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**Year 7 Curriculum Intent**

Our science curriculum intends to train excellent scientists. This means that they will be able to:

1. Recall, understand, apply and link subject knowledge
2. Select appropriate equipment
3. Formulate an aim and hypothesis
4. Risk assess
5. Follow and write a method
6. To identify and change the independent variable
7. To identify and measure the control variable
8. To identify the control variable and ensure that it is constant
9. Draw tables and identify anomalies
10. Calculate mean values\*
11. Draw line graphs and analyse the data\*
12. Understand how to ensure accurate and precise data
13. Write a conclusion from a set of data
14. Evaluate the validity of an experiment
15. Equations: identify, substitute, and re-arrange subjects.\*
16. Identify the correct units and convert them.\*

*\*Cross – curricular links with Mathematics.*

The curriculum teaches the fundamental ideas which are the building blocks of scientific understanding, and we sequence these in the best order so that students can see how these fundamental ideas link together.

**Biology**

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| **Topic** | **Key ideas** | **Why they are learning it and in what order.** | **What students often get wrong** |
| Cells | Definition of a cell  Eukaryotic and Prokaryotic cells  Structure of a cell  Function of cell organelles | Cells are the basic building blocks of living organisms.  Understanding this is essential to later topics. | Students often incorrectly think the following:  Only animal cells have cell membranes.  All cells have a nucleus.  Cells are flat.  All animal cells are the same.  There are only two types of cell (animal and plant).  Cells are the same size.  Only animal cells respire and plant cells photosynthesise. |
| Human Reproduction | Specialised cells  Structure, role and adaptations of gametes  Fertilisation and variation | The first building block into understanding variation, adaptation, evolution, speciation and endangered species.  The structure of cells will be revisited and built upon when thinking about the adaptations and roles of gametes. | Students often incorrectly think the following:  Fertilisation takes place in the uterus.  All cells have a typical animal structure. |
| Plant Reproduction | Specialised cells.  Structure, role and adaptations of gametes in plants.  Fertilisation and variation.  Methods of pollination.  The role of Bees in pollination. | The second building block into understanding variation, adaptation, evolution, speciation and endangered species.  Applying human reproduction to plants. This is a more abstract concept, which is why this follows human reproduction.  The structure of cells will be revisited and built upon when thinking about the adaptations and roles of gametes. | Students often incorrectly think the following:  Plants do not reproduce sexually.  There are not male and female gametes in plants.  All cells photosynthesise.  All cells have a palisade structure.  Pollination and fertilisation are the same process. |
| Human Body | Specialised cells.  Movement in living organisms.  Cell, tissue, organ, organ systems  Introduction to different organ systems – muscular-skeletal, cardiovascular, respiratory and nervous systems. | It is important to understand that cells are building blocks of all living organisms but have many varied adaptations.  It is important to understand that growth is caused by cell division, not just the cells enlarging.  It relates to health issues such as smoking and drugs as well as further learning.  Links different aspects of biology such as basic cells, to chemical reactions such as respiration and physics such as mechanical advantage of levers. | Students often incorrectly think the following:  All animal cells and plant cells look the same.  Organs are made of the same type of cell.  That blood takes only oxygen around the body.  The heart pumps twice. |

**Chemistry**

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| **Topic** | **Key ideas** | **Why they are learning it and in what order.** | **What students often get wrong** |
| Particle Theory | Everything is made up of atoms.  Our idea of atomic theory is only a model – is changing.  By heating an object you are transferring energy to its particles (reverse).  An element is made of only one type of atom.  How in different physical states the particles are arranged.  To be able to draw and label the sub-atomic parts of a nuclear atom. | Atoms are the building blocks of everything, but are incredibly small – so we have very large numbers of them.  Elements all have a given name – of which there are just over 100  The idea that mass cannot be destroyed or created underpins the whole theory of chemical reactions. This leads on to be able to balance equations at KS4.  It is fundamental that all particles have energy and are vibrating – by giving them more energy they move faster and take up more space. This is used to be able to draw and describe particle state diagrams.  This leads onto latent heat and specific heat capacity in KS4. | Students often incorrectly think the following:  That there must be “something” between atoms.  Atoms in solids have no energy and are stationary.  Atoms are flat circles and that we can actually see atoms.  Particles are all the same size.  Air has no mass.  Melting and dissolving are the same. |
| Elements and Periodic Table | The Periodic table only contains elements.  Definition of elements, mixtures and compounds.  Brief history of the Periodic Table and why it is arranged as it is. | From previous knowledge of Particle Theory being taken further and now able to describe and draw and label the sub-atomic particles.  Using this knowledge to discover how the Periodic Table is now ordered and how the elements sub-atomic particles change.  By knowing how atoms change this can be used to predict trends in Periodic groups and reactivity series.  This links to types of chemical reaction later in KS3 and C4.  . | Students often incorrectly think the following:  Everything is on the periodic table. E.g. water.  Students are often:  Unaware that as you go down a period you gain an electron shell.  Unaware that the group number tells you how many electrons are in the outmost shell. |
| Acids and Alkalis | Acids and alkalis neutralise each other forming salts.  pH Scale – use and application.  Range of concentrations of acids and alkalis. | Recognising safety  Symbols on every day products and relating their pH to their uses.  By understanding that pH is a scale with acids and alkalis opposites this helps everyday life.  Bee sting/Wasp sting- how best to alleviate the stings.  Because acids contain H+ ions and alkalis OH- ions a neutral solution (water) must have equal amounts of each. This knowledge of ions will demonstrate why metals form bases and non-metals acids. | Students often incorrectly think the following:  Acids are stronger than alkali.  The only salt is sodium chloride. |
| Separating mixtures | Soluble and insoluble.  Pure substances have a fixed melting and boiling point.  Particle arrangement in solutes, solvents and solutions.  Particle arrangement in elements, compounds and mixtures.  Understand how filtration, distillation and chromatography can separate mixtures. | This allows you to identify impure substances.  Allows you to apply to distillation.  These are the building blocks to filtration and electrolysis.  Building blocks to separating techniques, particle arrangement in chemical reactions, bonding.  These techniques are used in industry to purify useful chemicals. E.g. Diesel. | Students often incorrectly think the following:  Substances disappear when they dissolve.  All substances have the same melting and boiling point as water.  The elements in compounds can be separated from each other using these separation techniques. |

**Physics**

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| **Topic** | **Key ideas** | **Why they are learning it and in what order.** | **What students often get wrong** |
| Energy stores | Name the energy stores with examples.  Name the energy transfers.  Understand energy is conserved.  In any transfer there is no loss or gain. | Everything in science is based on energy and how it is transferred.  This learning is needed before looking at units such as chemical reactions, heating and cooling, respiration/photosynthesis.  The differences between renewable and non-renewable energy resources raise green issues on electricity generation and how we power the future. | Students often incorrectly think the following:  Energy can be created and lost.  Machines can be more than 100% efficient.  Energy and power are the same.  Energy resources are the same as energy stores. |
| Forces and Speed | Pushes, pulls and twists.  Balanced and unbalanced forces – effects on objects.  Contact and non-contact forces.  Draw and interpret force diagrams.  To calculate speed. | By understanding that all objects have an effect on each other you learn how the magnitude of this effect is related to size of mass and proximity.  This leads on to be able to show the effect on movement and forces required by different types of surface – friction.  You learn to calculate speed by recording distance and time and using formula. | Students often incorrectly think the following:  Objects stop moving when their force runs out.  There are no forces acting on an object at rest.  That weight and mass are the same thing.  Unbalanced forces always make an object move faster. |
| Light and Sound | Waves transfer energy.  Transverse and longitudinal.  Wavelength, amplitude and frequency.  Electromagnetic spectrum is a wave.  Sound is the movement of particles.  To be able to measure the speed of sound. | To understand that light travels in straight lines explains shadows.  We learn that things are seen because light reflects and colours are related to absorption of wavelengths we get. This gives building blocks for KS4 waves.  Light can be deflected by different density of materials called refraction. The density of materials has been learnt in particle theory.  White light is made up of a spectrum of colours (wavelengths) and we see them combined. Rainbows are caused when this is split back up.  The size of frequency and wavelength are reciprocal so blue light with shorter wavelength has a higher frequency than red light with longer wavelength and lower frequency. | Students often incorrectly think the following:  Sound travels in a vacuum (space).  Light travels instantly.  White light is all one wavelength.  That the difference between the speed of light and sound is not that large.  That because waves are more closely packed in a high frequency sound that it is louder. |
| Current, Voltage and Resistance | Electricity is the movement of delocalised electrons.  Recognising Circuit symbols.  Drawing circuit diagrams.  Electricity needs a complete circuit to flow.  Current is the number of electrons passing any one point in a circuit.  Voltage the potential difference between points in a circuit or the amount of electromotive force.  Electrical resistance is the amount of opposition to current flowing.  For a fixed potential difference if current is increased resistance will fall (vice-versa).  The differences between parallel and series circuits. | To describe materials as good conductors or insulators  To be able to build a circuit from a circuit diagram and the reverse.  Using the correct meter to be able to calculate current and Voltage anywhere in a series circuit.  This leads onto what happens to voltage and current in a parallel circuit.  This leads to lamps dim when added in series.  This explains why houses are wired in parallel. | Students often incorrectly think the following:  Electricity does not travel at the speed of light.  Current flows from positive to negative terminals.  Voltage and power are the same thing.  Voltmeters are connected in series. |
| Work | Work is done and energy is transferred when a force moves an object.  The bigger the force or distance, the greater the work done.  Levers and pulley reduce the force by increasing the distance moved.  Wheels reduce friction. | Following Forces unit Work is the transfer of energy when an object is moved.  Work is energy measured in joules.  Maths skills in using  Work = force x distance.  To reinforce energy transfer unit.  The greater the mass of an object the more energy will be transferred in moving it.  Investigating simple machines – levers and pulleys.  How these help us in everyday life. |  |
| Gravity | Gravity is a non-contact force, measured in Newtons.  Gravity varies on different planets.  All objects will attract each other; the strength depending on mass and proximity. | To reinforce the Forces unit.  Relate non-contact forces to real world.  To be able to calculate gravitational forces on different planets (Maths skill). | Students often incorrectly think the following:  Isaac Newton did not discover gravity.  There is zero gravity in space.  That a book placed on a desk has no forces acting upon it. |
| Magnetism | Magnetism is a non-contact force.  Permanent magnets are made up of lots of tiny domains.  Ferrous metals can have magnetism induced.  Investigating the shape of magnetic fields.  The poles of a magnet have the strongest field strengths.  Like poles repel and opposites attract.  A magnetic field is created by passing an electrical current through a wire.  To construct an electromagnet and investigate changing strength. | To reinforce the Forces unit with physical models of non-contact forces.  Investigating magnetic field shape in a permanent magnet and relating this to planet Earth.  Using a circus to investigate properties of magnetism.  Building an electromagnet , investigating what effects changing the number of coils, amount of current and types of core have on magnetic field strength .  Researching the uses of electromagnets in daily life – speakers, solenoid switches, relays. | Students often incorrectly think the following:  That the poles of magnets are always coloured the same i.e. red will always repel red.  An induced magnet stays permanently magnetic.  The core of an electromagnet is magnetic even when current is not flowing. |