ORGANISMS: MOVEMENT AND CALLS

END POINT STATEMENTS:

Cells: Identify the principal features of a cheek cell and describe their function

Movement: Explore how the skeletal systems and muscular system in a chicken wing work together to cause movement

KNOW

The parts of the human skeleton work as a system for support, protection, movement and the production of new blood cells. Antagonistic pairs of muscles create movement when one contracts and the other relaxes. Multicellular organisms are composed of cells which are organised into tissues, organs and systems to carry out life processes. There are many types of cell. Each has a different structure or feature so it can do a specific job.

APPLY

Explain how a physical property of part of the skeleton relates to its function. Explain why some organs contain muscle tissue. Explain how antagonistic muscles produce movement around a joint. Use a diagram to predict the result of a muscle contraction or relaxation. Explain why multi-cellular organisms need organ systems to keep their cells alive. Suggest what kind of tissue or organism a cell is part of, based on its features. Explain how to use a microscope to identify and compare different types of cells. Explain how uni-cellular organisms are adapted to carry out functions that in multi-cellular organisms are done by different types of cell.

EXTEND

Predict the consequences of damage to a joint, bone or muscle. Suggest factors that affect the force exerted by different muscles. Consider the benefits and risks of a technology for improving human movement. Make deductions about how medical treatments work based on cells, tissues, organs and systems. Suggest how damage to, or failure of, an organ would affect other body systems. Deduce general patterns about how the structure of different cells is related to their function. Find out how recreational drugs might affect different body systems.

FORCES: SPEED AND GRAVITY

END POINT STATEMENTS:

Speed: To be able to explain what affects the speed of a toy car rolling down a slope

Gravity: Explain the way in which astronaut's weight caries on a journey to the moon

KNOW

If the overall, resultant force on an object is non-zero, its motion changes and it slows down, speeds up or changes direction. Mass and weight are different but related. Mass is a property of the object; weight depends upon mass but also on gravitational field strength. Every object exerts a gravitational force on every other object. The force increases with mass and decreases with distance. Gravity holds planets and moons in orbit around larger bodies.

APPLY

Illustrate a journey with changing speed on a distance-time graph, and label changes in motion. Describe how the speed of an object varies when measured by observers who are not moving, or moving relative to the object. Explain unfamiliar observations where weight changes. Draw a force diagram for a problem involving gravity. Deduce how gravity varies for different masses and distances. Compare your weight on Earth with your weight on different planets using the formula

EXTEND

Suggest how the motion of two objects moving at different speeds in the same direction would appear to the other. Predict changes in an object's speed when the forces on it change. Compare and contrast gravity with other forces. Draw conclusions from data about orbits, based on how gravity varies with mass and distance. Suggest implications of how gravity varies for a space mission

ECOSYSTEMS: INTERDEPENDECE AND PLANT REPRODUCTION

END POINT STATEMENTS:

Interdependence: Use a model to investigate the impact of changes in a population of one organism on others in the ecosystem

Plant reproduction: Use models to evaluate the features of various types of seed dispersal

KNOW

Organisms in a food web (decomposers, producers and consumers) depend on each other for nutrients. So, a change in one population leads to changes in others. The population of a species is affected by the number of its predators and prey, disease, pollution and competition between individuals for limited resources such as water and nutrients. Plants have adaptations to disperse seeds using wind, water or animals. Plants reproduce sexually to produce seeds, which are formed following fertilisation in the ovary.

APPLY

Describe how a species' population changes as its predator or prey population changes. Explain effects of environmental changes and toxic materials on a species' population. Combine food chains to form a food web. Explain issues with human food supplies in terms of insect pollinators. Describe the main steps that take place when a plant reproduces successfully.
Identify parts of the flower and link their structure to their function. Suggest how a plant carried out seed dispersal based on the features of its fruit or seed. Explain why seed dispersal is important to survival of the parent plant and its offspring.

EXTEND

Suggest what might happen when an unfamiliar species is introduced into a food web. Develop an argument about how toxic substances can accumulate in human food. Make a deduction based on data about what caused a change in the population of a species. Describe similarities and differences between the structures of wind pollinated and insect pollinated plants.
Suggest how plant breeders use knowledge of pollination to carry out selective breeding. Develop an argument why a particular plant structure increases the likelihood of successful production of offspring.

WAVES: LIGHT AND SOUND

END POINT STATEMENTS:

Sound: Relate changes in shape of an oscilloscope trace to changes in pitch and volume

Light: Use ray diagrams to model how light passes through lenses and transparent materials

KNOW

Sound consists of vibrations which travel as a longitudinal wave through substances. The denser the medium, the faster sound travels. The greater the amplitude of the waveform, the louder the sound. The greater the frequency (and therefore the shorter the wavelength), the higher the pitch. When a light ray meets a different medium, some of it is absorbed and some reflected. For a mirror, the angle of incidence equals the angle of reflection. The ray model can describe the formation of an image in a mirror and how objects appear different colours. When light enters a denser medium it bends towards the normal; when it enters a less dense medium it bends away from the normal. Refraction through lenses and prisms can be described using a ray diagram as a model.

APPLY

Explain observations where sound is reflected, transmitted or absorbed by different media. Explain observations of how sound travels using the idea of a longitudinal wave. Describe the amplitude and frequency of a wave from a diagram or oscilloscope picture. Use drawings of waves to describe how sound waves change with volume or pitch. Use ray diagrams of eclipses to describe what is seen by observers in different places. Explain observations where coloured lights are mixed or objects are viewed in different lights. Use ray diagrams to describe how light passes through lenses and transparent materials.. Describe how lenses may be used to correct vision.

EXTEND

Suggest the effects of particular ear problems on a person's hearing. Evaluate the data behind a claim for a sound creation or blocking device, using the properties of sound waves. Use diagrams to compare the waveforms a musical instrument makes when playing different pitches or volumes. Use a ray diagram to predict how an image will change in different situations.. Predict whether light will reflect, refract or scatter when it hits the surface of a given material. Use ray diagrams to explain how a device with multiple mirrors works.

PRIMARY SCHOOL — YEAR 7 SUCCESS

STOP
END OF KEY YEAR ASSESSMENT

YEAR 8

MATTER: PARTICLE MODEL AND SPEARATING MIXTURES

END POINT STATEMENT:

Particle Model: Relate the features of the particle model to the properties of materials in different states

Separating mixtures: Devise ways to separate mixtures, based on their properties

KNOW

Properties of solids, liquids and gases can be described in terms of particles in motion but with differences in the arrangement and movement of these same particles: closely spaced and vibrating (solid), in random motion but in contact (liquid), or in random motion and widely spaced (gas). Observations where substances change temperature or state can be described in terms of particles gaining or losing energy. A pure substance consists of only one type of element or compound and has a fixed melting and boiling point. Mixtures may be separated due to differences in their physical properties. The method chosen to separate a mixture depends on which physical properties of the individual substances are different.

APPLY

Explain unfamiliar observations about gas pressure in terms of particles. Explain the properties of solids, liquids and gases based on the arrangement and movement of their particles. Explain changes in states in terms of changes to the energy of particles. Draw before and after diagrams of particles to explain observations about changes of state, gas pressure and diffusion. Explain how substances dissolve using the particle model.
Use the solubility curve of a solute to explain observations about solutions. Use evidence from chromatography to identify unknown substances in mixtures. Choose the most suitable technique to separate out a mixture of substances.

EXTEND

Argue for how to classify substances which behave unusually as solids, liquids or gases. Evaluate observations that provide evidence for the existence of particles. Make predictions about what will happen during unfamiliar physical processes, in terms of particles and their energy. Analyse and interpret solubility curves. Suggest a combination of methods to separate a complex mixture and justify the choices. Evaluate the evidence for identifying a unknown substance using separating techniques.

ELECTROMAGNETS: VOLTAGE & RESISTANCE AND CURRENT

END POINT STATEMENTS:

Voltage & Resistance: Compare the voltage drop across resistors connected in series in a circuit

Current: Compare and explain current flow in different parts of a parallel circuit

KNOW

We can model voltage as an electrical push from the battery, or the amount of energy per unit of charge transferred through the electrical pathway. In a series circuit, voltage is shared between each component. In a parallel circuit, voltage is the same across each loop. Components with resistance reduce the current flowing and shift energy to the surroundings. Current is a movement of electrons and is the same everywhere in a series circuit. Current divides between loops in a parallel circuit, combines when loops meet, lights up bulbs and makes components work. Around a charged object, the electric field affects other charged objects, causing them to be attracted or repelled. The field strength decreases with distance.

APPLY

Draw a circuit diagram to show how voltage can be measured in a simple circuit. Use the idea of energy to explain how voltage and resistance affect the way components work. Given a table of voltage against current. Use the ratio of voltage to current to determine the resistance. Use an analogy like water in pipes to explain why part of a circuit has higher resistance. Describe how current changes in series and parallel circuits when components are changed.
Turn circuit diagrams into real series and parallel circuits, and vice versa. Describe what happens when charged objects are placed near to each other or touching. Use a sketch to describe how an object charged positively or negatively became charged up.

EXTEND

Predict the effect of changing the rating of a battery or a bulb on other components in a series or parallel circuit. Justify the sizes of voltages in a circuit, using arguments based on energy. Draw conclusions about safety risks, from data on voltage, resistance and current. Compare the advantages of series and parallel circuits for particular uses. Evaluate a model of current as electrons moving from the negative to the positive terminal of a battery, through the circuit. Suggest ways to reduce the risk of getting electrostatic shocks.

REACTIONS: METALS & NON-METALS AND ACIDS & ALKALIS

END POINT STATEMENTS:

Metals and non-metals: Use experimental results to suggest an order of reactivity of various metals

Acids and Alkalis: Devise an enquiry to compare how well indigestion remedies work

KNOW

Metals and non-metals react with oxygen to form oxides which are either bases or acids. Metals can be arranged as a reactivity series in order of how readily they react with other substances. Some metals react with acids to produce salts and hydrogen. The pH of a solution depends on the strength of the acid: strong acids have lower pH values than weak acids. Mixing an acid and alkali produces a chemical reaction, neutralisation, forming a chemical called a salt and water

APPLY

Describe an oxidation, displacement, or metalacid reaction with a word equation. Use particle diagrams to represent oxidation, displacement and metal-acid reactions.. Identify an unknown element from its physical and chemical properties. Place an unfamiliar metal into the reactivity series based on information about its reactions. Identify the best indicator to distinguish between solutions of different pH, using data provided. Use data and observations to determine the pH of a solution and explain what this shows.. Explain how neutralisation reactions are used in a range of situations.. Describe a method for how to make a neutral solution from an acid and alkali.

EXTEND

Deduce the physical or chemical changes a metal has undergone from its appearance. Justify the use of specific metals and non-metals for different applications, using data provided. Deduce a rule from data about which reactions will occur or not, based on the reactivity series. Given the names of an acid and an alkali, work out the name of the salt produced when they react. Deduce the hazards of different alkalis and acids using data about their concentration and pH. Estimate the pH of an acid based on information from reactions.

FORCES: CONTACT FORCES AND PRESSURE

END POINT STATEMENT:
Contact forces: Explain the affect of frictional or drag forces on a moving and stationary object

Pressure: Explain how pressure from your foot onto the ground varies with different footwear

KNOW

When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line. One effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied. Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an upthrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the upthrust. Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces.

APPLY

Explain whether an object in an unfamiliar situation is in equilibrium. Describe factors which affect the size of frictional and drag forces. Describe how materials behave as they are stretched or squashed.
Describe what happens to the length of a spring when the force on it changes. Use diagrams to explain observations of fluids in terms of unequal pressure. Explain why objects either sink or float depending upon their weight and the upthrust acting on them. Explain observations where the effects of forces are different because of differences in the area over which they apply. Given unfamiliar situations, use the formula to calculate fluid pressure or stress on a surface.

EXTEND

Evaluate how well sports or vehicle technology reduces frictional or drag forces. Describe the effects of drag and other forces on falling or accelerating objects as they move. Using force and extension data, compare the behaviour of different materials in deformation using the idea of proportionality. Explain how turning forces are used in levers. Use the idea of pressure changing with depth to explain underwater effects. Carry out calculations involving pressure, force and area in hydraulics, where the effects of applied forces are increased. Use the idea of stress to deduce potential damage to one solid object by another.

ORGANISMS: BREATHING AND DIGESTION

END POINT STATEMENTS:
Breathing: Investigate a claim linking height to lung volume

Digestion: Evaluate how well a model represents key features of the digestive system

KNOW

In gas exchange, oxygen and carbon dioxide move between alveoli and the blood. Oxygen is transported to cells for aerobic respiration and carbon dioxide, a waste product of respiration, is removed from the body. Breathing occurs through the action of muscles in the ribcage and diaphragm. The amount of oxygen required by body cells determines the rate of breathing. The body needs a balanced diet with carbohydrates, lipids, proteins, vitamins, minerals, dietary fibre and water, for its cells' energy, growth and maintenance. Organs of the digestive system are adapted to break large food molecules into small ones which can travel in the blood to cells and are used for life processes

APPLY

Explain how exercise, smoking and asthma affect the gas exchange system. Explain how the parts of the gas exchange system are adapted to their function. Explain observations about changes to breathing rate and volume. Explain how changes in volume and pressure inside the chest move gases in and out of the lungs. Describe possible health effects of unbalanced diets from data provided. Calculate food requirements for a healthy diet, using information provided. Describe how organs and tissues involved in digestion are adapted for their role. Describe the events that take place in order to turn a meal into simple food molecules inside a cell.

EXTEND

Evaluate a possible treatment for a lung disease. Predict how a change in the gas exchange system could affect other processes in the body. Evaluate a model for showing the mechanism of breathing. Design a diet for a person with specific dietary needs. Critique claims for a food product or diet by analysing nutritional information. Make deductions from medical symptoms showing problems with the digestive system.

ENERGY: ENERGY COST AND ENERGY TRANSFER

END POINT STATEMENTS:
Energy Cost: Compare the running costs of fluorescent and filament light bulbs

Energy Transfer: Explain the energy transfers in a hand-crank torch

KNOW

We pay for our domestic electricity usage based on the amount of energy transferred. Electricity is generated by a combination of resources which each have advantages and disadvantages. Calculate the cost of home energy usage, using the formula: cost = power (kW) x time (hours) x price (per kWh). We can describe how jobs get done using an energy model where energy is transferred from one store at the start to another at the end. When energy is transferred, the total is conserved, but some energy is dissipated, reducing the useful energy.

APPLY

Compare the amounts of energy transferred by different foods and activities. Compare the energy usage and cost of running different home devices. Explain the advantages and disadvantages of different energy resources. Represent the energy transfers from a renewable or non-renewable resource to an electrical device in the home. Describe how the energy of an object depends on its speed, temperature, height or whether it is stretched or compressed. Show how energy is transferred between energy stores in a range of real-life examples. Calculate the useful energy and the amount dissipated, given values of input and output energy. Explain how energy is dissipated in a range of situations.

EXTEND

Evaluate the social, economic and environmental consequences of using a resource to generate electricity, from data. Suggest actions a government or communities could take in response to rising energy demand. Suggest ways to reduce costs, by examining data on a home energy bill. Compare the percentages of energy wasted by renewable energy sources. Explain why processes such as swinging pendulums or bouncing balls cannot go on forever, in terms of energy. Evaluate analogies and explanations for the transfer of energy.

ENERGY: WORK AND HEATHING & COOLING

END POINT STATEMENTS:
Work: Explain how an electric motor raising a weight is doing work

Heating and Cooling: Explain how heat is lost through conduction, convection and radiation

KNOW

Work is done and energy transferred when a force moves an object. The bigger the force or distance, the greater the work. Machines make work easier by reducing the force needed. Levers and pulleys do this by increasing the distance moved, and wheels reduce friction. The thermal energy of an object depends upon its mass, temperature and what it's made of. When there is a temperature difference, energy transfers from the hotter to the cooler object. Thermal energy is transferred through different pathways, by particles in conduction and convection, and by radiation.

APPLY

Draw a diagram to explain how a lever makes a job easier. Compare the work needed to move objects different distances. Explain observations about changing temperature in terms of energy transfer. Describe how an object's temperature changes over time when heated or cooled. Explain how a method of thermal insulation works in terms of conduction, convection and radiation. Sketch diagrams to show convection currents in unfamiliar situations.

EXTEND

Use the formula: work done (J) = force (N) x distance moved (m) to compare energy transferred for objects moving horizontally. Compare and contrast the advantages of different levers in terms of the forces need and distance moved. Sketch a graph to show the pattern of temperature change against time. Evaluate a claim about insulation in the home or for clothing technology. Compare and contrast the three ways that energy can be moved from one place to another by heating.

Year 7 — YEAR 8 SUCCESS — STOP END OF KEY YEAR ASSESSMENT — YEAR 9

MATTER: PERIODIC TABLE AND ELEMENTS

END POINT STATEMENTS:
Periodic Table: Sort elements using chemical data and relate this to their position in the periodic table

Element: Compare the properties of elements with the properties of a compound formed from them

KNOW

The elements in a group all react in a similar way and sometimes show a pattern in reactivity. As you go down a group and across a period the elements show patterns in physical properties. Most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different properties to the elements they contain.

APPLY

Use data to describe a trend in physical properties. Describe the reaction of an unfamiliar Group 1 or 7 element. Use data showing a pattern in physical properties to estimate a missing value for an element. Use observations of a pattern in chemical reactions to predict the behaviour of an element in a group. Name compounds using their chemical formulae. Given chemical formulae, name the elements present and their relative proportions. Represent atoms, molecules and elements, mixtures and compounds using particle diagrams. Use observations from chemical reactions to decide if an unknown substance is an element or a compound

EXTEND

Predict the position of an element in the periodic table based on information about its physical and chemical properties. Choose elements for different uses from their position in the periodic table. Use data about the properties of elements to find similarities, patterns and anomalies. Use particle diagrams to predict physical properties of elements and compounds. Deduce a pattern in the formula of similar compounds and use it to suggest formulae for unfamiliar ones. Compare and contrast the properties of elements and compounds and give a reason for their differences. Describe and explain the properties of ceramics and composites

ELECTROMAGNETS: ELECTROMAGNETS AND MAGNETS

END POINT STATEMENTS:
Electromagnets: Explain how electromagnet design can influence its effectiveness

Magnetism: Explore and explain the magnetic field pattern around different types or combinations of magnets

KNOW

An electromagnet uses the principle that a current through a wire causes a magnetic field. Its strength depends on the current, the core and the number of coils in the solenoid. Magnetic materials, electromagnets and the Earth create magnetic fields which can be described by drawing field lines to show the strength and direction. The stronger the magnet, and the smaller the distance from it, the greater the force a magnetic object in the field experiences.

APPLY

Use a diagram to explain how an electromagnet can be made and how to change its strength.
Explain the choice of electromagnets or permanent magnets for a device in terms of their properties. Use the idea of field lines to show how the direction or strength of the field around a magnet varies. Explain observations about navigation using Earth's magnetic field.

EXTEND

Critique the design of a device using an electromagnet and suggest improvements. Suggest how bells, circuit breakers and loudspeakers work, from diagrams. Predict the pattern of field lines and the force around two magnets placed near each other. Predict how an object made of a magnetic material will behave if placed in or rolled through a magnetic field.

EARTH: EARTH STRUCTURE AND UNIVERSE

END POINT STATEMENTS:
Earth Structure: model the processes that are responsible for rock formation and link these to the rock cycle

Universe: Relate observation of changing day length to an appropriate model of the solar system

KNOW

Sedimentary, igneous and metamorphic rocks can be inter converted over millions of years through weathering and erosion, heat and pressure, and melting and cooling. The solar system can be modelled as planets rotating on tilted axes while orbiting the Sun, moons orbiting planets and sunlight spreading out and being reflected. This explains day and year length, seasons and the visibility of objects from Earth. Our solar system is a tiny part of a galaxy, one of many billions in the Universe. Light takes minutes to reach Earth from the Sun, four years from our nearest star and billions of years from other galaxies.

APPLY

Explain why a rock has a particular property based on how it was formed. Identify the causes of weathering and erosion and describe how they occur. Construct a labelled diagram to identify the processes of the rock cycle. Describe the appearance of planets or moons from diagrams showing their position in relation to the Earth and Sun. Explain why places on the Earth experience different daylight hours and amounts of sunlight during the year. Describe how space exploration and observations of stars are affected by the scale of the universe. Explain the choice of particular units for measuring distance.

EXTEND

Identify circumstances that indicate fast processes of change on Earth and those that indicate slower processes. Predict planetary conditions from descriptions of rocks on other planets.
Describe similarities and differences between the rock cycle and everyday physical and chemical processes. Suggest how ceramics might be similar to some types of rock. Predict patterns in day length, the Sun's intensity or an object's shadow at different latitudes. Make deductions from observation data of planets, stars and galaxies. Compare explanations from different periods in history about the motion of objects and structure of the Universe.

ECOSYSTEMS: RESPIRATIONS AND PHOTOSYNETHESIS

END POINT STATEMENTS:

Photosynthesis: Use lab tests on variegated leaves to shoe that chlorophyll is essential for photosynthesis

Respiration: Use data from investigating fermentation with yeast to explore respiration

KNOW

Respiration is a series of chemical reactions, in cells, that breaks down glucose to provide energy and form new molecules. Most living things use aerobic respiration but switch to anaerobic respiration, which provides less energy, when oxygen is unavailable. Plants and algae do not eat, but use energy from light, together with carbon dioxide and water to make glucose (food) through photosynthesis. They either use the glucose as an energy source, to build new tissue, or store it for later use. Plants have specially-adapted organs that allow them to obtain resources needed for photosynthesis.

APPLY

Use word equations to describe aerobic and anaerobic respiration. Explain how specific activities involve aerobic or anaerobic respiration. Describe ways in which plants obtain resources for photosynthesis. Explain why other organisms are dependent on photosynthesis. Sketch a line graph to show how the rate of photosynthesis is affected by changing conditions. Use a word equation to describe photosynthesis in plants and algae.

EXTEND

Suggest how organisms living in different conditions use respiration to get their energy. Describe similarities and differences between aerobic and anaerobic respiration. Suggest how particular conditions could affect plant growth. Suggest reasons for particular adaptations of leaves, roots and stems.. Compare the movement of carbon dioxide and oxygen through stomata at different times of day

EARTH: CLIMATE AND EARTH'S RESOURCES

END POINT STATEMENTS:

Climate: Investigate the contributions that natural and human chemical processes make to our carbon dioxide emissions

Earth resources: Predict the method used for extracting metals based on their position in the reactivity series

KNOW

Carbon is recycled through natural processes in the atmosphere, ecosystems, oceans and the Earth's crust (such as photosynthesis and respiration) as well as human activities (burning fuels). Greenhouse gases reduce the amount of energy lost from the Earth through radiation and therefore the temperature has been rising as the concentration of those gases has risen. Scientists have evidence that global warming caused by human activity is causing changes in climate. There is only a certain quantity of any resource on Earth, so the faster it is extracted, the sooner it will run out. Recycling reduces the need to extract resources. Most metals are found combined with other elements, as a compound, in ores. The more reactive a metal, the more difficult it is to separate it from its compound. Carbon displaces less reactive metals, while electrolysis is needed for more reactive metals.

APPLY

Use a diagram to show how carbon is recycled in the environment and through living things.
Describe how human activities affect the carbon cycle. Describe how global warming can impact on climate and local weather patterns. Explain why recycling of some materials is particularly important. Describe how Earth's resources are turned into useful materials or recycled. Justify the choice of extraction method for a metal, given data about reactivity. Suggest factors to take into account when deciding whether extraction of a metal is practical.

EXTEND

Evaluate the implications of a proposal to reduce carbon emissions. Evaluate claims that human activity is causing global warming or climate change. Compare the relative effects of human-produced and natural global warming.. Suggest ways in which changes in behaviour and the use of alternative materials may limit the consumption of natural resources. Suggest ways in which waste products from industrial processes could be reduced. Use data to evaluate proposals for recycling materials.

GENES: EVOLUTION AND INHERITANCE

END POINT STATEMENTSS:

Evolution: Review the evidence for theories about how a particular species went extinct

Inheritance: Model the inheritance of a species trait and explore the variation in the offspring produced

KNOW

Natural selection is a theory that explains how species evolve and why extinction occurs. Biodiversity is vital to maintaining populations. Within a species variation helps against environment changes, avoiding extinction. Within an ecosystem, having many different species ensures resources are available for other populations, like humans.. Inherited characteristics are the result of genetic information, in the form of sections of DNA called genes, being transferred from parents to offspring during reproduction. Chromosomes are long pieces of DNA which contain many genes. Gametes, carrying half the total number of chromosomes of each parent, combine during fertilisation.

APPLY

Use evidence to explain why a species has become extinct or adapted to changing conditions. Evaluate whether evidence for a species changing over time supports natural selection. Explain how a lack of biodiversity can affect an ecosystem. Describe how preserving biodiversity can provide useful products and services for humans. Use a diagram to show the relationship between DNA, chromosomes and genes.. Use a diagram to show how genes are inherited. Explain how a change in the DNA (mutation) may affect an organism and its future offspring. Explain why offspring from the same parents look similar but are not usually identical.

EXTEND

Predict and explain the changes in a population over time due to natural selection. Suggest an explanation, based on data, for how a particular evolutionary change occurred. Evaluate ways of preserving plant or animal material for future generations. Suggest arguments for and against genetic modification. Suggest benefits from scientists knowing all the genes in the human genome. Determine how the number of chromosomes changes during cell division, production of sex cells and fertilisation. Find out why scientists Watson, Crick and Franklin were so important.

Year 8 — YEAR 9 SUCCESS — STOP END OF KEY STAGE ASSESSMENT — YEAR 10

GENES: VARIATION AND HUMAN REPRODUCTION

END POINT STATEMENTS:

Variation: Graph data relating to variation and explain how it may lead to survival of a species

Human reproduction: Relate advice to pregnant women to ideas about transfer of substances to the embryo

KNOW

There is variation between individuals of the same species. Some variation is inherited, some is caused by the environment and some is a combination. Variation between individuals is important for the survival of a species, helping it to avoid extinction in an always changing environment. The menstrual cycle prepares the female for pregnancy and stops if the egg is fertilised by a sperm. The developing foetus relies on the mother to provide it with oxygen and nutrients, to remove waste and protect it against harmful substances.

APPLY

Explain whether characteristics are inherited, environmental or both. Plot bar charts or line graphs to show discontinuous or continuous variation data. Explain how variation helps a particular species in a changing environment. Explain how characteristics of a species are adapted to particular environmental conditions. Explain whether substances are passed from the mother to the foetus or not. Use a diagram to show stages in development of a foetus from the production of sex cells to birth. Describe causes of low fertility in male and female reproductive systems. Identify key events on a diagram of the menstrual cycle.

EXTEND

Predict implications of a change in the environment on a population. Use the ideas of variation to explain why one species may adapt better than another to environmental change. Critique a claim that a particular characteristic is inherited or environmental. Explain why pregnancy is more or less likely at certain stages of the menstrual cycle. Make deductions about how contraception and fertility treatments work. Predict the effect of cigarettes, alcohol or drugs on the developing foetus.

WAVES: WAVE EFFECTS AND WAVE PROPERTIES

END POINT STATEMENTS:

Wave effects: Relate the impact of different types of waves on living cells to their frequency and the energy carid by the wave

Wave properties: Use the wave mode to explain observations of the reflections, absorption and transmission of waves

KNOW

When a wave travels through a substance, particles move to and fro. Energy is transferred in the direction of movement of the wave. Waves of higher amplitude or higher frequency transfer more energy. A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, and describes the properties of speed, wavelength and reflection.

APPLY

Explain differences in the damage done to living cells by light and other waves, in terms of their frequency. Explain how audio equipment converts sound into a changing pattern of electric current. Describe the properties of different longitudinal and transverse waves.. Use the wave model to explain observations of the reflection, absorption and transmission of a wave.

EXTEND

Suggest reasons why sound waves can agitate a liquid for cleaning objects, or massage muscles for physiotherapy. Evaluate electricity production by wave energy using data for different locations and weather conditions.. Compare and contrast the properties of sound and light waves. Suggest what happens when two waves combine

REACTIONS: CHEMICAL ENERGY AND TYPES OF REACTIONS

END POINT STATEMENTS:

Chemical energy: Investigate phenomenon that relies on an exothermic and endothermic reaction

Types of reaction: Investigate changes in mass for chemical and physical processes

KNOW

During a chemical reaction bonds are broken (requiring energy) and new bonds formed (releasing energy). If the energy released is greater than the energy required, the reaction is exothermic. If the reverse, it is endothermic.. Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light. Thermal decomposition is a reaction where a single reactant is broken down into simpler products by heating. Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved.

APPLY

Use experimental observations to distinguish exothermic and endothermic reactions. Use a diagram of relative energy levels of particles to explain energy changes observed during a change of state. Explain why a reaction is an example of combustion or thermal decomposition. Predict the products of the combustion or thermal decomposition of a given reactant and show the reaction as a word equation. Explain observations about mass in a chemical or physical change. Use particle diagrams to show what happens in a reaction.

EXTEND

Predict whether a chemical reaction will be exothermic or endothermic given data on bond strengths. Use energy data to select a reaction for a chemical hand warmer or cool pack. Compare the pros and cons of fuels in terms of their products of combustion. Use known masses of reactants or products to calculate unknown masses of the remaining reactant or product. Devise a general rule for how a set of compounds reacts with oxygen or thermally decomposes. Balance a symbol equation. Use mass of reactant in equation to determine mass of product eg magnesium and oxygen.

ENERGY

END POINT STATEMENTS: Explain how energy is transferred with in a steam engine. Demonstrate the ability to be able to manipulate equations to represent energy changes which have taken place. Evaluate energy production methods

Grade 6: Carry out calculations involving specific heat capacity. Interpret data on the efficiency of different machines.
Grade 5: Calculate changes in the way energy is stored when changes occur in a given system. Evaluate the various types of insulation used in the home. Calculate the efficiency of given energy transfers and describe ways to increase efficiency. Compare the ways different energy resources are used and explain their advantages and disadvantages
Grade 4: Calculate the amount of energy stored by various objects as kinetic, elastic potential and gravitational potential energy. Explain the factors affecting the kinetic energy of a moving object. Carry out calculations to determine work done, power + the amount of energy transferred by electrical work. Describe the main energy resources available on Earth
Grade 3: State the equations for calculating kinetic and gravitational potential energy. Define 'power', 'wasted energy' +'conservation of energy'.
Grade 2: Describe the changes in energy stores in simple machines and systems.
Grade 1: Define 'renewable' and 'non-renewable'.

ELECTRICITY

END POINT STATEMENTS: Compare series and parallel circuits. Demonstrate the ability to be able to manipulate equations to calculate resistance and current, Examine how electrical circuits are made safe in a domestic setting

Grade 8: Use of root mean square equation when looking at AC current and voltage. Explain how the concept of electric fields helps to explain the non-contact force between charged objects as well as other electrostatic phenomena.
Grade 7: Link the idea of generation of electricity with oscilloscope traces. Apply rules concerning conservation of current to circuit problems
Grade 6: Recall use + rearrange equations. Interpret V-I graphs for components and give scientific explanations for their shapes.
Grade 5: Recall + use equations. Explain how the transfer of electrons leads static electricity. Describe the differences between AC and DC.
Grade 4: State factors that affect resistance. Describe differences in linear and non-linear relationships. Define current and voltage
Grade 3: Identify series and parallel circuits and recall how current and voltage behaves in a series circuit.
Grade 2: Use circuit symbols to draw simple circuit diagrams.
Grade 1: Recognise some simple circuit symbols

PARTICLE MODEL OF MATTER

END POINT STATEMENTS: Explain how the internal energy of particles influences changes of states of substances. Explain what impacts gas pressure

Grade 7: Describe how changing the temperature can affect gas pressure.
Grade 6: Define 'specific heat capacity' and 'specific latent heat of fusion and vaporisation'+ carry out associated calculations. Describe + explain the motion of molecules in a gas at different temperatures. Explain gas pressure. Compare the specific latent heats of fusion and vaporisation.
Grade 5: State and use the density equation. Explain how increasing the temperature affects the internal energy of a substance and how this can lead to changes of state. Evaluate data on melting and boiling points linked to the strength of forces between the particles.
Grade 4: Explain the limitations of the particle model of matter. Explain why different states of matter have different densities, using diagrams. Draw + explain heating and cooling graphs. Describe factors that affect how quickly a substance heats up.
Grade 3: Describe the particle arrangement and motion in the three states of matter. Describe the difference between chemical and physical changes.
Grade 2: Describe the changes of state
Grade 1: State the changes of state.

ATOMIC STRUCUTRE

END POINT STATEMENTS: Understand the structure of atoms, nuclear forces and stability in relation in radioactivity. Examine the use of radioactive materials in medicine

Grade 8: Calculate the mass of a radioactive substance remaining given the half-life of the substance, and the initial mass
Grade 7: Calculate the size of an atom given the size of the nucleus and the scale of the nucleus compared to the atom.
Grade 6: Explain how electrons can be moved from their position within the atom. Evaluate the use of different shielding materials for use when handling radioactive sources. Construct + complete nuclear decay equations. Calculate the half-life of a radioactive source from a decay curve of the radioactive element. Evaluate the advantages and disadvantages of irradiating food
Grade 5: Describe the differences between different models of the atom. Describe radioactive decay + how it can be predicted. Describe the different kinds of nuclear radiation. Describe how radioactive contamination can occur, how risk can be minimised + the safety requirements taken. Describe the process and use of irradiation.
Grade 4: Calculate the number of protons, the number of neutrons or the mass number given information on an atom. State the different kinds of nuclear radiation + the safety precautions taken when using them.
Grade 3: Describe how electrons are arranged within the atom. Describe the composition of a given atom in terms of the number of protons, neutrons and electrons.
Grade 2: Describe the composition of an atom
Grade 1: Define 'atomic number', 'mass number' and 'isotope'

ATOMIC STRUCUTRE & THE PERIODIC TABLE

END POINT STATEMENTS: Analyse how the development of the periodic table has influences the discovered made. Draw correct electron structure diagrams

Grade 8: Describe + construct balanced formulae equations. Describe the properties of the elements in Groups 0, 1 and 7 + explain how they are related to the atomic structure of the elements.
Grade 7: Describe the development of the Periodic table + explain the evidence that supported it.
Grade 6: Calculate the number of protons, neutrons + electrons given the atomic + mass numbers of the first 20 elements. Explain how the elements are arranged + grouped in the Periodic table
Grade 5: Describe formulae equations. Describe + explain why the atomic model has changed over time due to new evidence. Describe why atoms have no charge. Construct word equations. Explain how the atomic structure of metals + non-metals relate to their position in the Periodic table + how they react.
Grade 4: Describe the structure of the atom. Draw the electronic structure of the first 20 elements. State the difference between metals + non-metals.
Grade 3: Explain how techniques for separating mixtures work. State the relative mass + charge of the particles that make up an atom.
Grade 2: State chemical names + symbols for often used elements. Describe techniques for separating mixtures. Describe word equations.
Grade 1: Define 'atom', 'element', 'compound' + 'mixture'. State the atomic number + mass number of a given element.

BONDING, STRUCUTRE & PROPERTIES OF MATTER

END POINT STATEMENTS: Analyse of structures shows thar atoms can be arranged in a variety of ways, and that these can be accurately drawn. Demonstrate an understanding of the link between arrangement of particles and the properties of a material

Grade 8: Explain how ionic, covalent + metallic bonding occur. Draw dot + cross diagrams for commonly used compounds. Describe the limitations of using dot + cross, ball + stick, 2D + 3D diagrams to represent giant structures. Evaluate the limitations of using the simple model of particle theory to explain the (thermal) properties of elements. Describe balanced symbol equations including the states of matter.
Grade 7: Work out the molecular formula from a given model or diagram of a compound. Describe giant ionic structures, giant covalent structures, polymers, giant metallic structures + their properties including their melting + boiling points + electrical conductivity + explain how they are related to their structure. Explain the properties of diamond + graphite related to their structure. Describe the structure + use of graphene and fullerenes.
Grade 6: Draw dot and cross diagrams for ionic compounds formed by metals in Groups 1 and 2 with non-metals from Groups 6 and 7. State the ionic charge of ions formed by metals in Groups 1 and 2 with non-metals from Groups 6 and 7.
Grade 5: Describe the three types of chemical bonding. Describe the structure and properties of diamond and graphite.
Grade 3: Recognise the three types of bonding in new scenarios. Explain the changes in the states of matter using particle theory.
Grade 2: State the three types of chemical bonding.
Grade 1: State the three states of matter and the changes that occur between them.

QUANTIATIVE CHEMISTRY

END POINT STATEMENTS: Accurate use quantitative methods to determine the purity of chemical substances. Make predictions about hoe difference substances will react together and produce chemical equations to represent these ideas

Grade 8: Write balanced symbol equations. Define 'mole' and the Avogadro constant. Balance symbol equations given the masses of reactants and products. Calculate the concentration of given solutions. Explain the effect of a limiting quantity of reactant on the possible amount of product linking it to amount of moles or mass. Calculate the mass of solute in given solutions.
Grade 7: Explain the change in mass in some reactions. Calculate the number of moles for a given mass of a substance. Calculate the masses of substances in a balanced symbol equation. Explain the meaning of 'concentration'.
Grade 6: Define limiting factors
Grade 5: Calculate the relative formula mass of compounds
Grade 4: State the law of conservation of mass
Grade 3: Define relative atomic mass and relative formula mass

ENERGY CHANGES

END POINT STATEMENTS: Graphically represent endothermic and exothermic reaction using reaction profiles. Analyse how these reactions are useful day to day

Grade 8: construct a reaction profile diagram. Explain activation energy. Evaluate fuel cells and write half equations.
Grade 7: Calculate the energy transferred in a chemical reaction using bond energies.
Grade 6: Use collision theory to explain fully how chemical reactions occur.
Grade 5: Interpret simple energy diagrams. Describe energy changes in bond braking/making. Describe a simple fuel cell
Grade 4: Use reaction profiles to identify reactions as endothermic or exothermic
Grade 3: Describe what exothermic and endothermic reactions are in terms of energy.
Grade 2: Recognise examples of exothermic + endothermic reactions. Recognise that a chemical reaction occurs in cells.
Grade 1: Recognise that a chemical reaction has taken place

CHEMICAL CHANGES

END POINT STSTATMENTS: Predict how substances would react based on the reactivity series. Accurate represent chemical reaction with equations for neutralisation reactions and displacement reactions. Fully annotate diagrams showing how electrolysis forms new products from ionic compounds.

Grade 8: Explain the processes of electrolysis and write half equations. Write ionic equations for displacement reactions. Explain REDOX reactions. Determine the concentration of reagents using titration
Grade 7: Use formulae for different salts to deduce chemical formulae. Explain neutralisation using H+ and OH- and choose appropriate methods for making soluble salts.
Grade 6: Relate strength of acids to concentration of H+ ions. Describe methods to produce a salt.
Grade 5: Describe products made from simple electrolysis cells. Use basic symbol equations. Identify if elements make positive or negative ions.
Grade 4: Make simple predictions on reactions using reactivity series. Name salts from neutralisation reactions.
Grade 3: Identify separating techniques to use when obtaining salts. Describe how acids can neutralise alkalis to produce salts
Grade 2: Label electrolysis equipment. Recognise the pH scale and the use of Universal Indicator.
Grade 1: Recognise that a chemical reaction has taken place

YEAR 9

YEAR 10 TRILOOGY SUCESS

YEAR 10 SEPARATE SUCCESS

CELL BIOLOGY

END POINT STATEMENTS: Analyse the structure and functional differences between eukaryotic and prokaryotic cells and how cell specialisation assists in the survival of an organism. Examine the importance of stem cells in medical advancement. Examine the importance of movement of substances around an organism

Grade 8: Explain how electron microscopy has increased understanding of sub cellular structures, referring to magnification and resolution. Interpret information regarding mitosis in contextual situations. Apply understanding of molecular movement to kidney dialysis and sports drinks.
Grade 7: Use models and analogies to develop explanations of how cells divide. Evaluate the practical, social + ethical issues surrounding the use of stem cells in medicine.
Grade 6: Explain how structure relates to function in specialised cells. Calculate the area of colonies/inhibition zones in microorganism cultures. Explain the purpose + uses of stem cells. Explain the adaptations of plants + animals for exchange. Calculate surface area to volume ratio
Grade 5: Calculate magnification. Describe how genetic information is organised. Explain how aseptic techniques are used in culturing microorganisms. Calculate population in microorganisms. Describe mitosis. Explain the factors affecting diffusion. Describe the adaptations of plants + animals for exchange.
Grade 4: Describe the functions of all cell structures. Demonstrate an understanding of scale using the correct keywords. Describe how microorganisms can be cultured. Define stem cells.
Grade 3: Label all cell components on a diagram of a plant, animal + bacterial cell. Define diffusion, osmosis + active transport.
Grade 2: Label the basic cell components on a diagram of a plant + animal cell
Grade 1: Identify a plant, animal + bacterial cell from a diagram

ORGANISATION

END POINT STATEMENTS: Examine the importance of systems working together in the body and the potential impact on individuals if damage occurs. Analyse the importance of transport systems within plants to enable them to survive

Grade 8: Interpret data + evaluate the effect of different factors on biological reactions. Evaluate the advantages + disadvantages of treating CVD by drugs, mechanical devices or transport.
Grade 7: Use models to explain enzyme action + denaturation + apply this to the action of digestive systems.
Grade 6: Carry out rate calculations + use simple compound measures such as rate. Link adaptations of cells, tissues and organs to their functions.
Grade 5: Describe function of organ systems using key terms in the correct context. Explain how enzymes are affected by temperature + pH.
Grade 4: Understand the principles of sampling as applied to communicable + non-communicable diseases. Describe the function of enzymes.
Grade 3: Recall parts of organs. Describe the function of the 3 types of blood vessels.
Garde 2: Label a diagram of different organ systems in animals + plants
Grade 1: Order the hierarchy into cells, tissues, organ, and organ systems

INFECTION AND RESPONSE

END POINT STATEMENTS: Understand the difference between various pathogens. Examine the impact of pathogens on the body and how the body effectively protects itself. Examine how human activity has brought about a rise in antibiotic resistant pathogens

Grade 8: Evaluate the advantages + disadvantages of using monoclonal antibodies in medicine
Grade 7: Evaluate the health/economic/medical issues surrounding antibiotic resistant microorganisms. Explain how monoclonal antibodies can be produced + used in medicine. Interpret data to demonstrate how results of clinical trials can be manipulated to produce bias
Grade 6: Evaluate global use of vaccination in preventing disease. Explain how pathogens can become resistant to antibiotics. Define' monoclonal antibodies'. Explain how plants can defend against pathogens.
Grade 5: Explain how diseases may be transferred with reference to specific examples. Explain how antibiotics can be used to treat disease. Describe the process of developing medicines. Explain how plant diseases + deficiency conditions can be identified, stating examples.
Grade 4: Describe examples of viral, bacterial, fungal + protist diseases. Describe vaccination with examples
Grade 3: State examples of viral, bacterial, fungal + protist diseases. Describe how white blood cells protect the human body. Describe how drugs used in treating disease work
Grade 2: Describe how the human body defends against pathogens (non-specific). State the types of drugs that can be used to treat disease. State examples of drugs produced from plants + microorganisms.
Grade 1: Define 'pathogen' - State examples of pathogens.

BIOENERGETICS

END POINT STATEMENTS: Relate the limiting factors of photosynthesis to effective plant growth. Examine the impact of rigorous exercise on the human body

Grade 8: Use data to relate limiting factors to cost effectiveness when growing plants.
Grade 7: Explain how the body deals with oxygen debt. Interpret + explain graphs showing rate of photosynthesis with more than 1 limiting factor, including inverse square law in reference to light as a limiting factor.
Grade 6: State the symbol equations for photosynthesis, aerobic and anaerobic respiration. Explain how oxygen debt occurs. Interpret graphs showing rate of photosynthesis involving 1 limiting factor. Describe the chemical reactions involved in metabolism.
Grade 5: Compare aerobic + anaerobic respiration. Explain the changes that occur during exercise. Describe the practical tests for starch, glucose + protein.
Grade 4: Describe the changes that occur to the body during exercise. Explain the factors affecting rate of photosynthesis. Describe the uses of glucose.
Grade 3: Define aerobic + anaerobic respiration. State the word equation for anaerobic respiration. Describe how factors will affect the rate of photosynthesis. Define 'metabolism'
Grade 2: State the word equations for photosynthesis + respiration. State the factors affecting the rate of photosynthesis.
Grade 1: State the purpose of photosynthesis + respiration.

STOP
PAPER ONE ASSESSMENT

YEAR 11

ENERGY

END POINT STATEMENTS: Explain how energy is transferred with in a steam engine. Demonstrate the ability to be able to manipulate equations to represent energy changes which have taken place. Evaluate energy production methods

Grade 6: Carry out calculations involving specific heat capacity. Interpret data on the efficiency of different machines.
Grade 5: Calculate changes in the way energy is stored when changes occur in a given system. Evaluate the various types of insulation used in the home. Calculate the efficiency of given energy transfers and describe ways to increase efficiency. Compare the ways different energy resources are used and explain their advantages and disadvantages
Grade 4: Calculate the amount of energy stored by various objects as kinetic, elastic potential and gravitational potential energy. Explain the factors affecting the kinetic energy of a moving object. Carry out calculations to determine work done, power + the amount of energy transferred by electrical work. Describe the main energy resources available on Earth
Grade 3: State the equations for calculating kinetic and gravitational potential energy. Define 'power', 'wasted energy' +'conservation of energy'.
Grade 2: Describe the changes in energy stores in simple machines and systems.
Grade 1: Define 'renewable' and 'non-renewable'.

ELECTRICITY

END POINT STATEMENTS: Compare series and parallel circuits. Demonstrate the ability to be able to manipulate equations to calculate resistance and current, Examine how electrical circuits are made safe in a domestic setting

Grade 8: Use of root mean square equation when looking at AC current and voltage. Explain how the concept of electric fields helps to explain the non-contact force between charged objects as well as other electrostatic phenomena.
Grade 7: Link the idea of generation of electricity with oscilloscope traces. Apply rules concerning conservation of current to circuit problems
Grade 6: Recall use + rearrange equations. Interpret V-I graphs for components and give scientific explanations for their shapes.
Grade 5: Recall + use equations. Explain how the transfer of electrons leads static electricity. Describe the differences between AC and DC.
Grade 4: State factors that affect resistance. Describe differences in linear and non-linear relationships. Define current and voltage
Grade 3: Identify series and parallel circuits and recall how current and voltage behaves in a series circuit.
Grade 2: Use circuit symbols to draw simple circuit diagrams.
Grade 1: Recognise some simple circuit symbols

PARTICLE MODEL OF MATTER

END POINT STATEMENTS: Explain how the internal energy of particles influences changes of states of substances. Explain what impacts gas pressure

Grade 7: Describe how changing the temperature can affect gas pressure.
Grade 6: Define 'specific heat capacity' and 'specific latent heat of fusion and vaporisation'+ carry out associated calculations. Describe + explain the motion of molecules in a gas at different temperatures. Explain gas pressure. Compare the specific latent heats of fusion and vaporisation.
Grade 5: State and use the density equation. Explain how increasing the temperature affects the internal energy of a substance and how this can lead to changes of state. Evaluate data on melting and boiling points linked to the strength of forces between the particles.
Grade 4: Explain the limitations of the particle model of matter. Explain why different states of matter have different densities, using diagrams. Draw + explain heating and cooling graphs. Describe factors that affect how quickly a substance heats up.
Grade 3: Describe the particle arrangement and motion in the three states of matter. Describe the difference between chemical and physical changes.
Grade 2: Describe the changes of state
Grade 1: State the changes of state.

ATOMIC STRUCUTRE

END POINT STATEMENTS: Understand the structure of atoms, nuclear forces and stability in relation in radioactivity. Examine the use of radioactive materials in medicine

Grade 8: Calculate the mass of a radioactive substance remaining given the half-life of the substance, and the initial mass
Grade 7: Calculate the size of an atom given the size of the nucleus and the scale of the nucleus compared to the atom.
Grade 6: Explain how electrons can be moved from their position within the atom. Evaluate the use of different shielding materials for use when handling radioactive sources. Construct + complete nuclear decay equations. Calculate the half-life of a radioactive source from a decay curve of the radioactive element. Evaluate the advantages and disadvantages of irradiating food
Grade 5: Describe the differences between different models of the atom. Describe radioactive decay + how it can be predicted. Describe the different kinds of nuclear radiation. Describe how radioactive contamination can occur, how risk can be minimised + the safety requirements taken. Describe the process and use of irradiation.
Grade 4: Calculate the number of protons, the number of neutrons or the mass number given information on an atom. State the different kinds of nuclear radiation + the safety precautions taken when using them.
Grade 3: Describe how electrons are arranged within the atom. Describe the composition of a given atom in terms of the number of protons, neutrons and electrons.
Grade 2: Describe the composition of an atom
Grade 1: Define 'atomic number', 'mass number' and

ATOMIC STRUCUTRE & THE PERIODIC TABLE

END POINT STATEMENTS: Analyse how the development of the periodic table has influences the discovered made. Draw correct electron structure diagrams

GRADE DECRIPTORS SAME AS TRILOGY WITH THE ADDITION OF:

Grade 6: Describe the properties of the transition metals + compare them with Group 1 elements.

BONDING, STRUCUTRE & PROPERTIES OF MATTER

END POINT STATEMENTS: Analyse of structures shows thar atoms can be arranged in a variety of ways, and that these can be accurately drawn. Demonstrate an understanding of the link between arrangement of particles and the properties of a material

GRADE DECRIPTORS SAME AS TRILOGY WITH THE ADDITION OF:

Grade 6: Evaluate the use of nanoparticles
Grade 5: Describe the use of nanoparticles
Grade 4: Make order of magnitude calculation. Describe size of particles

QUANTIATIVE CHEMISTRY

END POINT STATEMENTS: Accurate use quantitative methods to determine the purity of chemical substances. Make predictions about hoe difference substances will react together and produce chemical equations to represent these ideas

GRADE DECRIPTORS SAME AS TRILOGY WITH THE ADDITION OF:

Grade 8: Calculate the volumes of gaseous reactants + products from a balanced equation.
Grade 7: Calculate theoretical mass of a product from given mass of reactant + a balanced equation for a reaction. Explain how concentration of a solution is related to the mass of solute and the volume of solution.
Grade 6: Calculate volume + pressure of gas at room temperature from mass + relative formula mass.
Grade 5: Calculate percentage yield from actual yield. Calculate atom economy of a reaction.
Grade 4: Define 'yield' + 'atom economy'.

ENERGY CHANGES

END POINT STATEMENTS: Graphically represent endothermic and exothermic reaction using reaction profiles. Analyse how these reactions are useful day to day

Grade 8: construct a reaction profile diagram. Explain activation energy. Evaluate fuel cells and write half equations.
Grade 7: Calculate the energy transferred in a chemical reaction using bond energies.
Grade 6: Use collision theory to explain fully how chemical reactions occur.
Grade 5: Interpret simple energy diagrams. Describe energy changes in bond braking/making. Describe a simple fuel cell
Grade 4: Use reaction profiles to identify reactions as endothermic or exothermic
Grade 3: Describe what exothermic and endothermic reactions are in terms of energy.
Grade 2: Recognise examples of exothermic + endothermic reactions. Recognise that a chemical reaction occurs in cells.
Grade 1: Recognise that a chemical reaction has taken place

CHEMICAL CHANGES

END POINT STSTATMENTS: Predict how substances would react based on the reactivity series. Accurate represent chemical reaction with equations for neutralisation reactions and displacement reactions. Fully annotate diagrams showing how electrolysis forms new products from ionic compounds.

GRADE DECRIPTORS SAME AS TRILOGY WITH THE ADDITION OF:

Grade 7: Calculate chemical quantities in titrations
Grade 5: Describe how to carry put titrations to find reacting elements accurately

YEAR 10

YEAR 11 TRILOGY SUCESS

YEAR 11 SEPARATE SUCCESS

STOP
MOCK
EXAMINATIONS

STOP
MOCK
EXAMINATIONS

STOP
FINAL
EXMINATIONS

FUTURE

FORCES

END POINT STATEMENTS: Compare scalar and vector quantities and link these to various forces. Accurately describe the impact of forces acting on an object. Analyse distance-time graphs effectively

Grade 8: Resolve single forces in 2 components and adding two forces using scale diagrams. Use principle of moments and conservation laws to solve complex problems.
Grade 7: Apply the principles of pressure to columns of liquid and the atmosphere. Use principle of moments and conservation of momentum to solve problems.
Grade 6: Recall + rearrange equations. Be able to calculate acceleration and distance covered on V-T graphs. Calculate work done on a spring using a graph.
Grade 5: State + use equations. Identify shapes on D-T and V-T graphs and relate it to motion. Interpret V-T graphs for falling objects.
Grade 4: Classify Vectors and Scalars. Describe differences in linear and non linear relationships. Link together balanced and unbalanced forces with motion.
Grade 3: Recall factors that affect braking and thinking distance. Describe a simple model of the Earth's atmosphere
Grade 2: Name examples of contact and non-contact forces
Grade 1: Recognise that forces can be a push and pull

WAVES

END POINT STATEMENTS: Compare longitudinal and transverse waves. Demonstrate the importance of the electromagnetic spectrum in everyday life, but also recognise the dangers

Grade 7: Explain the changes in air pressure caused by longitudinal waves. Describe the effects of gamma, X-ray + ultra-violet waves on the body. Explain the uses + dangers of electromagnetic radiation.
Grade 6: Describe the propagation of transverse + longitudinal waves. State the range of wavelengths + speed of the electromagnetic spectrum and describe its uses. Explain refraction. Describe how radio waves can be produced in electrical circuits. Describe how electromagnetic waves are generated
Grade 5: Draw diagrams to show the features of transverse + longitudinal waves + describe their features using key terminology. Calculate the frequency of a wave. Describe reflection, refraction, absorption + transmission of waves.
Grade 4: Define key terminology to describe the properties of waves. Calculate wavelength from a labelled diagram. State + use the equations to calculate the period and speed of a wave. Describe the properties of all electromagnetic waves
Grade 3: List the waves in the electromagnetic spectrum in order. Draw ray diagrams to show refraction

MAGNETISM AND ELECTROMAGNETS

END POINT STATEMENTS: Be able to apply Flemings left hand rule to the orientation of the forces within a conductor. Examine how electromagnets produce an electric field which can vary in strength depending on the design of the electromagnet

Grade 8: Describe magnetic flux density. Explain how rotation is caused in an electric motor
Grade 7: Explain why an electric motor will not work with alternating current. Use Fleming's left-hand rule to predict the direction of rotation of a motor given relevant information
Grade 6: Explain how the motor effect causes a motor to spin. Explain why changing the direction of the electric current changes the direction of rotation in a motor
Grade 5: Explain what is meant by the motor effect. Recall Fleming's left-hand rule. Describe the factors that affect the size of the force on a conductor in a magnetic field. Calculate the force on a conductor in a magnetic field, given values.
Grade 4: Describe how an induced magnet is produced. Evaluate the advantages of using an electromagnet rather than a permanent magnet. Describe the magnetic field around a wire carrying an electric current + explain what can affect it.
Grade 3: Explain permanent, induced and electromagnets. Describe + explain the magnetic field of a magnet. Explain how a compass provides evidence for the core of the Earth being magnetic. Define 'solenoid'
Grade 2: Draw the shape of the magnetic field. Describe how to identify a magnetic material and a magnet. Explain how a compass works.
Grade 1: Describe the interaction between two magnets. State three magnetic elements.

RATE AND EXTENDT OF CHEMCIAL CHANGE

END POINT STATEMENTS: Analyse how various factors can have an influence on the progress of a reaction. Explain the progress of a reaction using collision theory and reference to activation energy

Grade 8: Describe Le Chatelier's principle. Explain the effect of changing concentration, temperature and pressure on equilibrium. Interpret data to predict the effect on changing conditions in given reactions.
Grade 7: Describe + interpret graphs comparing rates of reaction when given factors are changed.
Grade 6: Calculate the gradient of a tangent to determine the rate of reaction at a specific time. Define 'activation energy'. Explain how equilibrium can be reached.
Grade 5: Explain the units used in rate of reaction calculations. Explain how different factors affect the rate of reaction using collision theory. Define 'equilibrium'. Describe temperature changes in a reversible reaction.
Grade 4: Draw + interpret graphs about the rate of reaction. Define 'exothermic', 'endothermic' + 'reversible' reactions.
Grade 2: Calculate the mean rate of a reaction from given information. State the factors that affect the rate of reaction.

ORGANIC CHEMISTRY

END POINT STATEMENTS: Explain the importance of hydrocarbons in modern society, alongside the negative impact of hydrocarbons. Examine the differences between alkenes and alkanes

Grade 8: Evaluate the cultural and environmental impact of the oil industry. Write balanced symbol equations for the complete combustion of given hydrocarbons.
Grade 7: Explain the separation of crude oil by fractional distillation. Write balanced symbol equations for the cracking of alkanes.
Grade 6: Describe the process of fractional distillation. Describe the trends of properties in hydrocarbons. Explain how the properties of hydrocarbons relate to their structure. Explain the process of cracking + its usefulness.
Grade 5: Describe the covalent bonding in the 4 smallest alkanes using diagrams. Describe the uses for the products of fractional distillation. Describe the process of cracking. State the chemical test for alkenes.
Grade 4: Define 'alkane' + 'alkene' using key terminology. Describe the structure of alkanes and alkenes.
Grade 3: Describe the formation + composition of crude
Grade 2: Define 'hydrocarbon'

CHEMICAL ANALYSIS

END POINT STATEMENTS: Describe how scientist using experimental method to test for gases. Evaluate the use of experimental methods to analyse substances

Grade 8: Explain melting + boiling points in terms of intermolecular forces. Explain how chromatography can be used to distinguish between pure + impure substances.
Grade 7: Interpret data to identify pure + impure substances. Calculate the Rf values from chromatograms
Grade 6: Explain what happens to substances during chromatography.
Grade 5: Describe the tests for hydrogen, oxygen, carbon dioxide + chlorine.
Grade 4: State examples of formulations. Describe the method for paper chromatography.
Grade 3: Define 'pure substance', 'compound', 'mixture' + formulation
Grade 2: Recognise the positive result for Oxygen + Hydrogen

CHEMISTRY OF OUT ATMOPHERE

END POINT STATEMENTS: Explain the importance of the Earth's atmosphere. Analyse the impact of human activity on the atmosphere

Grade 8: Evaluate different theories about the evolution of the Earth's atmosphere. Evaluate the use of models for predicting climate change. Evaluate the quality of evidence in reports on climate change. Evaluate the implications of climate change
Grade 7: Interpret evidence relating to the evolution of the Earth's atmosphere. Explain the effects of climate change + the problems caused by increased amounts of pollutants in the air.
Grade 6: Compare the Earth's atmosphere to that of Mars + Venus. Explain how algae and plants changed the composition of the atmosphere. Describe the long term effects of increased greenhouse gases in the atmosphere
Grade 5: Describe + explain the theory of the evolution from Earth's early atmosphere. Explain how sedimentary rock formation changed the composition of the atmosphere. Explain how greenhouse gases make the Earth habitable. Write word equations for complete and incomplete combustion.
Grade 4: Describe how greenhouse gases are produced. State the effects of global warming. Describe what a carbon footprint is and how it can be reduced
Grade 3: Draw an accurate pie chart to show the composition of the atmosphere. Describe the problems of reducing carbon footprints.
Grade 2: State the gases and particulates that may be released when a fuel is burnt.
Grade 1: Describe the composition of the atmosphere

USING RESOURCES

END POINT STATEMENTS: Examine how humans extract materials from the Earth to make useful products. Explain how scientist use the Earth's resources sustainably

Grade 8: Evaluate data about the use of resources using orders of magnitude. Evaluate the benefits + impact of biological methods of extracting metal. Evaluate the issues relating to reducing the use of limited resources.
Grade 7: Describe how waste water may be treated. Interpret Life Cycle Assessment information for given materials or products. Explain the issues surrounding the use of Life Cycle Assessments.
Grade 6: Describe the process of distillation. Describe the processes of phytomining + bioleaching.
Grade 5: Interpret data about the use of resources from charts, graphs + tables. Describe a Life Cycle Assessment, including examples. Carry out simple Life Cycle Assessments.
Grade 4: Describe how potable water is sourced and treated. Describe the environmental impacts of obtaining raw materials from the Earth.
Grade 3: Define 'finite' and 'renewable' + state examples. Describe potable water
Grade 2: State the difference between pure and potable water.

HOMEOSTASIS AND RESPONSE

TRILOGY END POINT STATEMENTS: Review the importance of internal mechanisms to maintain homeostasis. Understand the role of hormones and contraceptive methods on fertility

Grade 8: Evaluate information on the relationship between obesity + diabetes. Evaluate the advantages + disadvantages of treating organ failure by mechanical device + transplant.
Grade 7: Evaluate the issues surrounding the treatment of infertility for patients + doctors.
Grade 6: Compare type 1 + type 2 diabetes. Explain the role of hormones in homeostasis + the menstrual cycle including their use in infertility treatment. Compare methods of contraception including the wider implications.
Grade 5: Explain how the structure of the nervous system is adapted to its function. Describe the principles of kidney transplants + dialysis.
Grade 4: Describe how information passes through the nervous system. Explain how reflexes occur. Describe how water + blood glucose levels are controlled.
Grade 3: Describe the composition of the endocrine system + the function of the 2 main reproductive hormones.
Grade 2: Define homeostasis. Describe the components of all control systems. Identify the position of the endocrine glands.
Grade 1: State factors that must be controlled in the human body and their importance.

SEPARATE END POINT STATEMENT: Review the importance of internal mechanisms to maintain homeostasis. Understand the role of hormones and contraceptive methods on fertility . Explain how eye disorders are corrected. Understand the role of plant hormones in horticultural

GRADE DECRIPTORS SAME AS TRILOGY WITH THE ADDITION OF:

Grade 7: Evaluate the benefits + risks of procedures carried out on the nervous system.
Grade 6: Explain common defects of the eye + how they are treated, using lens diagrams. Explain how plant hormones can be used in agriculture + horticulture
Grade 5: Explain how plant hormones control growth + control responses to stimuli. Describe 'accommodation'. Explain how thermoregulation occurs.
Grade 4: Describe the function of the structures of the eye.
Grade 3: Describe the functions of the regions of the brain. State the structures of the eye.

INHERITANCE, VARIATION AND EVOLUTION

TRILOGY AND SEPARATE END POINT STATEMENTS: Explore how mutation can influence genetic outcomes within a species. Analyse the theory of natural selection and it implications on the world

Grade 8: Interpret and analyse data regarding infection rate + explain fully how microbes can be resistance to antibiotics.
Grade 7: Explain the process of genetic engineering, how GM crops effect populations + how medical research is exploring how GM could overcome inherited diseases.
Grade 6: Explain the importance of understanding the human genome + the treatment of inherited disorders.
Grade 5: Describe the processes of selective breeding + evolution using named examples and evidence. Describe antibiotic resistance.
Grade 4: Complete Punnett square diagrams + interpret the results. Describe how a cell divides through mitosis and explain how it divides to form gametes.
Grade 3: Describe the features + differences between sexual + asexual reproduction.
Grade 2: Identify + describe the function of adaptations.
Grade 1: State characteristics that are genetic, environmental or both

ECOLOGY

TRILOGY END POINT STATEMENTS: Understand the importance of interdependence within ecosystems. Examine the impact of human activities on ecosystem stability

Grade 8: Extract and interpret information to explain the impact of changes in abiotic factors on a community.
Grade 7: Evaluate information about human impact on the environment, including biodiversity.
Grade 6: Use graphs to model predator-prey cycles. Evaluate the impact of environmental change on an ecosystem.
Grade 5: Describe methods of ecological investigation including calculations. Describe the Carbon cycle. Explain the biological impact of waste, land use, deforestation + global warming. Explain the conservation programmes in place to reduce the negative human impact on the environment.
Grade 4: Describe the biotic + abiotic factors that may affect a community. Describe structural, behavioural + functional adaptations of different organisms.
Grade 3: Define 'ecosystem'. Describe a food chain using key terminology.
Grade 2: State the different types of pollution that may impact biodiversity.
Grade 1: State how organisms are adapted to their environment. State factors that plants + animals may compete for. Construct a food chain.

SEPARATE END POINT STATEMENTS: Understand the importance of interdependence within ecosystems. Examine the impact of human activities on ecosystem stability. Examine the role of pyramids of biomass.

GRADE DECRIPTORS SAME AS TRILOGY WITH THE ADDITION OF:

Grade 7: Interpret population + food production statistics to evaluate food security.
Grade 6: Calculate the efficiency of energy transfer between trophic levels in a pyramid of biomass.
Grade 5: Explain the factors that affect food security
Grade 4: Describe the techniques to make food production more efficient. Describe examples of biotechnology in food production
Grade 3: Describe a pyramid of biomass using key terminology.
Grade 2: Construct a pyramid of biomass. Define 'food security'.

FORCES

END POINT STATEMENTS: Compare scalar and vector quantities and link these to various forces. Accurately describe the impact of forces acting on an object. Analyse distance-time graphs effectively . Examinae how forces act in liquids. Explain how levers help when applying a force.

GRADE DECRIPTORS SAME AS TRILOGY WITH THE ADDITION OF:

Grade 6: Explain how levers + gears transmit the rotational effects of forces. Explain the factors affecting the pressure in a column of liquid. Describe upthrust + the factors which influence floating + sinking.
Grade 5: State + apply the equations to calculate the moment of a force + the pressure of a fluid. Calculate the pressure in a column of liquid.
Grade 4: Describe examples in which forces cause rotation.

WAVES

END POINT STATEMENTS: Compare longitudinal and transverse waves. Demonstrate the importance of the electromagnetic spectrum in everyday life, but also recognise the dangers

Grade 7: Explain the changes in air pressure caused by longitudinal waves. Describe the effects of gamma, X-ray + ultra-violet waves on the body. Explain the uses + dangers of electromagnetic radiation.
Grade 6: Describe the propagation of transverse + longitudinal waves. State the range of wavelengths + speed of the electromagnetic spectrum and describe its uses. Explain refraction. Describe how radio waves can be produced in electrical circuits. Describe how electromagnetic waves are generated
Grade 5: Draw diagrams to show the features of transverse + longitudinal waves + describe their features using key terminology. Calculate the frequency of a wave. Describe reflection, refraction, absorption + transmission of waves.
Grade 4: Define key terminology to describe the properties of waves. Calculate wavelength from a labelled diagram. State + use the equations to calculate the period and speed of a wave. Describe the properties of all electromagnetic waves
Grade 3: List the waves in the electromagnetic spectrum in order. Draw ray diagrams to show refraction

MAGNETISM AND ELECTROMAGNETS

END POINT STATEMENTS: Be able to apply Flemings left hand rule to the orientation of the forces within a conductor. Examine how electromagnets produce an electric field which can vary in strength depending on the design of the electromagnet

Grade 8: Describe magnetic flux density. Explain how rotation is caused in an electric motor
Grade 7: Explain why an electric motor will not work with alternating current. Use Fleming's left-hand rule to predict the direction of rotation of a motor given relevant information
Grade 6: Explain how the motor effect causes a motor to spin. Explain why changing the direction of the electric current changes the direction of rotation in a motor
Grade 5: Explain what is meant by the motor effect. Recall Fleming's left-hand rule. Describe the factors that affect the size of the force on a conductor in a magnetic field. Calculate the force on a conductor in a magnetic field, given values.
Grade 4: Describe how an induced magnet is produced. Evaluate the advantages of using an electromagnet rather than a permanent magnet. Describe the magnetic field around a wire carrying an electric current + explain what can affect it.
Grade 3: Explain permanent, induced and electromagnets. Describe + explain the magnetic field of a magnet. Explain how a compass provides evidence for the core of the Earth being magnetic. Define 'solenoid'
Grade 2: Draw the shape of the magnetic field. Describe how to identify a magnetic material and a magnet. Explain how a compass works.
Grade 1: Describe the interaction between two magnets. State three magnetic elements.

SPACE

END POINT STATEMENTS: Explain the composition of our universe. Explain the life cycle of a star

Grade 7: Explain how fusion processes lead to the formation of new elements
Grade 6: Explain the life cycle of a star. Explain how red-shift provides evidence for the Big Bang theory + the expanding universe.
Grade 5: Describe the similarities + distinctions between the planets, their moons + artificial satellites. Explain quantitatively how circular + stable orbits can be affected.
Grade 4: Describe the organisation of our solar system

RATE AND EXTENDT OF CHEMCIAL CHANGE

END POINT STATEMENTS: Analyse how various factors can have an influence on the progress of a reaction. Explain the progress of a reaction using collision theory and reference to activation energy

Grade 8: Describe Le Chatelier's principle. Explain the effect of changing concentration, temperature and pressure on equilibrium. Interpret data to predict the effect on changing conditions in given reactions.
Grade 7: Describe + interpret graphs comparing rates of reaction when given factors are changed.
Grade 6: Calculate the gradient of a tangent to determine the rate of reaction at a specific time. Define 'activation energy'. Explain how equilibrium can be reached.
Grade 5: Explain the units used in rate of reaction calculations. Explain how different factors affect the rate of reaction using collision theory. Define 'equilibrium'. Describe temperature changes in a reversible reaction.
Grade 4: Draw + interpret graphs about the rate of reaction. Define 'exothermic', 'endothermic' + 'reversible' reactions.
Grade 2: Calculate the mean rate of a reaction from given information. State the factors that affect the rate of reaction.

ORGANIC CHEMISTRY

END POINT STATEMENTS: Explain the importance of hydrocarbons in modern society, alongside the negative impact of hydrocarbons. Examine the differences between alkenes and alkanes. Explain how crude oil form polymers. Explain how alkenes react.

GRADE DECRIPTORS SAME AS TRILOGY WITH THE ADDITION OF:

Grade 8: Describe condensation polymerisation. Describe amino acids. Describe naturally occurring polymers
Grade 7: Describe the reactions of alcohols with Na, H20, oxidising agents and during combustion. Describe the reactions of carboxylic acids with H20, carbonates and alcohols
Grade 6: Describe reactions of alkenes with O2, H2, H20 and the halogens.
Grade 5: Describe fermentation to produce ethanol. Describe addition polymerisation.

CHEMICAL ANALYSIS

END POINT STATEMENTS: Describe how scientist using experimental method to test for gases. Evaluate the use of experimental methods to analyse substances

Grade 8: Explain melting + boiling points in terms of intermolecular forces. Explain how chromatography can be used to distinguish between pure + impure substances.
Grade 7: Interpret data to identify pure + impure substances. Calculate the Rf values from chromatograms
Grade 6: Explain what happens to substances during chromatography.
Grade 5: Describe the tests for hydrogen, oxygen, carbon dioxide + chlorine.
Grade 4: State examples of formulations. Describe the method for paper chromatography.
Grade 3: Define 'pure substance', 'compound', 'mixture' + formulation
Grade 2: Recognise the positive result for Oxygen + Hydrogen

CHEMISTRY OF OUT ATMOPHERE

END POINT STATEMENTS: Explain the importance of the Earth's atmosphere. Analyse the impact of human activity on the atmosphere

Grade 8: Evaluate different theories about the evolution of the Earth's atmosphere. Evaluate the use of models for predicting climate change. Evaluate the quality of evidence in reports on climate change. Evaluate the implications of climate change
Grade 7: Interpret evidence relating to the evolution of the Earth's atmosphere. Explain the effects of climate change + the problems caused by increased amounts of pollutants in the air.
Grade 6: Compare the Earth's atmosphere to that of Mars + Venus. Explain how algae and plants changed the composition of the atmosphere. Describe the long term effects of increased greenhouse gases in the atmosphere
Grade 5: Describe + explain the theory of the evolution from Earth's early atmosphere. Explain how sedimentary rock formation changed the composition of the atmosphere. Explain how greenhouse gases make the Earth habitable. Write word equations for complete and incomplete combustion.
Grade 4: Describe how greenhouse gases are produced. State the effects of global warming. Describe what a carbon footprint is and how it can be reduced
Grade 3: Draw an accurate pie chart to show the composition of the atmosphere. Describe the problems of reducing carbon footprints.
Grade 2: State the gases and particulates that may be released when a fuel is burnt.
Grade 1: Describe the composition of the atmosphere

USING RESOURCES

END POINT STATEMENTS: Examine how humans extract materials from the Earth to make useful products. Explain how scientist use the Earth's resources sustainably. Explain the Haber process and its usefulness. Understand why alloys are more durable that pure metals.

GRADE DECRIPTORS SAME AS TRILOGY WITH THE ADDITION OF:

Grade 7: Interpret graphs of reaction condition vs rate. Describe production + uses of NPK fertilisers
Grade 6: Compare the properties of thermosetting + thermosoftening polymers. Describe the Haber process including the conditions required.
Grade 5: Give examples of alloys + their uses. Describe properties of different materials + relate them to their uses.
Grade 4: Describe corrosion + how it can be prevented.