Subject: Science

Subject Teacher

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National Curriculum

The “Proper Science KS3 Syllabus” is an approach to teaching the current National Curriculum KS3 Programme of Study. It has been designed to equip students for success at GCSE using big ideas with an approach that promotes understanding that prepares students for following the AQA Co-Taught ELC/ GCSE and AQA 9–1 GCSE Combined Trilogy specification at KS4. We believe that the KS3 science units has something to offer every student. KS3 science units have been designed to support each student along their education journey through secondary science at every level regardless of secondary school qualification whether that be AQA Entry level Certificate (ELC) or the GCSE Combined Trilogy in Science. By putting students at the heart of everything we do, our aim is to help teachers shape successful lessons in science for every student.

Entry Level Certificates (ELCs) are nationally recognised qualifications which give students the opportunity to achieve a certificated award. The Co-Taught ELC/ GCSE Combined Trilogy provides flexibility, but on a clear progression pathway. It equips students with skills and knowledge transferable to both educational and career settings, and provides a worthwhile course for our Y10 and Y11 students coming to us from a range of diverse backgrounds. All our science qualifications provide opportunities for progression. Entry Level Certificate provides the foundation for studying science at the GCSE level. The Co-Taught ELC/ Combined Science Trilogy gives students the opportunity to progress onto further education or apprenticeships.

Curriculum Intent

Our primary aim is to ignite curiosity, foster a love of learning, and provide every student with the opportunity to achieve their full potential in science.

Our curriculum is designed to:

1. **Promote Understanding and Engagement:**
    - We strive to make science accessible and exciting for all students. Through hands-on experiments, sensory-rich activities, and real-life applications, we ensure that learning is relevant and stimulating.
    - By utilizing a variety of teaching methods and resources, including visual aids, interactive technology, and outdoor learning opportunities, we cater to different learning styles and needs.
2. **Develop Key Skills and Knowledge:**
    - We focus on building a strong foundation in scientific concepts and practical skills. Our curriculum covers key areas such as biology, chemistry, physics, and environmental science, adapted to be comprehensible and meaningful to our students.
    - Critical thinking, problem-solving, and inquiry-based learning are at the heart of our approach, encouraging students to ask questions, conduct experiments, and make discoveries.
3. **Support Personal Growth and Wellbeing:**
    - Recognizing the unique challenges our students face, we integrate social and emotional learning within our science curriculum. This includes fostering teamwork, communication skills, and resilience.
    - We create a supportive and nurturing environment where students feel safe to explore, make mistakes, and learn from them, thereby building their confidence and self-esteem.
4. **Promote SMSC and British Values:**
    - Our curriculum is committed to promoting Spiritual, Moral, Social, and Cultural (SMSC) development, alongside Fundamental British Values. We encourage students to appreciate the wonders of the natural world, understand the ethical implications of scientific advancements, and respect diverse perspectives.

- Through studying contributions from scientists of various backgrounds and discussing contemporary issues such as climate change and sustainable living, we help students develop a sense of responsibility and global citizenship.

5. **Prepare for the Future:**
   - We aim to equip our students with the knowledge and skills they need to succeed beyond school. Whether pursuing further education, vocational training, or entering the workforce, our curriculum provides a strong foundation for future opportunities.
   - By highlighting the relevance of science in everyday life and potential career paths, we inspire students to see the value of their education and aspire to achieve their goals.

In summary, our Science curriculum is thoughtfully designed to inspire, educate, and empower our students. We are committed to creating an inclusive learning environment where every student can thrive, develop a lifelong passion for science, and gain the confidence to explore the world around them.

Curriculum Implementation

Year	Topic	Content
7	**Cells**	**Cell Structure** 1. **Identify Parts of a Cell:** o Recognize and name basic parts of a cell such as the cell membrane, nucleus, and cytoplasm. 2. **Describe the Function of Cell Parts:** o Explain the role of each part of the cell in simple terms (e.g., cell membrane controls what enters and exits the cell). 3. **Compare Plant and Animal Cells:** o Differentiate between plant and animal cells based on their structures (e.g., presence of cell wall, chloroplasts). 4. **Practice observing different types of cells under a microscope and describing their structures.** **Specialised Cells** 1. **Recognize Specialised Cells:** o Identify examples of specialised cells (e.g., red blood cells, nerve cells, root hair cells). 2. **Understand Adaptations of Specialised Cells:** o Describe how specialised cells are adapted to perform specific functions (e.g., shape of red blood cells for carrying oxygen). 3. **Explain Importance of Specialised Cells:** o Discuss why specialised cells are necessary for organisms to function effectively.

7	**Energy Transfers**	**Energy** 1. **Define Energy:** o Understand what energy is and identify different forms of energy (e.g., light, heat, electrical). 2. **Recognize Sources of Energy:** o Identify common sources of energy (e.g., food, batteries, fuels) and classify them as renewable or non-renewable. 3. **Describe Energy Changes:** o Explain how energy can change from one form to another (e.g., electrical energy to light energy in a bulb). **Wasted Energy** 1. **Define Wasted Energy:** o Understand the concept of wasted energy and identify examples (e.g., heat produced by friction, sound from a noisy machine). 2. **Explain Causes of Wasted Energy:** o Identify factors that cause energy to be wasted (e.g., inefficient machines, poor insulation). 3. **Discuss Consequences of Wasted Energy:** o Discuss why wasting energy is not sustainable and its impact on the environment and resources. **Heat and Temperature** 1. **Define Heat and Temperature:** o Differentiate between heat (transfer of thermal energy) and temperature (measure of hotness or coldness). 2. **Measure Temperature:** o Use thermometers to measure and compare temperatures in different materials and environments. 3. **Understand Heat Transfer Methods:** o Describe how heat is transferred through conduction, convection, and radiation.
7	**Reproduction**	**Sexual and Asexual Reproduction** 1. **Understand Sexual Reproduction:** o Define sexual reproduction as the process involving two parents and the formation of offspring with genetic variation. 2. **Understand Asexual Reproduction:**

		- Define asexual reproduction as the process involving one parent and the formation of offspring genetically identical to the parent. 3. **Compare Sexual and Asexual Reproduction:** - Identify similarities and differences between sexual and asexual reproduction in terms of offspring diversity and method of reproduction. **Menstrual Cycle** 1. **Describe the Menstrual Cycle:** - Explain the phases of the menstrual cycle (menstruation, follicular phase, ovulation, luteal phase) in simple terms. 2. **Understand Hormonal Changes:** - Describe the role of hormones (estrogen and progesterone) in controlling the menstrual cycle. 3. **Explain the Purpose of the Menstrual Cycle:** - Discuss the purpose of the menstrual cycle in preparing the body for possible pregnancy and its connection to fertility. **Embryo Development** 1. **Understand Fertilization:** - Explain what happens during fertilization, including the fusion of egg and sperm to form a zygote. 2. **Describe Early Embryo Development:** - Outline the stages of early embryo development (cleavage, blastocyst formation) in simple terms. 3. **Explain Implantation and Early Pregnancy:** - Describe how the embryo implants in the uterus and begins early development, leading towards pregnancy.
7	**Particles**	**Particle Model and Change of State** 1. **Describe the Particle Model:** - Explain the basic principles of the particle model of matter, including the concepts of particles, arrangement, and movement. 2. **Identify Changes of State:** - Recognize and describe changes of state (e.g., melting, freezing, evaporation, condensation) in terms of particle arrangement and energy changes. 3. **Explain Factors Affecting Changes of State:**

		○ Understand how temperature affects changes of state and describe the role of energy in these processes.
Y7	**Earth Systems**	**Earth Processes (Rocks)** 1. **Identify Types of Rocks:** ○ Recognize and name the three main types of rocks: igneous, sedimentary, and metamorphic. 2. **Describe How Each Type of Rock is Formed:** ○ Explain the formation process of igneous rocks (cooling and solidification of magma or lava). ○ Describe how sedimentary rocks are formed (compaction and cementation of sediments). ○ Understand the formation of metamorphic rocks (alteration of existing rocks by heat and pressure). 3. **Understand the Rock Cycle:** ○ Describe the rock cycle and how rocks can change from one type to another over time through various processes (e.g., melting, erosion, heat, and pressure). 4. **Identify Examples of Each Rock Type:** ○ Provide examples of igneous (e.g., granite, basalt), sedimentary (e.g., sandstone, limestone), and metamorphic rocks (e.g., marble, slate). **Potable Water** 1. **Understand What Potable Water is:** ○ Define potable water as water that is safe to drink. 2. **Explain the Importance of Potable Water:** ○ Understand why potable water is essential for human health and survival. 3. **Describe How Water is Made Safe to Drink:** ○ Explain the processes involved in making water potable, such as filtration, sedimentation, and chlorination. 4. **Identify Sources of Potable Water:** ○ Recognize different sources of potable water, such as rivers, lakes, and underground aquifers. 5. **Understand the Challenges of Providing Potable Water:** ○ Discuss the challenges and solutions for providing potable water in different parts of the world.
7	**Contact Forces**	**Balanced and Unbalanced Forces** 1. **Identify Balanced and Unbalanced Forces:** ○ Differentiate between balanced forces (forces that cancel each other out) and unbalanced forces (forces that cause a change in motion).

		2. **Describe Effects of Balanced and Unbalanced Forces:** o Explain what happens to an object when balanced forces act on it (e.g., remains stationary or moves at a constant speed) and when unbalanced forces act (e.g., accelerates or decelerates). 3. **Demonstrate Understanding with Examples:** o Provide examples from everyday situations where balanced and unbalanced forces are at play (e.g., a car accelerating, a book resting on a table). **Friction** 1. **Define Friction:** o Define friction as a force that opposes motion when surfaces are in contact. 2. **Identify Factors Affecting Friction:** o Identify factors that affect friction (e.g., roughness of surfaces, force pushing surfaces together). 3. **Experiment with Friction:** o Conduct simple experiments to observe how different surfaces or materials affect the amount of friction (e.g., sliding objects on different types of floors). **Density** 1. **Understand Density:** o Define density as the amount of mass in a given volume of a substance. 2. **Calculate Density:** o Calculate density using the formula: Density = Mass / Volume. 3. **Relate Density to Everyday Objects:** o Relate density to the properties of everyday objects (e.g., why some objects float while others sink in water).
Y8	**Movement**	**Speed** 1. **Define Speed:** o Define speed as the distance traveled per unit of time. 2. **Calculate Speed:** o Calculate speed using the formula: speed = distance ÷ time. 3. **Units of Speed:** o Understand and use appropriate units for speed (e.g., meters per second, km/h).

		Distance-Time Graphs 1. **Interpret Distance-Time Graphs:** o Read and interpret simple distance-time graphs, identifying key features such as constant speed, stationary periods, and changes in speed. 2. **Calculate Speed from a Graph:** o Determine speed from a distance-time graph by finding the gradient (slope) of the line. 3. **Describe Motion from Graphs:** o Describe the motion represented by different types of distance-time graphs (e.g., constant speed, accelerating, decelerating).
Y8	**Health and Digestion**	**Cell Organisation** 1. **Identifying Cells:** o Recognize different types of cells such as muscle cells, nerve cells, and skin cells. 2. **Understanding Cell Structure:** o Describe the basic parts of a cell including the cell membrane, nucleus, and cytoplasm. 3. **Explaining Cell Functions:** o Explain what different cells do in the body, such as muscle cells contracting or nerve cells transmitting signals. **Digestive System** 1. **Identifying Digestive Organs:** o Name and locate major organs involved in digestion (e.g., mouth, stomach, intestines). 2. **Describing Digestive Processes:** o Describe how food is broken down in the mouth and stomach, and nutrients are absorbed in the intestines. 3. **Understanding the Importance of Digestion:** o Explain why digestion is important for obtaining energy and nutrients for the body. **Health and Fitness** 1. **Understand the Role of Organs in Health and Fitness:** o Describe the functions of key organs (e.g., heart, lungs, liver, stomach) and explain their importance in maintaining a healthy and fit body. 2. **Recognize How Body Systems Work Together:**

		○ Understand how the circulatory, respiratory, and digestive systems work together to provide energy and oxygen needed for exercise and overall fitness. **3. Explain How Lifestyle Choices Affect Organs and Health:** ○ Identify how diet, exercise, smoking, and alcohol can impact organs (e.g., heart, lungs, liver) and overall health, and suggest ways to improve fitness and well-being.
Y8	**Gravity**	**Weight** 1. **Understand the Concept of Weight:** ○ Define weight as the gravitational force acting on an object. 2. **Differentiate Weight from Mass:** ○ Differentiate between weight and mass, understanding that weight depends on gravitational pull whereas mass is the amount of matter in an object. 3. **Calculate Weight:** ○ Calculate the weight of objects using the formula Weight=Mass× Gravitational Acceleration **Gravitational Force** 1. **Define Gravitational Force:** ○ Define gravitational force as the attractive force between two masses. 2. **Understand the Factors Affecting Gravitational Force:** ○ Recognize that gravitational force depends on the masses of the objects and the distance between them. 3. **Describe the Universal Law of Gravitation:** ○ State Newton's law of universal gravitation and explain its significance. **Solar System** 1. **Identify Components of the Solar System:** ○ Name the major components of the solar system including planets, moons, asteroids, and comets. 2. **Understand the Role of Gravity in the Solar System:** ○ Explain how gravity holds planets and moons in orbit around the Sun. 3. **Describe Orbits and Gravitational Influence:** ○ Describe the orbits of planets and moons in terms of gravitational influence from the Sun and other celestial bodies.

Y8	**Electric Circuits**	**Electric Current** 1. **Define Electric Current:** o Understand that electric current is the flow of electric charge (electrons) through a conductor. 2. **Identify Units of Electric Current:** o Recognize that electric current is measured in amperes (amps, A). 3. **Describe Factors Affecting Current:** o Explain how the thickness (diameter) of a wire affects the amount of current it can carry. **Resistance** 1. **Define Electrical Resistance:** o Understand that electrical resistance is the opposition to the flow of electric current in a material. 2. **Identify Units of Resistance:** o Recognize that resistance is measured in ohms (Ω). 3. **Describe Factors Affecting Resistance:** o Explain how the length and thickness (cross-sectional area) of a wire affect its resistance. **Electric Charge** 1. Understand the Concept of Electric Charge: o Explain what electric charge is (positive and negative charges). 2. Identify Charged Objects: o Recognize examples of objects that can become charged (e.g., balloons rubbed on hair, plastic rods). 3. Explain How Objects Become Charged: o Describe how objects can become charged by gaining or losing electrons through friction. 4. Understand the Effects of Electric Charge: o Explain how charged objects can attract or repel each other (like charges repel, opposite charges attract).

		Voltage 1. Define Voltage: o Understand that voltage is the potential difference between two points in a circuit. 2. Identify Sources of Voltage: o Recognize common sources of voltage, such as batteries and power supplies. 3. Understand the Role of Voltage in a Circuit: o Explain how voltage drives the flow of electric current in a circuit. 4. Measure Voltage: o Learn how to measure voltage using a voltmeter in simple circuits.
Y8	**Interdependence**	**Feeding Relationships** 1. **Identify Different Feeding Relationships:** o Recognize and differentiate between producers, consumers, and decomposers in an ecosystem. 2. **Understand Food Chains and Food Webs:** o Describe simple food chains and food webs, identifying the roles of organisms within them. 3. **Explain the Flow of Energy:** o Explain how energy flows through a food chain, starting from producers to consumers and decomposers. **Competition** 1. **Define Competition in Ecosystems:** o Define competition and identify examples of competition among organisms in an ecosystem. 2. **Understand Resource Competition:** o Explain how organisms compete for resources such as food, water, and space. 3. **Recognize Adaptations:** o Identify adaptations that organisms develop to reduce competition within their habitats.

		Abiotic and Biotic Factors 1. **Differentiate Between Abiotic and Biotic Factors:** o Differentiate between abiotic factors (non-living components) and biotic factors (living components) in an ecosystem. 2. **Understand the Influence of Abiotic Factors:** o Describe how abiotic factors such as temperature, water availability, and sunlight affect ecosystems and the organisms within them. 3. **Explore Interactions Between Abiotic and Biotic Factors:** o Investigate how changes in abiotic factors can affect the distribution and abundance of biotic factors in ecosystems.
Y9	**Sound and Light**	**Reflection** 1. **Identify Reflection:** o Define reflection as the bouncing back of light from a surface. 2. **Understand the Law of Reflection:** o State that the angle of incidence is equal to the angle of reflection. 3. **Demonstrate Reflection in Everyday Situations:** o Identify examples of reflection in daily life (e.g., mirrors, shiny surfaces). 4. **Explain How Reflection Affects Sight:** o Describe how reflection enables us to see objects and ourselves in mirrors. **Refraction** 1. **Define Refraction:** o Define refraction as the bending of light as it passes from one transparent medium to another. 2. **Identify Examples of Refraction:** o Identify instances of refraction (e.g., bending of light in water, through a lens). 3. **Understand the Cause of Refraction:** o Explain that refraction occurs due to the change in speed of light when it passes from air into glass or water. 4. **Describe Optical Devices that Use Refraction:** o Describe how lenses and prisms use refraction to focus light or separate colors.

		Sound 1. **Understand How Sound is Produced and Travels:** • Explain that sound is caused by vibrations and travels as a wave through solids, liquids, and gases, but not in a vacuum. 2. **Describe the Properties of Sound Waves:** • Recognize key features of sound waves, such as pitch (frequency) and volume (amplitude), and relate these to the characteristics of the vibrations. 3. **Explain How We Hear Sounds:** • Describe how sound waves travel to the ear, are detected by the eardrum, and converted into signals that the brain interprets as sound.
Y9	**Respiration and Photosynthesis**	**Cellular Energy** 1. **Understand the Importance of Energy in Cells:** o Explain why cells need energy (e.g., for movement, growth, and repair). 2. **Identify Sources of Cellular Energy:** o Describe how cells obtain energy from food. **Aerobic Respiration** 1. **Define Aerobic Respiration:** o Understand that aerobic respiration is the process of producing cellular energy involving oxygen. 2. **Describe the Aerobic Respiration Equation:** o Learn the word equation for aerobic respiration: glucose + oxygen → carbon dioxide + water + energy. 3. **Explain Where Aerobic Respiration Occurs:** o Identify that aerobic respiration takes place in the mitochondria of cells. 4. **Understand the Products of Aerobic Respiration:**

- Recognize that aerobic respiration produces energy, carbon dioxide, and water.

Anaerobic Respiration

1. **Define Anaerobic Respiration:**
   - Understand that anaerobic respiration is the process of producing cellular energy without oxygen.
2. **Describe the Anaerobic Respiration Equation in Muscles:**
   - Learn the word equation for anaerobic respiration in muscles: glucose → lactic acid + energy.
3. **Explain When Anaerobic Respiration Occurs:**
   - Discuss situations when anaerobic respiration happens (e.g., during intense exercise when oxygen is low).
4. **Understand the Products of Anaerobic Respiration:**
   - Recognize that anaerobic respiration produces less energy and lactic acid, which can cause muscle fatigue.

Comparison of Aerobic and Anaerobic Respiration

1. **Compare Energy Production:**
   - Compare the amount of energy produced by aerobic and anaerobic respiration.
2. **Identify Differences in By-products:**
   - Contrast the by-products of aerobic and anaerobic respiration (e.g., water and carbon dioxide vs. lactic acid).

Photosynthesis

1. **Understand the Process of Photosynthesis:**
   - Describe photosynthesis as the process by which plants use sunlight, water, and carbon dioxide to produce glucose and oxygen, and learn the word equation:
     carbon dioxide + water → glucose + oxygen (with sunlight and chlorophyll).
2. **Explain How Plants Use the Products of Photosynthesis:**
   - Understand that glucose provides energy for growth, repair, and storage (e.g., as starch) and oxygen is released as a by-product.
3. **Identify Plant Adaptations for Photosynthesis:**
   - Recognize adaptations of leaves for photosynthesis, such as a large surface area, chlorophyll in chloroplasts, and stomata for gas exchange.

Y9	**Atoms, Elements and Compounds**	**Elements and Compounds** 1. **Define Elements and Compounds:** o Understand what an element is (a substance made of only one type of atom). o Understand what a compound is (a substance made of two or more different types of atoms chemically bonded together). 2. **Identify Examples of Elements and Compounds:** o Recognize and name common elements (e.g., oxygen, hydrogen, carbon). o Recognize and name common compounds (e.g., water, carbon dioxide, sodium chloride). 3. **Understand the Differences Between Elements and Compounds:** o Compare elements and compounds in terms of their composition and properties. 4. **Describe How Compounds are Formed:** o Explain that compounds are formed when elements chemically combine in fixed ratios. **Simple or Giant Structures** 1. **Identify Simple Molecular Structures:** o Understand what simple molecular structures are (e.g., water, carbon dioxide). 2. **Understand the Properties of Simple Molecular Structures:** o Describe the properties of simple molecular structures (e.g., low melting and boiling points, usually gases or liquids at room temperature). 3. **Identify Giant Covalent Structures:** o Understand what giant covalent structures are (e.g., diamond, graphite). 4. **Understand the Properties of Giant Covalent Structures:** o Describe the properties of giant covalent structures (e.g., high melting and boiling points, usually solids at room temperature). 5. **Differentiate Between Simple and Giant Structures:** o Compare the properties and examples of simple molecular and giant covalent structures.
Y9	**Reactants and Products**	**Acid Reactions** 1. **Identify Acids and Bases:** o Recognize common acids (e.g., hydrochloric acid, sulfuric acid) and bases (e.g., sodium hydroxide) in everyday substances. 2. **Understand Acid Reactions:**

		- Describe what happens when acids react with metals (e.g., magnesium, zinc) and metal carbonates (e.g., calcium carbonate). 3. **Explain Neutralization:** - Understand the concept of neutralization and describe what happens when acids react with bases to form salts and water. **Oxidation and Reduction** 1. **Identify Oxidation and Reduction Reactions:** - Recognize basic examples of oxidation (e.g., rusting of iron) and reduction (e.g., burning of magnesium) reactions. 2. **Understand the Role of Oxygen in Oxidation:** - Explain how oxygen is involved in oxidation reactions and describe its effects on materials. 3. **Describe Everyday Examples:** - Provide examples of oxidation and reduction reactions that occur in everyday life (e.g., burning of fuels, tarnishing of metals).
Y9	**Species**	**Natural Selection** 1. **Understand the Concept of Natural Selection:** - Explain what natural selection is and why it is important for the survival of species. 2. **Identify Key Components of Natural Selection:** - Describe the main components of natural selection, such as variation, competition, and survival of the fittest. 3. **Explain the Process of Natural Selection:** - Understand how advantageous traits become more common in a population over time due to natural selection. 4. **Provide Examples of Natural Selection:** - Give examples of natural selection in action, such as the peppered moth or Darwin's finches. **Variation** 1. **Define Variation:** - Understand what variation is and recognize that it occurs within and between species. 2. **Identify Types of Variation:** - Describe the different types of variation, such as genetic variation (inherited) and environmental variation (acquired). 3. **Explain the Importance of Variation:**

		o Understand why variation is important for the survival and adaptation of species. 4. **Observe Variation:** o Identify examples of variation in everyday life, such as different breeds of dogs or types of plants. **Selective Breeding** 1. **Understand the Concept of Selective Breeding:** o Explain what selective breeding is and why humans use it. 2. **Identify Examples of Selective Breeding:** o Give examples of selective breeding in plants and animals, such as dogs, cattle, and crops. 3. **Explain the Process of Selective Breeding:** o Describe the steps involved in selective breeding, including choosing parents with desired traits and breeding them over several generations. 4. **Discuss the Benefits and Drawbacks of Selective Breeding:** o Understand the advantages of selective breeding (e.g., improved crop yields, healthier livestock) as well as potential drawbacks (e.g., reduced genetic diversity).

ELC/GCSE

Year	Term	Content
9/10	**Autumn 1A**	**Biology 1A** **ELC** • **Animal Cells** • Understand the structure and function of animal cells. • Identify the different organelles in animal cells and their roles. • **Plant Cells** • Understand the structure and function of plant cells. • Compare the differences between plant and animal cells.

- **Microscopes**
  - Learn how to use a microscope effectively.
  - Prepare and observe cell samples using a microscope.
- **Specialized Cells**
  - Understand the concept of cell specialization.
  - Identify different types of specialized cells and their functions.
- **Stem Cells**
  - Explore the role and potential of stem cells in medicine.
  - Understand the different types of stem cells and their characteristics.
- **Mitosis and the Cell Cycle**
  - Understand the stages of the cell cycle, including mitosis.
  - Learn the importance of cell division in growth and repair.
- **Neurons**
  - Learn about the structure and function of neurons.
  - Understand how nerve impulses are transmitted.
- **Reflexes and Reaction Times**
  - Investigate reflex actions and their biological basis.
  - Measure and analyze reaction times in different scenarios.
- **DNA Structure**
  - Understand the structure and function of DNA.
  - Learn about the double helix and the components of DNA.
- **Inheritance**
  - Explore the principles of Mendelian genetics.

		• Understand how traits are inherited through generations. • **Genetic Disorders** • Learn about various genetic disorders and their causes. • Understand the impact of genetic disorders on individuals and families. • **Sex Determination** • Understand the genetic basis of sex determination. • Learn how sex chromosomes influence the development of sex characteristics. • **Variation** • Explore the sources of genetic and environmental variation. • Understand the importance of variation in populations. • **Natural Selection** • Understand the principles of natural selection. • Learn how natural selection drives evolution and adaptation. • **Selective Breeding** • Learn about the process and purpose of selective breeding. • Understand the implications and applications of selective breeding in agriculture and animal husbandry. • **Genetic Engineering** • Understand the techniques and applications of genetic engineering. • Explore the ethical considerations and potential benefits of genetic engineering.
10	**Autumn 1B**	**Chemistry 1A** **ELC** • **Atoms, Elements, and Compounds** • Define the terms atom, element, and compound.

- Provide examples of atoms, elements, and compounds.

- **Subatomic Particles**

  - Outline the relative sizes and charges of protons, neutrons, and electrons within an atom.
  - Identify the number of protons, neutrons, and electrons in an atom of a specific element.

- **Electronic Structure**

  - Identify and draw where electrons are on an electronic shell.
  - Describe the maximum number of electrons that can be placed on each shell of an atom.

- **Development of the Model of the Atom**

  - Identify different atomic models and understand their importance in the development of our understanding of the atom.
  - Explain why new evidence led to changes in our understanding of the atom.

- **Periodic Table**

  - Identify what the periodic table is and its uses.
  - Describe the structure and function of the periodic table.

- **Development of the Periodic Table**

  - Outline the early periodic table.
  - Describe why Mendeleev left gaps in the early periodic table.

- **Metals and Non-Metals**

  - Outline the differences between metals and non-metals.
  - Explain the differences between metals and non-metals based on their physical and chemical properties.

- **Ionic Bonding**

  - Outline how ionic bonding occurs between elements.
  - Draw and explain the transfer of electrons between atoms using dot and cross diagrams.

- **Covalent Bonding**

- Outline how and why atoms become covalently bonded.
- Draw structures using atomic diagrams or dot and cross diagrams of covalent substances.

- **Metallic Bonding**

  - Identify why metals are good conductors.
  - Describe how the atoms in metals are arranged and how this relates to their properties.

- **The Three States of Matter**

  - Outline and draw the arrangement of particles in the three states of matter.
  - Describe how particles are arranged in solids, liquids, and gases and how this relates to their properties and energy.

- **Properties of Small Molecules**

  - Outline what is classified as a small molecule.
  - Describe the properties of small molecules.

- **Giant Molecules**

  - Describe the properties of giant covalent structures such as melting point.
  - Provide examples of giant covalent structures such as diamond, graphite, and silicon dioxide.

- **Alloys**

  - Identify why alloys are created.
  - Describe the structure of an alloy.

- **Greenhouse Gases**

  - Define the term greenhouse gas.
  - Explain the greenhouse effect and how it is created.

- **Climate Change and Carbon Footprint**

  - Outline the effect that climate change has on the temperature of the Earth.
  - Describe the effects of global climate change on the Earth’s environment.

		• **Pollution** • Name the main greenhouse gases we emit into the atmosphere. • Explain the effects of greenhouse gases on our environment such as respiratory problems, acid rain, and global dimming.
10	**Spring 2A**	**Physics 1A** **ELC** • **Energy Transfers** • Understand how energy is transferred between different stores. • Identify different types of energy transfers and their real-life examples. • **Efficiency** • Calculate the efficiency of energy transfers in different systems. • Understand the importance of efficiency in energy use and conservation. • **Scalar and Vector** • Differentiate between scalar and vector quantities. • Provide examples of scalar and vector quantities in physical contexts. • **Contact and Non-Contact Forces** • Understand the difference between contact and non-contact forces. • Identify examples of contact and non-contact forces. • **Gravity** • Understand the concept of gravity and its effects on objects. • Calculate the gravitational force between objects. • **Resultant Force** • Understand how to determine the resultant force acting on an object.

- Calculate resultant forces in different scenarios.

- **Work Done**

  - Understand the concept of work done and how it relates to energy transfer.
  - Calculate the work done in various physical situations.

- **Forces and Elasticity**

  - Understand the relationship between forces and the deformation of materials.
  - Describe Hooke's Law and its applications.

- **Distance and Displacement**

  - Differentiate between distance and displacement.
  - Calculate distance and displacement in different scenarios.

- **Speed**

  - Understand the concept of speed and how it is measured.
  - Calculate average speed from given data.

- **Distance-Time Graphs**

  - Interpret and analyze distance-time graphs.
  - Understand how to determine speed from a distance-time graph.

- **Acceleration**

  - Understand the concept of acceleration and how it is calculated.
  - Interpret acceleration from velocity-time graphs.

- **Newton's 1st Law**

  - Understand Newton's 1st Law of Motion and its implications for objects in motion.
  - Provide examples illustrating Newton's 1st Law.

- **Newton's 2nd Law**

		• Understand Newton's 2nd Law of Motion and how it relates force, mass, and acceleration. • Apply Newton's 2nd Law to solve problems involving force and motion. • **Newton's 3rd Law** • Understand Newton's 3rd Law of Motion and the concept of action and reaction forces. • Provide examples illustrating Newton's 3rd Law. • **Stopping Distance** • Understand the factors that affect stopping distance of a vehicle. • Calculate stopping distances using appropriate data. • **Momentum** • Understand the concept of momentum and its conservation in collisions. • Calculate momentum and apply the principle of conservation of momentum to different scenarios.
Y10	**Spring 2B**	**Biology 1B ELC** • **Coronary Heart Disease (CHD)** • Understand the causes and risk factors of coronary heart disease. • Learn about the symptoms, prevention, and treatment of CHD. • **Non-Communicable Diseases** • Identify common non-communicable diseases and their risk factors. • Understand the impact of lifestyle choices on non-communicable diseases. • **Cancer** • Understand the different types of cancer and their causes. • Learn about the methods of cancer prevention, detection, and treatment. • **Communicable Prevention and Spread**

- Understand how communicable diseases are transmitted.
- Learn about methods to prevent the spread of communicable diseases.

- **Bacteria vs. Viruses**

  - Differentiate between bacteria and viruses in terms of structure and function.
  - Understand the diseases caused by bacteria and viruses and their modes of transmission.

- **Bacterial, Viral, and Fungal Infections**

  - Identify the characteristics of bacterial, viral, and fungal infections.
  - Learn about common diseases caused by bacteria, viruses, and fungi and their treatments.

- **Body Defense Mechanisms**

  - Understand the body's defense mechanisms against pathogens.
  - Learn about the immune system and how it protects the body from infections.

- **Vaccination**

  - Understand the principles of vaccination and how vaccines work.
  - Learn about the importance of vaccination in disease prevention and public health.

- **Antibiotics vs. Painkillers**

  - Differentiate between antibiotics and painkillers in terms of their uses and effects.
  - Understand the importance of responsible antibiotic use to prevent resistance.

- **Drug Development**

  - Learn about the stages of drug development and testing.
  - Understand the importance of clinical trials in ensuring drug safety and efficacy.

Biology Paper 1 Extra Content

- **Diffusion vs. Active Transport**
  - Differentiate between diffusion and active transport in terms of energy requirements and direction of movement.
  - Provide examples of substances that move by diffusion and active transport in cells.
- **Osmosis**
  - Understand the process of osmosis and its importance in maintaining cell stability.
  - Describe how osmosis affects cells in different solutions (hypertonic, hypotonic, isotonic).
- **Human Organisation**
  - Understand the levels of organization in the human body from cells to organ systems.
  - Identify and describe the function of major human organ systems.
- **The Digestive System**
  - Describe the structure and function of the digestive system.
  - Understand the process of digestion and the role of enzymes in breaking down food.
- **Enzymes**
  - Understand the structure and function of enzymes.
  - Explain how enzymes catalyze biochemical reactions and the factors affecting enzyme activity.
- **The Heart Structure and Problems**
  - Describe the structure and function of the heart.
  - Identify common heart problems and understand their causes and treatments.
- **Blood Vessels and the Blood**
  - Describe the structure and function of different types of blood vessels.
  - Understand the composition and functions of blood.
- **Plant Organs**
  - Identify the major organs of a plant and their functions.

		• Understand how plant organs work together to support growth and reproduction. • **Plant Tissues** • Describe the different types of plant tissues and their functions. • Understand how plant tissues contribute to the overall functioning of a plant. • **Photosynthesis** • Understand the process of photosynthesis and its importance for plants and ecosystems. • Describe the factors that affect the rate of photosynthesis. • **Aerobic Respiration** • Describe the process of aerobic respiration and its role in energy production. • Understand the equation for aerobic respiration and where it occurs in cells. • **Anaerobic Respiration** • Understand the process of anaerobic respiration and how it differs from aerobic respiration. • Describe the situations in which anaerobic respiration occurs and its products.
Y10	**Summer 3A**	**Chemistry 1B** **ELC** • **Separating Mixtures** • Understand different methods of separating mixtures, such as filtration, evaporation, and chromatography. • Learn about distillation and its application in separating liquid mixtures based on boiling points. • **Reactivity Series** • Understand the reactivity series of metals and its significance. • Explore displacement reactions and predict the outcomes based on the reactivity series. • **Extracting Metals**

- Learn about different methods of extracting metals from their ores, including reduction with carbon and electrolysis.
- Understand the economic and environmental considerations in metal extraction.

- **Acids and Metals**

  - Understand the reactions between acids and metals, producing salts and hydrogen gas.
  - Predict the products of reactions between various metals and acids.

- **Neutralisation**

  - Understand the process of neutralisation and its practical applications.
  - Learn about the reaction between acids and bases to form water and salt.

- **Soluble Salts**

  - Learn how to prepare soluble salts through reactions between acids and bases, acids and metals, or acids and metal carbonates.
  - Understand the process of crystallisation in purifying soluble salts.

- **pH Scale**

  - Understand the pH scale and how it measures the acidity or alkalinity of a solution.
  - Use indicators and pH meters to measure the pH of various solutions.

- **Electrolysis Part 1**

  - Understand the process of electrolysis and its applications.
  - Learn about the electrolysis of molten ionic compounds.

- **Electrolysis Part 2**

  - Explore the electrolysis of aqueous solutions and the factors affecting it.
  - Understand the products of electrolysis of different electrolytes.

- **Pure Substances and Formulations**

  - Differentiate between pure substances and mixtures.
  - Understand the concept of formulations and their importance in industries.

		• **Chromatography** • Learn about chromatography as a technique for separating and analyzing mixtures. • Perform chromatography to separate and identify components of a mixture. • **Gas Tests** • Learn about different tests for common gases such as hydrogen, oxygen, carbon dioxide, and chlorine. • Understand the chemical reactions involved in producing these gases. • **Potable Water** • Understand the process of making water potable and the importance of clean water. • Learn about methods of water purification and treatment. • **Life Cycle Assessment (LCA)** • Understand the concept of life cycle assessment and its importance in evaluating the environmental impact of products. • Learn how to conduct a simple LCA for common products. • **Ways of Reducing Resources** • Explore different strategies for reducing the use of natural resources. • Understand the importance of recycling, reusing, and conserving resources. • **Using the Earth's Resources** • Learn about the sustainable use of the Earth's resources. • Understand the balance between resource use and environmental impact.
Y10	**Summer 3B**	**Physics 1B** **ELC** • **Structure of an Atom** • Understand the basic structure of an atom, including protons, neutrons, and electrons. • Learn about the arrangement of subatomic particles within an atom.

- **Mass Number, Atomic Number, and Isotopes**
  - Differentiate between mass number and atomic number.
  - Understand the concept of isotopes and how they relate to elements.
- **Development of the Atom**
  - Trace the historical development of atomic models.
  - Understand key experiments and discoveries that shaped the modern atomic model.
- **Radioactive Decay**
  - Understand the process of radioactive decay and types of radiation (alpha, beta, gamma).
  - Learn about the changes in the nucleus during radioactive decay.
- **Nuclear Equations**
  - Write and interpret nuclear equations for radioactive decay.
  - Understand how to balance nuclear equations.
- **Half-Lives and the Random Nature of Radioactive Decay**
  - Understand the concept of half-life and its importance in measuring radioactive decay.
  - Learn about the random nature of radioactive decay and its implications.
- **Radioactive Contamination**
  - Understand the risks and consequences of radioactive contamination.
  - Learn about safety measures and procedures to handle radioactive materials.
- **Waves: Transverse vs. Longitudinal**
  - Differentiate between transverse and longitudinal waves.
  - Provide examples and properties of each type of wave.
- **Wave Properties**
  - Understand key properties of waves such as wavelength, frequency, amplitude, and speed.

		• Learn how to calculate wave speed using the wave equation. • **Waves Required Practical** • Conduct practical experiments to investigate wave properties. • Analyze and interpret data from wave experiments. • **Electromagnetic Spectrum (Part 1)** • Understand the structure and characteristics of the electromagnetic spectrum. • Learn about the uses and dangers of different parts of the electromagnetic spectrum. • **Electromagnetic Spectrum (Part 2)** • Explore the applications of various types of electromagnetic waves in everyday life. • Understand the concept of ionizing and non-ionizing radiation. • **Density** • Understand the concept of density and how it is calculated. • Learn how to measure the density of different materials. • **Changes of State and Specific Latent Heat** • Understand the processes of changing state (melting, freezing, boiling, condensing). • Learn about specific latent heat and how it relates to energy changes during state changes. • **Particle Motion in Gases** • Understand the behavior of particles in gases and how it relates to pressure and temperature. • Learn about the kinetic theory of gases and its applications.
Y11	**Autumn term 1A**	**Additional Biology Paper 2 content** **GCSE**

- **Homeostasis**
  - Understand the concept of homeostasis and its importance in maintaining stable internal conditions.
  - Learn about the mechanisms and systems involved in regulating temperature, water balance, and blood glucose levels.
- **Metabolism**
  - Understand the processes that constitute metabolism, including catabolism and anabolism.
  - Learn about the role of enzymes in metabolic reactions and how metabolic rate can be affected by various factors.
- **Endocrine System**
  - Identify the major glands of the endocrine system and the hormones they produce.
  - Understand how hormones regulate various physiological processes and maintain homeostasis.
- **Controlling Blood Glucose**
  - Understand the regulation of blood glucose levels through the actions of insulin and glucagon.
  - Learn about the causes and management of diabetes.
- **Menstrual Cycle**
  - Learn about the stages of the menstrual cycle and the hormones involved.
  - Understand the physiological changes that occur during the menstrual cycle.
- **Contraception**
  - Understand the different methods of contraception and how they work.
  - Learn about the advantages and disadvantages of various contraceptive methods.
- **Types of Reproduction and Meiosis**
  - Differentiate between sexual and asexual reproduction.
  - Understand the process of meiosis and its role in producing genetic variation.
- **Adaptation**
  - Understand the concept of adaptation and how organisms are suited to their environments.

- Learn about specific examples of adaptations in plants and animals.

- **Extinction**
  - Understand the causes and consequences of extinction.
  - Learn about historical and current examples of extinct species.

- **Fossils**
  - Learn how fossils are formed and what they can tell us about past life on Earth.
  - Understand the importance of fossils in studying evolutionary history.

- **Classification**
  - Understand the principles of classification and the hierarchy of taxa.
  - Learn about the binomial nomenclature system and how organisms are grouped based on similarities and differences.

- **Food Chains/Webs**
  - Understand the structure of food chains and food webs and the flow of energy through an ecosystem.
  - Learn about the roles of producers, consumers, and decomposers.

- **Communities**
  - Understand the concept of ecological communities and the interactions between different species.
  - Learn about the factors that influence the structure and stability of communities.

- **Quadrat and Transect Sampling**
  - Learn how to use quadrats and transects to sample and study the distribution of organisms in an ecosystem.
  - Understand the importance of sampling techniques in ecological research.

- **Carbon Cycle/Water Cycle**
  - Understand the processes involved in the carbon cycle and the water cycle.
  - Learn about the importance of these cycles in maintaining life on Earth.

- **Global Warming**

		• Understand the causes and consequences of global warming. • Learn about the impact of global warming on ecosystems and human societies. • **Pollution** • Identify different types of pollution and their sources. • Understand the impact of pollution on the environment and human health. • **Land Use** • Learn about different types of land use and their environmental impacts such as deforestation and peak bog destruction. • Understand the importance of sustainable land use practices. • **Biodiversity** • Understand the concept of biodiversity and its importance for ecosystems. • Learn about the threats to biodiversity and measures to protect and conserve it.
Y11	**Autumn Term 1B**	**Additional Chemistry Paper 1 and Paper 2 content** **GCSE** • **Word and Symbol Equations** • Understand how to write word and symbol equations for chemical reactions. • Learn to balance chemical equations and understand the principle of conservation of mass. • **Relative Atomic/Formula Mass** • Calculate relative atomic mass using isotope data. • Understand how to determine the relative formula mass of compounds. • **Group 0 Elements** • Understand the properties and trends of Group 0 elements (noble gases). • Learn about the uses and characteristics of noble gases.

- **Group 1 Elements**
  - Understand the properties and reactivity trends of Group 1 elements (alkali metals).
  - Learn about the reactions of alkali metals with water and oxygen.
- **Group 7 Elements**
  - Understand the properties and reactivity trends of Group 7 elements (halogens).
  - Learn about the displacement reactions involving halogens.
- **State Symbols**
  - Understand and use state symbols (s, l, g, aq) in chemical equations.
  - Learn about the significance of state symbols in describing chemical reactions.
- **Concentration of Solutions**
  - Understand the concept of concentration and how to calculate it.
  - Learn about the impact of concentration on the rate of reactions.
- **Metal Oxides**
  - Learn about the formation of metal oxides through reactions with oxygen.
  - Understand the properties and uses of metal oxides.
- **Endothermic/Exothermic Reactions**
  - Differentiate between endothermic and exothermic reactions.
  - Understand the energy changes involved in chemical reactions and their practical applications.
- **Rates of Reaction**
  - Understand the factors affecting the rates of chemical reactions.
  - Learn how to measure and calculate reaction rates.
- **Collision Theory**
  - Understand the collision theory and how it explains the rate of reactions.

		• Learn about activation energy and the conditions needed for successful collisions. • **Catalysts** • Understand the role of catalysts in increasing the rate of reactions without being consumed. • Learn about examples of catalysts, such as the use of hydrogen peroxide and yeast/liver. • **Reversible Reactions and Equilibrium** • Understand the concept of reversible reactions and dynamic equilibrium. • Learn about the conditions that affect equilibrium position (Le Chatelier's Principle). • **Crude Oil and Fractional Distillation** • Understand the composition of crude oil and the process of fractional distillation. • Learn about the different fractions obtained from crude oil and their uses. • **Alkanes** • Understand the structure, properties, and reactions of alkanes. • Learn about the importance of alkanes as fuels and raw materials. • **Cracking and Alkenes** • Understand the process of cracking and its importance in producing alkenes. • Learn about the structure, properties, and reactions of alkenes. • **Polymers** • Understand the formation and properties of polymers. • Learn about different types of polymers and their applications.
Y11	**Spring Term 2A**	**Additional Physics Paper 1 and Paper 2 Content** **GCSE** • **Energy Stores and Systems** • Understand different types of energy stores (e.g., thermal, kinetic, gravitational potential, chemical).

- Learn about the conservation of energy and energy transfers in various systems.

- **Changes in Energy (KE and GPE Calculations)**

  - Understand the concepts of kinetic energy (KE) and gravitational potential energy (GPE).
  - Learn to calculate changes in KE and GPE using the relevant formulas.

- **Specific Heat Capacity**

  - Understand the concept of specific heat capacity and its importance in heating substances.
  - Learn to calculate the energy change involved in heating a substance using its specific heat capacity.

- **Power**

  - Understand the definition of power and its relation to energy and time.
  - Learn to calculate power using the formula P=EtP = \frac{E}{t}P=tE.

- **Renewable Energy vs Non-Renewable Energy**

  - Differentiate between renewable and non-renewable energy sources.
  - Understand the advantages and disadvantages of various energy sources and their impact on the environment.

- **Circuit Symbols**

  - Learn the standard symbols used to represent electrical components in circuit diagrams.
  - Understand how to read and draw simple circuit diagrams using these symbols.

- **Electrical Charge**

  - Understand the concept of electrical charge and its role in electric circuits.
  - Learn about the unit of charge (coulomb) and the relationship between charge, current, and time.

- **Current, Resistance, and Potential Difference (PD)**

  - Understand the concepts of electrical current, resistance, and potential difference.
  - Learn Ohm's law (V=IRV = IRV=IR) and how to apply it to solve problems in circuits.

- **Resistance Graphs**

		• Understand how to plot and interpret resistance graphs for different components. • Learn about the behavior of ohmic and non-ohmic conductors. • **Series and Parallel Circuits** • Understand the characteristics of series and parallel circuits. • Learn how to calculate total resistance, current, and potential difference in series and parallel circuits. • **Wiring a Plug** • Learn the correct method of wiring a three-pin plug. • Understand the function of each wire (live, neutral, and earth) and the importance of proper insulation. • **Power in Electrical Circuits** • Understand the formula for electrical power (P=VIP = VIP=VI) and how it relates to energy transfer in circuits. • Learn to calculate power for different electrical components and devices. • **Energy Transfers in Appliances** • Understand how electrical appliances transfer energy from one form to another. • Learn to calculate the energy transferred by appliances using the power rating and time of operation. • **National Grid** • Understand the structure and function of the National Grid in distributing electricity. • Learn about the importance of transformers in stepping up and stepping down voltage for efficient transmission.
Y11	**Spring Term 2B**	**Revision**
Y11	**Summer Term 3A**	**EXAMS**
Y11	**Summer Term 3B**	**EXAMS**