Key Stage 3

Science Standards Overview

Key Stage 3 Science

Working At the Standard

Students working at the expected standard in KS3 Science should demonstrate the following abilities:

1. **Scientific Knowledge and Conceptual Understanding:**
    - Understand and apply key concepts in biology, chemistry, and physics.
    - Use scientific terminology accurately in context.
    - Explain processes and phenomena using appropriate scientific language.
2. **Experimental Skills and Investigations:**
    - Plan and carry out scientific investigations.
    - Make predictions, identify variables, and use appropriate methods.
    - Record data methodically and draw conclusions based on evidence.
3. **Analysis and Evaluation:**
    - Interpret data from various sources, including tables and graphs.
    - Evaluate methods and suggest improvements.
    - Use evidence to support or refute scientific arguments and hypotheses.
4. **Application of Science:**
    - Apply scientific knowledge to new and familiar contexts.
    - Understand the impact of scientific developments on society and the environment.
    - Make informed decisions based on scientific understanding.

Working Above the Standard

Students working above the expected standard in KS3 Science should demonstrate the following enhanced abilities:

1. **Advanced Scientific Knowledge and Conceptual Understanding:**
    - Show a deeper understanding of key concepts and interconnections between biology, chemistry, and physics.
    - Use scientific terminology with precision and fluency.
    - Explain complex processes and phenomena in detail.
2. **Advanced Experimental Skills and Investigations:**
    - Design and carry out sophisticated scientific investigations independently.
    - Identify and control variables accurately and use a range of techniques and equipment.
    - Record data meticulously and critically analyse results.
3. **Advanced Analysis and Evaluation:**
    - Analyse and interpret complex data from multiple sources.
    - Critically evaluate methods and suggest innovative improvements.
    - Construct coherent scientific arguments and hypotheses, supported by extensive evidence.
4. **Application of Advanced Science:**
    - Apply scientific knowledge to novel and complex contexts.
    - Critically evaluate the impact of scientific developments on society, technology, and the environment.
    - Demonstrate leadership in scientific discussion and decision-making processes.

Year 7

Science Standards Overview

Year 7 Science Standards

Working At the Standard

1. **Scientific Knowledge and Conceptual Understanding:**
    - **Biology:** Basic understanding of cells, tissues, organs, and systems in plants and animals.
    - **Chemistry:** Knowledge of particles and their behaviour, states of matter, and basic chemical reactions.
    - **Physics:** Understanding forces and basic principles of light and sound.
2. **Experimental Skills and Investigations:**
    - Plan simple experiments and identify key variables.
    - Record observations and measurements accurately.
    - Begin to draw simple conclusions from data.
3. **Analysis and Evaluation:**
    - Interpret basic data and identify patterns.
    - Evaluate the reliability of their methods and suggest improvements.
4. **Application of Science:**
    - Apply scientific concepts to everyday situations.
    - Understand the importance of science in daily life.

Working Above the Standard

1. **Advanced Scientific Knowledge and Conceptual Understanding:**
    - **Biology:** Detailed understanding of the structure and function of cells and organ systems.
    - **Chemistry:** In-depth knowledge of atoms, elements, compounds, and the periodic table.
    - **Physics:** Advanced understanding of forces and the principles of light and sound.
2. **Advanced Experimental Skills and Investigations:**
    - Design and conduct experiments with minimal guidance.
    - Record detailed observations and measurements.
    - Draw well-supported conclusions from data.
3. **Advanced Analysis and Evaluation:**
    - Analyse complex data and identify more subtle patterns.
    - Critically evaluate the reliability and validity of their methods.
4. **Application of Advanced Science:**
    - Apply scientific concepts to novel situations.
    - Understand and explain the role of science in global contexts.

Year 8

Science Standards Overview

Year 8 Science Standards

Working At the Standard

1. **Scientific Knowledge and Conceptual Understanding:**
    - **Biology:** Understanding of ecosystems, reproduction, and inheritance.
    - **Chemistry:** Knowledge of chemical reactions, acids and bases, and the reactivity series.
    - **Physics:** Understanding magnetism, energy, electricity and basic principles of motion.
2. **Experimental Skills and Investigations:**
    - Plan and carry out more complex experiments.
    - Record measurements with greater accuracy.
    - Draw conclusions based on evidence.
3. **Analysis and Evaluation:**
    - Interpret more complex data and identify trends.
    - Evaluate the effectiveness of their methods and suggest improvements.
4. **Application of Science:**
    - Apply scientific knowledge to solve practical problems.
    - Understand the impact of scientific advancements on society.

Working Above the Standard

1. **Advanced Scientific Knowledge and Conceptual Understanding:**
    - **Biology:** Detailed understanding of ecological relationships and genetics.
    - **Chemistry:** In-depth knowledge of chemical bonding, the periodic table, and complex reactions.
    - **Physics:** Advanced understanding of magnetism, energy, electricity and motion.
2. **Advanced Experimental Skills and Investigations:**
    - Design and conduct experiments independently.
    - Record and analyse data with precision.
    - Draw detailed conclusions supported by evidence.
3. **Advanced Analysis and Evaluation:**
    - Analyse complex data sets and identify intricate patterns.
    - Critically evaluate their methods and suggest substantial improvements.
4. **Application of Advanced Science:**
    - Apply scientific principles to novel and complex situations.
    - Understand and articulate the role of science in addressing global challenges.

Year 9

Science Standards Overview

Year 9 Science Standards

Working At the Standard

1. **Scientific Knowledge and Conceptual Understanding:**
    - **Biology:** Understanding of cells, tissues, organs, systems, and health.
    - **Chemistry:** Knowledge of the periodic table, chemical reactions, and rates of reaction.
    - **Physics:** Understanding of energy, electricity, and magnetism, and basic principles of forces and motion.
2. **Experimental Skills and Investigations:**
    - Plan and carry out detailed experiments.
    - Record accurate and precise measurements.
    - Draw well-supported conclusions from data.
3. **Analysis and Evaluation:**
    - Interpret complex data and identify significant trends.
    - Evaluate the reliability and validity of their methods and results.
4. **Application of Science:**
    - Apply scientific concepts to a wide range of contexts.
    - Understand the broader implications of scientific advancements.

Working Above the Standard

1. **Advanced Scientific Knowledge and Conceptual Understanding:**
    - **Biology:** Detailed understanding of complex biological systems and health issues.
    - **Chemistry:** In-depth knowledge of advanced chemical reactions, rates of reaction, and chemical analysis.
    - **Physics:** Advanced understanding of energy transfers, electrical circuits, and the principles of forces and motion.
2. **Advanced Experimental Skills and Investigations:**
    - Design and conduct sophisticated experiments independently.
    - Record and analyse data with high precision and accuracy.
    - Draw comprehensive conclusions supported by detailed evidence.
3. **Advanced Analysis and Evaluation:**
    - Analyse intricate data sets and identify subtle patterns.
    - Critically evaluate their methods and suggest innovative improvements.
4. **Application of Advanced Science:**
    - Apply scientific principles to complex and novel situations.
    - Understand and critically evaluate the role of science in contemporary issues and global challenges.

Key Stage 3 Topics

Science Standards Overview

Becoming Scientists

Working At Standard

Knowledge and Understanding:

- Demonstrates understanding of basic scientific concepts (e.g., states of matter, simple chemical reactions).
- Can identify and describe the function of basic lab equipment.
- Understands simple scientific vocabulary and can use it correctly in context.

Scientific Skills:

- Can follow simple scientific instructions and procedures with some guidance.
- Able to make and record simple observations and measurements.
- Begins to use basic scientific methods to plan and carry out investigations.

Analysis and Evaluation:

- Can present data in simple forms (e.g., tables, charts).
- Begins to identify patterns and draw basic conclusions from data.
- Can evaluate the reliability of their results with some support.

Communication:

- Communicates findings using simple scientific language.
- Can write basic scientific reports with a clear structure (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of scientific concepts and processes.
- Can explain the principles behind more complex scientific phenomena.
- Uses scientific vocabulary accurately and confidently in various contexts.

Scientific Skills:

- Independently follows scientific instructions and procedures.
- Makes precise and accurate observations and measurements.
- Plans and conducts investigations with minimal guidance, demonstrating a clear understanding of variables and controls.

Analysis and Evaluation:

- Presents data in a variety of forms, including more complex graphs and charts.
- Identifies patterns and relationships in data and draws well-reasoned conclusions.
- Critically evaluates the reliability and validity of their results and suggests improvements.

Communication:

- Communicates findings clearly and concisely, using appropriate scientific terminology.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions confidently.

Biology: Cells and Organisation

Working At Standard

Knowledge and Understanding:

- Recognises and names basic cell structures (e.g., nucleus, cytoplasm, cell membrane, cell wall, chloroplasts, vacuole).
- Understands the differences between plant and animal cells.
- Describes the basic functions of cell structures (e.g., nucleus controls cell activities, chloroplasts conduct photosynthesis).
- Understands the concept of tissues, organs, and organ systems.

Scientific Skills:

- Can use a microscope to observe and identify basic cell structures.
- Follows simple scientific procedures to prepare slides for observation.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from observations in simple forms (e.g., labelled diagrams, tables).
- Identifies basic patterns and relationships in data.
- Draws simple conclusions based on observations.

Communication:

- Uses basic scientific vocabulary to describe cell structures and functions.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of cell structures and their functions.
- Explains the process of cell division (mitosis) and its importance in growth and repair.
- Understands the concept of specialised cells and can provide examples (e.g., red blood cells, nerve cells).
- Explains the hierarchical organisation of cells into tissues, organs, and organ systems with examples.

Scientific Skills:

- Independently uses a microscope to observe and identify detailed cell structures.
- Prepares slides for observation with minimal guidance, demonstrating good technique.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex diagrams and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions.
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.

Biology: Skeletons and Muscles

Working At Standard

Knowledge and Understanding:

- Identifies the major bones in the human skeleton (e.g., skull, ribs, spine, femur).
- Understands the basic functions of the skeleton (support, protection, movement).
- Recognises the main types of joints (e.g., hinge, ball and socket) and their functions.
- Describes the role of muscles in movement and how they work in pairs (antagonistic muscles).

Scientific Skills:

- Can use models or diagrams to identify and label major bones and muscles.
- Follows simple scientific procedures to explore the movement of joints and muscles.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from observations in simple forms (e.g., labelled diagrams, tables).
- Identifies basic patterns and relationships in data.
- Draws simple conclusions based on observations.

Communication:

- Uses basic scientific vocabulary to describe the skeleton and muscles.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the skeletal system, including more detailed knowledge of bone structure (e.g., compact bone, spongy bone, bone marrow).
- Explains the process of bone growth and repair.
- Understands the different types of joints in more detail and provides examples of each (e.g., hinge joint in the elbow, ball and socket joint in the shoulder).
- Describes the structure and function of different muscle types (e.g., skeletal, smooth, cardiac) and how they contribute to movement.

Scientific Skills:

- Independently uses models or diagrams to identify and label more detailed structures of bones and muscles.
- Prepares and conducts experiments with minimal guidance to investigate the function of joints and muscles.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex diagrams and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions.
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
    - Writes detailed scientific reports with coherent arguments and logical structure.
    - Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: Particle Model

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of the particle model (e.g., particles in solids, liquids, and gases).
- Can describe the arrangement and movement of particles in different states of matter.
- Understands the processes of changing state (e.g., melting, freezing, evaporation, condensation).

Scientific Skills:

- Can use models or diagrams to represent particles in different states of matter.
- Follows simple scientific procedures to investigate changes of state.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from investigations in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., temperature changes during state changes).
- Draws simple conclusions based on observations (e.g., linking temperature to particle movement).

Communication:

- Uses basic scientific vocabulary to describe the particle model and changes of state.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the particle model, including concepts like diffusion and pressure.
- Can explain the kinetic theory and how it relates to the particle model.
- Understands the energy changes involved in changing states and can explain these in terms of particles.

Scientific Skills:

- Independently uses models or diagrams to represent detailed particle behaviour in different states of matter.
- Prepares and conducts experiments with minimal guidance to investigate more complex phenomena like diffusion and pressure.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions.
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: Separating Techniques

Working At Standard

Knowledge and Understanding:

- Understands basic separation techniques such as filtration, evaporation, distillation, and chromatography.
- Can describe the purpose of each separation technique (e.g., filtration is used to separate insoluble solids from liquids).
- Knows the equipment and materials required for each technique.

Scientific Skills:

- Can follow simple scientific instructions to perform basic separation techniques.
- Uses appropriate equipment correctly and safely (e.g., filter paper, evaporating dish, distillation apparatus).
- Records observations and results accurately during experiments.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how different substances separate in chromatography).
- Draws simple conclusions based on observations (e.g., effectiveness of different separation methods).

Communication:

- Uses basic scientific vocabulary to describe separation techniques and their purposes.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of separation techniques, including more complex methods and their applications.
- Can explain the principles behind each separation technique (e.g., how distillation separates substances based on boiling points).
- Understands the limitations and advantages of different separation techniques.

Scientific Skills:

- Independently follows detailed scientific instructions to perform more complex separation techniques.
- Prepares and conducts experiments with minimal guidance, demonstrating a clear understanding of the principles involved.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions.
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Physics: Forces, Motion and Speed

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of forces, motion, and speed.
- Can identify different types of forces (e.g., gravity, friction, air resistance) and describe their effects on motion.
- Understands the relationship between speed, distance, and time, and can use the basic formula: speed = distance/time.
- Knows the difference between balanced and unbalanced forces and their effects on motion.

Scientific Skills:

- Can use simple equipment to measure forces, speed, distance, and time (e.g., force metres, stopwatches, measuring tapes).
- Follows simple scientific procedures to investigate the effects of forces on motion.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how changing the force affects motion).
- Draws simple conclusions based on observations (e.g., identifying when forces are balanced or unbalanced).

Communication:

- Uses basic scientific vocabulary to describe forces, motion, and speed.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of forces, motion, and speed, including more complex concepts such as acceleration and deceleration.
- Can explain the principles behind Newton's laws of motion and apply them to real-world situations.
- Understands the concept of resultant force and how it affects motion.

Scientific Skills:

- Independently uses more advanced equipment to measure forces, speed, distance, and time with greater accuracy.
- Prepares and conducts experiments with minimal guidance to investigate more complex phenomena, such as the effect of varying forces on different masses.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., calculating resultant forces and predicting motion).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Biology: Reproduction

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of human and plant reproduction.
- Can identify and describe the main reproductive organs in humans (e.g., ovaries, testes) and their functions.
- Knows the stages of the human reproductive cycle (e.g., puberty, menstruation, fertilisation, pregnancy).
- Understands the process of pollination and fertilisation in plants.

Scientific Skills:

- Can use diagrams to identify and label reproductive organs in humans and plants.
- Follows simple scientific procedures to investigate reproductive processes (e.g., observing pollen grains under a microscope).
- Records observations and results accurately.

Analysis and Evaluation:

- Presents data from investigations in simple forms (e.g., labelled diagrams, tables).
- Identifies basic patterns and relationships in data (e.g., how environmental factors affect plant reproduction).
- Draws simple conclusions based on observations (e.g., the role of different parts of the flower in reproduction).

Communication:

- Uses basic scientific vocabulary to describe reproductive processes and organs.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of human and plant reproduction, including more detailed knowledge of hormonal control and genetic inheritance.
- Can explain the role of hormones in the human reproductive system (e.g., oestrogen, testosterone).
- Understands the process of seed dispersal and its importance for plant reproduction.
- Explains the stages of embryonic development in humans.

Scientific Skills:

- Independently uses more advanced diagrams to represent detailed reproductive processes.
- Prepares and conducts experiments with minimal guidance to investigate more complex aspects of reproduction (e.g., the effect of light on plant reproduction).
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex diagrams and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., linking hormone levels to reproductive health).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: Acids and Alkalis

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of acids and alkalis.
- Can identify common acids and alkalis and give examples (e.g., hydrochloric acid, sodium hydroxide).
- Knows how to use indicators (e.g., litmus paper, universal indicator) to determine if a substance is acidic or alkaline.
- Understands the pH scale and can place substances on the scale based on their acidity or alkalinity.

Scientific Skills:

- Can follow simple scientific procedures to test substances using indicators.
- Uses appropriate equipment correctly and safely (e.g., pipettes, pH metres).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how different substances affect pH).
- Draws simple conclusions based on observations (e.g., identifying if a substance is an acid or an alkali).

Communication:

- Uses basic scientific vocabulary to describe acids, alkalis, and the pH scale.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of acids and alkalis, including more complex concepts such as neutralisation reactions.
- Can explain the chemical properties of acids and alkalis and their reactions (e.g., acid + base → salt + water).
- Understands the role of acids and alkalis in everyday life and industry (e.g., digestion, cleaning products).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., titrations).
- Prepares and conducts experiments with minimal guidance to investigate neutralisation reactions and determine the concentration of unknown solutions.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., calculating the concentration of an acid or alkali from titration data).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Physics: Sound

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of sound as a wave.
- Can describe how sound travels through different mediums (solids, liquids, gases).
- Knows the basic properties of sound waves, including frequency, amplitude, and wavelength.
- Understands how the ear detects sound and the basic structure of the human ear.

Scientific Skills:

- Can use simple equipment to measure properties of sound (e.g., sound level meters, tuning forks).
- Follows simple scientific procedures to investigate sound properties (e.g., experiments to measure the speed of sound in different media).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how changing the medium affects the speed of sound).
- Draws simple conclusions based on observations (e.g., how frequency affects pitch).

Communication:

- Uses basic scientific vocabulary to describe sound properties and how sound is detected.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of sound, including more complex concepts such as the Doppler effect and resonance.
- Can explain the relationship between frequency and pitch, and amplitude and loudness.
- Understands the principles of sound wave interference and how they relate to phenomena such as beats and standing waves.
- Explains the structure and function of the human ear in more detail, including the role of the cochlea.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the Doppler effect or resonance in musical instruments).
- Prepares and conducts experiments with minimal guidance to investigate sound wave properties and interactions.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how sound wave interference creates beats).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Physics: Light

Working At Standard

Knowledge and Understanding:

- Understands that light travels in straight lines and can be reflected, refracted, and absorbed.
- Can describe the basic properties of light, including speed in different mediums.
- Knows how to use mirrors and lenses to manipulate light (e.g., reflection, refraction).
- Understands the structure and function of the human eye and how it detects light.

Scientific Skills:

- Can use simple equipment to investigate the properties of light (e.g., ray boxes, mirrors, lenses).
- Follows simple scientific procedures to explore reflection, refraction, and absorption.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., diagrams, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how the angle of incidence affects the angle of reflection).
- Draws simple conclusions based on observations (e.g., describing how lenses focus light).

Communication:

- Uses basic scientific vocabulary to describe light properties and how light interacts with different materials.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of light, including more complex concepts such as the wave-particle duality of light.
- Can explain the principles of light reflection, refraction, and dispersion in detail.
- Understands how different types of lenses (convex and concave) affect light rays.
- Explains the structure and function of the human eye in more detail, including common vision defects and their corrections (e.g., myopia, hyperopia).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the dispersion of light through prisms).
- Prepares and conducts experiments with minimal guidance to investigate the properties of lenses and mirrors.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex diagrams and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how lenses form images).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Biology: Ecosystems

Working At Standard

Knowledge and Understanding:

- Understands the basic components of an ecosystem, including biotic (living) and abiotic (non-living) factors.
- Can describe the roles of producers, consumers, and decomposers in an ecosystem.
- Knows the basic concepts of food chains and food webs, including how energy flows through an ecosystem.
- Understands the importance of biodiversity and the impact of human activities on ecosystems.

Scientific Skills:

- Can use simple equipment to study ecosystems (e.g., quadrats, pH meters).
- Follows simple scientific procedures to investigate ecosystem components (e.g., measuring soil pH, identifying organisms).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how different factors affect organism distribution).
- Draws simple conclusions based on observations (e.g., the role of a particular species in a food web).

Communication:

- Uses basic scientific vocabulary to describe ecosystem components and interactions.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of ecosystems, including more complex interactions and cycles (e.g., nitrogen cycle, carbon cycle).
- Can explain the principles of ecological succession and how ecosystems change over time.
- Understands the impact of invasive species, pollution, and climate change on ecosystems.
- Explains conservation strategies and the importance of maintaining biodiversity.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex ecosystem studies (e.g., assessing biodiversity using various sampling methods).
- Prepares and conducts experiments with minimal guidance to investigate ecological interactions and cycles.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., how abiotic factors influence species distribution).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: Earth Science

Working At Standard

Knowledge and Understanding:

- Understands the basic structure of the Earth, including the crust, mantle, and core.
- Can describe the rock cycle and identify different types of rocks (igneous, sedimentary, metamorphic).
- Understands the processes of weathering, erosion, and deposition.
- Knows the basic principles of plate tectonics and how they cause earthquakes, volcanoes, and mountain formation.
- Understands the water cycle and its components (evaporation, condensation, precipitation, collection).

Scientific Skills:

- Can use simple tools and techniques to study rocks and minerals (e.g., hand lens, streak test).
- Follows simple scientific procedures to investigate geological processes (e.g., simulating erosion with water).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments and observations in simple forms (e.g., diagrams, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how different factors affect erosion rates).
- Draws simple conclusions based on observations (e.g., describing how sedimentary rocks are formed).

Communication:

- Uses basic scientific vocabulary to describe geological processes and features.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of Earth science, including more complex concepts such as the carbon cycle and its impact on climate.
- Can explain the formation and characteristics of different types of rocks in detail.
- Understands the dynamic nature of the Earth's crust and can explain the mechanisms behind plate tectonics.
- Can describe the role of the water cycle in shaping the Earth's surface and its importance to life.
- Understands the interrelationship between geological and atmospheric processes (e.g., how volcanic eruptions can affect climate).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex investigations (e.g., modelling plate tectonics).
- Prepares and conducts experiments with minimal guidance to explore geological and atmospheric processes.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex diagrams and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how geological processes contribute to the rock cycle).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Physics: Space

Working At Standard

Knowledge and Understanding:

- Understands the basic structure of the solar system, including the positions and characteristics of the planets.
- Can describe the phases of the Moon and explain why they occur.
- Knows the difference between stars, planets, and moons.
- Understands the concept of gravity and its role in the solar system (e.g., orbital motion).

Scientific Skills:

- Can use models and diagrams to represent the solar system and the phases of the Moon.
- Follows simple scientific procedures to explore concepts like gravity and orbits (e.g., using simulations or physical models).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments and observations in simple forms (e.g., diagrams, basic graphs).
- Identifies basic patterns and relationships in data (e.g., the relationship between the Sun, Earth, and Moon).
- Draws simple conclusions based on observations (e.g., explaining why we have seasons).

Communication:

- Uses basic scientific vocabulary to describe the solar system, phases of the Moon, and gravity.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of space, including more complex concepts such as the life cycle of stars and the Big Bang theory.
- Can explain the different types of celestial bodies (e.g., asteroids, comets, dwarf planets) and their characteristics.
- Understands the concept of light years and the vast distances in space.
- Explains how telescopes and other technologies have expanded our understanding of the universe.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex investigations (e.g., modelling the life cycle of a star).
- Prepares and conducts experiments and observations with minimal guidance to explore advanced concepts (e.g., using software to simulate space phenomena).
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex diagrams and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., analysing the data from space telescopes).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Planning Investigations

Working At Standard

Knowledge and Understanding:

- Understands the basic steps involved in planning a scientific investigation (e.g., identifying the question, forming a hypothesis, selecting variables).
- Knows the difference between independent, dependent, and control variables.
- Can describe the importance of repeatability and reliability in experiments.

Scientific Skills:

- Can formulate a clear and testable hypothesis.
- Identifies and selects appropriate variables for an investigation.
- Designs a simple method or procedure to test a hypothesis, including necessary materials and equipment.
- Follows safety guidelines when planning experiments.

Analysis and Evaluation:

- Plans how to collect and record data accurately (e.g., using tables, charts).
- Considers basic ways to ensure accuracy and reliability (e.g., repeating measurements).
- Identifies potential sources of error in their plan.

Communication:

- Uses basic scientific vocabulary to describe their investigation plan.
- Writes simple investigation plans with clear sections (aim, hypothesis, variables, method, safety considerations).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the principles of scientific investigation, including the importance of controls and fair testing.
- Can explain the rationale behind selecting specific variables and methods.
- Understands more complex concepts such as random error and systematic error.

Scientific Skills:

- Formulates a detailed and well-structured hypothesis based on scientific knowledge.
- Selects and justifies the choice of variables and controls for an investigation.
- Designs detailed and methodical procedures to test a hypothesis, ensuring all necessary steps and contingencies are considered.
- Incorporates advanced safety measures and ethical considerations into their planning.

Analysis and Evaluation:

- Plans how to collect, record, and analyse data using various methods (e.g., detailed tables, graphs, statistical tools).
- Considers multiple ways to ensure accuracy and reliability, including precise measurement techniques and multiple trials.
- Critically evaluates potential sources of error and suggests ways to minimise them.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed investigation plans with coherent arguments and logical structure, including sections on background research, aim, hypothesis, variables, method, safety, and ethical considerations.
- Engages in scientific discussions, justifying their investigation plan with evidence and reasoning.

Biology: Breathing and Health

Working At Standard

Knowledge and Understanding:

- Understands the basic structure and function of the human respiratory system (e.g., lungs, trachea, bronchi, alveoli).
- Can describe the process of gas exchange in the lungs.
- Knows the role of the diaphragm and intercostal muscles in breathing.
- Understands the basics of how exercise and lifestyle choices (e.g., smoking, diet) affect respiratory health.

Scientific Skills:

- Can use models or diagrams to identify and label parts of the respiratory system.
- Follows simple scientific procedures to measure aspects of breathing (e.g., using a spirometer to measure lung capacity).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how exercise affects breathing rate).
- Draws simple conclusions based on observations (e.g., linking lifestyle choices to respiratory health).

Communication:

- Uses basic scientific vocabulary to describe the respiratory system and its functions.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the respiratory system, including more detailed knowledge of alveolar structure and function.
- Can explain the physiological mechanisms behind gas exchange and the transport of oxygen and carbon dioxide in the blood.
- Understands how various diseases and conditions (e.g., asthma, bronchitis) affect the respiratory system.
- Explains the impact of long-term lifestyle choices on respiratory health and overall well-being.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the effects of different exercises on lung function).
- Prepares and conducts experiments with minimal guidance to investigate the efficiency of gas exchange.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how different factors affect lung capacity and efficiency).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Physics: Energy

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of energy, including different types (e.g., kinetic, potential, thermal, chemical).
- Can describe the principle of conservation of energy and that energy can be transferred, stored, or dissipated but never created or destroyed.
- Knows the basic methods of energy transfer (e.g., conduction, convection, radiation).
- Understands the difference between renewable and non-renewable energy sources.

Scientific Skills:

- Can use simple equipment to measure energy changes and transfers (e.g., thermometers, calorimeters).
- Follows simple scientific procedures to investigate energy transfer (e.g., experiments on insulation, energy dissipation).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how different materials affect energy transfer).
- Draws simple conclusions based on observations (e.g., effectiveness of different insulation materials).

Communication:

- Uses basic scientific vocabulary to describe types of energy and energy transfer.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of energy, including more complex concepts such as energy efficiency and specific heat capacity.
- Can explain energy transfer processes in detail and apply the principle of conservation of energy to different scenarios.
- Understands the implications of energy use and the importance of energy conservation and efficiency.
- Can describe the detailed mechanisms of renewable energy technologies (e.g., solar panels, wind turbines).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., calculating specific heat capacity, investigating energy efficiency of devices).
- Prepares and conducts experiments with minimal guidance to investigate energy transfer and efficiency.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., evaluating the efficiency of different energy sources).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Biology: Digestion

Working At Standard

Knowledge and Understanding:

- Understands the basic structure and function of the digestive system, including key organs (e.g., mouth, oesophagus, stomach, intestines).
- Can describe the process of digestion and the role of different digestive enzymes (e.g., amylase, protease, lipase).
- Knows the importance of a balanced diet and the role of nutrients (carbohydrates, proteins, fats, vitamins, and minerals) in the body.
- Understands the concept of absorption and how nutrients are absorbed in the small intestine.

Scientific Skills:

- Can use diagrams to identify and label parts of the digestive system.
- Follows simple scientific procedures to investigate digestion (e.g., experiments on enzyme activity).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how temperature affects enzyme activity).
- Draws simple conclusions based on observations (e.g., describing the effect of pH on enzyme activity).

Communication:

- Uses basic scientific vocabulary to describe the digestive process and the role of enzymes.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the digestive system, including more detailed knowledge of the biochemical processes involved.
- Can explain the mechanisms of enzyme action and factors affecting enzyme activity (e.g., temperature, pH).
- Understands the role of the liver and pancreas in digestion and nutrient metabolism.
- Explains the process of nutrient absorption in detail, including the structure and function of villi in the small intestine.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the effect of different variables on enzyme activity).
- Prepares and conducts experiments with minimal guidance to investigate the digestion of various nutrients.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how different factors affect the rate of digestion).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: Periodic Table

Working At Standard

Knowledge and Understanding:

- Understands the basic structure and layout of the periodic table, including groups and periods.
- Can identify and describe the properties of metals and non-metals.
- Knows the basic trends in the periodic table, such as the reactivity of alkali metals and halogens.
- Understands the concept of atomic number and its significance in the arrangement of elements in the periodic table.

Scientific Skills:

- Can use the periodic table to locate elements and predict their properties.
- Follows simple scientific procedures to explore the properties of elements (e.g., testing reactivity of metals).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., trends in reactivity).
- Draws simple conclusions based on observations (e.g., linking element position to its properties).

Communication:

- Uses basic scientific vocabulary to describe elements, groups, and periods.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the periodic table, including the significance of electron configuration.
- Can explain the periodic trends in greater detail (e.g., ionisation energy, atomic radius).
- Understands the significance of transition metals and their unique properties.
- Can explain how the periodic table is used to predict chemical reactions and the formation of compounds.

Scientific Skills:

- Independently uses the periodic table to predict and explain the properties and behaviours of elements.
- Prepares and conducts more complex experiments with minimal guidance to investigate periodic trends (e.g., comparing the reactivity of different groups).
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining trends in ionisation energy).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Physics: Forces and Pressure

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of forces, including types of forces (e.g., gravity, friction, air resistance, tension).
- Can describe how forces can change the shape, speed, and direction of objects.
- Understands the concept of pressure and can describe how it is calculated (pressure = force/area).
- Knows the difference between balanced and unbalanced forces and their effects on motion.

Scientific Skills:

- Can use simple equipment to measure forces (e.g., force metres, spring balances).
- Follows simple scientific procedures to investigate the effects of forces and pressure (e.g., experiments with different surfaces to measure friction).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how surface area affects pressure).
- Draws simple conclusions based on observations (e.g., how changing the force affects motion).

Communication:

- Uses basic scientific vocabulary to describe forces and pressure.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of forces and pressure, including more complex concepts such as fluid pressure and buoyancy.
- Can explain the principles behind pressure in fluids and how it relates to depth and density.
- Understands the mathematical relationships involved in calculating force, pressure, and area, and can apply these to real-world situations.
- Explains the effects of different types of forces on objects in more detail, including resultant forces and equilibrium.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating pressure in different fluids, the effects of buoyancy).
- Prepares and conducts experiments with minimal guidance to investigate the principles of forces and pressure.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., calculating the resultant force in different scenarios).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Biology: Photosynthesis

Working At Standard

Knowledge and Understanding:

- Understands the basic process of photosynthesis and its importance for plants and other organisms.
- Can write and explain the word equation for photosynthesis: carbon dioxide + water → glucose + oxygen.
- Knows the main parts of a plant involved in photosynthesis (e.g., chloroplasts, leaves, stomata).
- Understands the basic conditions required for photosynthesis (e.g., light, water, carbon dioxide).

Scientific Skills:

- Can use simple equipment to investigate photosynthesis (e.g., test tubes, light sources, aquatic plants like Elodea).
- Follows simple scientific procedures to demonstrate the presence of starch in leaves as evidence of photosynthesis.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how light intensity affects the rate of photosynthesis).
- Draws simple conclusions based on observations (e.g., explaining the effect of light on photosynthesis).

Communication:

- Uses basic scientific vocabulary to describe the process and importance of photosynthesis.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of photosynthesis, including the chemical equation: $6CO_2 + 6H_2O \rightarrow C_6H_{12}O_6 + 6O_2$.
- Can explain the role of chlorophyll and other pigments in absorbing light energy.
- Understands the light-dependent and light-independent reactions of photosynthesis in more detail.
- Explains the factors affecting the rate of photosynthesis (e.g., light intensity, carbon dioxide concentration, temperature).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the effect of different wavelengths of light on the rate of photosynthesis).
- Prepares and conducts experiments with minimal guidance to measure the rate of photosynthesis using techniques like counting oxygen bubbles or using a data logger.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how varying conditions affect the rate of photosynthesis).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: Metals and Non-Metals

Working At Standard

Knowledge and Understanding:

- Understands the basic properties of metals (e.g., malleability, conductivity, lustre) and non-metals (e.g., brittleness, insulating properties).
- Can identify common examples of metals and non-metals and describe their uses.
- Knows basic reactions of metals with oxygen, water, and acids (e.g., rusting, formation of metal oxides).
- Understands the concept of the reactivity series and can place common metals in order of reactivity.

Scientific Skills:

- Can use simple equipment to investigate the properties of metals and non-metals (e.g., testing conductivity, observing reactions).
- Follows simple scientific procedures to carry out basic experiments (e.g., reacting metals with acids).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., reactivity trends in the reactivity series).
- Draws simple conclusions based on observations (e.g., determining which metals are more reactive).

Communication:

- Uses basic scientific vocabulary to describe the properties and reactions of metals and non-metals.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the properties and uses of metals and non-metals, including alloys and their advantages.
- Can explain more complex chemical reactions involving metals and non-metals (e.g., displacement reactions, redox reactions).
- Understands the environmental and economic considerations of metal extraction and recycling.
- Explains the periodic table trends related to metals and non-metals, such as atomic size and ionisation energy.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating displacement reactions).
- Prepares and conducts experiments with minimal guidance to investigate the properties and reactions of metals and non-metals in various conditions.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining the outcome of displacement reactions based on the reactivity series).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Physics: Electricity

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of electricity, including current, voltage, and resistance.
- Can identify and describe the function of basic electrical components (e.g., batteries, bulbs, resistors, switches).
- Knows how to construct and interpret simple series and parallel circuits.
- Understands the difference between conductors and insulators.

Scientific Skills:

- Can use basic equipment to measure electrical quantities (e.g., ammeters, voltmeters).
- Follows simple scientific procedures to investigate the properties of electrical circuits.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., circuit diagrams, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how the number of components affects current in a series circuit).
- Draws simple conclusions based on observations (e.g., the effect of adding resistors to a circuit).

Communication:

- Uses basic scientific vocabulary to describe electrical concepts and components.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of electricity, including more complex concepts such as Ohm's Law.
- Can explain the principles behind the behaviour of series and parallel circuits in detail.
- Understands the relationship between current, voltage, and resistance and can perform calculations using Ohm's Law.
- Explains the role of more complex electrical components (e.g., diodes, capacitors, transistors).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the effect of different resistors on current and voltage).
- Prepares and conducts experiments with minimal guidance to explore more advanced electrical concepts (e.g., calculating the total resistance in parallel circuits).
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex circuit diagrams and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how changing one component affects the entire circuit).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: Chemical Reactions

Working At Standard

Knowledge and Understanding:

- Understands the basic concept of a chemical reaction, including the rearrangement of atoms to form new substances.
- Can identify common types of chemical reactions (e.g., combustion, neutralisation, oxidation).
- Understands the law of conservation of mass in chemical reactions.
- Knows the basic properties of reactants and products in a reaction.

Scientific Skills:

- Can use simple equipment to carry out basic chemical reactions safely (e.g., test tubes, Bunsen burners).
- Follows simple scientific procedures to observe and record chemical changes.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., changes in mass or temperature during a reaction).
- Draws simple conclusions based on observations (e.g., identifying evidence of a chemical reaction such as gas production, colour change).

Communication:

- Uses basic scientific vocabulary to describe chemical reactions and their properties.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of chemical reactions, including more complex concepts such as exothermic and endothermic reactions.
- Can explain the principles behind reaction rates and factors that affect them (e.g., temperature, concentration, surface area).
- Understands chemical equations and can balance simple chemical equations.
- Explains the concept of catalysts and their role in chemical reactions.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating reaction rates).
- Prepares and conducts experiments with minimal guidance to explore the effects of different variables on chemical reactions.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how different factors affect reaction rates).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Biology: Genetics and Evolution

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of genetics, including the role of DNA and genes.
- Can describe the structure of DNA and explain its role in inheritance.
- Knows the difference between inherited and acquired traits.
- Understands basic principles of natural selection and how it leads to evolution.
- Can explain the process of selective breeding and its applications.

Scientific Skills:

- Can use models or diagrams to represent the structure of DNA and chromosomes.
- Follows simple scientific procedures to investigate inheritance patterns (e.g., using Punnett squares).
- Records observations and results accurately.

Analysis and Evaluation:

- Presents data from investigations in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., dominant and recessive traits).
- Draws simple conclusions based on observations (e.g., predicting the probability of inherited traits).

Communication:

- Uses basic scientific vocabulary to describe genetic concepts and processes.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of genetics and evolution, including more complex concepts such as mutations, genetic variation, and speciation.
- Can explain the mechanisms of genetic inheritance, including the role of alleles and meiosis.
- Understands the molecular basis of mutations and their potential effects on organisms.
- Explains the evidence supporting the theory of evolution (e.g., fossil records, comparative anatomy, genetic similarities).
- Understands the ethical considerations and implications of genetic research and biotechnology.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex investigations (e.g., exploring genetic crosses and inheritance patterns in more detail).
- Prepares and conducts experiments with minimal guidance to investigate genetic variation and natural selection.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how genetic variation contributes to evolution).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: The Earth (Climate and Resources)

Working At Standard

Knowledge and Understanding:

- Understands the basic structure of the Earth, including the crust, mantle, and core.
- Can describe the water cycle and its stages (e.g., evaporation, condensation, precipitation).
- Knows the basic concepts of renewable and non-renewable resources and can give examples of each.
- Understands the basics of climate change, including its causes (e.g., greenhouse gases) and potential impacts.

Scientific Skills:

- Can use simple diagrams to represent processes such as the water cycle and the carbon cycle.
- Follows simple scientific procedures to investigate resource use and climate patterns.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from investigations in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., temperature changes over time).
- Draws simple conclusions based on observations (e.g., linking human activities to climate change).

Communication:

- Uses basic scientific vocabulary to describe Earth's structure, climate processes, and resource use.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the Earth's structure and processes, including plate tectonics and the rock cycle.
- Can explain the detailed mechanisms behind the water cycle and the carbon cycle.
- Understands the complexities of renewable and non-renewable resources, including their extraction, use, and environmental impact.
- Explains the scientific principles behind climate change, including the role of feedback loops and the detailed impact of greenhouse gases.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex investigations (e.g., modelling the greenhouse effect).
- Prepares and conducts experiments with minimal guidance to investigate resource management and climate data.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., analysing long-term climate data to predict trends).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Physics: Magnetism

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of magnetism, including magnetic poles (north and south) and magnetic fields.
- Can identify materials that are magnetic (e.g., iron, nickel, cobalt) and those that are not.
- Knows how magnets interact with each other (attraction and repulsion) and how they interact with magnetic materials.
- Understands the concept of a magnetic field and can describe how field lines represent the magnetic field around a magnet.

Scientific Skills:

- Can use simple equipment to investigate the properties of magnets and magnetic fields (e.g., bar magnets, iron filings, compasses).
- Follows simple scientific procedures to explore magnetic interactions and field patterns.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., diagrams, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how the strength of the magnetic field changes with distance).
- Draws simple conclusions based on observations (e.g., describing the shape of the magnetic field around a magnet).

Communication:

- Uses basic scientific vocabulary to describe magnetic properties and interactions.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of magnetism, including concepts such as the Earth's magnetic field and electromagnetism.
- Can explain the principles of how electromagnets work and their applications (e.g., electric motors, generators).
- Understands the relationship between electricity and magnetism (e.g., how an electric current creates a magnetic field).
- Explains how magnetic domains contribute to the magnetism of a material.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., creating and investigating electromagnets).
- Prepares and conducts experiments with minimal guidance to explore the relationship between electric current and magnetism.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex diagrams and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining how changing the current affects the strength of an electromagnet).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Biology: Cell Biology

Working At Standard

Knowledge and Understanding:

- Understands the structure and function of key cell organelles (e.g., nucleus, mitochondria, ribosomes, chloroplasts).
- Can differentiate between prokaryotic and eukaryotic cells and describe their main features.
- Understands the principles of cell division (mitosis and meiosis) and their roles in growth, repair, and reproduction.
- Knows the basic principles of cell transport mechanisms (e.g., diffusion, osmosis, active transport).

Scientific Skills:

- Can use microscopes to observe and identify cell structures.
- Follows scientific procedures to prepare and examine slides (e.g., staining techniques).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments and observations in appropriate forms (e.g., diagrams, tables, graphs).
- Identifies patterns and relationships in data (e.g., stages of the cell cycle).
- Draws conclusions based on evidence (e.g., effects of osmosis on plant cells).

Communication:

- Uses scientific vocabulary accurately to describe cell structures and processes.
- Writes clear and structured scientific reports (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of cell biology, including more complex concepts such as cellular respiration and photosynthesis.
- Can explain the molecular structure and function of DNA and its role in protein synthesis.
- Understands the regulation of the cell cycle and the mechanisms of cancer development.
- Can describe advanced cell transport mechanisms (e.g., endocytosis, exocytosis).

Scientific Skills:

- Independently uses advanced microscopy techniques (e.g., electron microscopy) to study cell structures.
- Prepares and conducts experiments with minimal guidance to investigate more complex cellular processes (e.g., enzyme activity, genetic engineering).
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., linking genetic mutations to diseases).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses advanced scientific terminology confidently and accurately.
- Writes detailed and coherent scientific reports with logical arguments and critical analysis.
- Engages in scientific discussions, justifying their methods and conclusions with robust evidence.

Physics: Energy

Working At Standard

Knowledge and Understanding:

- Understands the different types of energy (e.g., kinetic, potential, thermal, chemical, electrical).
- Can describe energy transfer and transformation processes (e.g., from potential to kinetic energy).
- Understands the principle of conservation of energy.
- Knows the basic concepts of work, power, and efficiency, and can use the relevant formulas (e.g., work = force x distance, power = work/time).

Scientific Skills:

- Can use simple equipment to measure energy changes and transfers (e.g., calorimeters, dynamometers).
- Follows scientific procedures to investigate energy transformations (e.g., experiments with pendulums, electrical circuits).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how changing height affects gravitational potential energy).
- Draws simple conclusions based on observations (e.g., describing energy conservation in a closed system).

Communication:

- Uses basic scientific vocabulary to describe energy types, transfers, and transformations.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of energy concepts, including more complex ideas such as specific heat capacity and latent heat.
- Can explain the efficiency of energy transfers and the factors affecting it.
- Understands the principles behind renewable and non-renewable energy sources and their impact on the environment.
- Applies the laws of thermodynamics to real-world situations.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the efficiency of different energy sources).
- Prepares and conducts experiments with minimal guidance to investigate energy transfer in various contexts (e.g., insulation properties, energy transfer in ecosystems).
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., calculating the efficiency of different machines).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Biology: Organisation and Differentiation

Working At Standard

Knowledge and Understanding:

- Understands the basic principles of cell organisation (cells, tissues, organs, and organ systems).
- Can describe the process of cell differentiation and its importance in the development of specialised cells.
- Knows the main types of specialised cells (e.g., nerve cells, muscle cells) and their functions.
- Understands the hierarchy of biological organisation from cells to organ systems.

Scientific Skills:

- Can use microscopes to observe and identify different types of cells and tissues.
- Follows scientific procedures to prepare slides and make accurate observations.
- Records observations and measurements accurately in a structured format.

Analysis and Evaluation:

- Presents data from observations in organised forms (e.g., labelled diagrams, tables).
- Identifies basic patterns and relationships in data (e.g., how structure relates to function in specialised cells).
- Draws simple conclusions based on observations (e.g., the importance of cell differentiation).

Communication:

- Uses appropriate scientific vocabulary to describe cell organisation and differentiation.
- Writes clear scientific reports with structured sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of cell organisation and differentiation, including more complex concepts such as stem cells and their potential uses.
- Can explain the genetic and environmental factors that influence cell differentiation.
- Understands the structure and function of different types of tissues (e.g., epithelial, connective, muscle, nervous tissue) and their roles in organs and organ systems.
- Explains the significance of cell signalling and communication in the process of differentiation.

Scientific Skills:

- Independently uses advanced microscopes and techniques to observe and identify detailed cell structures and different tissue types.
- Prepares and conducts detailed experiments with minimal guidance to investigate cell differentiation and tissue organisation.
- Makes precise and accurate observations and measurements, showing a clear understanding of the procedures involved.

Analysis and Evaluation:

- Presents data in various forms, including complex diagrams and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining the role of stem cells in tissue repair and regeneration).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses advanced scientific terminology confidently and accurately.
- Writes detailed and well-structured scientific reports with coherent arguments and logical flow.
- Engages in scientific discussions, justifying their methods and conclusions with robust evidence.

Biology: Digestion and Enzymes

Working At Standard

Knowledge and Understanding:

- Understands the basic structure and function of the human digestive system (e.g., mouth, oesophagus, stomach, intestines).
- Can describe the role of different digestive enzymes (e.g., amylase, protease, lipase) in breaking down carbohydrates, proteins, and fats.
- Knows the conditions required for enzyme activity (e.g., pH, temperature) and how these conditions affect enzyme function.
- Understands the concept of substrate and active site in enzyme action.

Scientific Skills:

- Can use models or diagrams to identify and label parts of the digestive system.
- Follows simple scientific procedures to investigate enzyme activity (e.g., using iodine to test for starch breakdown by amylase).
- Records observations and measurements accurately during experiments.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how temperature affects enzyme activity).
- Draws simple conclusions based on observations (e.g., optimal conditions for enzyme activity).

Communication:

- Uses basic scientific vocabulary to describe the digestive system and enzyme function.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the digestive system, including more detailed knowledge of digestive processes (e.g., peristalsis, absorption).
- Can explain the mechanisms of enzyme action in detail, including concepts like enzyme specificity and the lock-and-key model.
- Understands the factors affecting enzyme activity (e.g., inhibitors, coenzymes) and their implications in biological and industrial contexts.
- Explains the role of bile in digestion and its effect on enzyme activity.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the effect of pH on enzyme activity using buffer solutions).
- Prepares and conducts experiments with minimal guidance to investigate enzyme kinetics and the effect of different variables on enzyme activity.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., calculating the rate of enzyme-catalysed reactions).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: Bonding

Working At Standard

Knowledge and Understanding:

- Understands the basic types of chemical bonds: ionic, covalent, and metallic.
- Can describe how ionic bonds form between metals and non-metals and the properties of ionic compounds (e.g., high melting points, electrical conductivity when molten or dissolved).
- Understands how covalent bonds form between non-metals and the properties of simple covalent molecules (e.g., low melting and boiling points, poor electrical conductivity).
- Can describe the structure and properties of metallic bonds (e.g., malleability, electrical conductivity).
- Knows how to draw dot and cross diagrams for simple ionic and covalent compounds.

Scientific Skills:

- Can use models and diagrams to represent different types of chemical bonds.
- Follows scientific procedures to investigate the properties of ionic, covalent, and metallic substances (e.g., melting point experiments, conductivity tests).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how bonding type affects melting point).
- Draws simple conclusions based on observations (e.g., linking bonding type to physical properties).

Communication:

- Uses basic scientific vocabulary to describe different types of chemical bonds and their properties.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of chemical bonding, including more complex concepts such as polar covalent bonds and intermolecular forces (e.g., van der Waals forces, hydrogen bonding).
- Can explain the formation and properties of giant covalent structures (e.g., diamond, graphite, silicon dioxide).
- Understands the concept of electronegativity and how it affects bond polarity.
- Can describe and explain the properties of substances in terms of their bonding and structure (e.g., why ionic compounds conduct electricity when molten but not solid).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the solubility of different substances in polar and non-polar solvents).
- Prepares and conducts experiments with minimal guidance to investigate the properties of different types of bonding.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining trends in boiling points of substances based on intermolecular forces).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Biology: Bioenergetics

Working At Standard

Knowledge and Understanding:

- Understands the basic principles of bioenergetics, including photosynthesis and respiration.
- Can describe the word and symbol equations for photosynthesis and aerobic respiration.
- Understands the importance of chlorophyll and light in photosynthesis.
- Knows the difference between aerobic and anaerobic respiration and their respective equations.
- Understands the factors affecting the rate of photosynthesis and respiration (e.g., light intensity, carbon dioxide concentration, temperature).

Scientific Skills:

- Can use appropriate equipment to measure factors affecting photosynthesis and respiration (e.g., light metres, carbon dioxide sensors).
- Follows scientific procedures to investigate the effects of different variables on the rate of photosynthesis and respiration.
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how light intensity affects the rate of photosynthesis).
- Draws simple conclusions based on observations and data analysis.

Communication:

- Uses basic scientific vocabulary to describe bioenergetic processes and their importance.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of bioenergetics, including more complex concepts such as the light-dependent and light-independent reactions of photosynthesis.
- Can explain the detailed biochemical pathways of aerobic respiration (glycolysis, Krebs cycle, and electron transport chain).
- Understands the role of ATP in energy transfer within cells.
- Can describe the adaptations of cells and organisms to optimise energy capture and use (e.g., leaf structure, mitochondria).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the effect of different wavelengths of light on photosynthesis).
- Prepares and conducts experiments with minimal guidance to investigate cellular respiration under different conditions.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining the effects of limiting factors on photosynthesis).
- Critically evaluates the reliability and validity of their observations, suggesting improvements and considering experimental errors.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Physics: Forces

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of forces and their effects on motion.
- Can describe and calculate the resultant force when multiple forces are acting on an object.
- Knows Newton's three laws of motion and can apply them to simple scenarios.
- Understands the relationship between force, mass, and acceleration (F = ma).
- Can describe the concepts of weight, mass, and gravitational field strength (W = mg).

Scientific Skills:

- Can use appropriate equipment to measure forces (e.g., force meters, spring balances).
- Follows scientific procedures to investigate the effects of forces on motion (e.g., experiments using trolleys and ramps).
- Records observations and measurements accurately and systematically.

Analysis and Evaluation:

- Presents data from experiments in suitable forms (e.g., tables, graphs).
- Identifies patterns and relationships in data (e.g., how increasing force affects acceleration).
- Draws conclusions based on observations and data, relating them to scientific theories (e.g., Newton's laws).

Communication:

- Uses scientific vocabulary accurately to describe forces and their effects.
- Writes structured scientific reports with clear sections (introduction, method, results, conclusion).
- Can explain basic concepts and findings to peers.

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of forces, including more complex scenarios involving multiple forces.
- Can explain and apply Newton's laws of motion to a variety of real-world situations.
- Understands and can calculate work done (W = Fd), kinetic energy (KE = 1/2 mv^2), and potential energy (PE = mgh).
- Understands the concept of momentum (p = mv) and can apply the principle of conservation of momentum to collisions.
- Can describe and calculate the effects of friction, air resistance, and other non-contact forces (e.g., magnetic, electrostatic).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the effect of varying forces on different masses).
- Prepares and conducts experiments with minimal guidance, demonstrating a clear understanding of variables and controls.
- Makes precise and accurate observations and measurements using advanced equipment (e.g., data loggers, motion sensors).

Analysis and Evaluation:

- Presents data in various forms, including complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., analysing force-time graphs to determine impulse).
- Critically evaluates the reliability and validity of their observations, suggests improvements, and considers sources of error.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments, logical structure, and critical analysis.
- Engages in scientific discussions, justifying their methods and conclusions with evidence, and responds effectively to questions and feedback.

Chemistry: Particle Model of Matter

Working At Standard

Knowledge and Understanding:

- Understands the basic particle model, including the arrangement and movement of particles in solids, liquids, and gases.
- Can describe the processes of changing state (e.g., melting, freezing, evaporation, condensation) in terms of particle movement and energy changes.
- Knows the concept of density and can calculate it using the formula: density = mass/volume.
- Understands the principles of gas pressure in terms of particle collisions.

Scientific Skills:

- Can use appropriate equipment to measure mass, volume, and temperature accurately.
- Follows scientific procedures to investigate changes of state, density, and gas pressure.
- Records observations and measurements accurately and systematically.

Analysis and Evaluation:

- Presents data from experiments in clear forms (e.g., tables, graphs).
- Identifies patterns and relationships in data (e.g., how temperature affects gas pressure).
- Draws conclusions based on observations and theoretical knowledge (e.g., explaining density differences between states of matter).

Communication:

- Uses scientific vocabulary accurately to describe particle behaviour and properties of matter.
- Writes coherent scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of the particle model, including kinetic theory and its application to different states of matter.
- Can explain the energy changes involved in state changes using the concepts of specific heat capacity and latent heat.
- Understands the ideal gas law and can apply it to solve problems involving gas pressure, volume, and temperature.
- Can describe and explain Brownian motion and its significance in supporting the particle theory of matter.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., measuring specific heat capacity and latent heat).
- Prepares and conducts experiments with minimal guidance to investigate the behaviour of gases under different conditions.
- Makes precise and accurate observations and measurements, demonstrating an understanding of error and uncertainty.

Analysis and Evaluation:

- Presents data in various forms, including complex graphs and mathematical models.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., relating gas laws to real-life applications).
- Critically evaluates the reliability and validity of their observations, discusses sources of error, and suggests improvements.

Communication:

- Uses advanced scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments, logical structure, and critical analysis.
- Engages in scientific discussions, justifying their methods and conclusions with evidence and theoretical knowledge.

Chemistry: Reactivity of Metals

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of metal reactivity and the reactivity series.
- Can identify and place common metals in the reactivity series based on their reactions with water, acids, and oxygen.
- Knows the general reactions of metals with acids, water, and oxygen (e.g., metal + acid → salt + hydrogen).
- Understands the concept of displacement reactions and can predict the outcomes of simple reactions.

Scientific Skills:

- Can follow scientific procedures to carry out basic experiments to investigate the reactivity of metals.
- Uses appropriate equipment correctly and safely (e.g., test tubes, Bunsen burners).
- Records observations and measurements accurately, including the formation of gases and temperature changes.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., ranking metals by reactivity based on experimental observations).
- Draws simple conclusions based on observations (e.g., determining which metals are more reactive).

Communication:

- Uses basic scientific vocabulary to describe metal reactivity and the outcomes of reactions.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of metal reactivity, including more complex concepts such as the electrochemical series.
- Can explain the principles behind reactivity trends in the periodic table and the factors affecting reactivity (e.g., atomic structure, ionisation energy).
- Understands the detailed mechanisms of displacement reactions and redox reactions, including identifying oxidising and reducing agents.
- Explains the applications of metal reactivity in real-world contexts (e.g., extraction of metals, corrosion prevention).

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the reactivity of metals in different conditions).
- Prepares and conducts experiments with minimal guidance to investigate detailed aspects of metal reactivity (e.g., using electrochemical cells to measure reactivity).
- Makes precise and accurate observations and measurements, including quantitative data (e.g., measuring the rate of gas production).

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining trends in reactivity based on atomic structure).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Biology: Transport in Cells

Working At Standard

Knowledge and Understanding:

- Understands the basic concepts of cell transport, including diffusion, osmosis, and active transport.
- Can describe how substances move in and out of cells through the cell membrane.
- Knows the factors that affect the rate of diffusion (e.g., concentration gradient, temperature, surface area).
- Understands the concept of osmosis and can explain its importance in biological systems.

Scientific Skills:

- Can use diagrams to illustrate and explain the processes of diffusion, osmosis, and active transport.
- Follows scientific procedures to investigate cell transport mechanisms (e.g., experiments with dialysis tubing, potato osmosis experiments).
- Records observations and measurements accurately.

Analysis and Evaluation:

- Presents data from experiments in simple forms (e.g., tables, basic graphs).
- Identifies basic patterns and relationships in data (e.g., how changing concentration affects the rate of osmosis).
- Draws simple conclusions based on observations (e.g., understanding the effect of osmosis on plant cells).

Communication:

- Uses basic scientific vocabulary to describe cell transport mechanisms.
- Writes simple scientific reports with clear sections (introduction, method, results, conclusion).

Working Above Standard

Knowledge and Understanding:

- Demonstrates a deeper understanding of cell transport mechanisms, including the molecular basis of diffusion, osmosis, and active transport.
- Can explain the role of carrier proteins and energy (ATP) in active transport.
- Understands the significance of cell transport in maintaining homeostasis and its applications in real-world contexts (e.g., kidney function, nutrient absorption in the gut).
- Can describe and explain the process of facilitated diffusion and its importance in cells.

Scientific Skills:

- Independently follows detailed scientific procedures to conduct more complex experiments (e.g., investigating the effect of different variables on the rate of active transport).
- Prepares and conducts experiments with minimal guidance to investigate the quantitative aspects of osmosis and diffusion.
- Makes precise and accurate observations and measurements.

Analysis and Evaluation:

- Presents data in various forms, including more complex graphs and charts.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., explaining the quantitative relationship between concentration gradient and rate of diffusion).
- Critically evaluates the reliability and validity of their observations and suggests improvements.

Communication:

- Uses appropriate scientific terminology confidently and accurately.
- Writes detailed scientific reports with coherent arguments and logical structure.
- Engages in scientific discussions, justifying their methods and conclusions with evidence.

Chemistry: Separation Techniques

Working At Standard

Knowledge and Understanding:

- Understands the basic principles of various separation techniques, including filtration, crystallisation, distillation (simple and fractional), and chromatography.
- Can describe the purpose and application of each separation technique in both laboratory and real-world contexts.
- Understands the concepts of solubility, saturation, and the separation of mixtures.

Scientific Skills:

- Can follow detailed scientific procedures to perform basic separation techniques accurately.
- Uses appropriate equipment correctly and safely (e.g., filter paper, distillation apparatus, chromatography paper).
- Records observations and measurements accurately and systematically.

Analysis and Evaluation:

- Presents data from experiments in clear forms (e.g., tables, graphs, chromatograms).
- Identifies patterns and relationships in data (e.g., interpreting chromatograms to identify substances).
- Draws conclusions based on evidence and observations (e.g., effectiveness of different separation methods).

Communication:

- Uses scientific vocabulary accurately to describe separation techniques and their applications.
- Writes clear and structured scientific reports, including introduction, method, results, and conclusion.
- Can explain the steps and reasoning behind each separation technique.

Working Above Standard

Knowledge and Understanding:

- Demonstrates a comprehensive understanding of separation techniques, including advanced methods such as gas chromatography and mass spectrometry.
- Can explain the principles behind each technique in detail (e.g., boiling points in fractional distillation, molecular interactions in chromatography).
- Understands the limitations and advantages of different separation techniques and can select the most appropriate method for a given problem.

Scientific Skills:

- Independently follows complex scientific procedures to perform advanced separation techniques.
- Prepares and conducts experiments with minimal guidance, demonstrating a clear understanding of underlying principles.
- Makes precise and accurate observations and measurements, using advanced equipment when necessary.

Analysis and Evaluation:

- Presents data in various sophisticated forms, including detailed chromatograms and complex graphs.
- Identifies detailed patterns and relationships in data and draws well-reasoned conclusions (e.g., determining purity of substances, calculating Rf values in chromatography).
- Critically evaluates the reliability and validity of their methods and results, suggesting improvements and considering possible errors.

Communication:

- Uses advanced scientific terminology confidently and accurately.
- Writes detailed and coherent scientific reports with well-structured arguments and logical conclusions.
- Engages in scientific discussions, justifying their methods, results, and conclusions with robust evidence.