| **This 3-Year Scheme of Work offers a flexible approach for KS4 using the Collins AQA GCSE (9-1) Combined Science: Synergy – Life and Environmental Sciences Student Book and Physical Sciences Student Book. The suggested timings are based on terms of 12 weeks and two teachers teaching a total of 2-3 hours per week in Year 9 and a total of 4 hours per week in years 10 and 11. The timings can however be tailored to suit the needs of a particular class or group of students. The teaching scheme is scheduled to finish in the second term of Year 11 to allow time for revision and GCSE examinations in the summer term. Please note that some of these lessons are shorter than others and therefore sometimes there are more than four hours a week. The maths skills spreads are sometimes numbered as the last spread in a chapter but can be used at any appropriate point according to the needs of your students.** | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Year** | **Term** | **Week** | **Student book spread number** | **Lesson title** | **Lesson objectives** | **AQA specification reference** | **Working scientifically and maths skills** | |
| **Year 9 Term 1** | | | | | | | |
| Year 9 | Term 1 | 1-6 | Introduction to GCSE, such as the six free Transition Units from Collins (<http://www.collins.co.uk/page/GCSE+Science/Transition+Units>), or AQA’s own 6-week teaching pack on Biomimicry (http://www.aqa.org.uk/resources/science/gcse/teach/six-week-teaching-pack-biomimicry) | | | | | |
| **Teacher A (Life Sciences): Topic 1, 4.1.1 States of matter**  **Teacher B (Physical Sciences): Topic 5, 4.5.1 The periodic table** | | | | | | | | |
| **Teacher A (Life Sciences)**  **Topic 1 Building blocks**  **Chapter 1.1 States of matter (6-7 hours)** | | | | | | | |
| Year 9 | Term 1 | 7 | 1.1a | The particle model | describe and explain the properties of solids, liquids and gases using the particle model  relate the size and scale of atoms to objects in the physical world  identify the strengths and limitations of the particle model (HT). | 4.1.1.1 | WS 1.2  MS 1d | |
| Year 9 | Term 1 | 7 | 1.1b | Density | define density  explain the differences in density between different states of matter using the particle model  calculate densities of different materials. | 4.1.1.2 | WS 3.3  MS 1a, 1b, 1c, 3c | |
| Year 9 | Term 1 | 8 | 1.1c | Required practical: To investigate the densities of regular and irregular solid objects and liquids | interpret observations and data  use spatial models to solve problems  plan experiments and devise procedures  use an appropriate number of significant figures in measurements and calculations. | 4.1.1.2 | WS 2.4, 3.3, 4.2, 4,3, 4.5, 4.6  MS 21, 3c | |
| Year 9 | Term 1 | 8 | 1.1d | Key concept: Particle theory | use the particle model to explain states of matter  use ideas about energy and bonds to explain changes of state  explain the relationship between temperature and energy. | 4.1.1.1, 4.1.1.4 | WS 1.2, 3.5  MS 4a | |
| Year 9 | Term 1 | 9 | 1.1e | Gas pressure | use the particle model to relate the temperature of a gas to the average kinetic energy of the particles  explain how a gas has a pressure. | 4.1.1.3 |  | |
| Year 9 | Term 1 | 9 | 1.1f | Heating and changes of state | describe how mass is conserved when the physical state changes  describe how heating a system changes its internal energy  explain that when a change of state occurs the internal energy changes but not the temperature. | 4.1.1.4, 4.1.1.1 |  | |
| Year 9 | Term 1 | 10 | 1.1g | Specific heat capacity | define and explain specific heat capacity  state the factors that are involved in increasing the temperature of a substance  calculate specific heat capacity and energy changes when a material is heated. | 4.1.1.4 | WS 3.3, 3.5, 4.3, 4.5  MS 1a, 3c, 3d | |
| Year 9 | Term 1 | 10 | 1.1h | Required practical: Investigating specific heat capacity | use theories to develop a hypothesis  evaluate a method and suggest improvements  perform calculations to support conclusions. | 4.1.1.4 | WS 2.2, 2.3, 2.4, 2.6, 2.7, 3.1, 3.2, 3.3 3.5, 3.6, 3.8, 4.2, 4.3  MS 3c | |
| Year 9 | Term 1 | 11 | 1.1i | Changes of state and specific latent heat | explain what is meant by latent heat and distinguish it from specific heat capacity  perform calculations involving specific latent heat. | 4.1.1.4 | WS 4.3, 4.5  MS 1a, 3c, 3d | |
| Year 9 | Term 1 | 11 | 1.1j | Maths skills: Drawing and interpreting graphs | draw a graph of temperature against time  interpret a graph of temperature against time. | 4.1.1.4 | WS 3.1, 3.2, 3.5, 3.6  MS 4c | |
| Year 9 | Term 1 | 11 | 1.1k | Meanings of purity | explain what is meant by purity  distinguish between the scientific and everyday use of the term ‘pure’  use melting and boiling point data to distinguish pure from impure substances. | 4.1.1.5 | WS 3.5 | |
| Year 9 | Term 1 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Teacher B (Physical Sciences)**  **Topic 5 Building blocks for understanding**  **Chapter 5.1 The periodic table (6-7 hours)** | | | | | | | |
| Year 9 | Term 1 | 7 | 5.1a | Atomic number and the periodic table | explain that the elements in the periodic table are arranged in order of atomic (proton) number  represent the electronic structure of the first 20 elements  explain how the electronic structure of atoms follows a pattern. | 4.5.1.1 |  | |
| Year 9 | Term 1 | 7/8 | 5.1b | Electronic structure and groups | explain how the electronic structure of atoms follows a pattern  recognise that the number of electrons in an element’s outer shell corresponds to the element’s group number  explain that elements in a group have similar properties because they have the same number of outer electrons. | 4.5.1.1 | WS 1.2 | |
| Year 9 | Term 1 | 8 | 5.1c | Mendeleev and the periodic table | describe the steps in the development of the periodic table  explain how Mendeleev left spaces for undiscovered elements  explain why the element order in the modern periodic table was changed  explain how testing a prediction can support or refute a new scientific idea. | 4.5.1.1 | WS 1.1 | |
| Year 9 | Term 1 | 9 | 5.1d | Metals and non-metals | identify where metals and non-metals are located on the periodic table  explain the differences between metals and non-metals based on their physical and chemical properties  explain that metals react by losing electrons to form positive ions and more reactive non-metals react by gaining electrons to form negative ions. | 4.5.1.2 | WS 1.2 | |
| Year 9 | Term 1 | 9 | 5.1e | Key concept: Atoms into ions | recognise the difference between atoms and ions  explain why metal ions carry a positive charge and non-metal ions carry a negative charge  represent electronic structure of atoms and ions in diagrams  explain how the reactions of elements are related to their electronic structure. | 4.5.1.1, 4.5.1.2 |  | |
| Year 8 | Term 1 | 10 | 5.1f | Exploring Group 0 | describe the unreactivity of the noble gases  predict the properties of noble gases from trends down the group  explain how properties of the elements in Group 0 depend on the outer shell of electrons of their atoms. | 4.5.1.3 | WS 1.2 | |
| Year 9 | Term 1 | 10/11 | 5.1g | Exploring Group 1 | explain why Group 1 metals are known as the alkali metals  predict the properties of Group 1 metals from trends down the group  relate the properties of the alkali metals to the number of electrons in their outer shell. | 4.5.1.4 | WS 1.2 | |
| Year 9 | Term 1 | 11 | 5.1h | Exploring Group 7 | recall that fluorine, chlorine, bromine and iodine are non-metals called halogens  relate the properties of the halogens to the number of electrons in their outer shell  predict the properties of Group 7 elements from trends down the group  construct balanced symbol equations for the reactions of metals with halogens. | 4.5.1.5 | WS 1.2 | |
| Year 9 | Term 1 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Year 9 Term 2**  **Teacher A (Life Sciences): Topic 1, 4.1.2 Atomic structure, 4.1.3 Cells in animals and plants**  **Teacher B (Physical Sciences):Topics 5 and 6, 4.5.2 Chemical quantities, 4.6.1 Forces and energy changes (part)** | | | | | | | |
| **Topic 1 (continued) Building blocks**  **Chapter 1.2 Atomic structure (3-4 hours)** | | | | | | | |
| Year 9 | Term 2 | 1 | 1.2a | Scientific models of the atom | describe how and why the model of the atom has changed over time  explain how data support theories, and how new data lead to changes in theories. | 4.1.2.1 | WS 1.1 | |
| Year 9 | Term 2 | 1 | 1.2b | The size of atoms | recall the size and order of magnitude of atoms and small molecules  recognise expressions in standard form  estimate the size of atoms based on scale diagrams. | 4.1.2.2  4.1.1.1 | WS 4.4, 4.5  MS 1b, 1d | |
| Year 9 | Term 2 | 1/2 | 1.2c | Maths skills: Standard form and making estimates | recognise the format of standard form  convert decimals to standard form and vice versa  make estimates without calculators so the answer in standard form seems reasonable. | 4.1.2.2 | WS 4.4, 4.5  MS 1a, 1b, 1d | |
| Year 9 | Term 2 | 2 | 1.2d | Sub-atomic particles | interpret and draw diagrams of the structure of atoms  recall that the radius of a nucleus is less than 1/10 000 that of the atom (about 1 × 10–14 m)  recall the relative charges and masses of protons, neutrons and electrons  calculate the number of protons, neutrons and electrons in atoms. | 4.1.2.3 | WS 1.2  MS 1b | |
| Year 9 | Term 2 | 2 | 1.2e | Maths skills: Sizes of particles and orders of magnitude | identify the scale of measurements of length  explain the conversion of small lengths to metres  explain the relative sizes of nuclei and atoms  make order of magnitude calculations. | 4.1.2.2 | WS 3.3, 4.4, 4.5  MS 1b | |
| Year 9 | Term 2 | 3 | 1.2f | Isotopes | recognise that atoms of the same element can have different masses because they have different numbers of neutrons  calculate the number of protons, neutrons and electrons in isotopes  interpret symbols representing the mass number and atomic number of an atom. | 4.1.2.4 | WS 1.2 | |
| Year 9 | Term 2 | 3 | 1.2g | Electrons in atoms | recall that in atoms with more than one electron, the electrons are arranged at different distances from the nucleus  recognise that the energy associated with an electron shell increases with distance from the nucleus  explain how electrons occupy shells in an order. | 4.1.2.5 |  | |
| **Chapter 1.3 Cells in animals and plants (8-10 hours)** | | | | | | | |
| Year 9 | Term 2 | 4 | 1.3a | Electron microscopy | identify the differences in the magnification and resolving power of light and electron microscopes  explain how electron microscopy has increased our understanding of sub-cellular structures  carry out calculations involving magnification, real size and image size (HT)  use estimations and make order of magnitude calculations  use prefixes centi, milli, micro and nano and interconvert units. | 4.1.3.1 | WS 3.3, 4.4, 4.5, 4.6  MS 1a, 1b, 1c, 1d, 2a, 2h | |
| Year 9 | Term 2 | 4/5 | 1.3b | Cell structures | describe the structure of eukaryotic and prokaryotic cells and explain how the sub-cellular structures are related to their functions  carry out calculations involving magnification, real size and image size including numbers written in standard form (HT)  use estimations and make order of magnitude calculations  use prefixes centi, milli, micro and nano and interconvert units. | 4.1.3.2 | MS 1a, 1b, 1c, 2h | |
| Year 9 | Term 2 | 5/6 | 1.3c | 1.3c Required practical: Observing cells under a light microscope | use appropriate apparatus to record length and area  use a microscope to make observations of biological specimens and produce labelled scientific drawings  use estimations to judge the relative size or area of sub-cellular structures  carry out calculations involving magnification, real size and image size. | 4.1.3.2 | MS 1a, 1b, 1c, 1d, 2h | |
| Year 9 | Term 2 | 5/6 | 1.3d | Maths skills: size and number | use appropriate apparatus to record length and area  recognise and use expressions in decimal and standard form  use ratios, fractions and percentages  make estimates for simple calculations. | 4.1.3.2 | WS 3.3, 4.4, 4.5  MS 1a, 1b, 1c, 1d, 2h | |
| Year 9 | Term 2 | 7 | 1.3e | Diffusion into and out of cells | explain how substances are transported into and out of cells by diffusion  identify the factors that affect rate of diffusion  explain what the term ‘partially permeable membrane’ means. | 4.1.3.3 |  | |
| Year 9 | Term 2 | 7/8 | 1.3f | Osmosis | describe how water moves by osmosis in living tissues  identify factors that affect the rate of osmosis. | 4.1.3.3 |  | |
| Year 9 | Term 2 | 8 | 1.3g | Required practical: Investigating osmosis | use scientific ideas to develop a hypothesis  plan experiments to test a hypothesis  draw conclusions from data and compare these with hypotheses made. | 4.1.3.3 | WS 2.1, 2.2, 2.6, 2.7, 3.1, 3.2, 3.3, 3.5, 3.6  MS 1a, 1c, 2b, 4a, 4b, 4c, 4d | |
| Year 9 | Term 2 | 9 | 1.3h | Maths skills: The spread of scientific data | be able to calculate means and ranges of data  be able to use range bars on graphs  understand how to estimate uncertainty from a set of measurements. |  | WS 3.4  MS 2b | |
| Year 9 | Term 2 | 9/10 | 1.3i | Active transport | describe active transport  explain how active transport is different from diffusion and osmosis  explain why active transport is important. | 4.1.3.3 |  | |
| Year 9 | Term 2 | 10 | 1.3j | Mitosis and the cell cycle | describe mitosis as part of the cell cycle  describe the role of mitosis in growth and tissue repair  describe how the process of mitosis produces cells that are genetically identical to the parent cell. | 4.1.3.4 |  | |
| Year 9 | Term 2 | 11 | 1.3k | Meiosis | explain how meiosis halves the number of chromosomes for gamete production  explain how a new cell with the normal number of chromosomes is made at fertilisation  understand that the four gametes produced by meiosis are genetically different. | 4.1.3.5 |  | |
| Year 9 | Term 2 | 11 | 1.3l | Cell differentiation | explain the importance of cell differentiation  describe the function of stem cells in embryonic and adult animals. | 4.1.3.6 |  | |
| Year 9 | Term 2 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Teacher B (Physical Sciences)**  **Topic 5 Building blocks for understanding (continued)**  **Chapter 5.2 Chemical quantities (8-10 hours)** | | | | | | | | |
| Year 9 | Term 2 | 1 | 5.2a | Chemical equations | explain that compounds are formed from elements by chemical reactions  explain how formulae represent elements and compounds  write equations for simple reactions including the physical states of products and reactants. | 4.5.2.1 | WS 4.1 | |
| Year 9 | Term 2 | 1/2 | 5.2b | Conservation of mass and balanced equations | explain the law of conservation of mass  explain why a multiplier appears as a subscript in a formula  use ratio when writing and balancing equations. | 4.5.2.2 | MS 1a | |
| Year 9 | Term 2 | 2 | 5.2c | Explaining observed changes in mass | explain any observed changes in mass in a chemical reaction  identify the mass changes using a balanced symbol equation  explain these changes in terms of the particle model. | 4.5.2.2 | WS 1.2 | |
| Year 9 | Term 2 | 3 | 5.2d | Relative formula mass | identify the relative atomic mass of an element from the periodic table  calculate relative formula masses from relative atomic masses  verify the law of conservation of mass in a balanced equation. | 4.5.2.3 | WS 3.3  MS 1a, 3a | |
| Year 9 | Term 2 | 3/4 | 5.2e | Amounts in moles | describe the measurement of amounts of substances in moles and be able to define the Avogadro constant (HT)  calculate the number of moles in a given mass (HT)  calculate the mass of a given number of moles (HT). | 4.5.2.4 | WS 4.6  MS 1a, 1b, 1c, 2a, 3a | |
| Year 9 | Term 2 | 4 | 5.2f | Using balanced equations to calculate masses | calculate the masses of substances in a balanced symbol equation (HT)  calculate the masses of reactants and products from balanced symbol equations (HT)  calculate the mass of a given reactant or product (HT). | 4.5.2.5 | WS 4.6  MS 1a, 1c, 2a, 3c, 3d | |
| Year 9 | Term 2 | 5 | 5.2g | Balancing equations | convert masses in grams to amounts in moles (HT)  balance an equation given the masses of reactants and products (HT)  change the subject of a mathematical equation (HT). | 4.5.2.5 | MS 3b, 3c, 3d | |
| Year 9 | Term 2 | 5/6 | 5.2h | Key concept: Amounts of reactants and products | identify which reactant is in excess (HT)  explain the effect of a limiting quantity of a reactant on the amount of products (HT)  calculate amount of products in moles or masses in grams (HT). | 4.5.2.5 |  | |
| Year 9 | Term 2 | 7 | 5.2i | Concentrations of solutions | know that concentration is mass per given volume of solution  calculate the mass of solute in solution  explain how concentration is related to mass and volume (HT). | 4.5.2.6 | MS 1c, 3c | |
| Year 9 | Term 2 | 7/8 | 5.2j | Key concept: Amounts in chemistry | use relative atomic masses to calculate relative formula mass  explain how relative formula mass relates to number of moles (HT)  explain how number of moles relate to other quantities (HT). | 4.5.2.4 and 4.5.2.5 | MS 1a, 1b, 1c, 3c, 3d | |
| Year 9 | Term 2 | 8 | 5.2k | Maths skills: Change the subject of an equation | use an equation to demonstrate conservation of mass  rearrange the subject of an equation to carry out a multi-step calculation. | 4.5.2.2 | MS 3b | |
| **Topic 6 Interactions over small and large distances**  **Chapter 6.1 Forces and energy changes (part, 4 hours)** | | | | | | | | |
| Year 9 | Term 2 | 9 | 6.1a | Forces as vectors | describe a force  recognise the difference between contact and non-contact forces  state examples of scalar and vector quantities. | 4.6.1.1 |  | |
| Year 9 | Term 2 | 10 | 6.1b | Combining forces | understand how forces can be combined (HT)  draw free-body diagrams to find resultant forces (HT). | 4.6.1.2 | WS 1.2  MS 4a, 5a, 5b | |
| Year 9 | Term 2 | 11 | 6.1c | Finding forces from a vector diagram | calculate the resultant of a number of forces (HT)  draw free-body diagrams to find resultant forces (HT)  understand that a force can be resolved into two components acting at right angles to each other (HT). | 4.6.1.2 | WS 1.2  MS 4a, 5a, 5b | |
| Year 9 | Term 2 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Year 9 Term 3**  **Teacher A (Life Sciences): Topics 1 and 2, 4.1.4 Waves, 4.2.1 Systems in the human body (part)**  **Teacher B (Physical Sciences): Topic 6, 4.6.1 Forces and energy changes (remainder), 4.6.2 Structure and bonding (part)** | | | | | | | |
| **Topic 1 (continued) Building blocks**  **Chapter 1.4 Waves (6-8 hours)** | | | | | | | | |
| Year 9 | Term 3 | 1 | 1.4a | Key concept: Transferring energy and information by waves | understand that all waves have common properties  understand how waves can be used to carry information  understand various applications of energy transfer by different types of electromagnetic waves. | 4.1.4.1 |  | |
| Year 9 | Term 3 | 1 | 1.4b | Transverse and longitudinal waves | compare transverse and longitudinal waves  describe water waves as transverse waves and sound waves as longitudinal waves  describe evidence that the wave travels along, but not the medium itself  describe how to measure the speed of water waves. | 4.1.4.1 | WS 2.2, 2.3, 3.5 | |
| Year 9 | Term 1 | 2 | 1.4c | Measuring wave speed | describe how to measure the speed of sound waves in air using an echo method  apply the echo method to waves in water  apply the relationship between wavelength, frequency and wave velocity. | 4.1.4.1 | WS 2.3, 3.5 | |
| Year 9 | Term 3 | 2 | 1.4d | A wave equation | describe wave motion in terms of amplitude, wavelength, frequency and period  describe and apply the relationship between wavelength, frequency and speed  apply the equation relating period and frequency. | 4.1.4.2 | WS 3.3, 4.6  MS 1a, 1b, 1c, 2a, 3b, 3c | |
| Year 9 | Term 3 | 3 | 1.4e | Required practical: Measuring the  wavelength, frequency and speed of waves in a ripple tank and waves in a solid | develop techniques for making observations of waves  select suitable apparatus to measure frequency and wavelength  use data to answer questions. | 4.1.4.1, 4.1.4.2 | WS 2.3, 2.6, 3.8, 4.2, 4.3  MS 1a, 1c, 3b, 3c | |
| Year 9 | Term 3 | 4 | 1.4f | Electromagnetic waves | recall that electromagnetic waves are transverse waves that can transfer energy through space  describe the main groupings of the electromagnetic spectrum  recall and apply the relationship between frequency and wavelength. | 4.1.4.3 | WS 3.3, 4.6  MS 1a, 1b, 1c, 2a, 3b, 3c | |
| Year 9 | Term 3 | 4 | 1.4g | Uses of electromagnetic waves | give examples of practical uses of electromagnetic waves  show that the uses of electromagnetic waves illustrate the transfer of energy from source to absorber  recall that radio waves can be produced by, or can induce, oscillations in electrical circuits (HT). | 4.1.4.3, 4.1.4.4 | WS 1.2 | |
| Year 9 | Term 3 | 5 | 1.4h | Required practical: Investigating infrared  absorption and radiation | use appropriate apparatus to observe the interaction of electromagnetic waves with matter  explain methods and interpret results  recognise the importance of scientific quantities and understand how they are determined  use SI units. | 4.1.4.4 | WS 1.4, 2.3, 2.7, 3.8, 4.3 | |
| Year 9 | Term 3 | 5/6 | 1.4i | Reflection and refraction of electromagnetic waves | recall that different substances may refract or reflect electromagnetic waves (HT)  construct ray diagrams to illustrate refraction at a boundary (HT)  use wavefront diagrams to explain refraction in terms of change of wave speed in different substances (HT). | 4.1.4.5 | WS 1.2 | |
| Year 9 | Term 3 | 6 | 1.4j | Using and rearranging equations | select and apply appropriate equations  substitute numerical values into equations using appropriate units  change the subject of an equation. |  | WS 3.3  MS 1a, 1b, 1c, 2a, 3b, 3c | |
| **Teacher A (Life Sciences)**  **Topic 2 Transport over larger distances**  **Chapter 2.1 Systems in the human body (part, 5-7 hours)** | | | | | | | |
| Year 9 | Term 3 | 7 | 2.1a | Cellular respiration | explain the need for energy  describe aerobic respiration as an exothermic reaction  write a balanced symbol equation for respiration, given the formula of glucose (HT). | 4.2.1.1 | WS 1.2 (HT) | |
| Year 9 | Term 3 | 8 | 2.1b | Comparing aerobic and anaerobic respiration | describe the process of anaerobic respiration in humans  compare the processes of aerobic and anaerobic respiration. | 4.2.1.1 |  | |
| Year 9 | Term 3 | 9 | 2.1c | The need for transport systems in multicellular organisms | explain why multicellular organisms need a transport system, in terms of surface area : volume ratio. | 4.2.1.2 | MS 1c, 5c | |
| Year 9 | Term 3 | 9/10 | 2.1d | Surface area : volume ratio | be able to calculate surface area and volume  calculate and compare surface area : volume ratios  know how to apply ideas about surface area and volume  use SI units (e.g. m, mm)  use prefixes and powers of ten for orders of magnitude (e.g. centi, milli, micro)  interconvert units. | 4.2.1.2 | MS 1c, 5c | |
| Year 9 | Term 3 | 11 | 2.1e | Exchange surfaces | explain how efficient exchange surfaces are adapted to carry out their function  calculate and compare surface area : volume ratios. | 4.2.1.2 |  | |
| Year 9 | Term 3 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Teacher B (Physical Sciences)**  **Topic 6 Interactions over small and large distances**  **Chapter 6.1 Forces and energy changes (remainder, 6-9 hours)** | | | | | | | | |
| Year 9 | Term 3 | 1 | 6.1c | Finding forces from a vector diagram (recap) | calculate the resultant of a number of forces (HT)  draw free-body diagrams to find resultant forces (HT)  understand that a force can be resolved into two components acting at right angles to each other (HT). | 4.6.1.2 | WS 1.2  MS 4a, 5a, 5b | |
| Year 9 | Term 3 | 2 | 6.1d | Work | understand what is meant by work done  explain the relationship between work done and force applied  identify the transfers between energy stores when work is done against friction. | 4.6.1.3 | WS 1.2, 4.5  MS 1c, 3b, 3c | |
| Year 9 | Term 3 | 3 | 6.1e | Mass and weight | identify the correct units for mass and weight  explain the difference between mass and weight  understand how weight is an effect of gravitational fields. | 4.6.1.4 | WS 1.2  MS 3a, 3b, 3c | |
| Year 9 | Term 3 | 4 | 6.1f | Gravitational potential energy | describe what is meant by gravitational potential energy  calculate the energy stored by an object raised above ground level. | 4.6.1.5 | WS 1.2  MS 3c | |
| Year 9 | Term 3 | 5 | 6.1g | Elastic deformation | explain why you need two forces to stretch a spring  describe the difference between elastic and inelastic deformation  calculate extension, compression and elastic potential energy | 4.6.1.6, 4.6.1.7 | WS 1.2  MS 1c, 3b, 3c, 4a, 4b, 4c | |
| Year 9 | Term 3 | 6/7 | 6.1h | Required practical: Investigate the relationship between force and extension for a spring | interpret readings to show patterns and trends  interpret graphs to form conclusions  apply the equation for a straight line to the graph. | 4.6.1.6 | WS 3.1, 3.2, 3.3, 3.5, 3.8  MS 2b, 3b, 4a, 4b, 4c | |
| **Chapter 6.2 Structure and bonding (part, 4-6 hours)** | | | | | | | | |
| Year 9 | Term 3 | 8 | 6.2a | Types of chemical bonding | describe the three main types of bonding  explain how electrons are used in the three types of bonding  explain how bonding and properties are linked. | 4.6.2.1 |  | |
| Year 9 | Term 3 | 9 | 6.2b | Ionic bonding | represent an ionic bond with a diagram  draw dot and cross diagrams for ionic compounds  work out the charge on the ions of metals and non-metals from the group number of the element (1, 2, 6 & 7). | 4.6.2.2 | WS 1.2  MS 4a | |
| Year 9 | Term 3 | 10 | 6.2c | Ionic compounds | identify ionic compounds from structures  explain the limitations of diagrams and models  work out the empirical formula of an ionic compound. | 4.6.2.2 | MS 1a, 5b | |
| Year 9 | Term 3 | 11 | 6.2d | Properties of ionic compounds | describe the properties of ionic compounds  relate their melting points to forces between ions  explain when ionic compounds can conduct electricity. | 4.6.2.3 | WS 1.2 | |
| Year 9 | Term 3 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Year 10 Term 1**  **Teacher A (Life Sciences): Topics 2 and 3, 4.2.1 Systems in the human body (remainder), 4.2.2 Plants and photosynthesis, 4.3.1 Lifestyle and health (part)**  **Teacher B (Physical Sciences): Topics 6 and 7, 4.6.2 Structure and bonding (remainder), 4.6.3 Magnetism and electromagnetism, 4.7.1 Forces and motion** | | | | | | | |
| **Teacher A (Life Sciences)**  **Topic 2 Transport over larger distances**  **Chapter 2.1 Systems in the human body (remainder, 8-9 hours)** | | | | | | | |
| Year 10 | Term 1 | 1 | 2.1f | The human heart | describe the structure and function of the heart  explain how the structure of the heart is adapted to its function  explain the movement of blood around the heart  use simple compound measures such as heart rate  carry out calculations of heart rate. | 4.2.1.3 | MS 1a, 1c | |
| Year 10 | Term 1 | 1 | 2.1g | The human circulatory system | describe the human circulatory system, including its relationship with the gaseous exchange system  describe functions of parts of the circulatory system  explain how the structures of the blood vessels are adapted for their functions  describe some of the substances transported into and out of organisms. | 4.2.1.3, 4.2.1.2 |  | |
| Year 10 | Term 1 | 1/2 | 2.1h | Blood cells | identify the parts of the blood and their functions  explain how the different parts of the blood are adapted to their functions  identify different types of blood cell in a photograph or diagram. | 4.2.1.4 | WS 3.5 | |
| Year 10 | Term 1 | 2 | 2.1i | The human digestive system | explain how large insoluble food molecules are broken down by digestion into small soluble molecules  explain how the products of digestion can be used in cells  describe some of the substances transported into and out of organisms, including dissolved food molecules and urea. | 4.2.1.5, 4.2.1.2 |  | |
| Year 10 | Term 1 | 2 | 2.1j | Required practical: Food tests | use a Bunsen burner and a boiling water bath safely  carry out experiments appropriately having due regard for the correct manipulation of apparatus, and health and safety considerations  interpret observations and draw conclusions. | 4.2.1.5 | WS 2.4 | |
| Year 10 | Term 1 | 3 | 2.1k | The human nervous system | describe the structure of neurones and of the nervous system  explain how the nervous system is adapted to its functions. | 4.2.1.6 |  | |
| Year 10 | Term 1 | 3 | 2.1l | Reflex actions | explain the importance of reflex actions  describe the path of the pain withdrawal reflex arc  explain how the structures in the reflex arc relate to their function. | 4.2.1.6 |  | |
| Year 10 | Term 1 | 3/4 | 2.1m | Required practical: Investigating reaction time | select appropriate apparatus and techniques to measure the physiological function of reaction time  carry out physiological experiments safely  translate information between numerical and graphical form. | 4.2.1.6 | MS 2b, 2c, 2f, 4a | |
| Year 10 | Term 1 | 4 | 2.1n | The endrocrine system | recall that the endocrine system is made up of glands that secrete hormones into the blood  understand why the pituitary gland is the ‘master gland’  describe the principles of hormonal coordination and control by the human endocrine system. | 4.2.1.7 |  | |
| Year 10 | Term 1 | 4 | 2.1o | Negative feedback | describe the effects of adrenaline (HT)  explain the role of thyroxine in the body (HT)  understand the principles of negative feedback, as applied to thyroxine (HT). | 4.2.1.7 | WS 1.2  MS 2c (HT) | |
| **Chapter 2.2 Plants and photosynthesis (8-10 hours)** | | | | | | | | |
| Year 10 | Term 1 | 5 | 2.2a | Meristems | describe the function of meristems in plants  describe and explain the use of stem cells from meristems  to produce clones of plants quickly and economically. | 4.2.2.1 | WS 1.4 | |
| Year 10 | Term 1 | 5 | 2.2b | Plant structures | describe some of the substances transported into and out of plants  understand that the roots, stem and leaves form a transport system in plants. | 4.2.2.2 |  | |
| Year 10 | Term 1 | 5/6 | 2.2c | Transpiration | explain the need for exchange surfaces and a transport system in multicellular organisms  explain how the structure of the root hair cells in plants relates to their function  explain how the structure of xylem is adapted to its functions in the plant. | 4.2.2.3 |  | |
| Year 10 | Term 1 | 6 | 2.2d | Looking at stomata | describe the process of transpiration  explain the relationship between transpiration and leaf structure  explain the structure and function of stomata. | 4.2.2.3 |  | |
| Year 10 | Term 1 | 6 | 2.2e | Rate of transpiration | describe how transpiration is affected by different factors  understand and use simple compound measures such as rate of transpiration  draw and interpret appropriate graphs, charts and tables. | 4.2.2.3 | WS 3.3  MS 1a, 1c, 2c, 4a, 4c | |
| Year 10 | Term 1 | 7 | 2.2f | Chlorophyll and other plant pigments | explain how to set up paper chromatography  distinguish pure from impure substances  interpret chromatograms and determine *Rf* values  carry out and represent mathematical and statistical analysis. | 4.2.2.4 | WS 3.3  MS 1a, 1c, 4a | |
| Year 10 | Term 1 | 7 | 2.2g | Required practical: Paper chromatography | safely and accurately use a range of appropriate apparatus to separate and distinguish plant pigments by chromatography  extract and interpret information from charts and tables  determine *Rf* values. | 4.2.2.4 | WS 2.4, 2.6, 3.3, 4a  MS 1a, 1c | |
| Year 10 | Term 1 | 7/8 | 2.2h | Photosynthesis | describe the process of photosynthesis as an endothermic reaction  write a word equation for photosynthesis  write a balanced symbol equation for photosynthesis given the formula of glucose (HT). | 4.2.2.5 | WS 1.2 (HT) | |
| Year 10 | Term 1 | 8 | 2.2i | Factors affecting rate of photosynthesis | identify factors that affect the rate of photosynthesis  interpret graphs relating different factors to the rate of photosynthesis  explain the interaction of factors in limiting the rate of photosynthesis and relate to the cost effectiveness of controlling conditions in greenhouses. | 4.2.2.6 | WS 1.4 (HT), 3.5 (HT)  MS 1a, 1c, 2c, 4a, 4c | |
| Year 10 | Term 1 | 8 | 2.2j | Maths skills: Looking at tables and graphs | draw and interpret graphs and tables  understand and use the inverse square law in relation to light intensity and photosynthesis (HT). | 4.2.2.6 | WS 3.5 (HT)  MS 2g, 4a, 4c | |
| Year 10 | Term 1 | 9 | 2.2k | Required practical: How does light intensity affect the rate of photosynthesis? | use scientific ideas to develop a hypothesis  use the correct sampling techniques to ensure that readings are representative  present results in a graph. | 4.2.2.6 | WS 2.1, 2.2, 2.5, 2.6, 3.1, 3.2  MS 1a, 1c, 3d (HT), 4a, 4c | |
| Year 10 | Term 1 | 9 | 2.2l | Maths skills: Calculating rate of change from a line graph | understand and use simple compound measures such as rate of change  use the gradient of a graph to calculate the rate of change. |  | WS 3.3  MS 2g, 4a, 4b, 4c, 4d, 4e | |
| Year 10 | Term 1 | 10 | 2.2m | Translocation | describe the movement of sugar in a plant as translocation  explain how the structure of phloem is adapted to its function in the plant  explain the movement of sugars around the plant. | 4.2.2.7 |  | |
| Year 10 | Term 1 | 10/11 | 2.2n | Plant diseases | describe the causes, symptoms and identification of some plant diseases  explain how communicable diseases are spread in plants  explain applications of science to reduce or prevent the spread of communicable plant diseases. | 4.2.2.8 | WS 1.4 | |
| **Topic 3 Interactions with the environment**  **Chapter 3.1 Lifestyle and health (part, 1-2 hours)** | | | | | | | | |
| Year 10 | Term 1 | 11 | 3.1a | Health and disease | define what we mean by ‘health’ and describe the relationship between health and disease  describe examples of communicable and non-communicable diseases  discuss the costs of non-communicable diseases to people and communities. | 4.3.1.1 | WS 1.4 | |
| Year 10 | Term 1 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Teacher B (Physical Sciences)**  **Topic 6 Interactions over small and large distances**  **Chapter 6.2 Structure and bonding (remainder, 7-8 hours)** | | | | | | | | |
| Year 10 | Term 1 | 1 | 6.2e | Covalent bonding | recognise substances made of small molecules from their formula.  draw dot and cross diagrams for small molecules  deduce molecular formula from models and diagrams. | 4.6.2.4 | WS 1.2  MS 1a, 5b | |
| Year 10 | Term 1 | 2 | 6.2f | Properties of small covalent molecules | identify small molecules from formulae  explain the strength of covalent bonds  relate the intermolecular forces to the bulk properties of a substance. | 4.6.2.5 | WS 1.2 | |
| Year 10 | Term 1 | 3 | 6.2g | Polymers | recognise polymers from their unit formula and structure diagrams  represent covalent bonds in polymer diagrams. | 4.6.2.5 | WS 1.2  MS 5b | |
| Year 10 | Term 1 | 3/4 | 6.2h | Giant covalent structures | recognise giant covalent structures from bonding and structure diagrams  explain the properties of giant covalent structures  recognise the differences in different forms of carbon. | 4.6.2.5 | WS 1.2  MS 5b | |
| Year 10 | Term 1 | 2/3/4 | 6.2i | Key concept: Intermolecular forces | recognise the strong covalent bonds within molecules  recognise the weak intermolecular forces between molecules  describe the effects of weak intermolecular forces on properties of substances. | 4.6.2.5 | WS 1.2 | |
| Year 10 | Term 1 | 4 | 6.2j | Metallic bonding | describe why metals form giant structures  explain how metal ions are held together  consider the metallic bonds in molten metals. | 4.6.2.6 | MS 5b | |
| Year 10 | Term 1 | 4 | 6.2k | Properties of metals | identify metal elements and metal alloys  describe the purpose of a lead–tin alloy  explain why alloys are harder than pure metals. | 4.6.2.7 | WS 1.2 | |
| Year 10 | Term 1 | 2/3/4 | 6.2l | Maths skills: Visualise and represent 2D and 3D shapes | use 2D diagrams and 3D models to:  › represent atoms, molecules and ionic structures  › represent giant covalent structures  › calculate empirical formulae of ionic structures. | 4.6.2.2, 4.6.2.4 | WS 1.2  MS 5b | |
| **Chapter 6.3 Magnetism and electromagnetism (6 hours)** | | | | | | | | |
| Year 10 | Term 1 | 5 | 6.3a | Magnets | explain what is meant by the poles of a magnet  identify which are magnetic materials  explain how magnetism is induced. | 4.6.3.1 |  | |
| Year 10 | Term 1 | 5 | 6.3b | Magnetic fields | describe the field pattern of a bar magnet  plot the magnetic field around a bar magnet. | 4.6.3.2 | WS 2.2 | |
| Year 10 | Term 1 | 5 | 6.3c | The Earth’s magnetism | describe the Earth’s magnetic field  explain how a compass works  describe the evidence for the Earth’s changing magnetic field. | 4.6.3.3 | WS 1.3 | |
| Year 10 | Term 1 | 6 | 6.3d | Magnetic effect of an electric current | describe the magnetic effect of a current  investigate the magnetic field around a conducting wire  predict the direction of the magnetic field. | 4.6.3.4 | WS 1.2, 3.1 | |
| Year 10 | Term 1 | 6 | 6.3e | Magnetic field due to a solenoid | draw the magnetic field around a solenoid  describe what factors affect the strength of the magnetic field. | 4.6.3.4 | WS 1.4, 3.1 | |
| Year 10 | Term 1 | 6 | 6.3f | The motor effect | describe the force on a wire in a magnetic field  use Fleming’s left-hand rule to show the direction of the movement of the wire. | 4.6.3.5 | WS 1.2 | |
| Year 10 | Term 1 | 7 | 6.3i | Key concept: The link between electricity and magnetism | explore how electricity and magnetism are connected. | 4.6.3.4, 4.6.3.5 |  | |
| Year 10 | Term 1 | 7 | 6.3g | Calculating the force on a conductor | explain the meaning of magnetic flux density, B  calculate the force on a current-carrying conductor in a magnetic field  change the subject of an equation. | 4.6.3.5 | WS 3.3  MS 3c | |
| Year 10 | Term 1 | 7 | 6.3h | Electric motors | list equipment that uses motors  describe how motors work  describe how to change the speed and direction of rotation of a motor. | 4.6.3.6 | WS 1.2, 1.4 | |
| **Topic 7 Movement and interactions**  **Chapter 7.1 Forces and motion (8 hours)** | | | | | | | | |
| Year 10 | Term 1 | 8 | 7.1a | Speed and velocity | state examples of scalar and vector quantities  calculate speed using distance travelled divided by time taken. | 4.7.1.1 |  | |
| Year 10 | Term 1 | 8 | 7.1b | Distance, speed and time | calculate speed using distance travelled divided by time taken  interpret speed information from a distance-time graph  calculate speed from a distance–time graph  measure the gradient of a distance–time graph at any point (HT). | 4.7.1.2 | WS 1.2, 3.5, 4.5  MS 1c, 3b, 3c, 4a, 4b, 4c, 4d, 4f | |
| Year 10 | Term 1 | 9 | 7.1c | Acceleration | describe acceleration  calculate acceleration  explain motion in a circle (HT). | 4.7.1.3, 4.7.1.4 | WS 1.2, 3.3  MS 3b, 3c | |
| Year 10 | Term 1 | 9 | 7.1d | Using velocity-time graphs | draw velocity–time graphs  calculate acceleration using a velocity–time graph  calculate displacement using a velocity–time graph (HT). | 4.7.1.4 | WS 1.2, 3.5  MS 4a, 4b, 4c, 4d, 4f, 5c (HT) | |
| Year 10 | Term 1 | 9/10 | 7.1e | Using an equation for uniform motion | describe uniform motion  use an equation for uniform motion  apply this equation to vertical motion. | 4.7.1.4 | WS 1.2, 3.3  MS 3c (HT) | |
| Year 10 | Term 1 | 10 | 7.1f | Free fall | State what the value of acceleration due to gravity is  Explain what terminal velocity is. | 4.7.1.4 | WS 1.2, 3.5  MS 4a, 4b, 4c, 4d, 4f, 5c | |
| Year 10 | Term 1 | 10 | 7.1g | Newton's first law | explain what happens to an object if all the forces acting on it cancel each other out  analyse how this applies to everyday situations. | 4.7.1.5 |  | |
| Year 10 | Term 1 | 10 | 7.1h | Newton's second law | calculate the resultant of a number of forces, and show using free-body diagrams  explain what happens to the motion of an object when the resultant force is not zero  explain what inertia is (HT) | 4.7.1.6 | WS 1.2, 3.3  MS 3a, 3c | |
| Year 10 | Term 1 | 10/11 | 7.1i | Required practical: Investigating the acceleration of an object | plan an investigation to explore an idea  analyse results to identify patterns and draw conclusions  compare results with scientific theory. | 4.7.1.6 | WS 2.2, 2.3, 3.2, 3.3. 3.5, 3.8, 4.3  MS 2b, 2g, 4a, 4b, 4c | |
| Year 10 | Term 1 | 11 | 7.1j | Newton's third law | identify force pairs  understand and be able to apply Newton’s third law. | 4.7.1.7 |  | |
| Year 10 | Term 1 | 11 | 7.1k | Momentum | explain what is meant by momentum  apply ideas about rate of change of momentum to safety features in cars  use momentum calculations to predict what happens in a collision. | 4.7.1.8 | WS 1.2, 3.3  MS 3c | |
| Year 10 | Term 1 | 11 | 7.1l | Kinetic energy | describe how the kinetic energy store of an object changes as its speed changes  calculate kinetic energy  consider how energy is transferred. | 4.7.1.9 | WS 1.2, 3.3  MS 3c | |
| Year 10 | Term 1 | 11 | 7.1m | Stopping distances | explain the factors that affect stopping distance  explain the dangers caused by large deceleration  estimate the forces involved in the deceleration of a road vehicle  apply the idea of rate of change of momentum to explain safety features. | 4.7.1.10 | WS 1.5, 2.2, 3.5, 3.6  MS 1a, 1c, 4a | |
| Year 10 | Term 1 | 11 | 7.1n | Calculations using significant figures | substitute numerical values into equations and use appropriate units  change the subject of an equation  give an answer to an appropriate number of significant figures. |  | WS 3.3, 4.6  MS 2a, 3b, 3c, 3d | |
| Year 10 | Term 1 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Year 10 Term 2**  **Teacher A (Life Sciences): Topic 3, 4.3.1 Lifestyle and health (remainder), 4.3.2 Radiation and risk, 4.3.3 Preventing, treating and curing diseases (part)**  **Teacher B (Physical Sciences): Topic 7, 4.7.2 Electricity, 4.7.3 Acids and alkalis** | | | | | | | |
| **Teacher A (Life Sciences)**  **Topic 3 Interactions with the environment**  **Chapter 3.1 Lifestyle and health (remainder, 11-12 hours)** | | | | | | | |
| Year 10 | Term 2 | 1 | 3.1b | Risk factors for non-communicable diseases | understand what we mean by ‘risk factors’  explain lifestyle risk factors for non-communicable diseases  recall that many non-communicable human diseases are caused by interactions of factors  interpret and manipulate data about risk factors, | 4.3.1.2 | WS 1.5  MS 2c, 2d, 2g, 4a | |
| Year 10 | Term 2 | 1/2 | 3.1c | Treatments for cardiovascular disease | identify the causes and symptoms of cardiovascular disease  describe and evaluate the risks and benefits of treatments for cardiovascular disease. | 4.3.1.3 | WS 1.3, 1.4 | |
| Year 10 | Term 2 | 1/2 | 3.1d | Maths skills: Analysing and interpreting data | use information about risk factors from charts, graphs and tables  use a scatter diagram to identify a correlation between a risk factor and incidence of a disease  understand the principles of sampling data about risk factors  interpret data about differences in the incidence of non-communicable diseases in different parts of the world. | 4.3.1.3 | WS 1.5  MS 2c, 2g, 4a | |
| Year 10 | Term 2 | 2/3 | 3.1e | Homeostasis | understand that homeostasis is maintaining a constant internal environment in the body  explain why homeostasis is important  explain how the body responds to internal and external change to keep conditions stable. | 4.3.1.4 |  | |
| Year 10 | Term 2 | 3 | 3.1f | Controlling blood glucose | recall that blood glucose is monitored and controlled by the pancreas  understand how insulin controls the blood glucose level  extract and interpret information about blood glucose control from graphs, charts and tables  understand how insulin works with another hormone – glucagon – to control blood sugar level (HT). | 4.3.1.5 |  | |
| Year 10 | Term 2 | 4 | 3.1g | Diabetes | understand the causes of Type 1 and Type 2 diabetes  compare Type 1 and Type 2 diabetes  evaluate information on the relationship between obesity and diabetes. | 4.3.1.5 |  | |
| Year 10 | Term 2 | 4 | 3.1h | Human reproductive hormones | describe the roles of hormones in sexual reproduction  extract and interpret data from graphs showing hormone levels during the menstrual cycle (HT). | 4.3.1.6 | MS 2c, 4a (HT) | |
| Year 10 | Term 2 | 5 | 3.1i | Contraception | explain how fertility can be controlled by different hormonal and non-hormonal methods of contraception  evaluate the personal, social, economic and environmental implications of different methods of contraception. | 4.3.1.7 |  | |
| Year 10 | Term 2 | 5 | 3.1j | Which contraceptive? | explain how fertility can be controlled by different hormonal and non-hormonal methods of contraception  evaluate the personal, social, economic and environmental implications of different methods of contraception. | 4.3.1.7 | WS 1.4 | |
| Year 10 | Term 2 | 6 | 3.1k | Treatment for infertility | explain the use of hormones in technologies to treat infertility (HT)  describe the technique of *in-vitro* fertilisation (HT). | 4.3.1.8 | WS 1.4 | |
| Year 10 | Term 2 | 6 | 3.1l | IVF evaluation | evaluate the scientific, emotional, social and ethical issues of *in-vitro* fertilisation (HT). | 4.3.1.8 | WS 1.4 | |
| **Chapter 3.2 Radiation and risk (7-8 hours)** | | | | | | | | |
| Year 10 | Term 2 | 7 | 3.2a | Absorption and emission of radiation | recall that the electron arrangement in atoms may change when electromagnetic radiation is absorbed or emitted  be able to use the energy level model of the atom. | 4.3.2.1 | WS 1.2 | |
| Year 10 | Term 2 | 7 | 3.2b | Radioactivity | recall that some nuclei are unstable and may decay, emitting radiation  recall that radioactive decay may change the mass or charge of the nucleus, or both  write balanced nuclear equations. | 4.3.2.2 |  | |
| Year 10 | Term 2 | 8 | 3.2c | Nuclear equations | understand nuclear equations  write balanced nuclear equations. | 4.3.2.2 | WS 1.2  MS 1b, 1c, 3c | |
| Year 10 | Term 2 | 8 | 3.2d | Half-life | explain what is meant by radioactive half-life  calculate half-life  calculate the net decline in radioactive emission after a given number of half-lives (HT). | 4.3.2.3 | WS 3.3  MS 4a | |
| Year 10 | Term 2 | 8 | 3.2e | Maths skills: Drawing and using lines of best fit | draw a curve of best fit to calculate radioactive half-life  calculate the net decline in radioactive emission after a given number of half-lives (HT). | 4.3.2.3 | MS 1c, 3d, 4a, 4c | |
| Year 10 | Term 2 | 9 | 3.2f | Penetration properties of radiation | recall that changes in atoms and nuclei can generate radiation  recall that atoms can become ions by loss of outer electrons  recall the differences in the penetration properties of alpha particles, beta particles and gamma rays  compare the penetration of the different types of nuclear radiation and their ionising power. | 4.3.2.4 |  | |
| Year 10 | Term 2 | 9 | 3.2g | Contamination and irradiation | recall the differences between contamination and irradiation effects  compare the hazards associated with contamination and irradiation. | 4.3.2.5 |  | |
| Year 10 | Term 2 | 9/10 | 3.2h | Risks of ionising radiations | describe how UV, X-rays and gamma rays can have hazardous effects on human tissues  interpret simple measures of risk showing the probability of harm from radiation  give examples to show that perceived risk can be very different from measured risk  describe precautions to reduce the risks from radiation. | 4.3.2.6 | WS 1.5 | |
| Year 10 | Term 2 | 10 | 3.2i | Cancer | describe cancer as uncontrolled cell division and growth resulting from changes in cells  identify risk factors for cancer  describe the differences between types of tumours. | 4.3.2.7 |  | |
| **Chapter 3.3 Preventing, treating and curing diseases (part, 34 hours)** | | | | | | | | |
| Year 10 | Term 2 | 10 | 3.3a | Spread of communicable diseases | explain how communicable diseases are spread in animals  know how the common cold, flu, cholera, athlete’s foot and malaria are spread. | 4.3.3.1 | WS1.2 | |
| Year 10 | Term 2 | 11 | 3.3b | Viral diseases | describe the symptoms and transmission of some viral diseases  explain applications of science to prevent the spread of some viral diseases. | 4.3.3.2 | WS 1.4 | |
| Year 10 | Term 2 | 11 | 3.3c | Bacterial diseases | describe the symptoms and transmission of some bacterial diseases  explain applications of science to prevent the spread of some bacterial diseases. | 4.3.3.2 | WS 1.4 | |
| Year 10 | Term 2 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Teacher B (Physical Sciences)**  **Topic 7 Movement and interactions (remainder)**  **Chapter 7.2 Electricity (14 hours)** | | | | | | | | |
| Year 10 | Term 2 | 1 | 7.2a | Electric current | know circuit symbols  recall that current is a rate of flow of electric charge  explain how an electric current passes around a circuit. | 4.7.2.1, 4.7.2.4 | WS 3.3  MS 3b, 3c | |
| Year 10 | Term 2 | 1 | 7.2b | Current, resistance and potential difference | describe what resistance in a conductor is  define a volt (V)  recall that current (I) depends on resistance (R) and potential difference (V). | 4.7.2.2 | WS 3.3  MS 3c | |
| Year 10 | Term 2 | 1/2 | 7.2c | Key concept: What is the difference between potential difference and current? | understand and be able to apply the concepts of current and potential difference.  use these concepts to explain various situations. | 4.7.2.1, 4.7.2.2 | WS 2.2, 2.3, 2.4, 2.6, 3.1, 3.2, 3.3, 4.2, 4.3, | |
| Year 10 | Term 2 | 2 | 7.2d | Ohmic and non-ohmic conductors | set up a circuit to investigate resistance  investigate the changing resistance of a filament lamp  compare the properties of a resistor and filament lamp. | 4.7.2.2 | WS 1.2, 3.5  MS 4c, 4d, 4e | |
| Year 10 | Term 2 | 2/3 | 7.2e | Control circuits | use a thermistor and light-dependent resistor (LDR)  investigate the properties of thermistors, LDRs and diodes. | 4.7.2.2 | WS 1.2, 3.5  MS 4c, 4d, 4e | |
| Year 10 | Term 2 | 3 | 7.2f | Required practical: Investigate, using circuit diagrams to construct circuits, the *I-V* characteristics of a filament lamp, a diode and a resistor at constant temperature | understand how an experiment can be designed to test an idea  evaluate how an experimental procedure can yield more accurate data  interpret and explain graphs using scientific ideas. | 4.7.2.2 | WS 2.1, 2.2, 2.4, 2.5, 2.6, 2.7, 3.1, 3.2, 3.3, 3.4, 3.5, 3.6, 3.7, 3.8 | |
| Year 10 | Term 2 | 4 | 7.2g | Series and parallel circuits | recognise series and parallel circuits  describe the changes in the current and potential difference in series and parallel circuits. | 4.7.2.3 | WS 3.3, MS 1c, 3b, 3c, 3d | |
| Year 10 | Term 2 | 4/5 | 7.2h | Required practical: Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits, including the length of a wire at constant temperature and combinations of resistors in series and in parallel | use a circuit to determine resistance  gather valid data to use in calculations  apply the circuit to determine the resistance of combinations of components. | 4.7.2.2 | WS 2.2, 2.3, 2.4, 2.6, 3.1, 3.2, 3.3, 4.2, 4.3 | |
| Year 10 | Term 2 | 5 | 7.2i | Electricity in the home | recall that the domestic supply in the UK is a.c. at 50 Hz and about 230 V  describe the main features of live, neutral and earth wires. | 4.7.2.5, 4.7.2.6 | WS 1.5 | |
| Year 10 | Term 2 | 5/6 | 7.2j | Key concept: Power | define power  compare the rate of energy transfer by various machines and electrical appliances  calculate power. | 4.7.2.7 | WS 1.2, 3.3  MS 3b, 3c | |
| Year 10 | Term 2 | 6 | 7.2k | Power of an electrical device | calculate electrical power  use power equations to solve problems. | 4.7.2.7 | WS 1.2, 3.3  MS 3b, 3c | |
| Year 10 | Term 2 | 6/7 | 7.2l | Power and domestic appliances | describe the energy transfers in different domestic appliances  describe power as a rate of energy transfer  calculate the energy transferred. | 4.7.2.8 | WS 1.2, 1.4, 3.3  MS 3c | |
| Year 10 | Term 2 | 7 | 7.2m | The National Grid | describe how electricity is transmitted using the National Grid  explain why electrical power is transmitted at high potential differences  understand the role of transformers. | 4.7.2.9 | WS 1.4 | |
| **Chapter 7.3 Acids and alkalis (8 hours)** | | | | | | | | |
| Year 10 | Term 2 | 8 | 7.3a | Reaction of metals with acids | describe how reacting metals and acids produces a salt  write full balanced symbol equations for making salts  use half equations to describe oxidation and reduction (HT). | 4.7.3.1 | WS 1.2 (HT), 4.1 (HT) | |
| Year 10 | Term 2 | 8 | 7.3b | Reactions of carbonates with acids | describe how carbonates react with acids  describe the test for carbon dioxide  predict products from given reactants. | 4.7.3.2 | WS 1.2 | |
| Year 10 | Term 2 | 9 | 7.3c | Making salts | describe different ways salts can be made  outline purification techniques  deduce the formulae of salts from the formulae of common ions. | 4.7.3.2 | WS 1.2 | |
| Year 10 | Term 2 | 9 | 7.3d | Required practical: Preparing a pure, dry sample of a soluble salt from an insoluble oxide or carbonate | describe a practical procedure for producing a salt from a solid and an acid  explain the apparatus, materials and techniques used for making the salt  describe how to safely manipulate apparatus and accurately measure melting points. | 4.7.3.2 | WS 2.3, 2.4, 2.6 | |
| Year 10 | Term 2 | 10 | 7.3e | Key concept: Energy changes and reactions | identify exothermic and endothermic reactions from temperature changes  describe what endothermic and exothermic mean  investigate the variables that affect temperature changes in reacting mixtures. | 4.7.3.3 | WS 2.1 | |
| Year 10 | Term 2 | 10 | 7.3f | Required practical: Investigate the variables that affect temperature changes in reacting solutions, such as acid plus metals, acid plus carbonates, neutralisations, displacement of metals | use scientific theories and explanations to develop hypotheses  plan experiments to make observations and test hypotheses  evaluate methods to suggest possible improvements and further investigations. | 4.7.3.3 | WS 2.1, 2.2, 2,7  MS 1a, 2a, 2b | |
| Year 10 | Term 2 | 11 | 7.3g | The pH scale and neutralisation | describe the use of universal indicator to measure pH  use the pH scale to identify acidic or alkaline solutions  investigate pH changes when a strong acid neutralises a strong alkali. | 4.7.3.4 | WS 1.2, 2.3, 3.2 | |
| Year 10 | Term 2 | 11 | 7.3h | Strong and weak acids | explain strong and weak acids by the degree of ionisation (HT)  describe neutralisation by the effect on hydrogen ions and pH (HT)  explain dilute and concentrated as amounts of substance (HT). | 4.7.3.5 |  | |
| Year 10 | Term 2 | 11 | 7.3i | Maths skills: Order of magnitude calculations | use graphs and diagrams to apply the pH scale to acid rain distribution  calculate the concentration of acids  calculate the effect of hydrogen ion concentration on the numerical value of pH (HT). | 4.7.3.5 | MS 1a, 1b, 1c, 2h. 3c, 3d | |
| Year 10 | Term 2 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Year 10 Term 3**  **Teacher A (Life Sciences): Topics 3 and 4, 4.3.3 Preventing, treating and curing diseases (remainder)**  **Teacher B (Physical Sciences): Topics 7 and 8, 4.7.4 The rate and extent of chemical change, 4.7.5 Atoms into ions and ions into atoms, 4.8.1 Carbon chemistry** | | | | | | | |
| **Teacher A (Life Sciences)**  **Topic 3 Interactions with the environment (continued)**  **Chapter 3.3 Preventing, treating and curing diseases (remainder, 10-12 hours)** | | | | | | | |
|  |  |  |  |  |  |  |  | |
| Year 10 | Term 3 | 1 | 3.3d | Defences against pathogens | describe and explain how the human body defends itself against pathogens. | 4.3.3.3 |  | |
| Year 10 | Term 3 | 1 | 3.3e | The human immune system | explain how the human immune system defends against disease using phagocytosis, antibodies and antitoxins. | 4.3.3.4 |  | |
| Year 10 | Term 3 | 2 | 3.3f | Vaccination | recall how vaccinations prevent infection  explain how mass vaccination programmes reduce the spread of a disease. | 4.3.3.5 |  | |
| Year 10 | Term 3 | 2 | 3.3g | Medicines | explain the use of antibiotics and painkillers in the prevention and treatment of disease  recall that the emergence of antibiotic-resistant bacteria is a serious threat  explain that medicines are formulations of mixtures. | 4.3.3.6 |  | |
| Year 10 | Term 3 | 3 | 3.3h | Testing new drugs | describe how new medicines are discovered, developed and tested  explain that research is published only after evaluation by peer review. | 4.3.3.7 | WS 1.4, 1.6 | |
| Year 10 | Term 3 | 3/4 | 3.3i | Genetic modification | explain and evaluate some gene technologies used in medicine, taking into account benefits, risks, and the practical and ethical issues raised. | 4.3.3.8 | WS 1.3, 1.4 | |
| Year 10 | Term 3 | 4 | 3.3j | Stem cells | describe some uses of stem cells in medicine  evaluate possible uses of stem cells in medicine taking into account benefits, risks and the ethical issues raised. | 4.3.3.9 | WS 1.3 | |
| Year 10 | Term 3 | 5 | 3.3k | Interactions between different types of diseases | describe the interactions between different types of disease. | 4.3.3.10 | MS 2c, 4a | |
| Year 10 | Term 3 | 5/6 | 3.3l | Maths skills: Sampling and scientific data | understand why sampling is used in science  be able to explain different sampling techniques. | 4.3.1.2 | WS 3.7  MS 2d | |
| Year 10 | Term 3 | 6-12 | Revision and Assessments | | | | | |
| **Teacher B (Physical Sciences)**  **Topic 7 Movement and interactions (continued)**  **Chapter 7.4 The rate and extent of chemical change (12-16 hours)** | | | | | | | | |
| Year 10 | Term 3 | 1 | 7.4a | Progress of a reaction | explain how to measure the volume of a gas given off in a reaction  explain how to measure the rate of a reaction  read data from graphs to interpret stages of a reaction. | 4.7.4.1 | WS 3.3, 3.5  MS 1a, 1c, 4a, 4b, 4c | |
| Year 10 | Term 3 | 1 | 7.4b | Calculating rates | calculate the mean rate of a reaction  draw and interpret graphs of reaction times  draw tangents to the curves as a measure of the rate of reaction (HT). | 4.7.4.1 | WS 3.3, 3.5  MS 1a, 1c, 4a, 4b, 4c, 4d, 4e | |
| Year 10 | Term 3 | 2 | 7.4c | Factors affecting rates | identify which factors affect the rate of reactions  explain how rates are affected by different factors. | 4.7.4.1 | WS 3.5  MS 4a, 4b, 4c | |
| Year 10 | Term 3 | 2 | 7.4d | Effect of surface area on reaction rate | explain how changes of surface area affect rates of reaction  use surface area to volume ratio to explain the differences in rate. | 4.7.4.2 | MS 1c, 5c | |
| Year 10 | Term 3 | 3 | 7.4e | Collision theory | describe how a reaction takes place by particles colliding  explain the effects of changes of factors on rates of reaction using collision theory  use the particle model to explain collision theory. | 4.7.4.3 | WS 1.2 | |
| Year 10 | Term 3 | 3/4 | 7.4f | Maths skills: Use the slope of a tangent as a measure of rate of change | draw graphs from numeric data  draw tangents to the curve to observe how the slope changes  calculate the slope of the tangent to identify the rate of reaction. | 4.7.4.1 | WS 3.3, 3.5  MS 4a, 4b, 4c, 4d, 4e | |
| Year 10 | Term 3 | 4 | 7.4g | Required practical: Investigate how changes in concentration affect the rates of reactions by a method involving the production of a gas and a method involving a colour change | use scientific theories and explanations to develop a hypothesis  plan experiments to test the hypothesis and check data  make and record measurements using gas syringes  evaluate methods and suggest improvements and further investigations. | 4.7.4.3 | WS 2.1, 2.2, 2.3, 3.2, 3.5, 3,6, 3.7  MS 2a, 4a, 4c, 4d, 4e | |
| Year 10 | Term 3 | 5 | 7.4h | Activation energy | draw simple reaction profiles (energy level diagrams)  use reaction profiles to identify reactions as exothermic or endothermic  explain the energy changes needed for a reaction to occur and calculate energy changes. | 4.7.4.4 | WS 3.2, 3.5  MS 4a | |
| Year 10 | Term 3 | 5 | 7.4i | Bond breaking and bond formation | describe the energy changes in bond breaking and bond making (HT)  explain how a reaction is endothermic or exothermic overall (HT)  calculate the energy transferred in chemical reactions using bond energies (HT). | 4.7.4.5 | WS 1.2, 3.3  MS 1a, 4a | |
| Year 10 | Term 3 | 5/6 | 7.4j | Catalysts | identify catalysts in reactions  explain catalytic action  explain activation energy. | 4.7.4.6 | WS 1.2, 3.5 | |
| Year 10 | Term 3 | 6 | 7.4k | Enzymes | describe what enzymes are and how they work  explain the lock-and-key theory  use the collision theory to explain enzyme action. | 4.7.4.7 | WS 3.3, 3.5  MS 1a, 1c, 1d | |
| Year 10 | Term 3 | 6 | 7.4l | Required practical: The effect of pH on the activity of amylase | plan to use appropriate apparatus and techniques to make observations and measurements  measure rates of reaction by a variety of methods  use appropriate techniques to identify biological molecules. | 4.7.4.7 | WS 2.1, 2,2, 2.4, 2.7, 3.1, 3.2, 3.7  MS 1a, 1c | |
| Year 10 | Term 3 | 7 | 7.4m | Reversible reactions | identify a reversible reaction  explain how energy changes occur in a reversible reaction  consider changing the conditions of a reversible reaction. | 4.7.4.8 |  | |
| Year 10 | Term 3 | 7 | 7.4n | Dynamic equilibrium | explain how dynamic equilibrium is reached  explain what happens to the forward and reverse reactions  predict the effects of changes on systems at equilibrium (HT). | 4.7.4.9 | WS 1.2 (HT) | |
| Year 10 | Term 3 | 8 | 7.4o | Effect of concentration on position of equilibrium | identify reactants and products in a reversible reaction (HT)  explain how changing concentration changes the position of equilibrium (HT)  interpret data to predict the effect of a change in concentration (HT). | 4.7.4.10 | WS 1.2, 3.5 (HT) | |
| Year 10 | Term 3 | 8 | 7.4p | Effect of temperature on position of equilibrium | explain how exothermic and endothermic reactions behave  describe how a reaction that is exothermic in one direction is endothermic in the other direction (HT)  apply Le Châtelier's principle to reactions in equilibrium (HT). | 4.7.4.10 | WS 1.2 (HT) | |
| Year 10 | Term 3 | 8 | 7.4q | Effect of pressure on position of equilibrium | predict the effects of changes in pressure (HT)  explain why these changes occur (HT)  interpret data to predict the effect of a change in pressure (HT). | 4.7.4.10 |  | |
| Year 10 | Term 3 | 9-12 | Revision and Assessments | | | | | |
| **Year 11 Term 1**  **Teacher A (Life Sciences): Topic 4, 4.4.1 The Earth’s atmosphere, 4.4.2 Ecosystems and biodiversity, 4.4.3 Inheritance**  **Teacher B (Physical Sciences): Topics 7 and 8, 4.7.5 Atoms into ions and ions into atoms, 4.8.1 Carbon chemistry** | | | | | | | |
| **Teacher A (Life Sciences)**  **Topic 4 Explaining change**  **Chapter 4.1 The Earth’s atmosphere (10 hours)** | | | | | | | |
| Year 11 | Term 1 | 1 | 4.1a | The early atmosphere | describe ideas about the Earth’s early atmosphere  interpret evidence about the Earth’s early atmosphere  evaluate different theories about the Earth’s early atmosphere. | 4.4.1.1 | WS 1.1, 1.3  MS 1c | |
| Year 11 | Term 1 | 1 | 4.1b | Changes in the atmosphere | identify the processes allowing oxygen levels to increase  explain the role of algae in the composition of the atmosphere  recall the equation for photosynthesis. | 4.4.1.1 | MS 1c | |
| Year 11 | Term 1 | 2 | 4.1c | The carbon cycle | recall that plants take in carbon as carbon dioxide  explain how carbon is recycled  interpret a diagram of the carbon cycle. | 4.4.1.2 | WS 1.2 | |
| Year 11 | Term 1 | 2 | 4.1d | Key concept: The greenhouse effect | describe the greenhouse gases  explain the greenhouse effect  explain these processes as interaction of short and long wavelength radiation with matter. | 4.4.1.3 | WS 1.2 | |
| Year 11 | Term 1 | 2/3 | 4.1e | Human impacts on the climate | describe human activities that increase the amounts of carbon dioxide and methane  evaluate the quality of evidence about global climate change  recognise the uncertainties in predictions about climate change. | 4.4.1.4 | WS 1.3, 1.6  MS 2c, 2h, 4a | |
| Year 11 | Term 1 | 3 | 4.1f | Effects of climate change | describe four potential effects of global climate change  discuss the scale and risk of global climate change  discuss the environmental implications of climate change. | 4.4.1.5 | WS 1.4 | |
| Year 11 | Term 1 | 3 | 4.1g | Mitigating the effects of climate change | explain that carbon footprints can be reduced by reducing emissions of carbon dioxide and methane  describe how emissions of carbon dioxide can be reduced  describe how emissions of methane can be reduced. | 4.4.1.5 | WS 1.4 | |
| Year 11 | Term 1 | 4 | 4.1h | Air pollution | describe how carbon monoxide, soot, sulfur dioxide and oxides of nitrogen are produced by burning fuels  predict the products of combustion of a fuel knowing the composition of the fuel  predict the products of combustion of a fuel knowing the conditions in which it is used. | 4.4.1.6 | WS 1.4 | |
| Year 11 | Term 1 | 4 | 4.1i | The water cycle | explain the stages in water cycles  explain the importance of the water cycle to living organisms. | 4.4.1.7 | WS 1.2 | |
| Year 11 | Term 1 | 4/5 | 4.1j | Required practical: Analysis and purification of water samples | describe how safety is managed, apparatus is used and  accurate measurements are made  recognise when sampling techniques need to be used and made representative  evaluate methods and suggest possible improvements and further investigations. | 4.4.4.18 | WS 2.3, 2.4, 2.5, 2.6, 2.7 | |
| Year 11 | Term 1 | 5 | 4.1k | Sources of potable water | distinguish between potable water and pure water  describe the differences in treatment of ground water and salty water  give reasons for the steps used to produce potable water. | 4.4.1.8 | WS 1.4 | |
| Year 11 | Term 1 | 5 | 4.1l | Maths skills: Use ratios, fractions and percentages | extract information from charts, graphs and tables  use orders of magnitude to evaluate significance of data. | 4.4.1.1 | MS 1c | |
| **Chapter 4.2 Ecosystems and biodiversity (7 hours)** | | | | | | | | |
| Year 11 | Term 1 | 6 | 4.2a | Habitats and communities | describe different levels of organisation in an ecosystem  describe the differences between producers and consumers  describe predator and prey cycles. | 4.4.2.1 | WS 1.2 | |
| Year 11 | Term 1 | 6 | 4.2b | Interdependence and competition | describe how competition impacts on populations  explain why animals in the same habitat are in competition  describe how one population affects another in a community  explain the importance of interdependence. | 4.4.2.2 |  | |
| Year 11 | Term 1 | 7 | 4.2c | Factors that affect communities | identify factors that affect ecosystems  explain how biotic and abiotic factors affect communities  describe the effect of interacting factors on species distribution. | 4.4.2.3 | WS 1.2  MS 1c, 2c, 4a | |
| Year 11 | Term 1 | 7 | 4.2d | Required practical: Investigating the population size of a common species in a habitat | describe abundance and distribution  plan experiments to test a hypothesis  explain the apparatus and techniques used to sample a population  explain how a representative sample is taken | 4.4.2.4, 4.4.2.3 | WS 2.1, 2.2, 2.3, 2.7, 3.3  MS 1d, 2b, 2d, 2f, 2g, 4c | |
| Year 11 | Term 1 | 7/8 | 4.2e | Biodiversity | recall that biodiversity is the range of different plants and organisms living in an ecosystem  describe the benefits of maintaining biodiversity  explain some ways of maintaining local and global biodiversity. |  |  | |
| Year 11 | Term 1 | 8 | 4.2f | Negative human impacts on ecosystems | describe how humans interact negatively with the ecosystem  explain how this impacts on biodiversity. |  | WS 1.4 | |
| Year 11 | Term 1 | 9 | 4.2g | Positive human impacts on ecosystems | describe positive human interactions on biodiversity  describe some conservation measures  describe the impact of breeding programmes  explain how habitats are regenerated. |  | WS 1.4 | |
| **Chapter 4.3 Inheritance (5 hours)** | | | | | | | |
| Year 11 | Term 1 | 9/10 | 4.3a | Chromosomes and genes | describe DNA, chromosomes and genes  describe the structure of DNA  explain what the genome of an organism is. | 4.4.3.1 |  | |
| Year 11 | Term 1 | 10 | 4.3b | Sex determination in humans | explain how meiosis halves the number of chromosomes for gamete production  explain how fertilisation restores the chromosome number  describe how the sex chromosomes determine the sex of the offspring. | 4.4.3.2 |  | |
| Year 11 | Term 1 | 10/11 | 4.3c | Single gene inheritance | explain single gene inheritance  predict the results of single gene crosses  explain the difference between dominant and recessive characteristics  explain homozygous and heterozygous characteristics. | 4.4.3.3 | WS 1.2  MS 1c, 2a | |
| Year 11 | Term 1 | 11 | 4.3d | Genotype and phenotype | compare the terms genotype and phenotype  explain how the genome interacts with the environment to influence the phenotype  describe how most phenotypic features are the result of multiple gene inheritance. | 4.4.3.4 | WS 1.1, 1.2 | |
| Year 11 | Term 1 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Teacher B (Physical Sciences)**  **Topic 7 Movement and interactions (continued)**  **Chapter 7.5 Atoms into ions and ions into atoms (6-8 hours)** | | | | | | | | |
| Year 11 | Term 1 | 1 | 7.5a | A reactivity series for metals | describe the reactions, if any, of metals with water or dilute acids  deduce an order of reactivity of metals based on experimental results  explain how the reactivity is related to the tendency of the metal to form its positive ion (HT). | 4.7.5.1 | WS 1.2 (HT), 3.5, 3.8 | |
| Year 11 | Term 1 | 1/2 | 7.5b | The process of electrolysis | identify reactions at electrodes during electrolysis  write and balance half equations for the electrode reactions (HT). | 4.7.5.2 | WS 1.2 (HT) | |
| Year 11 | Term 1 | 2 | 7.5c | Electrolysis of molten ionic compounds | identify which ions move to the positive and negative electrodes  explain how the ions of a molten electrolyte are discharged  predict the products of electrolysis of molten binary compounds  write half equations for the reactions at the electrodes **(**HT). | 4.7.5.2 | WS 1.2 (HT) | |
| Year 11 | Term 1 | 3 | 7.5d | Electrolysis of aqueous solutions | describe competing reactions at the electrodes in the electrolysis of aqueous solutions  predict the products of electrolysis of aqueous solutions  represent reactions at the electrodes by half equations (HT). | 4.7.5.3, 4.7.5.5 | WS 1.2 (HT), 4.1 | |
| Year 11 | Term 1 | 3/4 | 7.5e | Required practical: Investigating what happens when aqueous solutions are electrolysed using inert electrodes | use scientific theories and explanations to develop hypotheses  plan experiments to make observations and test hypotheses  apply a knowledge of the apparatus needed for electrolysis including use of inert electrodes and varying electrolytes  make and record observations. | 4.7.5.3 | WS 2.1, 2.4, 2.6, 3.5, 3.6, 3.8 | |
| Year 11 | Term 1 | 3/4 | 7.5g | Tests for gases | describe tests to identify selected gases  identify methods of collecting gases depending on their solubility and density. | 4.7.5.4 | WS 3.5 | |
| **Topic 8 Guiding spaceship Earth to a sustainable future**  **Chapter 4.8 Carbon chemistry (8-10 hours)** | | | | | | | | |
| Year 11 | Term 1 | 5 | 8.1a | Diamond | identify why diamonds are so hard  explain how the properties relate to the bonding structure and in diamond  explain why diamond differs from graphite. | 4.8.1.1 | WS 1.4  MS 5b | |
| Year 11 | Term 1 | 5 | 8.1b | Graphite | describe the structure and bonding of graphite  explain the properties of graphite  explain the similarity to metals. | 4.8.1.1 | WS 1.4  MS 5b | |
| Year 11 | Term 1 | 6/7 | 8.1c | Graphene and fullerenes | explain the properties of graphene by its structure and bonding  recognise graphene and fullerenes from their bonding and structure  describe the uses of fullerenes, including carbon nanotubes. | 4.8.1.1 | WS 1.4  MS 5b | |
| Year 11 | Term 1 | 7 | 8.1d | Hydrocarbons in crude oil | describe that crude oil is the main source of hydrocarbons and is a finite resource  explain that the ability of carbon to form four covalent bonds leads to the formation of a vast number of compounds  describe the structure and formulae of the family of alkanes. | 4.8.1.2 | WS 1.2  MS 5b | |
| Year 11 | Term 1 | 7/8 | 8.1e | Fractional distillation of crude oil | describe how crude oil is used to provide modern materials  explain how crude oil is separated by fractional distillation  explain why boiling points of the fractions are different. | 4.8.1.3 | WS 1.2 | |
| Year 11 | Term 1 | 8 | 8.1f | Properties of hydrocarbons | describe how different hydrocarbon fuels have different properties  identify the properties that influence the use of fuels  explain how the properties are related to the size of molecules. | 4.8.1.3 | WS 1.2 | |
| Year 11 | Term 1 | 9 | 8.1g | Combustion of hydrocarbon fuels | describe the process of complete combustion  balance equations of combustion of hydrocarbons  explain the consequences of incomplete combustion. | 4.8.1.3 | WS 1.2 | |
| Year 11 | Term 1 | 10/11 | 8.1h | Cracking hydrocarbons | describe the usefulness of cracking  balance chemical equations as examples of cracking  explain how modern life depends on the uses of hydrocarbons. | 4.8.1.4 | WS 1.2 | |
| Year 11 | Term 1 | 6/8/11 | 8.1i | Maths skills: Visualise and represent 2D and 3D | use 3D models to represent  › hydrocarbons  › polymers  › large biological models. | 4.8.1, 4.6.2.5 | WS 1,2  MS 5b | |
| Year 11 | Term 1 | 12 | End of term assessment (including end of chapter questions) | | | | | |
| **Year 11 Term 2**  **Teacher A (Life Sciences): Topic 4, 4.4.4 Variation and evolution**  **Teacher B (Physical Sciences): Topic 8, 4.8.2 Resources of materials and energy** | | | | | | | |
| **Teacher A (Life Sciences)**  **Topic 4 Explaining change (continued)**  **Chapter 4.4 Variation and evolution (9-12 hours)** | | | | | | | |
| Year 11 | Term 2 | 1 | 4.4a | Mutations | describe how genetic variation arises in a population  explain how variants arise from mutations  describe the negative and sometimes positive effects of mutations. | 4.4.4.1 |  | |
| Year 11 | Term 2 | 2 | 4.4b | Evolution through natural selection | explain the theory of evolution by natural selection  describe the process of natural selection  understand that when natural selection operates differently on populations, a new species is produced. | 4.4.4.2 |  | |
| Year 11 | Term 2 | 3 | 4.4c | Evidence for evolution | understand how, and the situations in which, fossils are formed  understand how fossils are used as evidence for evolution of species from simpler life forms  explain how antibiotic resistance in bacteria is evidence of evolution. | 4.4.4.3 |  | |
| Year 11 | Term 2 | 4 | 4.4d | Identification and classification of living things | describe how living things have been classified into groups using a system devised by Linnaeus  describe how new models of classification have developed. | 4.4.4.4 |  | |
| Year 11 | Term 2 | 4/5 | 4.3e | Selective breeding | describe the process of selective breeding  explain how selective breeding enables humans to choose desirable characteristics in plants and animals  explain how selective breeding can lead to inbreeding. | 4.4.4.5 | WS 1.3, 1.4 | |
| Year 11 | Term 2 | 5 | 4.3f | Genetic engineering | give examples of how plant crops have been genetically engineered to improve products and describe how fungus cells are engineered to produce human insulin. | 4.4.4.6 |  | |
| Year 11 | Term 2 | 6 | 4.3g | Gene technology: benefits and risks | explain the benefits of using gene technology in modern agriculture  explain the risks of using gene technology in agriculture  describe some of the practical and ethical considerations of using modern technology. | 4.4.4.6 | WS 1.3, 1.4 | |
| Year 11 | Term 2 | 6 | 4.3h | Maths skills: Using charts and graphs to display data | understand when and how to use bar charts  understand how to show sub-groups on bar charts  understand how to plot histograms. |  | MS 2c, 4a | |
| Year 11 | Term 2 | 7 | End of term assessment (including end of chapter questions) | | | | | |
| Year 11 | Term 2 | contd. | Revision | | | | | |
| **Teacher B (Physical Sciences)**  **Topic 8 Guiding spaceship Earth to a sustainable future (continued)**  **Chapter 8.2 Resources of materials and energy (9-10 hours)** | | | | | | | | |
| Year 11 | Term 2 | 1 | 8.2a | Key concept: Electron transfer, oxidation and reduction | explain why atoms lose or gain electrons  explain oxidation and reduction by electron transfer (HT).  relate ease of losing electrons to reactivity (HT). | 4.8.2.1 | WS 1.2, 1.4, 4.1 | |
| Year 11 | Term 2 | 1 | 8.2b | Metal extraction by reduction of oxides | identify that metals react with oxygen to form metal oxides  explain how extraction methods depend on metal reactivity  interpret or evaluate information on specific metal extraction processes (HT). | 4.8.2.1 | WS 1.2, 1.4 | |
| Year 11 | Term 2 | 2 | 8.2c | Metal extraction by electrolysis | explain the process of the electrolysis of aluminium oxide  explain why a mixture is used and why the anode needs constant replacement  write half equations for the reactions at the electrodes (HT). | 4.8.2.2 | WS 1.4 | |
| Year 11 | Term 2 | 2 | 8.2d | Metal extraction by biological methods | describe the process of phytomining (HT)  describe the process of bioleaching (HT)  evaluate alternative biological methods of metal extraction (HT). | 4.8.2.3 | WS 1.4 | |
| Year 11 | Term 2 | 3 | 8.2e | Energy resources | describe the main energy sources available for use on Earth  distinguish between renewable and non-renewable sources  explain what the issues are when using energy resources. | 4.8.2.4 | WS 1.4, 4.4, MS 1c, 2c, 4a | |
| Year 11 | Term 2 | 3 | 8.2f | Energy conservation and dissipation | recall the law of conservation of energy  describe where there are energy transfers in a system  calculate the energy changes within a system (HT). | 4.8.2.5 | WS 3.3  MS 1a, 1c, 3c | |
| Year 11 | Term 2 | 3/4 | 8.2g | Key concept: Energy transfer | understand why energy is a key concept in science  use ideas about stores and transfers to explain what energy does  understand why accounting for energy transfers is a useful idea. | 4.8.2.5 |  | |
| Year 11 | Term 2 | 4 | 8.2h | Preventing unwanted energy transfers | explain ways of reducing unwanted energy transfer  describe what affects the rate of cooling of a building  understand thermal conductivity. | 4.8.2.6 | WS 1.4 | |
| Year 11 | Term 2 | 4 | 8.2i | Energy efficiency | explain what is meant by energy efficiency  calculate the efficiency of energy transfers  find out about energy-efficient light technology. | 4.8.2.7 | WS 3.3  MS 1a, 1c, 3c | |
| Year 11 | Term 2 | 5 | 8.2j | Life cycle assessment | describe the components of a Life Cycle Assessment (LCA)  interpret LCAs of materials or products from information  carry out a simple comparative LCA for shopping bags. | 4.8.2.8 | WS 1.3, 1.4, 3.3, 3.5, 4.6  MS 1a, 1d, 2a, 4a | |
| Year 11 | Term 2 | 5 | 8.2k | Ways of reducing the use of resources | describe ways of recycling and reusing materials  explain why recycling, reusing and reducing are needed  evaluate ways of reducing the use of limited resources. | 4.8.2.9 | WS 1.4 | |
| Year 11 | Term 2 | 5 | 8.2l | Maths skills: Translate information between graphical and numerical form | represent information from pie charts numerically  represent information from graphs numerically  represent information from numeric form graphically. |  | MS 4a, 4c | |
| Year 11 | Term 2 | 6 | End of term assessment (including end of chapter questions) | | | | | |
| Year 11 | Term 2 | contd. | Revision | | | | | |