Year 56 B1B Science - Material Changes 2018 Template

Please Note: There should be plenty of opportunities throughout the year for children to use the school/local environment to observe and identify a variety of plant and animal life cycles. This could be done through an ongoing/monthly nature journal to observe, record and review a variety of examples over a period of time. The unit on 'Human life cycles' can be linked to PSHEE work on 'Relationships' and the Year 5 Science unit 'Habitats and life cycles' rather than being taught as a separate unit.

Environment - Observing Life cycles

Pupils should be taught to:

- Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.
- Describe the life process of reproduction in some plants and animals.

Notes and Guidance (non-statutory):

Pupils should study and raise questions about their local environment throughout the year. They should observe life-cycle changes in a variety of living things, for example plants in the vegetable garden or flower border, and animals in the local environment. They should find out about the work of naturalists and animal behaviourists, for example, David Attenborough and Jane Goodall.

Pupils should find out about different types of reproduction, including sexual and asexual reproduction in plants and sexual reproduction in animals.

Pupils might work scientifically by:

- Observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times).
- Asking pertinent questions.
- Suggesting reasons for similarities & differences.
- They might try to grow new plants from different parts of the parent plant, for example, seeds, stem and root cuttings, tubers, bulbs.
- Observe changes in an animal over a period of time (for example, by hatching and rearing chicks).
- Comparing how different animals reproduce and grow.

Material Properties – Testing Material Properties

Pupils should be taught to:

- Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.
- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.
- Compare a variety of materials and measure their effectiveness (e.g. hardness, strength, flexibility, solubility, transparency, thermal conductivity, electrical conductivity).

Temperature and Thermal Insulation

- Heat always moves from hot to cold.
- Some materials (insulators) are better at slowing down the movement of heat than others.
- Objects/liquids will warm up or cool down until they reach the temperature of their surroundings.

Notes and Guidance (non-statutory):

Pupils should build a more systematic understanding of materials by exploring and comparing the properties of a broad range of materials and relating these to what they learnt about magnetism in Year 3 and about electricity in Year 4.

Note: Pupils are not required to make quantitative measurements about conductivity and insulation at this stage. It is sufficient for them to observe that some conductors will produce a brighter bulb in a circuit than others and that some materials will feel hotter than others when a heat source is placed against them.

Pupils might work scientifically by:

- Carry out tests to answer questions such as 'Which materials would be the most effective for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?'
- Compare materials in order to make a switch in a circuit.

Material Changes - Reversible changes

- Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.
- Demonstrate that dissolving, mixing and changes of state are reversible changes.
- Changes can occur when different materials are mixed.
- Some material changes can be reversed and some cannot.
- Recognise that dissolving is a reversible change.
- Distinguish between melting and dissolving.
- Mixtures of solids (of different particle size) can be separated by sieving.
- Mixtures of solids and liquids can be separated by filtering if the solid is insoluble (un-dissolved).
- Evaporation helps us separate soluble materials from water.
- Changes to materials can happen at different rates (factors affecting dissolving, factors affecting evaporation – amount of liquid, temperature, wind speed).
- Freezing, melting and boiling changes can be reversed (revision from YR4).

Notes and Guidance (non-statutory):

Pupils should explore reversible changes including evaporating, filtering, sieving, melting and dissolving, recognising that melting and dissolving are different processes.

Material Changes – Irreversible changes

Pupils should be taught to:

- 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.

Notes and Guidance (non-statutory):

Pupils should explore changes that are difficult to reverse, for example, burning, rusting and other reactions, for example vinegar with bicarbonate of soda. They should find out about how chemists create new materials, for example Spencer Silver, who invented the glue for sticky notes or Ruth Benerito, who invented wrinkle-free cotton.

Note: Safety guidelines should be followed when burning materials.

Pupils might work scientifically by:

- Observing and comparing the changes that take place, for example, when burning different materials or baking bread or cakes.
- Researching and discussing how chemical changes have an impact on our lives, for example cooking.
- Discuss [research] the creative use of new materials such as polymers, super-sticky and super-thin materials.

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Animals - Human Life Cycles

Pupils should be taught to:

- Describe the changes as humans develop to old age.
- Animals are alive; they move, feed, grow, use their senses, reproduce, breathe/respire and excrete.

Notes and Guidance (non-statutory):

Pupils should draw a timeline to indicate stages in the growth and development of humans. They should learn about the changes experienced in puberty.

Pupils might work scientifically by:

- Researching the gestation periods other animals and comparing them with humans.
- By finding out and recording the length and mass of a baby as it grows.

Light and Astronomy – Earth and Space

Pupils should be taught to:

- Describe the movement of the Earth, and other planets, relative to the Sun in the solar system.
- Describe the movement of the Moon relative to the Earth.
- Describe Sun/Earth/Moon as approximately spherical bodies.
- Use the idea of the Earth's rotation to explain day and night.
- The Earth spins once around its own axis in 24 hours, giving day and night.
- The Earth orbits the Sun in one year.
- We can see the Moon because the Sun's light reflects off it.
- The Moon orbits the Earth in approximately 28 days and changes to the appearance of the moon are evidence of this.
- The Sun appears to move across the sky from East to West and this causes shadows to change during the day.
- Changes to shadow length over a day or changes to sunrise and sunset times over a year are evidence supporting the movement of the Earth.

Notes and Guidance (non-statutory):

Pupils should be introduced to a model of the Sun and Earth that enables them to explain day and night. Pupils should learn that the Sun is a star at the centre of our solar system and that it has eight planets: Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus and Neptune (Pluto was reclassified as a 'dwarf planet' in 2006). They should understand that a moon is a celestial body that orbits a planet (Earth has one moon; Jupiter has four large moons and numerous smaller ones).
Note: Pupils should be warned that it is not safe to look directly at the Sun, even when wearing dark glasses. Pupils should find out about the way that ideas about the solar system have developed, understanding how the geocentric model of the solar system gave way to the heliocentric model by considering the work of scientists such as Ptolemy, Alhazen and Copernicus.

Pupils might work scientifically by:

- Comparing the time of day at different places on the Earth through internet links and direct communication.
- Creating simple models of the solar system.
- Constructing simple shadow clocks and sundials, calibrated to show midday and the start and end of the school day.
- Finding out why some people think that structures such as Stonehenge might have been used as astronomical clocks.

Forces – Effects on Movement

Pupils should be taught to:

- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces.
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.
- There are different types of forces (push, pull, friction, air resistance, water resistance, magnetic forces, gravity).
- Gravity can act without direct contact between the Earth and an object.
- Friction, air resistance and water resistance are forces which slow down moving objects.
- Friction, air resistance and water resistance can be useful or unwanted.
- The effects of friction, air resistance and water resistance can be reduced or increased for a preferred effect.
- More than one force can act on an object simultaneously (either reinforcing or opposing each other).

Notes and Guidance (non-statutory):

Pupils should explore falling objects and raise questions about the effects of air resistance. They should explore the effects of air resistance by observing how different objects such as parachutes and sycamore seeds fall. They should experience forces that make things begin to move, get faster or slow down. Pupils should explore the effects of friction on movement and find out how it slows or stops moving objects, for example, by observing the effects of a brake on a bicycle wheel. Pupils should explore the effects of levers, pulleys and simple machines on movement. Pupils might find out how scientists such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation.

Pupils might work scientifically by:

- Exploring falling paper cones or cup-cake cases.
- Designing and making [exploring] a variety of parachutes.
- Carrying out fair tests to determine which designs are the most effective.
- Exploring resistance in water by making and testing boats of different shapes.
- Design and make artefacts that use simple levers, pulleys, gears and/or springs and explore their effects.

Sort / group / compare / classify / identify	**Research** *finding things out using a wide range of secondary sources of information and recognising that scientific ideas change and develop over time*	**Modelling**	**Recording of 'Explore / Observe'** *developing a deeper understanding of a wide range of scientific ideas encountering more abstract ideas*	**Questioning** *asking their own questions about scientific phenomena*	**Planning** *using different types of scientific enquiry making decisions about and explaining choices for testing*
▪ Compare and contrast things beyond their locality. ▪ Compare more complex processes, systems, functions (e.g. life cycles of different living things, organ systems of different animals). ▪ Suggest reasons for similarities and differences.	▪ Research the work of famous scientists (historical and modern day) and use this to find out how scientific ideas have changed over time. ▪ Find things out using a wide range of secondary sources of information.	▪ Create simple models to describe scientific ideas (e.g. circulatory system). ▪ Use simple models to describe scientific ideas (e.g. of movements of the Sun and Earth, solar system, shadow clocks, magnetic compasses for navigation).	▪ Read, spell and pronounce scientific vocabulary correctly (Y5/6). ▪ Use their developing scientific knowledge and understanding and relevant scientific language to discuss, communicate and explain their findings. ▪ Explore more abstract systems/functions/changes and record their understanding of these (e.g. circulatory system). ▪ Observe changes over different periods of time.	▪ Raise different kinds of questions (Y5/6) ▪ Refine a scientific questions so that it can be investigated. ▪ Ask their own pertinent questions.	▪ Explain which variables need to be controlled and why. ▪ Make most of the planning decisions about] and carry out fair tests. ▪ Recognise when it is appropriate to carry out a fair test and plan how to set it up.

Equipment and measurement *increasing complexity with increasing accuracy and precision make their own decisions about the data to collect*	**Communicating Recording** *recording data, reporting findings, presenting findings*	**Considering the results of an investigation / writing a conclusion**			**Collaborating**
		Describe results *Looking for patterns analysing functions, relationships and interactions more systematically*	**Explain results** *Draw conclusions based on evidence*	**Trusting my results**	
▪ Recording data and results of increasing complexity (Y5/6). ▪ Follow safety guidelines (Y5/6). ▪ Make their own decisions about what observations to make or measurements to use and how long to make them for [recognising the need for repeat readings on some occasions]. ▪ Decide how to record data from a choice of familiar approaches. ▪ Choose the most appropriate equipment to make measurements. ▪ Explain how to use equipment accurately.	▪ Record data and results of increasing complexity using tables, bar and line graphs, and models. ▪ Report findings from enquiries using discussion, drawings [annotated], oral and written explanations of results, and conclusions. ▪ Present findings in written form, displays and other presentations (Y5/6)	▪ Identify patterns that might be found in the natural environment. ▪ Look for patterns and notice relationships between things [and describe these].	▪ Use their developing scientific knowledge and understanding and relevant scientific language to explain their findings. ▪ Draw conclusions based on their data and observations. ▪ Read, spell and pronounce scientific vocabulary correctly (Y5/6).	▪ Use test results to make predictions to set up further comparative and fair tests. ▪ Comment on how reliable their data is.	

Possible Cross-curricular links, especially opportunities for English, Mathematics and Computing within teaching:	
English links	•
Mathematics links	•
Computing links	•
Other links	•
Possible Experiences including visits/visitors/other:	
Consider what could augment your planning to really enthuse the children in your class: •	
Display/Resources:	
Consider what resources could be brought into the classroom and what display work could be completed either before/during or after topic is taught:	

Session	Key Objective from skills listed above (What is it that you want the children to learn?)	Possible Activities including use of Computing and other technologies, and showing at least 3 differentiations	Outcomes/Evidence of what they have learnt (Where will this be found? Will it be in a book? Topic book? Display? Photographic evidence?	Possible extension into homework if appropriate to enhance and deepen learning
1	To know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.	What happens to salt or sugar if you add it to water? Invite children to share their ideas. Remind children that salt and sugar both dissolve in water. This means that you can no longer see the salt or sugar and that they have mixed with the water to create a solution. Show ppt explaining what can happen when materials are mixed with water. Look at some pictures of everyday materials. What would happen to each when mixed with water? Can you think of any other materials that would dissolve, react or float or sink? Create a list of ideas. Tell children that today they will be investigating what happens to different materials when they are	Children to record observations in a table. Table to be stuck in science books.	When children have mixed all the materials, ask them to arrange the mixtures into groups according to what happened when mixed.

		mixed with water. How can we do this and ensure that it is a fair test? Discuss. Ensure children recognise that they need to change water each time they use a new material. **Independent** Provide children with eight different materials to mix with Water. Children to describe what happened to each in a table. Children to work in pairs to make detailed notes.		
2	That some changes of state and dissolving and mixing processes can be reversed through filtering, sieving and evaporating.	What happens to sugar when it is mixed with water? Would I be able to get the sugar out of the water? again once the two have been mixed? Invite children to share their ideas. Tell children that soluble materials (materials that dissolve in water) such as sugar and salt can be separated from the water through evaporation. The water evaporates leaving the sugar or salt behind. Mixing with water to make a soluble solution is called a reversible change because you can separate both materials again to their original state. How would you separate sand from water? Invite children to share their ideas. Go through the information on filtering and ask children which pieces of equipment would be best suited for separating each of the solids from water (garden sieve, kitchen sieve or filter paper) and why. **Independent** Provide children with a list of materials. Children to define 'soluble' and 'insoluble', then describe how they would separate each of the materials listed. Children to test out their suggestions. Did they work? Record	Written work in science books. Photographs of children carrying out the activity.	
3	Explain that some changes form new materials, and that these changes are not usually reversible.	What is a reversible change? What is an irreversible change? Invite children to describe both terms. Remind children that reversible changes occur when two materials are mixed together and can then be separated	Written observations using scientific vocabulary in science books.	children to think of some examples of irreversible changes in everyday life that occur when you mix

		again using filtration or evaporation. Soluble and insoluble materials can be separated from water. Can you think of some examples of this? (e.g. salt water solution separated by evaporation, sand and water separated by filtering). Explain that an irreversible change occurs when two materials are mixed together and react with one another to create a new substance. This means that the two materials cannot be separated again. When you mix plaster of Paris with water what happens? This is an irreversible change because the water reacts with the plaster of Paris to create a new hard material. Some reactions are harder to spot as they create a gas instead of a solid. What happens when you mix effervescent tablets (e.g. Alka Seltzer) with water? (They fizz.) Why do materials like this fizz when they mix with water? Invite children to share their ideas. Explain that the tablets are reacting with the water to produce a gas which escapes as bubbles. The gas is a new substance that was produced through the reaction so it is not possible to get the materials back in their original form. This means it is an irreversible change. Tell children that today they will be investigating some irreversible changes. Remind children about how to work safely with the materials they will be using (e.g. not to taste the vinegar, lemon juice, etc., and to wash hands after their experiments **Independent** Provide children with vinegar, bicarbonate of soda, lemon juice, water, refresher sweets (which have the same reaction as effervescent tablets) and washing powder. Children to mix each of the materials with water, note down their observations and explain what new material has been produced to make an irreversible change DIFFERENTIATION TO BE PROVIDED THROUGH SUPPORT WITH RECORDING AND DISCUSSION		two materials together (e.g. baking a cake, making a cup of tea, etc.). Children to list their ideas and discuss with a partner

4	Explain that some changes, caused by heating or cooling form new materials, and that these changes are often not reversible.	What are reversible and irreversible changes? Children to define as a class. What would happen to these objects if you heated them? Show children the pictures on the sppt and discuss. Which of these changes would be reversible and irreversible? Why? Children to think, pair, share their ideas. Explain that some materials change state when they are heated or cooled. Go through the information about water and what happens when it is heated and cooled, using the terms evaporation and condensation. If you melt a bar of chocolate it will turn into a liquid. If a puddle of chocolate is cooled down again, will it be the same as when it started? Make sure children understand that even though it will set in a different shape, the material is still the same. **Independent** Provide children with a list of objects – children to explain what would happen if these objects were heated or cooled. Test the theory More able - children to create a list of materials that would cause an irreversible reaction and a list of materials that wouldn't, describing the reaction for each.		
5	Explain that changes caused by burning form new materials, and that these changes are not reversible.	What would happen if we were to light these logs? Children to think, pair, share their ideas, coming up with as many effects of burning as possible (e.g. smoke, ash, etc.). Can you think of any examples of how we use burning in our everyday lives? Encourage children to think about burning gas for cooking, burning charcoal for barbecues, fireworks, etc. Go through the information on the slides about what happens when some materials burn, including affects you can't see (i.e. gas produced). Are these changes reversible or irreversible? Why?	Evidence in books	children to create a poster illustrating the hazards of burning things (such as smoke inhalation, gases produced, fire spreading quickly, burning your skin, etc.) and how these hazards can be avoided or made safer. This

		Burning is an irreversible change because new products are produced. Some of these products can be hazardous, such as the gas produced when particular fabrics burn. Some materials also burn more easily than others which means that fire will spread very quickly if they ignite. Show children the picture of the 'flammable' sign. Where might you see this symbol? What does it mean? How can we make sure we stay safe around these materials? Children to think, pair, share their ideas. **Independent** children to state what would happen to each of the materials listed if they were burned and then describe three new materials that are produced when materials are burned		could be done manually or using ICT
6	To compare and group together everyday materials on the basis of their properties.	What differences are there between these two objects (show a plastic ruler and a piece of metal pipe)? Children to discuss their ideas. Show the slide comparing the two objects. Did you think of any of these differences? What differences are there between these two objects (show a washing powder tablet and a wooden block)? Children to discuss their ideas. Did you think of any of these differences (show table comparing the two objects)? Show the slides explaining how the properties of a material affect what it is used for. What are the properties of copper which mean it is useful for making these objects? Children to discuss their ideas. Collect ideas on the slide. Explain that today, children will be comparing and grouping a range of different materials according to their properties **Independent** - Give groups of children a set of Materials Cards. Children to sort materials using the Carroll diagram and then choose one of the everyday	Photographs and written evidence in books	

		objects listed, explore some of its properties and create a new Materials Card for it. Give groups of children a set of Materials Cards. On Worksheet 6C, children to design a table, Venn diagram or Carroll diagram to sort different materials according to two or more of their properties. Children to then choose one of the everyday objects listed, explore some of its properties and create a new Materials Card for it.		
7	To give reasons based on evidence from comparative and fair tests, for the particular uses of everyday materials.	Can you remember some of the properties we can use to describe different materials? Children to discuss their ideas. Show the slide with property words and definitions. Can you match them up? Explain that the properties of different materials are very useful for us; they help us choose which materials are best to use when we are making something, such as a frying pan. Why is stainless steel a good material to use for making this? Children to discuss their ideas. I want to make a model boat that I can sail on the pond at the park. Can you help me work out which materials I should use to make it? The materials I will use must be hard-wearing, waterproof and, most importantly, help the boat to stay afloat! Show the slides asking children how to test the different materials. Children to discuss their ideas. Show the slides explaining one way in which the materials could be tested. How could we ensure that this is a fair test? Children to discuss their ideas. Explain that today we will be finding out about the properties of different materials to determine which would be best to use in the construction of a model boat. **Independent** Children are to use the table of results to answer questions about the floating properties of different materials. They are then to finish a partially completed plan for a fair test of the hardness of the same materials		
