KS 3 Science sequence of lessons **Year 7 – Biology topics**

Year 7: Cells

Lesson number	Key learning objectives
1. microscopes	**Foundation** → What we use a microscope for and set up a slide with help **Developing** → Will be able to use some of the key terminology when using the microscope **Secure** → Can follow instructions to make their own slide and focus their microscope **Extension** → Will be able to work out the magnification they used to see their specimen
2. organelles	**Foundation** → Label the main parts of an animal and plant cell **Developing** → Describe what the nucleus, cell membrane and chloroplasts do **Secure** → Compare the cells and why they are suited to their functions **Extension** → To recognise ribosomes and mitochondria and explain simply what they do
3. seeing cells	**Foundation** → Make a slide with help and identify which cell is an animal cell and which cell is a plant cell **Developing** → Use key terminology when making the slide and identify the nucleus in the cell **Secure** → Observation drawings are accurate and more than one organelle is labelled **Extension** → Little help is need to make up the specimen slide, and no air bubbles are present and explanations are given for the identification of each cell
4. specialised cells	**Foundation** → Can identify organelles in different cells. **Developing** → Can describe what the specialised cells do **Secure** → Can identify how some of the cells adaptions help them to do their specialised job/function **Extension** → Can explain why cells have different organelles relating their explanation to the function of the cell
5. mitosis	**Foundation** → To know that cells divide to create identical cells. **Developing** → To describe simply what happens in the nucleus in cell division. **Secure** → Can explain the stages of mitosis making reference to number of chromosomes at the different stages. **Extension** → Can apply knowledge to an exam question.
6. organs	**Foundation** → To put cells, tissues, organs and systems in to size order **Developing** → To give examples of organs that make up systems **Secure** → Can link cells, tissues, organs and systems in one example e.g. nerves **Extension** → Can explain why organs are made up certain of tissues e.g. the heart for a specific function
7.	**Revision lesson**
9.	**Test**
10.	**Feedback**

Extension	Will be able to use a range of scientific words when explaining what plant and animal cells are, what they are made up of and the function of these parts, including mitochondria. They will be able to apply this to specialised cells and explain how they are adapted to their function. Pupils will also know the stages of mitosis and when this happens. They can hierarchy cells tissues organs and systems giving examples and applying to abstract models. In terms of scientific enquiry pupils can prepare specimen slides without air bubbles, focus they microscope to produce an image where organelles can be seen and draw scientific diagrams of their observations. If asked magnification can be calculated and parts of the microscope are known.
Secure	Can identify the organelles in the plant and animal cell and describe the function of most of these organelles. The functions of specialised cells can also be described with some application of knowledge of the organelles present. With some detail the stages of cell division can be outlined with reference to the nucleus. They can give examples of organs, and the systems they make up as well as explaining the different tissues that make up the heart. They can produce slides with little help and focus images on a low magnification using a light microscope.
Developing	The nucleus, cytoplasm, membrane and chloroplasts can be identified in plant cells(latter) and animal cells. The functions of these organelles can be simply described. Pupils know that cells will divide and produce identical cells. The main organs can be labelled and some of their jobs described. Cells, tissues, organs and system can be placed in size order. Examples of specialised cells can be given, their job and where they are found In terms of Microscope skills, I slide can be made with some help but air bubbles are present. Some help is needed to focus the microscope in order to see organelles clearly.
Foundation	The animal cell can be labelled and the jobs of these can be matched up if given. The main organs can be labelled and the systems that they make up. It is know that cells divide and that there are cells with different functions. Some of these can be named and an adaption for or two can be given. Pupils can produce a slide with help and mount it on the microscope stage. Once help is given the image can be focused and the basic cell can be drawn with one or two organelles labelled.

Year 7: **Reproduction**

Lesson number	Key learning objectives
1. Puberty	**Foundation** → Give 2 changes that happen to boys and 2 that happen in girls. Read data with help **Developing** → Simply explain why changes happen

	Secure → Interpret data from a graph without help **Extension →** Compare your own findings with given findings and name specific hormones that cause changes
2. reproductive organs	**Foundation →** Name the different parts of the reproduction system and distinguish between the sex cells **Developing →** Describe what some parts of the reproduction system do **Secure →** Explain some of the sex cell adaptations and why they are useful **Extension →** Give detailed explanation of the different sex cells including size and how these are useful
3. menstruation	**Foundation →** Identify the stages of menstruation and how long it lasts **Developing →** Describe when a female can get pregnant **Secure →** Use key terminology to describe what happens to the egg throughout menstruation **Extension →** Explain which hormones trigger each stage of menstruation
4. Journey of the sperm	**Foundation →** State that the sperm fertilises the egg in the oviduct **Developing →** Briefly explain fertilisation. Only one sperm reaches the egg and the DNA in the 2 cells fuses **Secure →** Identify some of the features of the oviduct and uterus and why this is beneficial **Extension →** Explain the journey of the sperm from the testes to the egg using the correct names of the reproduction organs
5. Fertilisation 1	**Foundation →** Know that both sperm and egg cells have half the DNA of a normal cell. can identify the umbilical cord and placenta **Developing →** Identify amniotic fluid and simply say what they do **Secure →** Describe meiosis simply and the function of the main structures involved in pregnancy **Extension →** Can apply knowledge to an exam question
6. fertilisation 2	**Foundation →** Know how big a foetus is at 0, 3, 6 and 9 months **Developing →** Describe some of the features a foetus has at different stages in development **Secure →** Can explain the difference between an embryo and a foetus **Extension →** Can explain health implications during pregnancy
7. IVF	**Foundation →** Know that offspring can be created outside of the uterus and that people have different opinions about whether this should happen **Developing →** Know why someone may not be able to conceive and discuss different opinions about using IVF **Secure →** Can describe the process of IVF and state which opinion they agree with and why **Extension →** Can explain how hormones are used in IVF and express their own opinions about the use of it
8.	**Revision lesson**
9.	**Test**
10.	**Feedback**

Extension	To explain the menstruation cycle making reference to the hormones involved at each stage. This knowledge can then be applied to IVF. They can also form an opinion as to whether they believe this should be provided on the NHS. Pupils can also identify the hormones involved in puberty as well as explaining the changes that will happen in both boys and girls. Pupils can describe the different parts of the reproductive organs and their adaptions. When discussing fertilisation pupils not only describe the journey to the egg, the adaptions of the sex cells/gametes but will also make reference to the stages of meiosis and joining of chromosomes. The development of the foetus and the placenta and umbilical cord role in this can be outlined. Pupils can interpret graphical data and compare primary and secondary data drawing their own conclusions from the results.
Secure	Can explain the stages of the menstrual cycle and the role of the hormone FSH. They can name key parts of the female and male reproduction system and link this to fertilisation. In addition adaptations of the sex cells can be described and why this is useful to ensure fertilisation. They can describe, in simple terms, the process of meiosis and how an embryo develops over 9 months, outlining the key changes. Amniotic fluid, umbilical cord and placenta can be labelled. The hormones responsible for changes during puberty are known and data can be used to explain the ages at which boys and girls go through puberty. Different opinions about IVF are considered and pupils can discuss which opinion they agree with the most.
Developing	Can give examples of changes boys and girls go through during puberty and can see if this is reflected in pupils' height within their own class. They can name some of the parts of the reproductive organs and what they may do. They can also label some of the parts of the sperm and egg cell and suggest why they are advantageous. Pupils know how long a period lasts and on what day the egg is released during the menstrual process. Pupils can give a reason as to why people may not be able to have children and look at different opinions on the use of IVF. Pupils can put stages of development in the correct order and identify key developments. The placenta and umbilical cord can be labelled.
Foundation	Know that boys and girls go through puberty during their teens, giving some examples of these changes. They can name the different sex cells and recognise the male and female reproductive organs naming one or two parts. They will know that there are different stages in the menstrual cycle and there is only a certain point in which the female can become fertilised. They will also know that offspring can be created outside of the womb in a lab. Pupils can put stages of development in the correct order.

Year 7: Plants and Photosynthesis

Lesson number	Key learning objectives
1.Photosynthesis equation	**Foundation →** To complete the word equation for photosynthesis and state where the reactants come from **Developing →** To simply explain what happens during photosynthesis **Secure →** To explain where in the plant photosynthesis happens and how the products are used **Extension →** To use graphical data to see that difference between CO_2 and O_2 production in plants
2 . Proving photosynthesis	**Foundation →** To follow a given method **Developing →** To state simply what you think will happen **Secure →** To identify variables that will need to be controlled and make predictions based on scientific **Extension →** outline how to control variables and make predictions using your results
3 Leaf adaptations	**Foundation →** to be able to label the different structures of the leaf **Developing →** To state simply why each part of the leaf is adapted for photosynthesis **Secure →** To refer to the photosynthesis equation when describing leaf adaptations **Extension →** to apply knowledge of the leaf structure to real life examples and exam questions
4. Ions and minerals	**Foundation →** to know some ions that are needed by plants and what they are used for **Developing →** to describe how deficiencies in minerals or ions may make the plant look and simply state how they move around the plant **Secure →** To describe how the ions are transported around the plant **Extension →** To explain the job of the phloem and xylem in transporting minerals and water around the plant
5. herbicides, pesticides and fertilizers	**Foundation →** to know what each one is used for **Developing →** to describe what herbicides, pesticides and fertilizers are made from and what they do **Secure →** To explain the benefits of using herbicides, pesticides and fertilizers as well as some negatives **Extension →** to explain the advantages and disadvantages of herbicides, pesticides and fertilizers including nitrification
6. plant reproduction	**Foundation →** to carry out a method safely and label the different parts of a plants reproductive organs **Developing →** To describe the process of fertilisation using the different parts of the plants reproductive organs **Secure →** to explain how plants are pollinated using the key parts of the plant and how they are suited to this function **Extension →** to explain the process of fertilisation using scientific words and explain the difference between sexual and asexual reproduction
7. Seed dispersal	**Foundation →** to give examples of some seeds and how they are dispersed as well as carrying out a given method to collect resultS **Developing →** To give some adaptions of seeds to help them disperse. To carry out a given method **Secure →** to explain the three ways seeds can be dispersed giving examples and some adaptions. To collect data and draw conclusions

	Extension → to link findings with seed adaptions and to use data in your conclusion
8. Bee research	**Foundation** → To explain what bees do **Developing** → To use a pro-forma to carry out guided research into the job of bees and how they could affect our survival **Secure** → to explain why bees are important, why they are endangered and the consequences if their number reduces **Extension** → to carry out independent research to create a focused presentation on the role of bees and issues surrounding their survival
9.	**Revision**
10.	**Test**
11.	**Feedback**

Extension	Can explain the photosynthesis equation and link findings from investigations back to scientific theory. The fact that plants also respire is known. Pupils also need to explain the adaptations of a leaf and how this enables it to maximise photosynthesis, apply ideas to different plants in different environments. Pupils should outline the nutrients plants need and how these are transported around the plant. The use of herbicides, pesticides and fertilized are outlined and evaluated in terms of environmental effect. Pupils can dissect and label the reproductive organs of a flower, explain fertilisation using keywords and distinguish between sexual and asexual reproduction. The different forms of seed dispersal can be outlined with examples and links to adaptations. Pupils engage in independent research to discover why the bumble bee is so important, why numbers are reducing and the consequence of its demise.
Secure	The photosynthesis equation can be reproduced without help and used to make predictions about what will happen in an investigation as well as knowing where the process takes place. Pupils can give examples of each method of seed dispersal and some of the adaptations seeds have. They can label all the part of the plants reproductive system and describe what the majority do. Some key words are used when describing fertilisation and pollination. The role of the bumble bee is outlined with little help and the some of the negatives of losing the bumble bees are described. Leaf adaptions are identified and how they increase photosynthesis. The nutrients needed for healthy growth are known and the deficiencies can be spotted in plants. Environmental consequences of pesticides and fertilizers can be described.
Developing	Can dissect and with help, and label the different parts of the flowers reproduction system. They can describe the process of fertilisation, the three ways seeds are dispersed and the role of bees in pollination. They can also use guidance to investigate why the number of bees is decreasing. Pupils can write the word equation for photosynthesis and explain where each reactant comes from. They can also use this to make basic predictions. Pupils can describe the structure of the leaf and as well as the ions that plants need in order to be healthy and what some of these ions do.

	Herbicides, fertilisers and pesticides can be described.
Foundation	Can label some of the key parts of the plants reproductive system and what some of them do in the fertilisation process. They can also describe how some seeds are dispersed and the roles of beed in pollination. The photosynthesis equation can be completed and the importance of light in the process is also known and can be linked back to experimental data. The key adaptations of a leaf can be linked to the correct part of the leaf. Pupils can name some nutrients that a plant needs for healthy growth. They know what a herbicide, pesticide and fertiliser is used for.

Year 7: The Skeletal System

Lesson number	Key learning objectives
1. the skeleton	**Foundation** → Label the main bones and structure and know the four jobs of the skeleton **Developing** → Give examples of bones that offer protection **Secure** → Draw their own diagram of a bone from a description **Extension** → Apply knowledge to exam questions
2. joints	**Foundation** → Know the 3 types of joint and give an example of each **Developing** → Give more than one example of each **Secure** → Explain the difference between tendons, ligaments and cartilage **Extension** → Apply knowledge to explain the joints involved in throwing a ball, brushing your teeth and jumping into a swimming pool
3. muscles	**Foundation** → Name 2 muscles in the arm and describe how they work **Developing** → Describe the difference between the three types of muscle **Secure** → Explain the different types of muscle, how antagonistic pairs work and correctly label 5 muscles **Extension** → Apply knowledge of the bicep and tricep to another antagonistic pair of muscles
4. levers	**Foundation** → Will be able to follow a given method and plot points with help **Developing** → Can plot points without help and write a simple conclusion about the relationships effort and work **Secure** → Can write their own conclusion about the relationship between effort and work using the graph **Extension** → They use data in their explanation and can identify ways to improve their investigation
5. muscle strength	**Foundation** → To draw bars for a graph with help and use this to identify the strongest set of muscles **Developing** → To draw bars without help on a pre-set axes and explain findings **Secure** → To label blank axes and plot bars **Extension** → To make predictions about which muscles are the strongest and suggest improvements for the investigation

6.	**Revision lesson**
7.	**Test**
8.	**Feedback**

Extension	Will be able to explain how new cells are made in the bone, to correctly recall the names of the main bones within the body and the muscles attached to them. They can explain how pairs of muscle cause movement using key terminology as well as comparing the make up the different muscle tissues and its function. They can clearly explain the differences between the joints and correctly identify each joint in the body. They can explain how levers work and apply it to levers in their body. They should also be able to conduct experiments without help and identify ways to improve theirs and others investigations.
Secure	Can identify some of the main bones and muscles and describe how the triceps and bicep work to move the arm. They will be able to describe the difference between most of the joints and give one or two examples. They should be able to describe the make-up of a bone and the functions of the skeleton. They can describe how different muscle tissue looks and where the tissue is found. They can carry out a given method and use data to support their conclusions.
Developing	Can recognise one or two bones in the body. They can give a brief description of what each joint does and will know the 4 functions of the skeleton. They understand that muscles have different jobs and can work together in pairs to move parts of the body. They can draw bars and a line of best fit on a given axes without help. Some scientific terminology is given in their conclusions.
Foundation	Will know the main functions of the skeleton. They will be able to describe what a joint is and that some muscles are attached to bone. They can recognise the differences between diagrams of muscle tissues. Some help is required to carry out enquires and with graph drawing.

Year 7: Acids and Alkalis

Lesson number	Key learning objectives
1.Acids and Alkalis	**Foundation** → Identify hazard symbols for harmful, irritant and corrosive substances **Developing** → Describe a range of uses of acids and alkalis in everyday situations **Secure** → Explain that bases cancel out acidity **Extension** → Explain the properties of acids and alkalis
2. Making Indicator solution	**Foundation** → Describe what colour acids and alkalis go in indicator solution **Developing** → State whether solutions are acids or alkalis using indicator solution **Secure** → Explain how to make your own indicator using beetroot **Extension** → Compare the results of indicator solution with the results of the litmus paper test
3. Neutralising	**Foundation** → Describe that when an acid is added to alkali, the pH of the mixture falls **Developing** → Explain how to get a neutral solution **Secure** → Explain a wider range of everyday applications of neutralisation **Extension** → Apply your knowledge of neutralisation to describe what computer generated pH graphs show
4. Acids and metals	**Foundation** → Recall what gas is produced when metals react with acid **Developing**→ Carry out a reaction between various metals and hydrochloric acid **Secure** → Carry out the test for the gas hydrogen **Extension** → Explain why metals corrode. Be able to work out the other product of the reactions.
5. Acids/Alkalis Summary lesson	**Foundation** → Identify hazard symbols for harmful, irritant and corrosive substances **Developing** → State whether solutions are acids or alkalis using indicator solution **Secure** → Explain a wider range of everyday applications of neutralisation **Extension** → Explain why metals corrode. be able to work out the other product of the reactions **Extension** → Can apply knowledge to an exam question.
6.	**Revision**
7.	**Test**
8.	**Feedback**

Extension	Extension level students should be able to explain the properties of acids and Alkalis. This will highlight the differences between the two. Students should also be able to compare the results of indicator solution with the results of the litmus paper test. This will require students to carry out their own investigations using the two. Extension students will also be able to apply their knowledge of neutralisation to describe what computer generated pH graphs show. Pupils should also be able to carry out an investigation using metals and non-metals and describe other products being produced other than hydrogen. They can explain how metal salts are made using a word equation to show the names of reactants and products.

Secure	Students who are working at a secure level should be able to explain that bases cancel out acidity. This will be explored during practical activities using bases and acids. Secure students will also be able to recall and explain how to make your own indicator using beetroot. The students will then use the indicator that they have made to test the pH of every day products e.g. orange juice, soap, vinegar etc. Explaining a wider range of everyday applications of neutralisation will be another skill that students will be able to do. This may range from house hold applications to use in industry. Secure students will also know how to use a squeaky pop test in order to test for hydrogen. They can describe neutralization reactions using general word equation to show what are reactants and products.
Developing	Students will be expected to describe a range of uses of acids and alkalis in everyday situations. This will include drinks and products for example soap. These different products will be tested during practical experiments. Students will be expected to carry out a practical to make their own indicators and state whether solutions are acids or alkalis using indicator solution. From these experiments students will be expected to describe how to get a neutral solution. Developing students are also expected to carry out chemical reactions between metals and acids. The practical skills of the students will be assessed in these situations. They can list the main products of neutralization reaction.
Foundation	Students that are working at a foundation level should be able to identify hazard symbols for harmful, irritant and corrosive substances. Students will demonstrate this knowledge by use of matching up symbols to words. Foundation students will also be expected to describe what colour acids and alkalis go in indicator solution and should be able to carry out this test within a group. Know/name the gas made when metals and acids are reacted together.

Keywords for learning in the order to be learnt:	
Acids	A chemical compound which is soluble in water tastes sour and turns blue litmus paper pink. Acids neutralize bases
Alkalis	A base is a compound that can neutralize an acid. An alkali is a soluble base which is very corrosive. Alkali solutions turn pink litmus paper blue
Bases	Bases have a pH of more than 7. When bases are dissolved in water, they are known as alkalis.
Solution	The mixture formed when a solute has dissolved in a solvent
Neutral	A substance that is neither acidic nor basic is neutral
Indigestion	Pain or discomfort in the stomach associated with difficulty in digesting

	food.
Products	The products are the substances that are formed during the chemical change.

Year 7: Pure and Impure substances

Lesson number	Key learning objectives
1.What do scientists mean by pure and impure substances?	**Foundation** → Outline that elements contain only one kind of atom **Developing** → Describe what we mean by a 'pure' substance **Secure** → Describe how compounds contain more than one kind of element but can still be a pure substance **Extension** → Evaluate table data to differentiate between pure and impure
2. Mixtures and dissolving	**Foundation** → Identify factors that affect dissolving **Developing** → Recognise a solvent, solution, solute and factors affecting solubility **Secure** → Describe a solvent, solution, solute and factors affecting solubility **Extension** → Explain dissolving using key words in terms of particles
3. How does a shark attract prey?	**Foundation** → Know that particles spread out **Developing** → Describe the diffusion of a fluid is using the idea of particles **Secure** → Describe why diffusion takes place at different rates in solids, liquids and gases **Extension** → Explain why solids, liquids and gases diffuse at different rates using the idea of particle structure
4. Filtration and evaporation	**Foundation** → Recall what solute, solvent and solution is **Developing** → Be able to safely separate sand from salt after doing a risk assessment **Secure** → Explain the changes in state during evaporation **Extension** → Create your own method for separating sand from salt
5. Chromatography	**Foundation** → Identify that chromatography is a method for separating a mixture of soluble substances **Developing** → Describe some of the uses of chromatography **Secure** → Successfully identify the different substances present in a mixture **Extension** → Apply this knowledge to unknown situations. Explain why the method is particular (using a pencil to draw the line not a pen)
6. Distillation	**Foundation** → Recall what change of state occurs in evaporation and condensation **Developing** → Describe evaporation and condensation using particles drawings **Secure** → Explain what distillation is **Extension** →Apply this learning to an unknown situation
7.	**Revision**
8.	**Test**
9.	**Feedback**

Extension	Students will be able to evaluate table data to differentiate between pure and impure. Explain dissolving using key words in terms of particles. Explain why solids, liquids and gases diffuse at different rates using the idea of particle structure. Create your own method for separating sand from salt. Apply this knowledge to unknown situations. Explain why the method is particular (using a pencil to draw the line not a pen). Apply this learning to an unknown situation
Secure	Students will be able to describe how compounds contain more than one kind of element but can still be a pure substance. Describe a solvent, solution, solute and factors affecting solubility. Describe why diffusion takes place at different rates in solids, liquids and gases. Explain the changes in state during evaporation. Successfully identify the different substances present in a mixture. Explain what distillation is
Developing	Students will be able to describe what we mean by a 'pure' substance. Recognise a solvent, solution, solute and factors affecting solubility. Describe the diffusion of a fluid is using the idea of particles. Be able to safely separate sand from salt after doing a risk assessment. Describe some of the uses of chromatography. Describe evaporation and condensation using particles drawings.
Foundation	Students will be able to outline that elements contain only one kind of atom. Identify factors that affect dissolving. Know that particles spread out. Recall what solute, solvent and solution is. Identify that chromatography is a method for separating a mixture of soluble substances. Recall what change of state occurs in evaporation and condensation.

Keywords for learning in the order to be learnt:	
Atom	The smallest particle of a chemical element that can exist.
Chemically bonded	A chemical bond is the attraction between 2 or more atoms that enables the formation of chemical compounds.
Chromatography	A technique for the separation of a mixture by passing it in solution or suspension through a medium in which the components move at different rates.
Compound	A substance that is made up of two or more separate elements. Can be chemically bonded together
condence	Make (something) denser or more concentrated OR change or cause to change from a gas or vapour to a liquid.
Element	Substances that cannot be chemically interconverted or broken down into simpler substances and are primary constituents of matter.
Evaporate/evaporation	Turn from liquid into vapour.
Mixture	A substance made by mixing other substances together which are not chemically bonded.

Solute	Substances that can dissolve in a solvent.
Solvent	Liquid substances that is able to dissolve other substances.

Year 7: The particulate nature of matter and Particle model

Lesson number	Key learning objectives
1.Solids, liquids and gases	**Foundation** → Be able to describe solids, liquids and gases using the formal model **Developing** → know that solids, liquids and gases are made up of particles **Secure** → Explain that many everyday materials are mixtures of solids, liquids and gases **Extension** → Explain observations in the differences between solids, liquids and gases
2. Particle Theory	**Foundation** → Describe what happens when a material expands or changes state **Developing** → Know that expanding, melting and evaporating require energy to be put into the material **Secure** → Use the particle model in some of your explanations of substances explanations **Extension** → Explain how energy input to the movement of the particles
3. What happens to ice when it melts?	**Foundation** → State the form ice changes into when it melts **Developing** → Carry out an experiment to investigate why ice melts **Secure** → Be able to explain why ice changes form when it is heated **Extension** → Construct a graph based on your investigation of ice melting
4. What is diffusion?	**Foundation** → Describe the differences between solids, liquids and gases **Developing** → To explain what a diffusion of a gas is **Secure** → To explain the movement of particles in diffusion **Extension** → Use the particle model to explain how we smell something
5. What causes pressure in gases?	**Foundation** → Describe what is meant by the term pressure **Developing** → Explain what causes gas pressure **Secure** → Use the particle model to show the effects of pressure **Extension** → Calculate density
6.	**Revision**
7.	**Test**
8.	**Feedback**

Extension	Extension level students should be able to explain observations in the differences between solids, liquids and gases. This will be explored during practical activities where the differences between solid, liquids and gases are investigated. During these practical experiments students will explore how energy input into a substance alters the particle movement. Extension level students will also be expected to carry out experiments a draw graph according to the results they obtain
Secure	Students who are working at a secure level will be able to explain that many everyday

	materials are mixtures of solids, liquids and gases. This will be observed during practical activities when students notice that some materials share properties. Students will also be able to verbally explain the states of matter using the particle model. One the particle model has been explored students will be able to explain why ice changes form when it is heated.
Developing	Students will be expected to know that solids liquids and gases are made of particles. Students will also be expected to draw the arrangement of particles in solids, liquids and gases. Working at a developing level will also require students to carry out experiments investigating condensation, expanding, evaporation and melting. Students will then be expected to describe how energy input can change a materials state how matter.
Foundation	Students that are working at a foundation level will be expected to explain how the arrangement of particles in solids, liquids, and gases differ. Students will also be expected to be able to describe some key properties on Solids, liquids and gases. Students will also be expected to carry out and experiment and explain what happens to ice when it melts.

Year 7: **Chemistry Working Scientifically**

Lesson number	Key learning objectives
1.What do we need?	**Foundation** → Pupils will be able to identify the different pieces of equipment. **Developing** → Pupils will be able to name and give uses for some pieces of scientific equipment. **Secure** → Pupils will be able to name all scientific equipment and give most uses. **Extension** → Pupils will be able to name and give uses for all pieces of scientific equipment and describe situations where the can be used.
2.How does a scientist plan an investigation?	**Foundation** → Pupils will be able to identify the different changes that can occur during an experiment. **Developing** → Pupils will be able to identify the different factors that can be measured during an experiment. **Secure** → Pupils will be able to use the appropriate keys to pose a question that can be investigated. **Extension** → Pupils will be able to suggest different ways in which the experiment can be carried out as well as making appropriate predictions.
3. How are you going to plan your investigation?	**Foundation** → Pupils will be able to draw a results table and include the independent and dependent variables correctly. **Developing** → Pupils will be able to draw a graph to represent their results clearly. **Secure** → Pupils will be able to identify which variable will go on each axes. Extension – Pupils will be able to make a scientific prediction and explain why they have given that particular prediction. They will also be able to identify errors and positives from given methods.
4. Does the type of tissue paper determine how	**Foundation** → Pupils will be able to draw a results table and include the independent and dependent variables correctly. **Developing** →Pupils will be able to write a prediction for the experiment they will be performing. **Secure** → Pupils will be able to write a prediction for the experiment they will be performing with given reasons why.

absorbent it can be?	**Extension →** Pupils will be able to make a scientific prediction and explain why they have given that particular prediction. They will also be able to identify errors and positives from given methods.
5. What factors affect how quickly sugar dissolves?	**Foundation →** Draw a graph with labeled axes and plot points with very little help. **Developing →** Write simple conclusion for their results to show a trend. **Secure →** Write a scientific conclusion with reasons as well as linking their results back to their prediction. **Extension →** Evaluate two sets of data competently and include data to support their claims.
6. What factors affect how quickly sugar dissolves?	**Foundation →** Write a conclusion to a set of random data they will receive. **Developing →** Carry out an experiment to test their prediction **Secure →** Craw a graph to represent their results and write a simple conclusion **Extension →** Write a scientific conclusion confidently including two sets of data to support their explanations.
7. What factors affect how quickly sugar dissolves?	**Foundation →** Write a conclusion to a set of random data they will receive. **Developing →** Carry out an experiment to test their prediction **Secure →** Draw a graph to represent their results and write a simple conclusion **Extension →** Write a scientific conclusion confidently including two sets of data to support their explanations.
8.Mock assessment – How Science Works	**Foundation →** Identify different pieces of equipment. **Developing →** Identify variables needed for the experiment. **Secure →** Choose and draw and suitable graph and write a simple conclusion. **Extension →** Write a scientific conclusion confidently including at least 2 sets of data.
9.	**Test**
10.	**Feedback**

Extension	Pupils will be able to name and give uses for all pieces of scientific equipment and describe situations where the can be used. Pupils will be able to suggest different ways in which the experiment can be carried out as well as making appropriate predictions. Pupils will be able to make a scientific prediction and explain why they have given that particular prediction. They will also be able to identify errors and positives from given methods. Pupils will be able to make a scientific prediction and explain why they have given that particular prediction. They will also be able to identify errors and positives from given methods. Pupils will be able to evaluate two sets of data competently and include data to support their claims. Pupils will be able to confidently write a scientific conclusion including two sets of data to support their explanations. Pupils will be able to confidently write a scientific conclusion including a set of data.

Secure	Pupils will be able to name all scientific equipment and give most uses. Pupils will be able to use the appropriate keys to pose a question that can be investigated. Pupils will be able to identify which variable will go on each ax. Pupils will be able to write a prediction for the experiment they will be performing with given reasons why. Pupils will be able to write a scientific conclusion with reasons as well as linking their results back to their prediction. Pupils will be able to choose and draw and suitable graph and write a simple conclusion.
Developing	Pupils will be able to name and give uses for some pieces of scientific equipment. Pupils will be able to identify the different factors that can be measured during an experiment. Pupils will be able to draw a graph to represent their results clearly. Pupils will be able to write a prediction for the experiment they will be performing. Pupils will be able to write simple conclusion for their results to show a trend. Pupils will be able to carry out an experiment to test their prediction. Pupils will be able to identify variables needed for the experiment.
Foundation	Pupils will be able to identify the different pieces of equipment. Pupils will be able to identify the different changes that can occur during an experiment. Pupils will be able to draw a results table and include the independent and dependent variables correctly. Pupils will be able to draw a results table and include the independent and dependent variables correctly. Pupils will be able to draw a graph with labeled axes and plot points with very little help. Pupils will be able to write a conclusion to a set of random data they will receive.

KS 3 Science sequence of lessons **Year 7 – Physics topics**

Year 7: <u>Circuits and space</u>

Lesson number	**Key learning objectives**
1.What is Current?	**Foundation** → Know that current is measured in amps and how to measure it and know the difference between insulators and conductors **Developing** → Describe and draw circuit diagrams **Secure** → Explain what a current does in a series or parallel circuit **Extension** → Predict the amps at different points in a circuit
2.Potential difference	**Foundation** → Be able to set up a simple circuit **Developing** → Describe what voltage does in a circuit **Secure** → Investigate voltage to see how it affects the circuit **Extension** → Calculate potential difference across circuits

3.Resistance	**Foundation →** State what resistance is **Developing →** Calculate resistance **Secure →** Identify how resistance changes in conducting and insulating materials **Extension →** Explain how resistance varies in conducting and insulating materials in terms of electrons
4. Marking and feedback lesson	Teacher can print up the test paper or the test paper is on a PowerPoint (if they want to go paperless).
5. Mass, weight and gravity	**Foundation →** Describe the difference between mass and weight **Developing →** Explain why the mass is the same and weight is different on Earth and the Moon **Secure →** Calculate the weight on different planets **Extension →** Explain why the weight differs on different planets
6. Seasons and day length	**Foundation →** Describe how long it takes for the Earth to rotate once on its axis and how long the earth takes to orbit the sun **Developing →** Explain the rising of the sun from east to west **Secure →** Explain how the seasons change according to the position of the northern hemisphere **Extension →** Explain how the length of day changes in each season based on the distance of the sun
7. Stars, galaxies and the universe	**Foundation →** Describe how stars, galaxies and the universe is related **Developing →** Explain the difference between a light year and a year **Secure →** Calculate the distance travelled in a certain number of light years **Extension →** Explain how the number of light years affects the present images astronomer see
8.	**Test**
9.	**Feedback**

Extension	Students will be able to predict the amps at different points in a circuit. Calculate potential difference across circuits. Explain why the weight differs on different planets. Explain how the length of day changes in each season based on the distance of the sun. Explain how the number of light years affects the present images astronomer see.
Secure	Students will be able to explain what a current does in a series or parallel circuit. Investigate voltage to see how it affects the circuit. Calculate the weight on different planets. Explain how the seasons change according to the position of the northern hemisphere. Calculate the distance travelled in a certain number of light years.
Developing	Students will be able to describe and draw circuit diagrams. Describe what voltage does in a circuit. Explain why the mass is the same and weight is different on Earth and the Moon. Explain the rising of the sun from east to west. Explain the difference between a light year and a year.
Foundation	Students will be able to know that current is measured in amps and how to measure it and know the difference between insulators and conductors. Be able to set up a simple

	circuit. Describe the difference between mass and weight. Describe how long it takes for the Earth to rotate once on its axis and how long the earth takes to orbit the sun. Describe how stars, galaxies and the universe is related.

Keywords for learning in the order to be learnt:	
Ammeter	An instrument for measuring electric current in amperes.
Ampere	A unit of electric current equal to a flow of one coulomb per second.
Circuit	A complete and closed path around which a circulating electric current can flow.
Component	A part or element of a larger whole, especially a part of a machine or vehicle.
Conductor	A material or device that conducts or transmits heat or electricity.
Galaxy	A system of millions or billions of stars, together with gas and dust, held together by gravitational attraction.
Gravitational field strength	The region of space surrounding a body in which another body experiences a force of gravitational attraction.
Hemisphere	A half of a sphere.
Insulator	A substance which does not readily allow the passage of heat or sound.
Light year	A unit of astronomical distance equivalent to the distance that light travels in one year, which is 9.4607×10^{12} km.
Stars	A fixed luminous point in the night sky which is a large, remote incandescent body like the sun.
Speed of light	The constant and universal speed at which all electromagnetic radiation travels through a vacuum, 2.998×10^{8} meters per second.
Volt	The unit of electromotive force, the difference of potential that would carry one ampere of current against one ohm resistance.
Voltage	an electromotive force or potential difference expressed in volts.
Voltmeter	an instrument for measuring electric potential in volts.

Year 7: Energy Changes, transfers and changes in the systems

Lesson	Key learning objectives
1. Energy	**Foundation →** Be able to name different types of energy resources **Developing → B**e able to decide if energy resources are renewable or not

Resources:	**Secure →** Be able to compare some resources using the advantages and disadvantages **Extension →** Understand how energy is transferred for one resource
2. Burning Food:	**Foundation →** Know that foods are fuels **Developing →** Understand that energy has a chemical effect in your body (respiration) **Secure →** To be able to identify the independent and dependent variables in an investigation **Extension →** Plan your own investigation with limited support
3. Exploring energy transfers:	**Foundation →** What energy is **Developing →** Identify the different energy stores **Secure →** Identify energy transfers from one store to another **Extension →** Devise energy transfer pathways
4. Storing	**Foundation →** Know that energy can be stored in lots of ways **Developing →** State the ways energy can be stored **Secure →** Explain the differences between the different ways of storing energy **Extension →** Calculate the amount of energy that can be stored in a spring
5. Transfer	**Foundation →** Know that energy can be stored in lots of ways **Developing →** State the ways energy can be stored **Secure →** Explain the differences between the different ways of storing energy **Extension →** Calculate the amount of energy that is stored
6. Work	**Foundation →** Know that energy is measured in joules **Developing →** State what factors affect the amount of work done on a system **Secure →** Explain the physical processes that result in energy transfers **Extension →** Calculate the third value in the work done equation if given the other two
7.	**Test**
8.	**Feedback**

Extension	Pupils working on the extension pathway will understand how energy is transferred for one resource. Pupils will need to be able to plan their own investigation with limited support from the teacher. Pupils will also need to be able to devise energy transfer pathways and be able to calculate the amount of energy that can be stored in a system, such as a spring.
Secure	Pupils working on the secure pathway will be able to compare energy resources, stating advantages and disadvantages. They will be able to identify the independent and dependant variables in an investigation. These pupils will also be able to identify energy transfers from one store to another. Pupils will also be able to qualitatively explain the different ways energy can be stored. This will be developed as pupils explain the physical processes that result in energy transfers.

Developing	Pupils working on the developing pathway will be able to decide if energy resources are renewable or not. They will understand that energy has a chemical effect in your body (respiration). Pupils will also be able to identify the different energy stores and state the ways energy can be stored. This will extend to pupils stating the factors that affect the amount of work done on a system
Foundation	Pupils on the foundation pathway will be able to state what energy is and name different types of energy resources. They will know that foods are fuels. Pupils will also know that energy can be stored in lots of ways and is measured in joules.

Keywords for learning in the order to be learnt:	
Joules	The unit for measuring energy
Renewable energy resource	Energy resources that can be reformed/will not run out
Non-renewable energy resource	Energy resources that cannot be reformed/will run out

Year 7: Forces, pressure and Hooke's Law

Lesson number	Key learning objectives
1.What are forces?	**Foundation** → Describe if a force is a push, a pull or a twist. Describe if it is a contact or non-contact force **Developing** → Name some forces and explain what causes them **Secure** → Explain the effect of different forces on an object **Extension** → Work out resultant forces and explain their effects on objects
2. Balanced and unbalanced forces	**Foundation** → State when forces are balanced or unbalanced using diagrams **Developing** → Draw diagrams with named forces to match different motions **Secure** → Link motion descriptors to scale-drawn force diagrams and work out resultant forces **Extension** → Work out resultant forces in 2 dimensions and explain the motion consequences of these forces
3. Turning effects	**Foundation** → Use/follow a given method and plot points with help **Developing** → Can plot points without help and write a simple conclusion about the relationship between effort and work **Secure** → Can write their own conclusion about the relationship between effort and work using the graph. **Extension** → Use data in their explanation and can identify ways to improve their investigation

4. Friction and work done	**Foundation →** State that friction is a contact force and compare rough and smooth surfaces **Developing →** Describe the effects of friction in everyday life scenarios **Secure →** Explain methods of reducing friction between two surfaces **Extension →** They use data in their explanation and can identify ways to improve their investigation
5. Hooke's Law	**Foundation →** Be able to draw a simple table to record the results of an experiment **Developing →** Be able to identify the control, independent and dependent variables in an experiment **Secure →** Be able to plot a line graph of your results **Extension →** Be able to explain the behaviour of the spring during your experiment and conclude from your results, using the word 'elastic' or 'plastic'
6.	**Checking progress tasks to enable marking and feedback/green pen**
7. Changing motion	**Foundation →** To be able to draw a simple table and record the results showing how much distance is covered in a certain time **Developing →** To be able to state the relationship between the speed of an object, and time taken for a journey **Secure →** To be able to plot distance-time graph and use the formula: speed = distance (m)/time (s) or distance-time graphs, to calculate speed **Extension →** Illustrate a journey with changing speed on a distance time graph, and label changes in motion
8. Floating or sinking	**Foundation →** Identify and label a diagram with forces **Developing →** Use appropriate length arrows (not width) and explain why they have drawn them **Secure →** Explain why some objects float, using the word density **Extension →** Explain why some objects float, with reference to density and the volume of water displaced/use the equation for density
9. Pressure with depth	**Foundation →** State that pressure increases if the force is bigger and it is bigger deeper underwater **Developing →** Describe how pressure increases with depth by linking the force to the weight of water **Secure →** Draw a graph to show the relationship between depth and pressure from an experiment **Extension →** Use and rearrange the formula for pressure and link this quantitatively to the increase in pressure with depth
10.	**Test**
11.	**Feedback**

Extension	Extension level students should be able to compare the effects of different sized and directed forces. This would enable them to work out resultant forces in 2 dimensions whilst explaining the motion consequences of these forces. Students should also be able to carry out an investigation to describe the behaviour of a spring and explain how this relates to Hooke's law. From these experiments, students will be expected to measure the extension of a spring and identify ways to improve their investigation. Extension

	students should be able to describe a journey with changing speed on a distance time graph and label changes in motion. They should be able to understand the quantitative relationship between average speed, distance and time (speed = distance ÷ time). They would also need to be able to explain why some objects float while some sink, with reference to density, displacement and upthrust, explain the implications of these ideas and predict the outcomes of various situations. They should be able to explain pressure increases in relation to particles and gravity and to solve pressure problems by from the force applied and the contact surface area.
Secure	Students on the secure pathway would be expected to be able to explain the effect of different forces on an object and link motion descriptors to scale-drawn force diagrams such that they are able to work out resultant forces. They should be able to write their own conclusion about the relationship between effort and work using data from graphs. They should be able to describe and explain methods of reducing friction between two surfaces. Students should be able to carry out an experiment to show and describe the relationship between depth and pressure. This will enable them to explain why some objects float and others sink, using the key terms density and upthrust. They should also be able to explain how pressure in a liquid alters with depth and identify the factors that determine the size of pressure on a solid. Representing data on graphs using appropriate variables, plotting distance-time graphs and using the formula: speed = distance (m)/time (s) or distance-time graphs, to calculate speed would be other skills students on the secure pathway will be able to do.
Developing	Students on the developing pathway should be able to name some forces and explain what causes them, draw diagrams with named forces to match different motions and use appropriate arrows (length not width). Students should be able to describe the causes and effects of friction and varying pressure in everyday life scenarios. They should be able to state the relationship between the speed of an object, and time taken for a journey plot points without help from a graph sheet. They should be expected to carry out an investigation and write a simple conclusion showing the relationship between effort and work. In addition, students on the developing pathway should be able to identify the control, independent and dependent variables in an investigation. Developing students will be able to describe how pressure increases with depth by simply linking the force to the weight of water and suggest why some objects float and others sink.
Foundation	Students on the foundation pathway should be able to simply describe if a force is a push, a pull or a twist, a contact or non-contact force. They should be able to Identify and label a diagram with forces and state when forces are balanced or unbalanced. They should also be able to state that pressure increases if the force is bigger and this effect is greater deeper underwater. Furthermore, they should be able to compare rough and smooth surfaces experimentally following a given method, draw a simple table to record the results, plot points on a graph with some help and give a simple conclusion for their results. Knowing that the speed an object moves depends on the distance and time taken is a final requirement foundation students are expected to know.

Keywords for learning in the order to be learnt:	
contact forces	a force that must touch an object before it can affect it
non-contact forces	a force that can affect an object without touching it
force meter	used to measure forces
weight	amount of force with which gravity pulls things towards the earth
friction	a force which slows things down when they rub against each other
air resistance	a force which tries to slow things that are moving through the air
lubrication	adding a lubricant to something
balanced	when two forces are acting equally on an object

Year 7: **Working Scientifically - Physics**

Lesson number	Key learning objectives
1.What do we need?	**Foundation →** Pupils will be able to identify the different variables and will be able to list some equipment that will be needed **Developing →** Pupils will be able to name the control variables in the experiment and different risks that could occur **Secure →** Pupils will be able to write a method for the experiment and be able to draw a results table to present data **Extension →** Pupils will be able to use the data they have recorded and draw a graph. From this graph they should be able to write a conclusion as to why they received the data they did
2.How do we compare?	**Foundation →** Pupils will be able to list some things that are necessary in a conclusion. **Developing →** Pupils will be able to write a simple conclusion to show trend in their results **Secure →** Pupils will be able to calculate the average correctly and will be able to write scientific conclusion appropriate keywords **Extension →** Pupils will be able to compare their data against secondary data and list different things that are necessary to improve their experiment and reduce anomalies
3.Are you	**Foundation →** Identify what a magnet can do **Developing →** Give examples of different uses of a magnet

attracted to it?	**Secure →** Relate what magnets can do in the outside world **Extension →** Will be able to draw a magnetic field and explain it
4.Energy Efficiency at home	**Foundation →** Pupils will be able to list some forms of energy efficiency in the home **Developing →** Pupils will be able to list more forms of energy efficiency at home as well brief description of why it s necessary **Secure →** Pupils will be able to give more detailed descriptions of energy efficiency in the home **Extension →**Pupils will be able to create an effective model of an energy efficient home with detailed descriptions of each method added
4.Model it	**Foundation →** Pupils will be able to apply some knowledge to support your group in creating the model **Developing →** Pupils will be able to add more knowledge to support your group in creating the model **Secure →** Pupils will be able to give more detailed descriptions of energy efficiency in the home **Extension →** Pupils will be able to create an effective model of an energy efficient home with detailed descriptions of each method added
5.How do we compare?	**Foundation →** Pupils will be able to participate in the presentation **Developing →** Pupils will be able to speak confidently about some forms of energy efficiency used in the model house **Secure →** Pupils will be able to give more detailed descriptions of energy efficiency in the home and showing this on a model **Extension →** Pupils will be able to create an effective model of an energy efficient home with detailed descriptions of each method added. The will be able to speak very confidently about the model and answer any questions asked by the audience
6.	**Test**
7.	**Feedback**

Extension	Pupils will be able to use the data they have recorded and draw a graph. From this graph they should be able to write a conclusion as to why they received the data they did. Pupils will be able to compare their data against secondary data and list different things that are necessary to improve their experiment and reduce anomalies. Pupils will be able to create an effective model of an energy efficient home with detailed descriptions of each method added.
Secure	Pupils will be able to write a method for the experiment and be able to draw a results table to present data. Pupils will be able to calculate the average correctly and will be able to write scientific conclusion appropriate keywords. Relate what magnets can do in the outside world. Pupils will be able to give more detailed descriptions of energy efficiency in the home and showing this on a model.

Developing	Pupils will be able to name the control variables in the experiment and different risks that could occur. Pupils will be able to write a simple conclusion to show trend in their results. Give examples of different uses of a magnet. Pupils will be able to list more forms of energy efficiency at home as well brief description of why it is necessary. Pupils will be able to speak confidently about some forms of energy efficiency used in the model house
Foundation	Pupils will be able to identify the different variables and will be able to list some equipment that will be needed. Pupils will be able to list some things that are necessary in a conclusion. Identify what a magnet can do and pupils will be able to list some forms of energy efficiency in the home. Pupils will be able to apply some knowledge to support your group in creating the model and then will be able to participate in the presentation.