Science Curriculum Map

Year 7

Carnforth High School

Rationale and Links to The National Curriculum
In year 7 the students begin year 1 of a 5 year spiral curriculum. The content taught links directly to the KS3 Science national curriculum. The topics chosen for year seven aim to build foundations of knowledge in all 3 science areas – the sequencing is chosen so that substantive knowledge is developed in a logical order. The topics begin with observable phenomena – observing cells, states of matter, the effect of forces, before more abstract concepts are introduced – e.g. chemical equations. In Biology – the first topics is cells – the building blocks for life. This then leads to reproduction which develops knowledge of specialist cells (sperm, cell, stem) so that pupils can link their understanding of cells to how genetic information is passed on in its simplest term. The third Biology topic is plants and photosynthesis which makes the link between all life on Earth depending on plants as producers. In Chemistry, the fundamentals are explored in particles and how matter behaves. This then links to chemical reactions where students explore how new products can be made from reactants. At the end of year seven students are introduced to the idea of the periodic table and can link this back to how certain elements behaved when used in chemical reactions in the previous topic. In Physics, the first topic is forces which helps students understand why and how objects move or stay still. Energy is covered next – this builds on the students' knowledge of forces and explores energy transfers through materials. An introduction to basic electrical circuits is studied. Waves is the final topic which explores energy being transferred and the applications of this in the real world.

	Term 1	Term 2	Term 3
Key Topics	• Cells. Tissues, Organs • Particles • Forces	• Reproduction • Chemical reactions • Energy	• Plants and photosynthesis • Periodic table • Light and Sound
Substantive Knowledge (The knowledge the students will develop)	**Cells Tissues and Organs** • Cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope • The functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole and chloroplasts • The similarities and differences between plant and animal cells	**Reproduction** • Reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and	**Plants and Photosynthesis** • Plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots. • The role of leaf stomata in gas exchange in plants. • The reactants in, and products of, photosynthesis, and a word summary for photosynthesis

	• The role of diffusion in the movement of materials in and between cells • The hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms. • The structural adaptations of some unicellular organisms • The tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food • The structure and functions of the gas exchange system in humans **Particles** • Explain the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure • Explain changes of state in terms of the particle model. • Know that conservation of mass applies to changes of state • Define the concept of a pure substance • Describe what is meant by mixtures, including dissolving • Explain diffusion in terms of the particle model • Describe simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography • Identify pure substances. • Describe energy changes on changes of state (qualitative) **Forces** • Forces as pushes or pulls, arising from the interaction between two objects • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces • Forces: associated with rubbing and friction between surfaces, with pushing things out of	dispersal, including quantitative investigation of some dispersal mechanisms. • Differences between species • The variation between individuals within a species being continuous or discrete (discontinuous), to include measurement and graphical representation of variation **Chemical Reactions** • Conservation of mass, chemical reactions. • Chemical reactions as the rearrangement of atoms (as shown in word equations) • Representing chemical reactions using (word) equations • Defining acids and alkalis in terms of neutralisation reactions (as intro to this for Y9) • The pH scale for measuring acidity/alkalinity; and indicators • Reactions of acids with metals to produce a salt and hydrogen • Reactions of acids with alkalis to produce a salt plus water **Energy** • Other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels. • Heating and thermal equilibrium: • Energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change • Comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions	• The dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere • The adaptations of leaves for photosynthesis. • The importance of plant reproduction through insect pollination in human food security **The periodic table** • A simple (Dalton and Bohr) atomic model • Differences between atoms, elements and compounds • Chemical symbols and formulae for elements and compounds • Conservation of mass during chemical reactions. • Chemical reactions as the rearrangement of atoms (as shown in symbol equations) • Representing chemical reactions using formulae and using (symbol) equations • The varying physical and chemical properties of different elements • The principles underpinning the Mendeleev Periodic Table • The Periodic Table: periods and groups; metals and non-metals • How patterns in reactions can be predicted with reference to the Periodic Table • The properties of metals and non-metals **Light and Sound** • The similarities and differences between light waves and waves in matter • Waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition.

	the way; resistance to motion of air and water • Forces: associated with deforming objects; stretching and squashing – springs • Forces measured in newtons • Forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) • Pressure measured by ratio of force over area – acting normal to any surface. • Gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg,	• Comparing energy values of different foods (from labels) (kJ) • Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge • Potential difference, measured in volts, battery and bulb ratings • Comparing power ratings of appliances in watts (W, kW) • Comparing amounts of energy transferred (J, kJ, kW hour) • Domestic fuel bills, fuel use and costs • Fuels and energy resources.	• Frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound • Sound needs a medium to travel, the speed of sound in air, in water, in solids • Sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal • Auditory range of humans and animals. • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound; waves transferring information for conversion to electrical signals by microphone.
Disciplinary Knowledge (The skills and approaches that students will develop)	**Cells Tissues and Organs** • Correctly use a microscope to view samples in greater detail • Identify independent, dependent and control variables • Drawing a suitable results table • Carry out an investigation to test a hypothesis **Particles** • Make and record accurate measurements • Check for reproducibility and recognise when results are reproducible • Evaluate separation methods and suggest improvements • Identify hazards and risks and suggest appropriate safety precautions **Forces** • Formulate a hypothesis and make a prediction. • Identify the variables in a given method • Select appropriate apparatus for making measurements	**Reproduction** • Analyse secondary data, describing patterns, suggesting reasons for patterns, spotting anomalies • Identify variables • Using a model to illustrate sexual reproduction **Chemical Reactions** • observations for evidence for a reaction • recognising hazard symbols, suggesting risks associated with them and appropriate safety precautions • Identifying variables to change, measure and control to test a hypothesis • Check for and comment on reproducibility **Energy** • Identify variables to change, measure and control • Identify hazards and risks, and suggest appropriate and relevant safety precautions • Evaluate methods and data, making suggestions for improvements to procedures or equipment	**Plants and Photosynthesis** • Writing comparisons • Drawing conclusions from observations • Identifying variables to change, measure and control **The periodic table** • Reproducibility ideas • Making predictions and evaluating predictions after experimental work **Light and Sound** • Identifying sources of error • Using SI units for wavelength, frequency, speed,

	• Write conclusions based on results obtained or secondary data provided, and relate results to predictions/ hypothesis		
Assessment (The methods that teachers will use to assess the progress of all students)	Student are assessed several times, formatively during each lesson. This includes: • Starter designed to check prior learning before moving on to trach new content. • Mini white board questions used throughout – this provides effective checks before students begin any independent task – to assess whether students have the knowledge and skills and also understand the task. • Live marking where appropriate • Self-assessment against models/mark schemes so that students get immediate feedback • Whole class feedback at regular points which includes reteach and independent follow up work • Test feedback highlighting misconceptions and including reteach and independent follow up work • Summative assessment is an end of topic test following department policy (10 x multiple choice, key word and definition and exam style questions. Whole class test feedback is used following on from the assessment. • Students are set HSW on Seneca 1 x per week and whole class feedback is given as a minimum every fortnight		
Reading, Writing and Vocabulary	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:
Numeracy	**Cells Tissues and Organs** • Calculating magnification using eyepiece lens x objective lens • Using magnification = image size ÷ actual size • Calculate means and rounding up numbers appropriately • Use data to form conclusions **Particles** • Use and interpret negative numbers • Plot graphs of secondary data onto axes given	**Reproduction** • Collect, process and display data appropriately, explaining the choice for bar charts or line graphs in terms of the type of data **Chemical Reactions** • Recognising repeatable data and processing it appropriately • Choice of bar chart based on categoric data **Energy**	**Plants and Photosynthesis** • Drawing conclusions from observations and from secondary data • Describing trends in graphs and using data to illustrate points made **The periodic table** • Processing primary data to calculate results • Straight lines of best fit with anomalous points

	Forces • Collect and process results, and choose to present the data as a suitable graph • Use and rearrange equations to perform calculations, using SI units where appropriate.	• Describing patterns in primary and secondary data • Drawing graphs	• Describing and explaining results from primary and secondary data and using data to back up these statements **Light and Sound** • Calculating means and uncertainties • Suggesting how additional data can be used to reduce error • The term range in the examples of hearing range and range in results to calculate uncertainty
Personal Development	**Career connect activity:** Microbiologist with Britvic (Cells lesson 1) Formulation Scientist Pfizer (Particles lesson 1) Aerodynamicist (Forces lesson 1)	**Career connect activity:** Midwife – Bolton Foundation HNS trust (Reproduction lesson 1) Senior Scientist – Pfizer (Chem Reactions lesson 1) Energy Manger – Eden Project (Energy lesson 2)	**Career connect activity:** Production manager – Humber VBH (Plants lesson 1) Senior Academic Fellow in Pharmacology (Periodic table lesson 1) Sound Engineer – Somethin' Else – (Light and Sound topic)

SUBJECT Curriculum Map

Year 8

Carnforth High School

Rationale and Links to The National Curriculum
Building on students' knowledge of cells, tissues and organs, the digestive system is introduced and how the body uses nutrients it obtains from digestion. Ecology is then studied which builds on year 7 knowledge of plants to deepen the stunts understanding on how plants animals and microbes are interdependent on each other. Again building on the ideas from the year 7 reproduction topic, students explore why there is variation within species and how this links to competition. The final Biology topic of this year deepens the understanding of how the body works (skeleton, muscles, breathing) and then looks at in more detail more abstract ideas such as respiration, heredity and genetics. In Chemistry, the structure of the Earth and rocks is studied – students already know that many elements exist as compounds which helps in the understanding of structure of the Earth and the minerals found in rocks. This year, year 8 study chemical reactions (it was not studied in year 7) which then links to reactivity and why some elements are more or less reactive than others. The final chemistry topic explores how and why the rate of chemical reactions can be changed, linking knowledge or energy, particle theory and reactivity together. In Physics, building on year 7 knowledge of particles matter is explored, linking to density and pressure and revisiting changes of state to include more detailed explanations for these. Simple equations are used and manipulated. Work done on Forces in year 7 is strengthened by looking at now not just how and why objects move or stay still, but quantitative relationships such as moments, speed and velocity, elastic forces, Electricity and Magnetism are the final physics topic in year 8 – students studied electricity basics (current, voltage) in year 7. This topic deepens builds on this core knowledge to look at resistance, static electricity, magnetism and the magnetic effect of a current.

	Term 1	Term 2	Term 3
Key Topics	• Digestion and Nutrition • Materials and the Earth • Matter	• Ecological relationships and classification • Chemical reactions • Reactivity • Forces in Action	• Biological systems and processes • Energetics and rates • Electricity and magnetism
Substantive Knowledge (The knowledge the students will develop)	**Digestion and Nutrition** • Content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water and why each is needed	**Ecological relationships and classification** • The interdependence of organisms in an ecosystem, including food webs and insect pollinated crops • The cause, ideal conditions and importance of the decay process.	**Biological systems and processes** • The structure and functions of the human skeleton, to include support, protection, movement and making blood cells • Biomechanics – the interaction between skeleton and muscles, including the

	• Describe the chemical tests for protein, fats, starch and sugar • Calculations of energy requirements in a healthy daily diet • The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases • The importance of bacteria in the human digestive system • How the digestive system digests food (enzymes simply as biological catalysts) **Materials and the Earth** • Properties of ceramics, polymers and composites (qualitative). • The composition of the Earth • The structure of the Earth • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks • Earth as a source of limited resources and the efficacy of recycling • The carbon cycle • The composition of the atmosphere • The production of carbon dioxide by human activity and the impact on climate. • The use of fossil fuels to make plastics and evaluating this use **Matter** • Atmospheric pressure, decreases with increase of height as weight of air above decreases with height • Pressure in liquids, increasing with depth; upthrust effects, floating and sinking • Conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving • Similarities and differences, including density differences, between solids, liquids and gases • Brownian motion in gases	• How organisms affect, and are affected by, their environment, including the accumulation of toxic materials. • The variation between species and between individuals of the same species means some organisms compete more successfully, which can drive natural selection • Changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction • The importance of maintaining biodiversity • The use of gene banks to preserve hereditary material. **Reactivity** • A simple Dalton (and Bohr) atomic model • Representing chemical reactions using formulae and using (symbol) equations • Displacement reactions • Reactions of acids with metals to produce a salt plus hydrogen • The properties of metals and non-metals • The chemical properties of metal and non-metal oxides with respect to acidity. • The order of metals and carbon in the reactivity series • The use of carbon in obtaining metals from metal oxides • Reactions of acids with metal carbonates to produce salt +water + carbon dioxide **Chemical Reactions** • Conservation of mass, chemical reactions. • Chemical reactions as the rearrangement of atoms (as shown in word equations) • Representing chemical reactions using (word) equations • Defining acids and alkalis in terms of neutralisation reactions	measurement of force exerted by different muscles • The function of muscles and examples of antagonistic muscles. • The effects of recreational drugs (including substance misuse) on behaviour, health and life processes. • The structure and functions of the gas exchange system in humans, including adaptations to function • The role of diffusion in the movement of materials in and between cells • The mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume • The difference in composition of inhaled and exhaled air and the reasons for this • The impact of exercise, asthma and smoking on the human gas exchange system • Reproduction in humans (as an example of a mammal), to include the effect of maternal lifestyle on the foetus through the placenta • Aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life • A word summary for aerobic respiration • The process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration • The differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism. • Heredity as the process by which genetic information is transmitted from one generation to the next • A simple model of chromosomes, genes and DNA in heredity, including the part played by

	• Diffusion in liquids and gases driven by differences in concentration • The difference between chemical and physical changes. • The differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density, the anomaly of ice-water transition • Atoms and molecules as particles. • Changes with temperature in motion and spacing of particles	• The pH scale for measuring acidity/alkalinity; and indicators • Reactions of acids with metals to produce a salt and hydrogen • Reactions of acids with alkalis to produce a salt plus water **Forces in Action** • Simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged • Speed and the quantitative relationship between mean speed, distance and time (speed = distance ÷ time) • Moment as the turning effect of a force • Forces: associated with deforming objects; stretching and squashing – springs • Measurements of stretch or compression as force is changed • Force-extension linear relation; Hooke's Law as a special case • Work done and energy changes on deformation • Internal energy stored in materials. • Opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface. • Using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes. • Speed and the quantitative relationship between mean speed, distance and time (speed = distance ÷ time) • The representation of a journey on a distance-time graph • Relative motion: trains and cars passing one another.	Watson, Crick, Wilkins and Franklin in the development of the DNA model **Energetics and Rates** • Combustion, thermal decomposition, oxidation reactions • Conservation of mass in chemical reactions. • Representing chemical reactions using formulae and using (symbol) equations • What catalysts do. • Exothermic and endothermic chemical reactions (qualitative). • The rate of a reaction can be found by measuring the quantity of reactant used or the product formed over time. • Factors that affect the rate of a reaction **Electricity and Magnetism** • Resistance, measured in ohms, as the ratio of potential difference (p.d.) to current • Differences in resistance between conducting and insulating components (quantitative). • Separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects • The idea of electric field, forces acting across the space between objects not in contact. • Non-contact forces: forces due to static electricity. • Magnetic poles, attraction and repulsion • Magnetic fields by plotting with compass, representation by field lines • Earth's magnetism, compass and navigation • The magnetic effect of a current, electromagnets, D.C. motors (principles only). • Non-contact forces: forces between magnets • Electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge)

Disciplinary Knowledge (The skills and approaches that students will develop)	**Digestion and Nutrition** • Interpretation of secondary data in various formats • Identify variables to change, measure and control to test a hypothesis • Identifying hazards and risks and suggesting appropriate safety measures • Drawing conclusions from data and observations and explaining them using scientific knowledge and understanding • Evaluation of models **Materials and the Earth** • Explain observations from practical work using scientific knowledge and understanding and using data to back these up **Matter** • How models allow us to understand phenomena • Explaining observations • Writing conclusions from data collected/secondary data •	**Ecological relationships and classification** • Select and use appropriate apparatus and sampling techniques for field work • Describe a method to sample the number of organisms in a habitat • Identify the control variables in a given method • Write conclusions based on results obtained or secondary data provided, and relate results to predictions/ hypothesis • Explaining how scientific theories have developed, as new evidence and ideas are taken into account **Reactivity** • Forming a hypothesis • Method writing, including equipment names chemicals and processes • Identification of variables from a hypothesis Calculating means • Identification of hazards and risks, and suggestions for reducing risk **Chemical Reactions** • observations for evidence for a reaction • recognising hazard symbols, suggesting risks associated with them and appropriate safety precautions • Identifying variables to change, measure and control to test a hypothesis • Check for and comment on reproducibility **Forces in Action** • Describe patterns in primary and secondary data, using data to back up statements.	**Biological systems and processes** • Identifying variables to change, measure and control • Interpreting results • Drawing conclusions and explaining them using knowledge and understanding **Energetics and Rates** • Describing patterns in data • Explaining patterns using scientific knowledge and understanding • Explaining choices for equipment to minimise heat loss and making suggestions on further improvements **Electricity and Magnetism** • Use equipment to make measurements of current, voltage and resistance and record it to an appropriate number of decimal places • Identify variables to change, measure and control to test a hypothesis

Assessment (The methods that teachers will use to assess the progress of all students)	Student are assessed several times, formatively during each lesson. This includes: • Starter designed to check prior learning before moving on to trach new content. • Mini white board questions used throughout – this provides effective checks before students begin any independent task – to assess whether students have the knowledge and skills and also understand the task. • Live marking where appropriate • Self-assessment against models/mark schemes so that students get immediate feedback • Whole class feedback at regular points which includes reteach and independent follow up work • Test feedback highlighting misconceptions and including reteach and independent follow up work • Summative assessment is an end of topic test following department policy (10 x multiple choice, key word and definition and exam style questions. Whole class test feedback is used following on from the assessment. • Students are set HSW on Seneca 1 x per week and whole class feedback is given as a minimum every fortnight		
Reading, Writing and Vocabulary	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:
Numeracy	**Digestion and Nutrition** • Design a table for results **Materials and the Earth** • Read and interpret graphs and tables of secondary data • Describe trends shown in graphs, using data to support and identifying when more than one trend is present • Comparison of data, including multipliers, e.g. 'double the rate' or '5x more' etc **Matter** • Calculating density and determining the correct unit • Sketching graphs and line of best fit • Explanations of observations, describing patterns in data, interpolating and extrapolating from tabular data	**Ecological relationships and classification** • Process data to estimate the population of organism in a habitat • Collect and process results **Reactivity** • Checking for reproducibility **Chemical Reactions** • Recognising repeatable data and processing it appropriately • Choice of bar chart based on categoric data **Forces in Action** • Calculate means, ignoring anomalies • Round means to the same resolution as their original readings • Scale and label axes and draw lines of best fit	**Biological systems and processes** • calculating means, spotting anomalies • identifying the range in a set of readings • analysing and interpreting secondary data in multiple formats • displaying secondary data appropriately **Energetics and Rates** • Scaling and plotting graphs • Drawing lines of best fit • Reading data from graphs and making conclusions from them **Electricity and Magnetism** • Plot a graph and describe the relationship shown • Recognise and describe proportional relationships • Use data to inform conclusions

		• Recognise and describe a proportional relationship	• Use and manipulate equations to calculate unknown values
Personal Development	**Career connect activity:** Dietician- Addenbrookes Hospital (Counselling student- The Princes Trust) (Diet and Health topic) Geologist – Tarmac (Materials topic)	**Career connect activity:** Ecologist- Forestry commission (ecology topic) Senior Scientist- Pfizer (Chemical Reactions topic) Space Scientist-Imperial College London (forces topic)	**Career connect activity:** Molecular Geneticist- Addenbrookes Hospital (Biology topic) Boiler team leader- E.ON (Electricity and Magnetism topic)

SUBJECT Curriculum Map

Year 9

Carnforth High School

Rationale and Links to The National Curriculum
As students begin their third year of the 5 year curriculum, in Biology we look to strengthen and expand on Cells as a fundamental topic in Biology. Students explore how substances enter and leave cells, how animals and plants are adapted for this exchange. Students develop knowledge of stem cells and the applications of these. Building on the Biological systems topic from year 8, students also revisit digestion and this time link to the enzyme activity involved in digestion. Breathing and gas exchange are revisited and also the heart and circulatory system, looking at lifestyle choices and factors that can affect health and wellbeing. Students have previously studied plants and photosynthesis but now go onto learn about transport systems in plants and plant tissues. Finally in Biology, the students study Infection and how the body responds. They have learnt about specialised cells and now get the opportunity to look at white blood cells in more detail and how the body uses its systems to defend against disease. In Chemistry, students begin to learn about the atom in more detail - they move on from using the term 'particles' and develop an understanding on how the structure of the atom links to the chemical reactions they have previously studied. Disciplinary knowledge is developed in learning out how models of the atoms have changed over time. This builds on the simple Dalton Bohr models studied previously. At the end of the year, students are introduced to how atoms bond together to form compounds. In Physics, students revisit the particle model of matter and look in more detail about the behaviour of particles, including new using new terms internal and potential energy. They will begin to use equations to describe energy needed to melt/boil or raise the temperature of substances. Building on work done in term 1, Atomic structure is studied, looking at what happens when atoms are unstable. At the ned of year nine, Energy is revisited, this time, introducing more challenging mathematical content.

	Term 1	Term 2	Term 3
Key Topics	• Cell Biology • Atomic Structure (chemistry) • Particle Model (Physics)	• Organisation • Energy Changes • Atomic Structure	• Infection and response • Energy • Bonding
Substantive Knowledge (The knowledge the students will develop)	**Cells** • Label the parts of a typical animal, plant and bacterial cell, describing the functions of each part • Define eukaryotic and prokaryotic cells and give examples. Compare different types of cells in terms of structures and size.	**Organisation** • Name the components of the diet and give examples of foods in which they are found • Interpret food labels • Describe the structure and function of the digestive system	**Infection and response** • Name the cause of infectious disease and describe how they make us ill • Describe how pathogens can be spread, and how this spread can be reduced • Describe the main defence mechanisms of the body

	• Compare the sizes of different cells and organelles • Explain the importance of cell differentiation • Describe specialised features of given cells • Explain the reason for the special features in terms of the cells function • Define diffusion using key terms • Describe and explain factors that can affect the rate of diffusion • Explain the need for internal surfaces and circulatory systems in larger organisms • Describe and explain the adaptations in plants and animals for the exchange of materials • Define the term osmosis and give some examples in living things • Describe the process of active transport and give some examples • Compare diffusion, osmosis and active transport • Interpret secondary data on active transport • Name sources of stem cells and their function • Describe some potential uses of stem cell technology • Evaluate different stem cell sources **Atomic Structure** • Identify elements and compounds from diagrams • Write and interpret chemical formulae • Identify reactants and products in equations • Define, identify and describe mixtures • Explain the steps in the separation of mixtures of soluble and insoluble substances • Explain how mixtures of soluble and insoluble substances are represented and recognised • Apply particle theory to distillation • State the definition of an isotope • Compare isotopes from given information • Describe what happens in terms of electrons when metals and non-metals react	• Describe the action of enzymes in digestion using the 'lock and key' model • Explain the results of the model gut experiment • Name the 3 main digestive enzymes, their substrate and products of their action • Describe the purpose and action of acid and bile in the digestive system • Describe the process of digestion and absorption • Describe and explain the effect of temperature on the rate of enzyme action • Describe and explain the effect of pH on the rate of enzyme activity • Label the major structures in the lungs • Describe gaseous exchange • Describe and explain how the lungs are adapted for efficient gaseous exchange. • Describe the components of the blood and their function • Describe the structure and function of arteries and veins • Describe adaptations of the blood components and blood vessels. • Label the major structures in the heart • Explain why the heart is a double pump • Describe how heart rate is controlled • Describe some of the causes of heart disease • Explain how coronary heart disease can lead to a heart attack • Evaluate treatments for heart disease • Describe some risk factors for diseases • Describe how one disease can trigger another • Analyse and interpret secondary data on disease incidence rates	• Describe the symptoms and spread of bacterial diseases salmonella and gonorrhoea • Describe ways to prevent further spread and treat these diseases • Describe trends in data and give reasons it may not be accurate • Describe the symptoms and spread of viral diseases measles, HIV and TMV • Describe ways to prevent further spread and treat these diseases • Explain why antibiotics cannot be used to treat these diseases • Describe the symptoms, spread and prevention of rose black spot • Describe the spread, symptoms and prevention of malaria • Explain what is meant by the term 'vector' • Describe the main defences to pathogens • Describe the three ways white blood cells respond to pathogens that do enter the body • Describe the difference between the primary and secondary response to a pathogen • Describe what a vaccine contains • Explain how vaccines give immunity • Describe the development of and importance of vaccination programmes • Explain the difference between over the counter medicines and antibiotics • Describe the stages in developing new drugs to treat disease • Describe the use of placebos and explain why they are needed **Energy** • Name the 8 energy stores

	• Explain why group 0 do not react in terms of electrons • Describe trends in physical properties of group 0 • Describe physical and chemical properties of the group 1 elements D • escribe and write equations to represent the reactions of group 1 metals with oxygen, chlorine and water • Describe and explain trends in reactivity of group 1 • Describe trends in physical properties of group 7 elements • Describe trends in reactivity going down group 7 • Explain the trend in boiling point and reactivity in group 7 • Describe the results of a series of reactions of group 7 elements and their compounds • Explain the results using knowledge of reactivity • Write word and symbol equations to represent the reactions • Explain how a double blind trial is carried out **Particle Model of Matter** • Describe the arrangement of particles in solids, liquids and gases and represent them with accurate drawings • Describe the two results of changing the internal energy of a system and recognize them on heating/cooling graphs • Describe heating and changes of state in terms of kinetic and potential energy stores • Describe changes to particle arrangement and movement during a change of state	• Explain the impacts of lifestyle choices and disease at local, national and global levels • Describe how cancer forms in the body • Explain the difference between 'benign' and 'malignant' tumours • Describe the risk factors associated with cancer development • Describe the job of the different types of plant tissue and how they are adapted for function • Describe the structure of a leaf and how it is adapted for gas exchange • Explain the function and location of stomata • Describe the processes of transpiration and translocation • Explain the importance of transpiration • Describe and explain the factors that affect the rate of transpiration **Energy Changes** • Identify endothermic and exothermic reactions and give examples of each type • Describe some everyday uses of exothermic and endothermic reactions • Evaluate applications of exothermic and endothermic reactions • Draw and recognise energy level diagrams for endothermic and exothermic reactions • Correctly identify activation energy and overall energy change on energy level diagrams • Explain why reactions are endothermic or exothermic in terms of bond breaking and bond making • Use bond energy tables to calculate overall energy changes during a reaction • Use the values to determine whether a reaction is endothermic or exothermic	• Describe the transfer of energy from one store to another, identifying pathways • Identify when energy is dissipated • Describe the energy transfers in a bouncing object • Describe, using examples, what is meant by power • Compare the power of different appliances or machines • Describe methods for reducing unwanted energy transfers • Explain what is meant by specific heat capacity • Name the main renewable and non-renewable energy resources and describe their main uses • Interpret data to compare use of our main energy resources • Describe how unintended energy transfers in homes can be reduced **Bonding** • Represent ionic bonding using diagrams • Describe the formation of an ionic bonds • Write formula for ionic compounds • Describe and explain some of the physical properties of ionic compounds • Describe the limitations of diagrams to represent ionic structures • Define a covalent bond • Draw covalent bonds showing shared pairs of electrons • Explain why some covalent substances form giant structures and some form molecules • Describe physical properties of simple and giant covalent substances • Explain physical properties of simple and giant covalent substances

	• Use the particle model to explain gas pressure • Explain why changing the temperature of a gas affects the pressure • Describe how volume changes affect pressure • Use the particle model to explain how changes in volume can result in changes in pressure	• Explain why bond energy calculations have a margin of error **Atomic Structure (Physics)** • Describe the current atomic model • Compare isotopes in terms of their sub atomic particles • Explain how EM radiation can cause changes in • Describe the effect of alpha, beta and gamma radiation on the nucleus • Describe the properties of alpha, beta and gamma radiation • Describe the properties of alpha, beta and gamma radiation • Describe what is meant by the radioactive half life of a sample. • irradiation • Compare the hazards associated with contamination and irradiation of a given source • Suggest ways of minimising risks • Apply knowledge of nuclear radiation properties to explain their uses • Choose a suitable radioactive isotope for a given use • Describe some of the hazards of exposure to radiation and how these are studied	• Draw, name and recognise polymers • Explain why polymers tend to be solids at room temperature • Describe the properties of diamond, graphite, fullerenes and graphene • Explain the properties using knowledge of the bonding and structure • Relate properties of these carbon allotropes to their uses • Describe the structure and bonding in metals • Describe and explain the properties of metals • Describe the structure of an alloy • Explain why alloys are harder than pure metals • Compare dimensions of particles of different sizes, converting units where necessary • Explain why nanoparticles have different properties than bulk materials, using calculations to support • Evaluate the use of nanoparticles given appropriate information
Disciplinary Knowledge (The skills and approaches that students will develop)	**Cells** • Describe how to use a light microscope to view cells • Explain what is meant by the terms resolution and magnification • Explain how electron microscopes have enhanced our understanding of cell structures and processes	**Organisation** • Describe how to safely test for starch and sugars • Describe the positive and negative results of these tests • Describe how to safely test for starch and sugars	**Energy** • Explain the method steps used to find the specific heat capacity of a substance • Suggest and explain improvements to the method used to improve accuracy • Write a method to determine the specific heat capacity of unknown substances

	• Prepare a slide to view plant cells using a light microscope • Make accurate drawings from the microscope • Use an equation to calculate magnification, image size or actual size, changing units where needed • Prepare a slide of human cheek cells and view them under the microscope • Use the magnification equation to calculate the image or actual size or magnification • Describe and explain the results of an investigation on diffusion • Use a microscope to observe osmosis and sketch the cells seen • Identify variables to change, measure and control to test a hypothesis • Explain reasons for given method steps • Make and record accurate mass measurements • Identify DNA, genes, chromosomes on a diagram • Describe the main stages in the cell cycle **Atomic Structure** • Name and identify equipment used in distillation • Describe how to separate a mixture of two or more liquids • Describe the process of chromatography • Carry out the chromatography of chlorophyll, explaining key steps • Interpret chromatograms • Describe atoms using the nuclear model • State the charges and mass of the three subatomic particles • Describe the development of the atomic model	• Describe the positive and negative results of these tests • Identify variables to change measure and control to test the effect of temperature on enzyme action • Write a method to describe how to investigate the effect of pH on the rate of enzyme activity. • Describe and explain patterns in secondary data • Interpret results for investigations using different methods for investigating rates **Energy Changes** • Investigate one of the variables affecting the temperature change, identifying variables to change, measure and control • Collect and record accurate data • Evaluate the equipment and method used, making and explaining suggestions for improvement • Interpret results from other endothermic and exothermic reactions **Atomic Structure (Physics)** • electron arrangement or ionisation • Compare the nuclear model of the atoms with the plum pudding model • Describe how evidence led to changes in the atomic model • Describe a method to determine which type of radiation is emitted from an unknown source • Explain observations using knowledge and understanding of radiation • Explain why Rutherford's atomic model was readily accepted	**Bonding** • Use different models for covalent molecules and give the limitations for each • Predict the state of substances at different temperatures • Predict the type of bonding present given melting and boiling point data

	• Compare the nuclear model with the plum pudding model • Explain how new evidence from the scattering experiment led to a change in the atomic model • Describe the layout of the modern periodic table • Compare the early versions of the periodic table with the modern one • Explain how the periodic table was developed as ideas changed **Particle Model of Matter** • Use the particle model to explain differences in properties of solids, liquids and gases • Evaluate the particle models		
Assessment (The methods that teachers will use to assess the progress of all students)	Student are assessed several times, formatively during each lesson. This includes: • Starter designed to check prior learning before moving on to trach new content. • Mini white board questions used throughout – this provides effective checks before students begin any independent task – to assess whether students have the knowledge and skills and also understand the task. • Live marking where appropriate • Self-assessment against models/mark schemes so that students get immediate feedback • Whole class feedback at regular points which includes reteach and independent follow up work • Test feedback highlighting misconceptions and including reteach and independent follow up work • Summative assessment is an end of topic test following department policy (10 x multiple choice, key word and definition and exam style questions. Whole class test feedback is used following on from the assessment. • Students are set HSW on Seneca 1 x per week and whole class feedback is given as a minimum every fortnight		
Reading, Writing and Vocabulary	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets

Numeracy	**Cells** • Calculate surface area to volume ratios • Make and record accurate measurements • Process and display data appropriately • Describe and explain the results obtained • Calculate rates of water uptake • Use information provided to calculate time spent in different phases during the cell cycle **Atomic Structure** • Apply conservation of mass to equations • Use the periodic table to calculate the number of protons, neutrons and electrons for any given element • Calculate RAM of isotopes given their abundance and give answers to specified number of significant figures or decimal places **Particle Model of Matter** • Use an equation to calculate density, mass or volume of an object • Describe how to measure the density of regular and irregular solid • Make and record accurate measurements • Describe how to measure the density of liquids • Make and record accurate measurements • Suggest possible sources of error and how to correct them • Plot secondary data for heating a substance • Use the specific heat capacity equation to calculate any value given the others • Describe latent heat of vaporization and fusion and recognize them on a graph	**Organisation** • Calculate enzyme rates and give answers to appropriate number of significant figures • Calculate blood flow using appropriate equations • Analyse data on cancer risk factors and incidence **Energy Changes** • Process results appropriately and describe patterns • Display data appropriately • **Atomic Structure (Physics)** • Represent radioactive decay using equations • Plot a graph representing the number of decays in a sample. • Determine half lives from information given	**Infection and Response** • Collect data on the action of different antibiotics on a bacteria and process it appropriately • Use the data to write a conclusion, commenting on reproducibility • **Chemical Change** • Process secondary data on an acid and alkali reaction • Make order of magnitude calculations to describe changes in pH • when one is changed using an equation **Energy** • Calculate the energy stored in a moving object • Rearrange the equation to calculate velocity or mass • Change units where necessary and express answers to given numbers of significant figures • Use an equation to calculate GPE, mass or height • Use values for GPE to calculate the theoretical velocity of an object • Explain why the maximum theoretical velocity is never actually reached. • Calculate the energy stored in a stretched or compressed object • Calculate power using energy transferred or work done • Calculate efficiency from energy transferred or power • Interpret Sankey diagrams • Use the specific heat capacity equation to calculate unknown values

	• Use an equation to calculate energy, mass or latent heat values • Plot data to show the effect of temperature on gas pressure and describe the pattern shown • Calculate the resulting pressure or volume		
Personal Development	Careers connect links • Cell Biology in lesson 1 • Atomic Structure lesson 1 • Particle model of matter lesson 1	Careers connect links • Organisation lesson 1 • Bonding lesson 1 • Energy lesson 1	Careers connect links: • Infection and response lesson1 • Chemical Change Lesson 1 •

SUBJECT Curriculum Map

Year 10

Carnforth High School

Rationale and Links to The National Curriculum
Students build on prior knowledge covered in year nine to tackle more challenging topics as they progress through KS4. In Biology, the KS3 topics of respiration and photosynthesis are covered in greater depth in Bioenergetics – linking now to limiting factors and the effects of exercise on respiration rates. Using prior knowledge of Biological systems and processes, students also look at how a constant environment is maintained in the human body in homeostasis and deepen their understanding of how hormones work – for example in KS3 the menstrual cycle is covered – in KS4 students learn about the hormones driving the cycle. The final Biology topic is inheritance, variation and evolution which revisits concepts taught in the kS3 topics reproduction and biological systems, deepening understanding of the mechanism of inheritance and how natural selection leads to evolution of species. In Chemistry more challenging mathematical concepts are covered in quantitative, energy changes and rates where alongside disciplinary skills, students develop mathematical skills of processing data, graph drawing and evaluation of practical work using data. In physics, students revisit the basic concepts of electricity covered at KS3 and then go on to investigate current, voltage and resistance with a number of different circuit components as well as developing an understanding of the electricity supply in the UK and how it is maintained. Atomic Structure and Waves are studied which builds on prior knowledge of atomic theory (Chemistry) and Energy which was studied at the end of year nine.

	Term 1	Term 2	Term 3
Key Topics	• Bioenergetics • Quantitative Chemistry • Electricity	• Homeostasis • Energy Changes • Atomic Structure (physics)	• Inheritance Variation and Evolution • Rate and extent of chemical change • Organic Chemistry • Waves
Substantive Knowledge (The knowledge the students will develop)	**Bioenergetics** • Represent photosynthesis using a word equation • Describe the uses for the glucose made during photosynthesis • Describe and explain the impact of rates of photosynthesis and respiration at different times of day • Describe ways of maximising rates of photosynthesis in farming • Evaluate greenhouse design features	**Homeostasis** • Describe the function and composition of the nervous system • Name the different types of receptors and their stimuli • Describe the reaction pathway in response to a stimulus • Label a diagram of a reflex arc, using key terms correctly • Describe what happens at a synapse • Describe the reflex response to stated stimuli	**Inheritance Variation and Evolution** • Describe the main steps in meiosis • Explain how meiosis leads to unique gametes • Compare meiosis with mitosis • Describe sexual and asexual reproduction in animals and plants • Explain why asexual reproduction leads to identical offspring • Explain why sexual reproduction leads to variation

	• Define respiration and explain its importance in the body • Describe the changes in the body during exercise • Explain why these changes are necessary • Define anaerobic respiration • Compare aerobic respiration with anaerobic respiration in animals and plants/yeast • Define the term metabolism, giving examples of the reactions involved • Describe the formation of lipids, amino acids and urea • Describe factors that can affect the metabolic rate **Quantitative Chemistry** • Use the periodic table and formulae to determine the relative mass of elements and compounds • Work out the percentage of given elements in a compound • Work out the mass of a particular element in a given mass of a compound • Write chemical formula using ideas of charge • Predict the mass of product from a specified starting mass • Use a balanced equation to work out the quantity of reacting elements needed to produce a specified quantity of product • Suggest why the mass obtained may be less than that calculated • Define the term 'concentration' • Define a limiting reactant • Describe the effect of a limiting reactant on the amount of products it is possible to achieve • Calculate the limiting reactant from a balanced symbol equation and information provided	• Label the main endocrine glands of the body • Describe how thyroxine and adrenaline work to bring about a response • Compare hormonal responses with nervous responses • Define homeostasis and name some of the conditions it relates to • Explain the importance of homeostasis in terms of enzymes and osmosis • Describe how blood glucose levels are monitored • Explain how insulin controls blood glucose levels in the body • Compare Type 1 and Type 2 diabetes • Describe some treatments for both types of diabetes • Describe the roles of male and female reproductive hormones • Describe the stages of the menstrual cycle, naming the hormones involved • Describe how fertility drugs and IVF work • Evaluate fertility treatments from the perspective of doctors and patients • Describe how different methods of contraception prevent pregnancy • Evaluate different contraceptive methods **Energy Changes** • Identify endothermic and exothermic reactions and give examples of each type • Describe some everyday uses of exothermic and endothermic reactions • Evaluate applications of exothermic and endothermic reactions • Draw and recognise energy level diagrams for endothermic and exothermic reactions • Correctly identify activation energy and overall energy change on energy level diagrams	• Identify diagrams or descriptions of genes, DNA and chromosomes • Describe the structure and function of DNA • Describe the importance of understanding the human genome • Construct and interpret genetic diagrams. • characteristics given information about the parents • Use genetic terms to describe parents & offspring characteristics • Describe the symptoms of the genetic diseases cystic fibrosis & polydactyly • Evaluate the use of embryo screening for inherited disorders • Name and recognise the chromosomes that determine sex • Construct and interpret diagrams to show how sex is inherited • Interpret family tree diagrams to explain the pattern of inheritance • Describe reasons for variation within species • Describe the effects of mutations • Explain how variation can lead to evolution • Interpret evolutionary trees • Explain why some organisms are now extinct • Describe some of the ways fossils are produced • Explain why we cannot be certain about how life on earth began • Describe how bacteria have evolved to become resistant to antibiotics • Describe ways of reducing the development of antibiotic resistant bacteria • Evaluate the use of antibiotics in agriculture • Describe the process of selective breeding in plants and animals • Describe the steps involved in Genetic Engineering • Describe classification systems • Use the binomial naming system given appropriate information

	Electricity • Draw circuits, using correct common circuit symbols • Describe electrical current • Describe what is meant by potential difference and resistance in circuits • Describe what happens to current when potential difference and resistance are varied • Predict current and pd in series circuits • Describe the effect of adding resistors in series circuits • Describe and apply the rules for pd and current in a parallel circuit • Describe and explain the relationship between current, pd and resistance in a filament lamp • Describe and explain the pattern of current and pd with a diode • Explain how resistance changes with light levels in an LDR • Draw a circuit diagram to illustrate how to test the resistance of a thermistor • Explain the uses of thermistors • Describe the features of UK mains supply and three core cable • Explain the use of live, neutral and earth wires • Explain the difference between direct and alternating potential difference • Describe how electrical work leads to energy changes • Describe how electricity is transmitted in the national grid, naming the components • Explain the use of transformers in the national grid • Evaluate the use of underground or overhead cables.	• Explain why reactions are endothermic or exothermic in terms of bond breaking and bond making • Use bond energy tables to calculate overall energy changes during a reaction • Use the values to determine whether a reaction is endothermic or exothermic • Explain why bond energy calculations have a margin of error **Atomic Structure (Physics)** • Describe the current atomic model • Compare isotopes in terms of their sub atomic particles • Explain how EM radiation can cause changes in • Describe the effect of alpha, beta and gamma radiation on the nucleus • Describe the properties of alpha, beta and gamma radiation • Describe the properties of alpha, beta and gamma radiation • Describe what is meant by the radioactive half life of a sample. • irradiation • Compare the hazards associated with contamination and irradiation of a given source • Suggest ways of minimising risks • Apply knowledge of nuclear radiation properties to explain their uses • Choose a suitable radioactive isotope for a given use • Describe some of the hazards of exposure to radiation and how these are studied	**Rate and extent of chemical change** • Describe and explain the effect of concentration on the rate of reaction • Describe and explain the effect of temperature on rates of reaction, using particle theory. • Describe and explain the effect of changing surface area on the rate of reaction • Describe and explain the effect of pressure on the rate of gaseous reactions • Describe what a catalyst is and how it affects the rate of a reaction • Explain why more than one catalyst is often needed • Draw a reaction profile for a reaction with and without a catalyst • Describe what is meant by a reversible reaction and how to represent it • Explain how reversible exothermic and endothermic reactions are linked • State and apply Le Chatelier's principle to any reversible reaction **Organic Chemistry** • Describe the composition of crude oil • Draw the first five alkanes and write their chemical formula • Use the general chemical formula of alkanes • Describe trends in the physical and chemical properties of the fractions collected • Explain why cracking is necessary **Waves** • Use scaled diagrams to measure wavelength or amplitude • Calculate frequency or the time period of a wave given diagrams or information • Use the wave equation to calculate wave speed • Process results appropriately to calculate

			wave speed • Process data to calculate wave speed in a solid • Present data as a bar chart. • Use the wave equation to calculate the speed of EM waves • Describe methods for investigating infrared emission and absorption • Process data to calculate means and uncertainty • Describe and explain data from an investigation • Calculate the probability of inheriting particular
Disciplinary Knowledge (The skills and approaches that students will develop)	**Bioenergetics** • Work safely to carry out a test for starch explaining the steps • Explain the results of the starch test • Explain the observations of secondary investigations using knowledge of photosynthesis • Identify variables to change, measure and control to test a hypothesis • Explain the steps in a given method to test a hypothesis • Collect data and process it • Explain the results of a simple experiment into anaerobic respiration using knowledge and understanding **Quantitative Chemistry** • Safely carry out the thermal decomposition of copper carbonate • Calculate and explain the change in mass	**Homeostasis** • Identify variables to change, measure and control • Collect, record and process data accurately • Display data collected (including uncertainties if appropriate) • Write a conclusion using evidence collected • Write a method to test a hypothesis regarding reaction times • Give reasons for choosing a ruler drop or computer based test • Describe patterns in secondary data **Energy Changes** • Investigate one of the variables affecting the temperature change, identifying variables to change, measure and control • Collect and record accurate data • Evaluate the equipment and method used, making and explaining suggestions for improvement • Interpret results from other endothermic and exothermic reactions	**Inheritance Variation and Evolution** • Describe the theory of evolution • Explain how fossil evidence gives us information about the development of life on earth • Explain how advances in biology have changed classification systems **Rate and extent of chemical change** • Collect and record data to investigate the effect of concentration on rates of reaction • Identify variables to change, measure and control to test a hypothesis • Write a valid method to test the given hypothesis **Organic Chemistry** • Describe how crude oil is separated into fractions • Carry out the distillation of crude oil • Describe the process and products of cracking • Draw and name polymers made from alkenes

		Atomic Structure (Physics) • electron arrangement or ionisation • Compare the nuclear model of the atoms with the plum pudding model • Describe how evidence led to changes in the atomic model • Describe a method to determine which type of radiation is emitted from an unknown source • Explain observations using knowledge and understanding of radiation • Explain why Rutherford's atomic model was readily accepted	**Waves** • Describe evidence that matter does not move • Describe a method to measure the speed of sound through air • Make and record measurements to calculate the speed of sound in air • Identify sources of error and suggest improvements to an experimental method. • Describe and explain how to accurately measure the speed of waves in water • Construct ray diagrams to illustrate the refraction of waves. • Describe some of the dangers of EM waves • Make conclusions from secondary data on the risks and consequences of exposure to radiation
Assessment (The methods that teachers will use to assess the progress of all students)	Student are assessed several times, formatively during each lesson. This includes: • Starter designed to check prior learning before moving on to trach new content. • Mini white board questions used throughout – this provides effective checks before students begin any independent task – to assess whether students have the knowledge and skills and also understand the task. • Live marking where appropriate • Self-assessment against models/mark schemes so that students get immediate feedback • Whole class feedback at regular points which includes reteach and independent follow up work • Test feedback highlighting misconceptions and including reteach and independent follow up work • Summative assessment is an end of topic test following department policy (10 x multiple choice, key word and definition and exam style questions. Whole class test feedback is used following on from the assessment. • Students are set HSW on Seneca 1 x per week and whole class feedback is given as a minimum every fortnight		

Reading, Writing and Vocabulary	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:
Numeracy	**Bioenergetics** • Present the data collected during the investigation appropriately • Describe and explain the relationship shown in a graph • Describe and explain the effect of other factors on the rate of photosynthesis • Interpret graphs of photosynthesis rate with multiple factors and decide which is limiting **Quantitative Chemistry** • Use an equation to convert between mass, atomic/formula mass and number of moles • Use Avogadro's constant to calculate the mass of single atoms or the number of atoms in a given mass • Use standard form in calculations and answers • Balance equations using the same number of atoms rule • Explain why equations have to balance • Apply conservation of mass to equations • Calculate concentration from mass and volume • Calculate the mass of a substance in a given volume of a solution of a known concentration **Electricity** • Use the equation Q=It to calculate any value given the other two, changing units where necessary • Use Ohm's Law to calculate current, resistance or pd •	**Homeostasis** • Collect data on skin receptors and make conclusions • Describe and explain a blood glucose graph • Interpret data from graphs on the effect of insulin on blood glucose in people with diabetes • Interpret secondary data on fertility treatments and IVF • Interpret data on the effectiveness of contraception **Energy Changes** • Process results appropriately and describe patterns • Display data appropriately • **Atomic Structure (Physics)** • Represent radioactive decay using equations • Plot a graph representing the number of decays in a sample. • Determine half lives from information given	**Inheritance Variation and Evolution** • Use genetic cross diagrams to calculate probability of offspring inheriting these diseases **Rate and extent of chemical change** • Collect and record data to measure the rate of reaction • Plot a graph of the data obtained. • Describe and explain patterns in the data collected • Calculate the rate of the reaction • Display this data appropriately • Process and analyse secondary data on the effect of temperature on the rate of reaction • Present secondary data appropriately, explaining the choice of graph **Organic Chemistry** • Describe the test for alkenes and its positive result • Represent cracking using equations • Balance equations for reactions of hydrocarbons • Calculate overall energy changes in combustion reactions **Waves** • Use scaled diagrams to measure wavelength or amplitude • Calculate frequency or the time period of a wave given diagrams or information • Use the wave equation to calculate wave speed

	• Use an equation linking potential difference, current and resistance to calculate any value given the other two • Calculate resistance in the wire using experimental results • Present results as suitable graph • Plot a graph of the data obtained • Describe and explain the relationship between current, pd and resistance in a fixed resistor • Process secondary data appropriately and use it to inform a conclusion • Choose the correct equation to calculate values, given appropriate information • Give answers with correct units and to the correct number of significant figures		• Process results appropriately to calculate wave speed • Process data to calculate wave speed in a solid • Present data as a bar chart. • Use the wave equation to calculate the speed of EM waves • Describe methods for investigating infrared emission and absorption • Process data to calculate means and uncertainty • Describe and explain data from an investigation Calculate the probability of inheriting particular
Personal Development	**Career connect links:** In each topic the first lesson has a short video linking to a range of careers where that aspect of science could be used.		

SUBJECT Curriculum Map

Year 11

Carnforth High School

Rationale and Links to The National Curriculum
The current year 11 will complete the Biology topics by studying Inheritance and Variation, which revisits concepts taught in the KS3 topics reproduction and biological systems, deepening understanding of the mechanism of inheritance and how natural selection leads to evolution of species. Ecology revisits interdependence and introduces quadrats as a practical way of sampling an environment. In Chemistry, Chemical analysis develops practical skills for analysing samples and Chemistry of the atmosphere provides a good link with the Ecology topic looking at wats in which humans are affecting the environment. This also ties in with using resources obtained from the Earth. Physics content is completed by looking at the behaviour of waves, and magnetism and electromagnetism. As these are two of the more challenging topics for students, they are done at this point as students have studied Energy, Forces and Electricity already, thus providing the core knowledge needed to understand these difficult abstract concepts.

	Term 1	Term 2	Term 3
Key Topics	• Inheritance and Variation • Ecology • Chemical Analysis • Chemistry of Atmosphere • Waves • Mock 1	• Organic Chemistry • Magnetism and Electromagnetism • Using resources • Space Physics (triple only) • Mock 2	• Revision and exam preparation
Substantive Knowledge (The knowledge the students will develop)	**Inheritance Variation and Evolution** • Describe the main steps in meiosis • Explain how meiosis leads to unique gametes • Compare meiosis with mitosis • Describe sexual and asexual reproduction in animals and plants • Explain why asexual reproduction leads to identical offspring • Explain why sexual reproduction leads to variation • Identify diagrams or descriptions of genes, DNA and chromosomes	**Organic Chemistry** • Describe the composition of crude oil • Draw the first five alkanes and write their chemical formula • Use the general chemical formula of alkanes • Describe trends in the physical and chemical properties of the fractions collected • Explain why cracking is necessary **Magnetism and Electromagnetism** • Describe the difference between a permanent and an induced magnet	

	• Describe the structure and function of DNA • Describe the importance of understanding the human genome • Construct and interpret genetic diagrams. • characteristics given information about the parents • Use genetic terms to describe parents & offspring characteristics • Describe the symptoms of the genetic diseases cystic fibrosis & polydactyly • Evaluate the use of embryo screening for inherited disorders • Name and recognise the chromosomes that determine sex • Construct and interpret diagrams to show how sex is inherited • Interpret family tree diagrams to explain the pattern of inheritance • Describe reasons for variation within species • Describe the effects of mutations • Explain how variation can lead to evolution • Interpret evolutionary trees • Explain why some organisms are now extinct • Describe some of the ways fossils are produced • Explain why we cannot be certain about how life on earth began • Describe how bacteria have evolved to become resistant to antibiotics • Describe ways of reducing the development of antibiotic resistant bacteria • Evaluate the use of antibiotics in agriculture • Describe the process of selective breeding in plants and animals • Describe the steps involved in Genetic Engineering • Describe classification systems • Use the binomial naming system given appropriate information **Ecology**	• Describe the test to see if a material is magnetic or a magnet • Describe and draw the direction of the magnetic field around a bar magnet • Explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic • Describe and draw the magnetic field around a wire carrying a current • Describe the magnetic field in and around a solenoid • Explain how the strength of the magnetic field can be varied • Describe the motor effect • Explain how a DC motor works, using Flemings left hand rule to predict direction of rotation **Using resources** • State ways in which natural products are supported or replaced by man-made products • Evaluate the use of finite and renewable resources • Describe some ways of reducing our use of finite resources • Evaluate ways of reducing our use of limited resources • State uses of the alloys bronze, brass and steel • Interpret and evaluate the composition and uses of alloys given appropriate information • Explain why alloys are more useful than pure metals • Explain how low density and high density poly(ethene) are both produced from ethene • Explain the difference between thermsoftening and thermosetting polymers in terms of their structures • Distinguish between pure and potable water	

	• Identify examples of interdependence within an ecosystem • Predict the impact of changes to one species on the rest of the community • Identify biotic and abiotic factors within an ecosystem • Give examples of behavioural, structural or functional adaptations • Suggest factors that organisms are competing for given information • Describe and explain how a change in a biotic or abiotic factor can affect an organism and the community • Describe ways in which plants are adapted to survive in different habitats • Explain how these features help survival • Explain what is meant by the term 'extremophile' and give examples • Describe the water cycle and explain its importance to living things • Describe the processes by which carbon is cycled through biotic and abiotic parts of ecosystems • Explain the importance of microorganisms and decay • Describe some man-made causes of pollution • Explain how an increased need for fuel and food has affected the atmosphere • Describe some of the consequences of global warming • Describe some impacts of humans on biodiversity • Explain the importance of biodiversity • Describe ways that humans have tried to restore or maintain biodiversity **Organic Chemistry** • Describe the composition of crude oil • Draw the first five alkanes and write their chemical formula • Use the general chemical formula of alkanes	• State components of waste water that can cause problems in the environment • Describe how waste water is treated to make it safe to release into the environment • Compare the treatments of waste, ground and salt water in terms of ease of producing potable water • Name the source of the reactants in the Haber process • Predict the effect of temperature, concentration and pressure on yield and rate of reaction in the Haber process • State the use and composition of NPK fertilisers • Describe the production of NPK fertilisers, naming reactants and products	

	• Describe trends in the physical and chemical properties of the fractions collected • Explain why cracking is necessary **Chemical analysis** • Identify pure and impure substances using diagrams or data • Describe and give examples of formulations • Describe the tests for oxygen, carbon dioxide, hydrogen and chlorine and their positive results **Chemistry of Atmosphere** • Compare the compositions of Earth's atmosphere with the modern one • Describe and explain the changes in the composition of the atmosphere over Earth's history • Describe and explain the formation of limestone, coal, crude oil and natural gas • Describe the greenhouse effect • Describe the reasons for and the impacts of increasing greenhouse gases on the temperature of the Earth's atmosphere • Describe potential consequences of climate change • Define the carbon footprint in a range of contexts • Describe how carbon monoxide, soot, sulphur dioxide and nitrogen oxides are produced and released into the atmosphere **Waves** • Identify the features of a longitudinal and transverse waves • Describe how longitudinal and transverse waves are produced • Describe the relationship between frequency and wavelength • Name the 7 waves of the electromagnetic		

	spectrum • Describe properties and uses of the EM spectrum waves		
Disciplinary Knowledge (The skills and approaches that students will develop)	**Inheritance Variation and Evolution** • Describe the theory of evolution • Explain how fossil evidence gives us information about the development of life on earth • Explain how advances in biology have changed classification systems **Ecology** • Describe how to use a quadrat to collect random samples • Suggest ways of making the data more accurate • Describe how to use a transect line to test a hypothesis **Organic Chemistry** • Describe how crude oil is separated into fractions • Carry out the distillation of crude oil • Describe the process and products of cracking • Draw and name polymers made from alkenes **Chemical analysis** • Describe how to test for purity • Correctly set up a paper chromatography experiment to identify the components in a mixture • Describe a method to identify a substance by chromatography • identify common mistakes in chromatography experiments • Carry out gas tests to identify gases • Predict the gaseous products of electrolysis and chemical reactions	**Organic Chemistry** • Describe how crude oil is separated into fractions • Carry out the distillation of crude oil • Describe the process and products of cracking • Draw and name polymers made from alkenes **Magnetism and Electromagnetism** • Describe how to plot the magnetic field pattern of a magnet using a compass • Use Flemings left hand rule to predict the direction of movement of a wire in a field **Using resources** • Carry out life cycle assessments given appropriate information • Describe experiments to prove the need for oxygen and water for rusting to occur • Interpret results from rusting experiments • Describe and explain methods of preventing corrosion, including sacrificial protection • Carry out a titration to produce a neutral solution of a soluble fertiliser, making and recording accurate readings.	

	Chemistry of Atmosphere • Predict the products of the combustion of a fuel given appropriate information • Describe and explain the steps involved in the treatment of safe drinking water • Test water for pH and dissolved solid content and calculate the concentration of dissolved solids **Waves** • Describe evidence that matter does not move • Describe a method to measure the speed of sound through air • Make and record measurements to calculate the speed of sound in air • Identify sources of error and suggest improvements to an experimental method. • Describe and explain how to accurately measure the speed of waves in water • Construct ray diagrams to illustrate the refraction of waves. • Describe some of the dangers of EM waves • Make conclusions from secondary data on the risks and consequences of exposure to radiation		
Assessment (The methods that teachers will use to assess the progress of all students)	Student are assessed several times, formatively during each lesson. This includes: • Starter designed to check prior learning before moving on to trach new content. • Mini white board questions used throughout – this provides effective checks before students begin any independent task – to assess whether students have the knowledge and skills and also understand the task. • Live marking where appropriate • Self-assessment against models/mark schemes so that students get immediate feedback • Whole class feedback at regular points which includes reteach and independent follow up work • Test feedback highlighting misconceptions and including reteach and independent follow up work		

	• Summative assessment is an end of topic test following department policy (10 x multiple choice, key word and definition and exam style questions. Whole class test feedback is used following on from the assessment. • Students are set HSW on Seneca 1 x per week and whole class feedback is given as a minimum every fortnight		
Reading, Writing and Vocabulary	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:	All key vocabulary is documented in curriculum content sheets that can be found here: Curriculum content sheets Guided reading tasks:	
Numeracy	**Inheritance Variation and Evolution** • Use genetic cross diagrams to calculate probability of offspring inheriting these diseases **Ecology** • Extract and interpret information from charts, tables and graphs relating to food webs • Extract and interpret information from secondary data • Calculate means and use them to estimate a population in a given area • Calculate percentage cover of organisms • Process and interpret secondary data, identifying variables • **Organic Chemistry** • Describe the test for alkenes and its positive result • Represent cracking using equations • Balance equations for reactions of hydrocarbons • Calculate overall energy changes in combustion reactions **Chemical analysis** • Calculate Rf values giving answers to an appropriate number of significant figures • Use Rf values to identify the substances within a mixture **Waves**	**Organic Chemistry** • Describe the test for alkenes and its positive result • Represent cracking using equations • Balance equations for reactions of hydrocarbons • Calculate overall energy changes in combustion reactions **Magnetism and Electromagnetism** • Interpret secondary data on an experiment to test the strength of a magnetic field • Use the equation linking force, magnetic flux density, current and length to calculate any value, changing units where appropriate • Combine equations to calculate missing values • Change units and use standard form **Using resources** • Extract and interpret information in charts, graphs and tables • Interpret graphs of reaction conditions versus rate • Calculate the volume of alkali needed to produce a given mass of fertiliser	•

	• Use scaled diagrams to measure wavelength or amplitude • Calculate frequency or the time period of a wave given diagrams or information • Use the wave equation to calculate wave speed • Process results appropriately to calculate wave speed • Process data to calculate wave speed in a solid • Present data as a bar chart. • Use the wave equation to calculate the speed of EM waves • Describe methods for investigating infrared emission and absorption • Process data to calculate means and uncertainty • Describe and explain data from an investigation Calculate the probability of inheriting particular		
Personal Development	**Career connect links:** In each topic the first lesson has a short video linking to a range of careers where that aspect of science could be used.		