Year 56 A2A Science - Earth and Space Spring 2019 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.

Year 56 A2A Science - Earth and Space Spring 2019 Template

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	• Children to write a report about the planets
Mathematics links	• Children to create a scaled distance drawing of planets from the sun. • Position and direction vocabulary • Time distances across different time zones (converting time)
Computing links	• Internet research. Some children to type their reports.
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	**Describe the Sun, Earth and Moon as approximately spherical bodies**	Watch http://www.bbc.co.uk/programmes/p00n6zgy as a starter- *scale model of solar system using fruit;* Have a range of different sized fruit out in bowls on the tables and ask chn to decide which one is which planet! See what they do and note discussions about size and relative size. In mixed ability pairs, chn make their own scale version of the solar system. What do they notice? Follow this guide, using data from research and the table attached. http://nrich.maths.org/7753 - use the hall.	Pictures of their scale models and tables in their science books.	
2	**Describe the movement**	Discuss how the planets are organised. Are they in a line? Show chn: http://www.theplanetstoday.com/ & http://www.solarsystemscope.com/#plans	Evidence in science books	

	of the Earth, and other planets, relative to the Sun in the solar system	Research Copernicus and Galileo together and discuss models of the solar system – Make notes and sketches in their science books http://www.bbc.co.uk/learningzone/clips/copernicus-and-galileo-the-movement-of-the-earth/5589.html http://sciencenetlinks.com/interactives/messenger/psc/PlanetSize.html Children to work in groups of five. Each child in a group to be given two planets to research. Children to use the internet and computer to find out information about their given planet and make notes on large sheets of sugar paper. Session 2 – cross curricular writing – Children to write a report about the planets.(this may be done in the English lesson)		
3	**Explain night and day in terms of the rotation of the Earth and that the Earth spins on its axis once every 24 hours, and the Earth orbits the Sun in a year**	Split the board or a large piece of paper into two columns, one titled day and the other night. Ask chn to fill each column with words, phrases and images that come to mind for each time of day. Students should note that it is light during the day and dark at night, or we see the sun during the day but not at night. Where does the sun go at night? http://www.bbc.co.uk/education/clips/zvks4wx - *Day and night* *HA* – Same as MA, but also consider what time of day it is if we complete a quarter turn. MA - Chn explore where it is daytime whilst we all sleep. - children to label a map . LA – with TA support The lamp and globe could then be placed in the middle of the classroom and chn could explore how the earth moves around the sun whilst still rotating.	EXT – depending on resources available and cost to buy materials. Children in pairs to make an orrery – Sun , Moon and Earth	Chn to look at the time difference in different countries and work out different times on a 24hr clock
4	**To understand how shadows change when a light source (the sun) is closer and further away.**	Work in the playground. Start in the morning and then at regular intervals during the day. One child to stand with their feet together whilst the other draws around their partner's feet and then around their shadow. Label shadow with initials. Then swap. Each child to measure the length of their shadow using a metre stick/ tape measure to the nearest cm. Children to predict what will happen to their shadows during the day. Take measurements at 10, 11, noon and 2pm. Chn to record measurements in a table and then plot onto a graph. What do the children think is happening? Discuss Were the childrens predictions correct?		

5	**Know that we can see the Moon because it reflects the light of the Sun and that the Moon orbits the Earth** **Know that the Sun does not travel round the Earth but appears to from east to west, causing shadows to change size throughout the day and that shadows may be of different lengths at different times of the year as well**	http://www.bbc.co.uk/bitesize/ks3/science/environment_earth_universe/astronomy_space/revision/6/ Discuss what reflection is. Demonstrate the phases of the moon with the chn - Share the fun facts from the resource sheet. Model the 'Oreo Experiment' - Ask each group to recreate the eight phases of the moon, using the eight cookie halves and by scraping the cream onto or off their cookies with a popsicle stick, spoon or other tool, to make them look like the shapes featured on the "Moon Phases Cards." (Chn may need to scrape some of the cream off of one cookie and add more to another to create their phases.) HA – Same as MA but add a description of each stage underneath. MA/LA - Print, cut out, and jumble all the cards. Chn put them back in the correct order, from the new moon to the waning crescent. EXT - Cut out the cards and staple them together on the left side. Flip the pages quickly to see the moon change phases http://www.primaryhomeworkhelp.co.uk/moon/phases.html	Photos of oreo experiment in books	Children to keep a daily diary for a month – Each evening draw the moon how they see it.
6	**Describe the movement of the Earth, and other planets, relative to the Sun in the solar system**	Ask – what is a year? Take suggestions from the children and discuss. Look at diagrams (plan bee) and explain that a year is how long it takes for a planet to orbit the sun. Explain that Earth's year is much longer than some of the other planets. Children to work in pairs to find out how long a year is on the other planets and record in a table. Ext – children to work out how old they would be if they lived on a different planet.	Recorded work in books	
7	**To learn about our solar system and man's journey into space.**	**THIS MAY TAKE TWO SESSIONS** **Discuss – Do you think sending humans to space is a good idea? Explain. Do you think everyone agrees with yu? What are the pros and cons of spending money on space exploration.** Activity – In pairs children to imagine that they want to interview some astronauts who have just returned from their first journey through our solar system. What questions might they ask them. Work in pairs to come up with a list of 5. Then use websites to try and find realistic answers – include as much scientific vocabulary as possible. Hot seat / role play	Recounts in science book	Children to find out some facts about an astronaut who has been to space

		Chn to imagine that they are an astronaut who has just returned from space. Write a recount of their journey. Include scientific vocabulary, features of a recount etc		
8		Complete Earth moon and sun quiz		