**Curriculum Overview: Year 7 Science**

The science curriculum is built around the three main sciences: Biology, Chemistry and Physics. We also include ‘Earth Sciences’ as a distinct thread within our chemistry curriculum. Within each science topics are sequenced around a series of “big questions” which students explore in increasing depth as they move through the school. These ‘Big questions’ build up on what students will have learnt in primary school and from their own experience and can be extended all the way to University level science and beyond.

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| **Biology** | **Chemistry** (& Earth Science) | **Physics** |
| * What are organisms made of? * How do organisms grow and reproduce? * How do organisms live in their environment? * Why are organisms so different? * What keeps organisms healthy? | * What are substances? * Why do substances behave in different ways? * How can substances be changed? * How does chemistry effect the Earth? * What is the Earth made of and why does it change? | * What is matter? * What makes things change? * How does information spread? * What is electricity and magnetism? * Where are we in space? |

Students will spend part of each year studying each science in turn and will usually have the same teacher for all three to help build and maintain relationships. Students will have a “Core questions” knowledge organiser for each term but the following resources can also be used to support the curriculum from home. On the term by term curriculum over view below you will find details of what ideas are covered in each topic to support you in engaging with their learning at home.

* BBC Bitesize – key stage three science
* Collins: AQA KS3 Science student book one & two (available from most bookstores)

**Autumn One**

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| Week | Big Questions | Topic | Ideas covered |
| One |  | Introduction to science | Introduction to science |
| Two | What are substances?  Why do substances behave in different ways? | Substances and mixtures | All materials are made up of either a single substance, or a mixture of substances. A substance has a characteristic sharp melting and boiling point which determines its state at room temperature. One substance can exist in either the solid, liquid or gas state depending upon the temperature.  A pure sample of a substance consists of only that substance whereas an impure sample is a mixture containing one or more additional substances. An impure sample of a substance melts over a temperature range. Melting points can be used to distinguish a pure sample of a substance from an impure sample.  Some substances dissolve in a particular solvent and some do not. A substance can be said to be soluble or insoluble in that solvent. The solution formed is a mixture of the solute and the solvent. Although the solute cannot be seen it is still present.  The properties of different substances may be used to separate a mixture using an appropriate practical technique. |
| Three |
| Four |
| Five | What are substances?  Why do substances behave in different ways?  How can substances be changed? | Elements, compounds and chemical changes | All matter is made up of atoms. Each element is made up of a different type of atom. A single atom does not have the properties of that element. The properties of an element arise due to the arrangement and behaviour of the atoms collectively. A compound is made up of two or more types of atom joined together. As different atoms are joined than in the separate elements, the compound has properties that are distinct from the elements that are made up of its constituent atoms.  Elements and compounds have one of two types of basic structure. Some are made up of separate groups of two or more atoms (molecules) whereas the atoms in others are joined to make one giant structure. These structures influence properties such as melting and boiling points because there are weaker forces between molecules than within molecules.  The element symbols that form part of a chemical formula represent the types of atom that make up that particular compound. The numbers in a chemical formula show the ratio of these different types of atom. For molecular substances, the number in a formula also gives the number of each type of atom in a molecule.  During a chemical reaction, atoms are rearranged and therefore a new substance (or substances) is formed with different properties to the reactants. |
| Six |
| Seven |

**Autumn Two**

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| Week | Big Question | Topic | Ideas covered |
| One | What are substances? | Comparing solubility | There is a maximum mass of a substance (solute) that will dissolve in any given volume of solvent. A solution in which no more solute will dissolve is called a saturated solution.  Solubility can change with temperature so the solubility of a particular substance is defined at a specific temperature.  Graphs of solubility can be used to predictions about whether some substance will remain undissolved. |
| Two |  |  | Progress check one Assessment |
| Three |  |  | Progress check feedback |
| Four | How can substances be changed? | Chemical reactions | Chemical reactions are represented by chemical equations. A word equation summarises the Reactants and products of a reaction.  State symbols are used to indicate whether substances are in the solid, liquid or gas state or if they are dissolved in water (aqueous).  For any chemical reaction, the total mass of the reactant substances is equal to the mass of the products. Mass is conserved because during a chemical reaction the atoms are rearranged. No new atoms are created and none are destroyed.  If a reaction takes place in an open system and a product is in the gas state, then this product is able to escape. The measured mass will therefore decrease. |
| Five |
| Six | What are organisms made of? | Cells | Detail of topic in Spring one term plan |
| Seven |  |  | Chemistry mastery session |

**Spring One**

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| --- | --- | --- | --- |
| Week | Big Question | Topic | Ideas covered |
| One | What are organisms made of? | cells | Organisms, living and dead, are made up of cells. Cells are made of molecules organised into membranes and other structures.  Most cells are too small to be seen with the naked eye but can be seen using a light microscope.  There are many different types of cells with different shapes and sizes, but all cells are made up of common parts: all cells have a genome and cytoplasm contained by a cell membrane; all animal and plant cells store their genome within a nucleus, and they also have mitochondria; plant cells additionally have a cell wall and can have chloroplasts and a vacuole. These parts have common functions in all cells. Molecules move through the cytoplasm by diffusion, and some molecules can enter and leave a cell by diffusing through the cell membrane.  A single cell can carry out all the processes of life. An organism may be made up of a single cell or many cells working together. This is why scientists think of cells as the basic units of life. |
| Two |
| Three | Why are organisms so different? | Why are organisms so different? | Each generation of organisms inherits characteristics from the one before, which arise from genetic information stored in the genome and are affected by the environment. This can explain the similarities and differences between related individuals and other members of the same species.  The genome is stored in cells, and is made of a chemical substance called DNA.  The structure and development of an organism is controlled by its genome. The growth, features and functions of an organism are affected by its genome and the environment. |
| Four |
| Five | What are organisms made of? | From cells to organ systems | Information for topic included in spring two due to overlap |
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**Spring Two**

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| --- | --- | --- | --- |
| Week | Big Question | Topic | Ideas covered |
| One | What are organisms made of? | From cells to organ systems | To stay alive, cells need a constant supply of energy and molecules for chemical reactions, and they need to get rid of waste. In a multicellular organism the cells are organised into tissues, organs and organ systems that work together to support the life processes of cells to keep the organism alive.  In humans, the circulatory system transports useful molecules and waste around the body. The blood transports useful molecules to cells from food that has been broken down by the digestive system. The blood also transports oxygen to cells from the gas exchange system, and transports waste carbon dioxide away from cells back to the gas exchange system to be removed from the body.  Humans have a skeleton and muscles, which are types of tissue made of cells. They work together to provide structural support and to enable humans to move around. |
| Two |
| Three | Why are organisms so different? | Variation | There is variation between individual organisms of the same species, which can be described as continuous or discontinuous. Variation can be caused by differences in the genome, lifestyle and interactions with the environment. Only variation caused by differences in the genome can be inherited. The fossil record provides evidence that the characteristics of species change over time, and that many species that once existed are now extinct. The fossil record is incomplete, and there are limitations to the conclusions that can be drawn from it. |
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**Summer One**

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| Week | Big Question | Topic | Ideas covered |
| One | What makes things change? | Forces | Force is a measure of the amount of push or pull that happen when objects interact. Forces can change the direction, speed or shape of an object. An arrow is a useful way to indicate on a diagram the direction of any force that is acting on an object. The arrowhead shows the direction in which the force acts on the object. The tip or the tail  of the arrow shows the point on the object at which the force acts (it does not matter which is used; the meaning is the same).  The size of a force (in newton, N) can be measured. In everyday situations, this can often be done using a spring balance or a top-pan balance. Often more than one force acts on an object. The net effect of two forces acting in the same straight line (same direction, or exactly opposite directions) is found by adding them, taking account of their directions. Many objects maintain their direction, speed (including remaining stationary) because the forces acting on them are balanced – they are said to be in equilibrium. If no “net” or overall force acts on an object it will continue moving in the same direction at a constant speed for ever. This can seem to defy common sense so the unit develops the idea of friction. The friction force acting an object is caused by the unevenness at a microscopic level of the surfaces in contact. This leads to a force along the line of the interface, when an applied force makes an object slide (or tend to slide) over another object. Friction can be reduced by using a liquid (a lubricant) to fill the tiny surface irregularities.  The unit also introduces the concept of energy as an account for the ability of an object to effect change or the “cost of getting things done.” The idea of fuels is introduced as materials that have energy stored in them that is transferred to an object as the fuel is used up. Several other stores of energy are introduced including chemical, kinetic, thermal, elastic, gravitational and electromagnetic. Energy can be transferred between stores as “things get done”, for example a ball rolling down a hill transfers energy from its gravitational store to its kinetic (movement) store. Students explore the idea that energy can be transferred by heating, forces (mechanically) or electrically. |
| Two |
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| Four |
| Five | How does information spread? | Sound and light | Sounds are caused by something vibrating. Sources of sound include musical instruments, loudspeakers, and the human voice. Sound travels in straight lines from its source, getting fainter as it goes. Sounds can vary in loudness and in pitch. Loudness is linked to the strength of the vibrations causing the sound. Sound is transmitted through vibrations in materials and cannot travel in a vacuum.  Some objects can affect others at a distance by emitting radiation which travels from one object (the source) to another (the receiver). Light and sound are examples of radiation. Radiation travels out from a source in straight lines in all directions. When it strikes another object, it may go straight through (transmission), bounce off (scattering or reflection), or be stopped (absorption). When radiation is blocked by an opaque object, this causes a shadow region. The effects of radiation get steadily less the further it goes, because it is spread over an ever-increasing area. When light hits a surface, some of it is usually reflected diffusely (scattered) in all directions. For surfaces which are very smooth (such as a mirror, shiny metal, or a water surface), an incident light beam of light is reflected as a beam, at the same angle as it hits the surface.  We see an object when light from it enters our eye. We see a non-luminous object when light from a source strikes the object, and some of the scattered light from it enters our eye. White light is a mixture of lights of different colours When a beam of white light is passed through a prism, the emerging light beam has the colours of the spectrum (ROYGBV). We can think of white light as a mixture of lights of all the colours of the spectrum. An object appears white if it scatters all the colours of light that fall on it, and black if it scatters none (and absorbs all). It appears coloured if it scatters light of some colours and absorbs light of other colours. Its observed colour is that of the light it scatters. The human eye has three types of colour sensor, which detect red, green and blue light respectively. These are called the primary colours. These colours can be combined to make others. This model can be used to explain and predict the appearance of coloured objects when illuminated by lights of different colours. |
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**Summer Two**

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| Week | Big Question | Topic | Ideas covered |
| One | How does information spread? | Sound and light | Topic summary in summer one |
| Two | What is matter? | Heating and cooling | Topic summary below |
| Three |  |  | Progress check two Assessment |
| Four |  |  |
| Five | What is matter? | Heating and cooling | The temperature of an object is a measure of how hot it is. It can be measured using a thermometer (in degrees Celsius, oC). How “hot” an object is a measure of the average speed of the particles it is made of. The idea of temperature is closely linked to the particle model with the kinetic energy of the particles at a sub-microscopic (atomic level) being measured as temperature at the macro (directly observable level.  Temperature spreads from “hot” to “cold” objects when the fast moving particles in a hot object crash into, and transfer energy to, the slower moving particles of the colder object they are next to. This is also how heat spreads through materials (conduction) by energetic particles colliding with the less energetic particles next to them and transferring energy along. Materials where this happens slowly are called thermal insulators, materials where it happens quickly are called good thermal conductors. Metals are generally good conductors because they contain “free electrons” which can move around freely and transfer energy faster. If several objects and materials are left for some time in contact with one another, all of them will reach the same temperature (thermal equilibrium).  To raise the temperature of an object, energy has to be transferred to it (gained by it). To lower the temperature of an object, energy has to be transferred from it (lost by it). The amount of energy stored in a hot object depends on its temperature – the hotter the object, the more energy is stored. Also if two objects made of the same material are at the same temperature, the bigger (more massive) object stores more energy. The amount of energy stored also depends on the type of material. Some materials can store more energy than others without their temperature rising as quickly (specific heat capacity). |
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| Seven |  |  |  |