### Curriculum Overview: Key Stage 3 Science

Please see the department MTP for a more in depth scheme of work.

<table>
<thead>
<tr>
<th>Year</th>
<th>Term</th>
<th>Unit/s of Work</th>
<th>Core Knowledge &amp; Concepts</th>
</tr>
</thead>
</table>
| 7    | 1    | 1A Unit 7.1 Living Things | ● The characteristics common to all living things, and their importance to the survival of the organism.  
● That all living things are made of cells, the structure and typical cells, how cells are adapted to their function.  
● How cells are organised into tissues, organs and organ systems to efficiently carry out the functions of life. |
|      |      | 1B Unit 7.2 Solids, Liquids and Gases | ● Students build on their previous knowledge of states of matter |
|      |      | 1C Unit 7.3 Energy Transformations | ● Different types of energy.  
● Energy as something that cannot be created or destroyed.  
● Energy transfers. |
| 2    | 2A   | Unit 7.4 Microorganisms and Disease | ● How some microorganisms can be useful to humans but others are harmful.  
● The use of microorganisms in food production.  
● How microorganisms breakdown can cause decay.  
● The work of Louis Pasteur and other scientists studying the human body. |
|      | 2B   | Unit 7.5 The Earth and Beyond | ● The different type of rocks and soils.  
● Simple models of the internal structure of the Earth.  
● Fossils and the fossil record as a guide to estimating the age of the Earth.  
● How the movement of the Earth causes the apparent daily and annual movement of the Sun and the stars.  
● The relative positions and movement of the planets and the Sun in the solar system.  
● The impact of the ideas and discoveries of Copernicus, Galileo and more recent scientists.  
● The Sun and other stars as sources of light, and that planets and other bodies are seen by reflected light. |
|      | 2C   | Unit 7.6 Putting Things into Groups | ● Metals and non-metals.  
● Everyday materials and their physical properties.  
● Classify animals and plants into major groups, using some locally occurring examples.  
● Understand what is meant by a species.  
● Investigate variation within a species. |
| 3    | 3A   | Unit 7.7 Habitats and Environment | ● Where organisms live.  
● How organisms interact with each other and the environment.  
● The influences humans have on the natural environment. |
|      | 3B   | Unit 7.8 Acids and Bases | ● How to tell if a solution is an acid or an alkali.  
● Using a pH scale.  
● Neutralisation and some of its applications. |
|      | 3C   | Unit 7.9 Forces and their Effects | ● The effects of forces on movement, including friction and air resistance.  
● The effects of gravity on objects. |
| 8    | 1    | 1A Unit 8.1 Obtaining Food | ● The need of plants for carbon dioxide, water and light for photosynthesis and that this process makes biomass and oxygen  
● The constituents of a balanced diet and the functions of various nutrients  
● The effects of nutritional deficiencies  
● The relationship between diet and fitness  
● The organs and functions of the alimentary canal  
● The function of enzymes |
|      |      | 1B Unit 8.2 Elements, Mixtures and Compounds | ● Changes of state, gas pressure and diffusion.  
● The chemical symbols for the first twenty elements of the Periodic Table. |

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<table>
<thead>
<tr>
<th>Unit</th>
<th>Title</th>
<th>Topics</th>
</tr>
</thead>
</table>
| 1C   | Unit 8.3 Light | - Elements, compounds and mixtures.  
- How light travels and the formation of shadows.  
- How non-luminous objects are seen.  
- Reflection at a plane surface and use the law of reflection.  
- Refraction at the boundary between air and glass or air and water.  
- The dispersion of white light.  
- Colour addition and subtraction, and the absorption and reflection of coloured light. |
| 2    | Unit 8.4 Respiration and Circulation | - How water and mineral salts are absorbed and transported in flowering plants.  
- They also develop their knowledge of transporting chemicals in humans by finding out about  
- The basic components of the circulatory system and their functions.  
- The basic components of the respiratory system and their functions.  
- Gaseous exchange.  
- The effects of smoking.  
- Aerobic respiration. |
| 2B   | Unit 8.5 Metals, Non-metals and Corrosion | - The differences between metals and non-metals.  
- Chemical reactions which are not useful.  
- Word equations. |
| 2C   | Unit 8.6 Sound | - The properties of sound in terms of movement of air particles.  
- The link between loudness and amplitude, pitch and frequency.  
- The human reproductive system, including the menstrual cycle, fertilisation and foetal development.  
- The physical and emotional changes that take place during adolescence.  
- How conception, growth, development, behaviour and health can be affected by diet, drugs and disease. |
| 3A   | Unit 8.7 Reproduction and Growth | - Some common compounds including oxides, hydroxides, chlorides, sulphates and carbonates.  
- Using word equations to describe a reaction. |
| 3B   | Unit 8.8 Chemical Reactions | - Speed including interpreting simple distance/time graphs.  
- How magnetism can be used to move things. |
| 3C   | Unit 8.9 Forces and Magnets | - The process of photosynthesis including the word equation.  
- The importance of water and mineral salts to plant growth.  
- The structure of an atom.  
- The methods and discoveries of Rutherford and other scientists.  
- The structures of the first twenty elements of the Periodic Table.  
- Trends in groups and periods.  
- Preparing some common salts by the reactions of metals or metal carbonates with acid.  
- Writing word equations to describe reactions of metals or metal carbonates with acids. |
| 1B   | Unit 9.2 The Periodic Table and Preparing Salts | - Electrostatics and the concept of charge, including digital sensors.  
- Simple series and parallel circuits.  
- How common types of component, including cells (batteries), affect current.  
- How current divides in parallel circuits.  
- Measuring current and voltage.  
- Sexual reproduction in flowering plants including pollination, fertilisation, seed formation and dispersal. |
| 1C   | Unit 9.3 Electrostatics and Electric Currents | - The reactivity series of metals with oxygen, water and dilute acids.  
- Displacement reactions.  
- The effects of concentration, particle size, temperature and catalysts on the rate of a reaction. |
| 2A   | Unit 9.4 Sexual Reproduction in Flowering Plants | - Objects turning on a pivot and understand the principle of moments.  
- Pressure as caused by the action of force on an area.  
- Pressures in gases and liquids (qualitative only).  
- The densities of solids, liquids and gases. |
| 2B   | Unit 9.5 Reactivity and Rates of Reaction | - Preparing some common salts by the reactions of metals or metal carbonates with acid.  
- Preparing word equations to describe reactions of metals or metal carbonates with acids. |
| 2C   | Unit 9.6 Movements, Pressure and Density | - Electrostatics and the concept of charge, including digital sensors.  
- Simple series and parallel circuits.  
- How common types of component, including cells (batteries), affect current.  
- How current divides in parallel circuits.  
- Measuring current and voltage.  
- Sexual reproduction in flowering plants including pollination, fertilisation, seed formation and dispersal.  
- The reactivity series of metals with oxygen, water and dilute acids.  
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- The effects of concentration, particle size, temperature and catalysts on the rate of a reaction. |

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### Curriculum Overview: Combined Science

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<tr>
<th>Year</th>
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</table>
| 10   | 1    | Cells and cell processes | ● Characteristics of Living Things  
 ● Cell structure  
 ● Movement in and out of cells  
 ● Enzymes |
|      |      | Animal nutrition  | ● Biological molecules  
 ● Diet  
 ● Alimentary canal  
 ● Digestion |
|      |      | Experimental techniques  | ● Measurement  
 ● Criteria of purity  
 ● Methods of purification |
|      |      | Particles, atomic structure, ionic bonding and the Periodic Table  | ● The particulate nature of matter  
 ● Atomic structure and the periodic table  
 ● Elements, compounds and mixtures  
 ● Physics and chemical changes  
 ● Properties of metals  
 ● Ions and ionic bonds  
 ● Energy changes in chemical reactions  
 ● The periodic table  
 ● Periodic trends  
 ● Stoichiometry  
 ● Group properties |
|      |      | Light  | ● Reflection of light  
 ● Refraction of light  
 ● Thin converging lens |
|      |      | Electricity 1  | ● Current, potential difference and electromotive force  
 ● Resistance  
 ● Electrical energy |
| 2    | 1    | Plant nutrition and transport  | ● Plant nutrition  
 ● Transport in plants |
|      |      | Air and water  | ● Water  
 ● Air  
 ● Noble gases  
 ● Carbon dioxide and methane  
 ●
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<tbody>
<tr>
<td><strong>Collaborate</strong></td>
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<td><strong>Communicate</strong></td>
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<td><strong>Respect</strong></td>
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| **Acids, bases and salts** | • Stoichiometry  
• The characteristic properties of acids and bases  
• Preparation of salts  
• Identification of ions and gases  |
| **Energy**        |                                                                 |
| **3**             | Respiration and transport in mammals  
• Respiration  
• Gas exchange  
• Transport in mammals  |
| **Reaction rates** |                                                                 |
|                  | • Rate of reaction  
• Energy changes in chemical reactions  |
| **Metals and the reactivity series** | • Properties of metals  
• Reactivity series  
• Extraction of metals from their ores  
• Transition elements  |
| **Mechanics 1**   | • Length and time  
• Motion  
• Mass and weight  
• Density  |
| **1**             | Coordination and response  
• Hormones in humans  
• Tropic responses  |
| **Reproduction in plants** | • Asexual and sexual reproduction  
• Sexual reproduction in plants  |
| **Covalent bonding** | • Molecules and covalent bonds  |
| **Organic 1**     | • Homologous series  
• Fuels  
• Alkanes  
• Alkenes  |
| **Electricity 2** | • Electric charge  
• Circuit diagrams  
• Series and parallel circuits  
• Dangers of electricity  |
| **Thermal physics** | • Simple kinetic model of matter  
• Matter and thermal properties  |
| **2**             | Human reproduction  
• Sexual reproduction in humans  |
| **Organisms and environment** | • Organisms and their environment  
• Human influences on ecosystems  |
| **Amount of substance** | • Stoichiometry  |
| **Redox, electrochemistry and Group VII** | • Redox  
• Electricity and chemistry  
• Extraction of metals from their ores  
• Group properties  |
| **Mechanics 2**   | • Effects of forces  
• Energy  
• Work  
• Power  
• Pressure  |
| **Waves**         | • General wave properties  
• Electromagnetic spectrum  
• Sound  |
| **3**             | Mock examinations and revision  |
**Curriculum Overview: Coordinated Science**

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<td>● Characteristics of living things</td>
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<td>● Movement in and out of cells</td>
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<td>● Criteria of purity</td>
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<td>● Methods of purification</td>
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<td>Particles, atomic structure, ionic</td>
<td>● The particulate nature of matter</td>
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<td>● Atomic structure and periodic table</td>
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<td>Electricity 1</td>
<td>● Current, potential difference and EMF</td>
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<td>Animal nutrition</td>
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<td>Plant nutrition and transport</td>
<td>● Plant nutrition</td>
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<td>● Photosynthesis</td>
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<td>● Transport in plants</td>
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<td>● Carbon dioxide and methane</td>
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<td>● Nitrogen and fertilisers</td>
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<td>● Types of oxides</td>
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<td>● Consequences of energy transfer</td>
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<td>Respiration and the human transport</td>
<td>● Respiration</td>
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<td>system</td>
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<td>● Transport in mammals</td>
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<td>Reaction rates</td>
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<td>● Reactivity series</td>
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</tbody>
</table>
| 1  | 11 | Coordination, response and homeostasis | • Nervous control in humans  
• Sense organs  
• Hormones in humans  
• Tropic responses  
• Homeostasis |
|---|---|---|---|
|  |  | Reproduction in plants | • Asexual and sexual reproduction  
• Cell division  
• Sexual reproduction in plants |
|  |  | Covalent bonding | • Molecules and covalent bonds  
• Macromolecules |
|  |  | Organic 1 | • Names of compounds  
• Homologous series  
• Fuels  
• Alkanes  
• Alkenes  
• Synthetic polymers  
• Alcohols |
|  |  | Electricity 2 | • Electric charge  
• Circuit diagrams  
• Series and parallel circuits  
• Dangers of electricity |
|  |  | Thermal physics | • Simple kinetic model of matter  
• Pressure changes  
• Matter and thermal properties  
• Measurement of temperature |
| 2 |  | Human reproduction | • Sexual reproduction in humans |
|  |  | Organisms and environment | • Organisms and their environment  
• Human influences on ecosystems |
|  |  | Amount of substance | • Stoichiometry  
• The mole |
|  |  | Organic 2 | • Polymers  
• Synthetic polymers |
|  |  | Mechanics 2 | • Effects of forces  
• Turning effect  
• Centre of mass  
• Energy  
• Work  
• Power  
• Pressure |
| 3 |  | Inheritance and evolution | • Chromosomes and genes  
• Monohybrid inheritance  
• Variation and selection |
|  |  | Redox, electrochemistry and Group VII | • Redox  
• Electricity and chemistry  
• Extraction of metals from their ores  
• Group properties |

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## Curriculum Overview: Diploma Program Biology

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| 12   | 1    | Cell Biology   | • Introduction to cells  
      |       |                | • Ultrastructure of cells  
      |       |                | • Membrane structure and transport  
      |       |                | • Origin of cells  |
|      |      | Molecular Biology | • Metabolism  
      |       |                | • Water  
      |       |                | • Carbohydrates and Lipids  
      |       |                | • Proteins  
      |       |                | • Enzymes  
      |       |                | • DNA, RNA structure  |
|      |      | Nucleic Acids  | • DNA Replication  
      |       |                | • Transcription and Gene expression  
      |       |                | • Translation  |
| 2    |      | Metabolism     | • Metabolism  
      |       |                | • Cell respiration  
      |       |                | • Photosynthesis  |
| 3    | 1    | Genetics       | • Genes  
      |       |                | • Chromosomes  
      |       |                | • Cell Division  
      |       |                | • Meiosis  
      |       |                | • Inheritance  
      |       |                | • Genetic Modification and Biotechnology  |
| 3    | 1    | Genetics and Evolution | • Meiosis  
      |       |                | • Inheritance  
      |       |                | • Gene Pools and Speciation  |
|      |      | Evolution and Biodiversity | • Evidence for Evolution  
      |       |                | • Natural Selection  
      |       |                | • Classification  
      |       |                | • Cladistics  |
|      |      | Plant Biology   | • Transport in xylem  
      |       |                | • Transport in Phloem  
      |       |                | • Growth  
      |       |                | • Reproduction  |
| 13   | 1    | Human Physiology | • Digestion  
      |       |                | • Blood System  
      |       |                | • Infectious Disease  
      |       |                | • Gas Exchange  
      |       |                | • Neurons and Synapses  
      |       |                | • Hormones, Homeostasis, Reproduction  |

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### Animal Physiology
- Antibody production and Vaccination
- Movement
- Kidney and Osmoregulation
- Sexual Reproduction

### Ecology
- Species, Communities and Ecosystems
- Energy Flow
- Carbon Cycling
- Climate Change

### Option
- Choice of:
  - Neurobiology and Behaviour
  - Biotechnology and Bioinformatics
  - Ecology and Conservation
  - Human Physiology

### Revision and Examinations

**Curriculum Overview: Diploma Program Chemistry**

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</table>
| 12   | 1    | Stoichiometry and Atomic Structure | • Atomic Structure  
• Electron Structure  
• Chemical Calculations  
• Emission Spectrometry |
|      |      | Bonding and Periodic Table | • Periodic Trends  
• Trends within groups  
• Intermolecular Forces  
• Types of Bonding  
• Molecular Orbitals  
• Hybridization  
• Coloured Complexes |
| 2    | 1    | Redox and Equilibrium    | • Oxidation and Reduction  
• Chemical Cells  
• Equilibrium  
• Le Chatelier's Principle |
|      |      | Acids                   | • Properties of Acids and Bases  
• Strong and weak acids  
• pH and pKa  
• Buffers  
• pH curves |
| 3    | 1    | Organic Chemistry       | • Functional Groups  
• Nomenclature  
• Fundamentals of Organic Chemistry |
|      |      | Energetics              | • Bond Enthalpies  
• Hess’ Law |
| 13   | 1    | Rates and Kinetics      | • Collision Theory  
• Rate Expression  
• Kinetics |
|      |      | Organic Chemistry       | • Organic Reactions  
• Synthetic Routes  
• Stereosomerism |
|      |      | Mechanisms              | • Choice of:  
  o Materials  
  o Biochemistry  
  o Energy  
  o Medicine |
| 3    |      | Revision and Examinations | |
### Curriculum Overview: Diploma Program Physics

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</table>
| 12   | 1    | Measurement and Uncertainties     | - Measurement in Physics  
- Uncertainties and errors  
- Vectors and scalars |
|      |      | Mechanics                         | - Motion  
- Forces  
- Work, energy and power  
- Momentum and Impulse |
|      |      | Waves                             | - Oscillation  
- Travelling waves  
- Wave characteristics  
- Wave behaviour  
- Standing waves |
| 3    |      | Thermal Physics                   | - Thermal concepts  
- Modelling a gas |
| 2    |      | Wave Phenomena                    | - Simple harmonic motion  
- Single-slit diffraction  
- Interference  
- Resolution  
- Doppler effect |
|      |      | Electricity and Magnetism         | - Electric fields  
- Heating effect of currents  
- Electric cells  
- Magnetic effects of electric currents |
| 3    |      | Circular Motion                   | - Circular motion  
- Newton's law of gravitation |
|      |      | Electromagnetic Induction         | - Electromagnetic induction  
- Power generation and transmission  
- Capacitance |
| 13   | 1    | Atomic, Nuclear and Particle Physics | - Discrete energy and radioactivity  
- Nuclear reactions  
- The structure of matter |
|      |      | Fields                            | - Describing fields  
- Fields at work |
| 2    |      | Energy Production                 | - Energy sources  
- Thermal energy transfer |
|      |      | Quantum and Nuclear Physics       | - The interaction of matter with radiation  
- Nuclear physics |
|      |      | Option                            | - Choice of  
  ○ Relativity  
  ○ Engineering physics  
  ○ Imaging  
  ○ Astrophysics |
| 3    |      | Revision and Examinations         |                                                                                         |