gas that happens when a liquid is heated to a specific temperature and bubbles of the gas can be seen in the liquid. Water boils when it is heated to 100oC.
5	Evaporation is the same state change as boiling (liquid to gas), but it happens slowly at lower temperatures and only at the surface of the liquid. Evaporation happens more quickly if the temperature is higher, the liquid is spread out or it is windy.
6	Condensation is the change back from a gas to a liquid caused by cooling.
7	Water Cycle Water at the surface of seas, rivers etc. evaporates into water vapour (a gas). This rises, cools and condenses back into a liquid forming clouds. When too much water has condensed, the water droplets in the cloud get too heavy and fall back down as rain, snow, sleet etc. and drain back into rivers etc. This is known as precipitation.

Future Learning

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