

**SUBJECT: Science**

| YEAR GROUP | Year Ten                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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| Rationale  | Students build on the content studied in key stage three. Pupils continue to develop their knowledge and understanding of Biology, Chemistry and Physics, tackling more challenging concepts to a greater depth than they have done previously. Students continue to develop scientific skills, directly linked to the required practicals including forming hypotheses, writing methods, using scientific equipment effectively as well as presenting and analysing results. Pupils will also continue to develop their understanding of the key scientific terms related to working scientifically. Pupils work through the units in rotation during the course of the year.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                             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| Topic/Unit | Biology: Organisation<br>Chemistry: Bonding, Structure & the Properties of Matter<br>Physics: Electricity                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Biology: Infection and Response (Biology Only)<br>Chemistry: Energy Changes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Biology: Bioenergetics<br>Chemistry: Quantitative Chemistry<br>Physics: Atomic Structure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  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                                                                                                                                                                                                | Chemistry: Rate & Extent of Chemical Change<br>Physics: Forces |
| Knowledge  | Biology – Organisation<br>1 – How is the digestive system organised?<br>2 – How do you test for the different food groups?<br>3 – How do enzymes help with digestion?<br>4 – How does the body create the best conditions for enzymes?<br>5 - How does a change in pH affect enzymes?<br>6 – How is the small intestine adapted for absorption?<br>7 – What happens in the breathing system?<br>8 - What is blood made up of?<br>9 - How does blood travel round the body?<br>10 - What happens in the heart?<br>11 - How can problems with the heart be treated?<br>Chemistry - Bonding, Structure & the Properties of Matter<br>1 – What is the difference between group 1 and transition metals? (CHEMISTRY ONLY)<br>2 – What are the states of matter and state symbols?<br>3 – What are the different types of bonding?<br>4 – What are the properties of ionic compounds?<br>5 - What are the properties of small covalent molecules?<br>6 – What are the properties of giant covalent structures?<br>7 – What are the properties of metals and alloys?<br>8 - What are fullerenes?<br>9 - What are nanoparticles and their uses? (CHEMISTRY ONLY)<br>Physics – Electricity<br>1 – What is Potential Difference and Current?<br>2 – What is resistance?<br>3 – How does the length of a wire effect resistance?<br>4 – What is Ohms Law?<br>5 - Are lamps and diodes ohmic conductors?<br>6 – What is a series circuit?<br>7 – What is a parallel circuit? | Biology – Infection and Response<br>1 – What are aseptic techniques and why are they used? (BIOLOGY ONLY)<br>2 - How can you measure the effectiveness of antibiotics? (BIOLOGY ONLY)<br>3 - How are monoclonal antibodies produced? (BIOLOGY ONLY)<br>4 - What are the uses of monoclonal antibodies? (BIOLOGY ONLY)<br>5 - How do plants defend themselves? (BIOLOGY ONLY)<br>6 - What are the effects of plant diseases? (BIOLOGY ONLY)<br>Chemistry – Energy Changes<br>1 – What are exothermic and endothermic reactions?<br>2 – What does a reaction profile diagram show?<br>3 – How do you calculate the energy change of a reaction?<br>4 – What are chemical cells and batteries? (CHEMISTRY ONLY)<br>5 - How do fuel cells work? (CHEMISTRY ONLY) | Biology - Bioenergetics<br>1 – How does light intensity affect photosynthesis?<br>2 – How are plant tissues adapted for photosynthesis?<br>3 – What happens to the glucose made by plants?<br>4 – What factors can limit the rate of photosynthesis?<br>5 - How does water move through a plant?<br>6 – What are the factors that affect transpiration?<br>7 – What happens in aerobic respiration?<br>8 - What happens in anaerobic respiration?<br>9 - How does exercise affect respiration?<br>10 - What happens in metabolism?<br>Chemistry – Quantitative Chemistry<br>1 – How do you calculate the relative formula mass of compounds?<br>2 – How do you calculate the percentage of an element in a compound?<br>3 – How do you calculate relative atomic mass of an element from its isotopes?<br>4 – What is the law of conservation of mass?<br>5 - How do we calculate the moles of a substance?<br>6 – How can we calculate the unknown mass of a substance?<br>7 – How can we use moles to balance equations?<br>8 - How do we calculate the limiting reactant?<br>9 - How do we calculate the concentration of a solution?<br>10 - How do we calculate the concentration in mol/dm3? (CHEMISTRY ONLY)<br>11 - How do you carry out a titration? (CHEMISTRY ONLY)<br>12 - How do you calculate the percentage yield? (CHEMISTRY ONLY)<br>13 - How do you calculate the atom economy of a reaction? (CHEMISTRY ONLY) | Biology – Ecology<br>1 – What is a stable community?<br>2 – What is the difference between biotic and abiotic factors?<br>3 – What do animals compete for and how are they adapted to win the competition?<br>4 – What do plants compete for and how are they adapted to win the competition?<br>5 - How are quadrats and transects used to sample a habitat?<br>6 – How are materials cycled in a habitat?<br>7 – How do peat bogs and deforestation affect ecosystems?<br>8 - What is biodiversity and how is waste managed?<br>9 - How can we maintain biodiversity?<br>10 - What can be the impact of environmental change? (BIOLOGY ONLY)<br>11 - What are trophic levels? (BIOLOGY ONLY)<br>12 - How is biomass lost between trophic levels? (BIOLOGY ONLY)<br>13 - What can affect our food security? (BIOLOGY ONLY)<br>14 - How can farming methods affect food production? (BIOLOGY ONLY)<br>15 - How can we use biotechnology to increase food production? (BIOLOGY ONLY)<br>16 - What happens in decay? (BIOLOGY ONLY)<br>17 - What is the effect of temperature on decay? (BIOLOGY ONLY)<br>Chemistry – Chemical Changes<br>1 – What is the reactivity series of metals?<br>2 – How are metals extracted?<br>3 – What happens in oxidation and reduction reactions?<br>4 – What is the pH scale and neutralisation?<br>5 - What is produced in a neutralisation reaction? | Chemistry – Rates of Reaction<br>1 – How do you calculate the rate of reaction?<br>2 – What factors affect the rates of a chemical reaction and why?<br>3 – How do you investigate the effect of changing concentration on the rate of a reaction?<br>4 – How do you investigate the effect of changing surface area on the rate of a reaction?<br>5 - How do you investigate the effect of changing temperature on the rate of a reaction?<br>6 - How does adding a catalyst effect the rate of a reaction?<br>7 - What is a reversible reaction?<br>8 - What are Le Chatelier's principles and how do they relate to equilibrium?<br>Physics – Forces<br>1 – What are scalars and vectors?<br>2 – How are journeys represented on distance-time graphs?<br>3 – How can the acceleration of an object be calculated?<br>4 – What is uniform acceleration?<br>5 - What is a resultant force?<br>6 – How can vectors measure a resultant force? (Higher Tier)<br>7 – What is Newton's First Law?<br>8 - What is Newton's Second Law?<br>9 - What is Newton's Third Law?<br>10 - What is Momentum? (Higher Tier)<br>11 – How does impact force affect a change in momentum? (PHYSICS ONLY)<br>12 – What affects the stopping distance of a vehicle?<br>13 - How do you calculate weight and work done?<br>14 - What is elasticity?<br>15 - What is a moment? (PHYSICS ONLY) |                                                                |



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|  | 8 - What happens to the total resistance in a circuit?<br>9 - How can conditions effect the resistance in a circuit?<br>10 - How can electrical power be calculated?<br>11 - Why is ACDC not just great music?<br>12 - How is electricity supplied to our homes?<br>13 - How is mains electricity supplied to our devices?<br>14 - How do fuses save lives?<br>15 - What is static electricity? (PHYSICS ONLY) |  | 14 - How do you calculate the volume of a gas? (CHEMISTRY ONLY)<br>Physics – Atomic Structure<br>1 - What is an atom?<br>2 - How has the model of the atom changed over time?<br>3 - How do unstable nuclei become more stable?<br>4 - What are radioactive decay equations?<br>5 - What is radioactive contamination and irradiation?<br>6 - What is half life?<br>7 - How is radiation useful? (PHYSICS ONLY)<br>8 - What is nuclear fission and fusion? (PHYSICS ONLY) | 6 - How do you make soluble salts?<br>7 - What are strong and weak acids?<br>8 - What is electrolysis?<br>9 - How can we use electrolysis to extract metals?<br>10 - What are the products during the electrolysis of solutions?<br>11 - What happens at the electrodes during electrolysis?<br>12 - What is produced during the electrolysis of NaCl(aq) and CuSO4(aq) solutions? | 16 - How does the force from particles affect pressure? (PHYSICS ONLY) |
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| <b>Skills</b>                 | Biology:<br>Food Tests:<br>- Pupils will use qualitative reagents to test for a range of carbohydrates, lipids and proteins. including:<br>Benedict's test for sugars, iodine test for starch and Biuret reagent for protein.<br>Enzymes:<br>- Pupils will investigate the effect of pH on the rate of reaction of amylase enzyme.<br>Physics:<br>Resistance<br>- Pupils will use circuit diagrams to set up and check appropriate circuits to investigate the factors that affect the resistance of an electrical circuit.<br>- Pupils will use circuit diagrams to construct appropriate circuits to investigate the I-V characteristics of a variety of circuit elements including a filament lamp, a resistor and a diode at constant temperature. | Biology:<br>Microbiology (Biology Only):<br>- Pupils will investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition.<br>Chemistry:<br>Temperature changes<br>- Pupils will Investigate the variables that affect temperature change in chemical reactions | Biology:<br>Photosynthesis:<br>- Pupils will investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed.<br>Chemistry:<br>Neutralisation (Chemistry Only)<br>- Pupils will determine the reacting volumes of solutions of a strong acid and a strong alkali by titration. |               | Biology:<br>Field Investigations:<br>- Pupils will measure the population size of a common species in a habitat, using sampling techniques to investigate the effect of a factor on the distribution of this species.<br>Decay (Biology Only)<br>- Pupils will investigate the effect of temperature on the rate of decay of fresh milk by measuring pH change.<br>Chemistry:<br>Making Salts<br>- Pupils will prepare a pure, dry sample of a soluble salt from an insoluble oxide or carbonate using a Bunsen burner to heat dilute acid and a water bath to evaporate the solution.<br>Electrolysis<br>- Pupils will investigate what happens when aqueous solutions are electrolysed using inert electrodes. | Chemistry:<br>Rates of reaction<br>- Pupils will investigate how changes in concentration affect the rates of reactions by both measuring the volume of a gas produced and monitoring a change in colour or turbidity.<br>Physics:<br>Force and Extension<br>- Pupils will investigate the relationship between force and extension of a spring.<br>Acceleration<br>- Pupils will investigate the effect of varying the force on the acceleration of an object of constant mass and the effect of varying the mass of an object on the acceleration produced by a constant force. |
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| <b>Assessments: Formative</b> | Formative assessment will regularly take place during science lessons.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                   |               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



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| <b>Assessments:<br/>Summative</b> |                                                                                                                                                                                                                                                                                                                                                          | Assessment Window 1<br><u>Biology Assessment</u><br>Biology Unit 1 – Cell Biology<br>Biology Unit 2 - Organisation<br>Biology Unit 3 – Infection & Response<br><u>Chemistry Assessment</u><br>Chemistry Unit 1 – Atomic Structure & the Periodic Table<br>Chemistry Unit 2 – Structure & Bonding<br><u>Physics Assessment</u><br>Physics Unit 1 – Energy<br>Physics Unit 2 - Electricity<br>Physics Unit 3 – Particle Model of Matter |  |  | Assessment Window 2 – Mock Exams<br><u>Biology Assessment</u><br>Biology Unit 1 – Cell Biology<br>Biology Unit 2 - Organisation<br>Biology Unit 3 – Infection & Response<br>Biology Unit 4 - Bioenergetics<br><u>Chemistry Assessment</u><br>Chemistry Unit 1 – Atomic Structure & the Periodic Table<br>Chemistry Unit 2 – Structure & Bonding<br>Chemistry Unit 3 - Quantitative Chemistry<br>Chemistry Unit 4 – Chemical Changes<br>Chemistry Unit 5 – Energy Changes<br><u>Physics Assessment</u><br>Physics Unit 1 – Energy<br>Physics Unit 2 - Electricity<br>Physics Unit 3 – Particle Model of Matter<br>Physics Unit 4 - Atomic Structure |
| <b>Homework</b>                   | Pupils in year ten will be set one piece of Sparx Science homework each week.<br>To help support pupils to develop a good routine in relation to home learning this science homework will always be set on a Friday and due in the following Thursday.<br>Pupils are expected to spend approximately 90 minutes on each piece of Sparx Science homework. |                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |