| **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.** |
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| **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](http://www.collins.co.uk/page/GCSE%2BScience/Transition%2BUnits)), 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 worldidentify 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 densityexplain the differences in density between different states of matter using the particle modelcalculate 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 datause spatial models to solve problemsplan experiments and devise proceduresuse 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, 4.6MS 21, 3c |
| Year 9 | Term 1 | 8 | 1.1d | Key concept: Particle theory | use the particle model to explain states of matteruse ideas about energy and bonds to explain changes of stateexplain the relationship between temperature and energy. | 4.1.1.1, 4.1.1.4 | WS 1.2, 3.5MS 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 particlesexplain 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 changesdescribe how heating a system changes its internal energyexplain 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 capacitystate the factors that are involved in increasing the temperature of a substancecalculate specific heat capacity and energy changes when a material is heated. | 4.1.1.4 | WS 3.3, 3.5, 4.3, 4.5MS 1a, 3c, 3d |
| Year 9 | Term 1 | 10 | 1.1h | Required practical: Investigating specific heat capacity | use theories to develop a hypothesisevaluate a method and suggest improvementsperform 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, 4.3MS 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 capacityperform 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 timeinterpret a graph of temperature against time. | 4.1.1.4 | WS 3.1, 3.2, 3.5, 3.6MS 4c  |
| Year 9 | Term 1 | 11 | 1.1k | Meanings of purity | explain what is meant by puritydistinguish 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) numberrepresent the electronic structure of the first 20 elementsexplain 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 patternrecognise that the number of electrons in an element’s outer shell corresponds to the element’s group numberexplain 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 tableexplain how Mendeleev left spaces for undiscovered elementsexplain why the element order in the modern periodic table was changedexplain 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 tableexplain the differences between metals and non-metals based on their physical and chemical propertiesexplain 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 ionsexplain why metal ions carry a positive charge and non-metal ions carry a negative chargerepresent electronic structure of atoms and ions in diagramsexplain 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 gasespredict the properties of noble gases from trends down the groupexplain 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 metalspredict the properties of Group 1 metals from trends down the grouprelate 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 halogensrelate the properties of the halogens to the number of electrons in their outer shellpredict the properties of Group 7 elements from trends down the groupconstruct 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 timeexplain 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 moleculesrecognise expressions in standard formestimate the size of atoms based on scale diagrams. | 4.1.2.24.1.1.1 | WS 4.4, 4.5MS 1b, 1d |
| Year 9 | Term 2 | 1/2 | 1.2c | Maths skills: Standard form and making estimates | recognise the format of standard formconvert decimals to standard form and vice versamake estimates without calculators so the answer in standard form seems reasonable. | 4.1.2.2 | WS 4.4, 4.5MS 1a, 1b, 1d  |
| Year 9 | Term 2  | 2 | 1.2d | Sub-atomic particles | interpret and draw diagrams of the structure of atomsrecall 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 electronscalculate the number of protons, neutrons and electrons in atoms. | 4.1.2.3 | WS 1.2MS 1b |
| Year 9 | Term 2  | 2 | 1.2e | Maths skills: Sizes of particles and orders of magnitude | identify the scale of measurements of lengthexplain the conversion of small lengths to metresexplain the relative sizes of nuclei and atomsmake order of magnitude calculations. | 4.1.2.2 | WS 3.3, 4.4, 4.5MS 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 neutronscalculate the number of protons, neutrons and electrons in isotopesinterpret 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 nucleusrecognise that the energy associated with an electron shell increases with distance from the nucleusexplain 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 microscopesexplain how electron microscopy has increased our understanding of sub-cellular structurescarry out calculations involving magnification, real size and image size (HT)use estimations and make order of magnitude calculationsuse prefixes centi, milli, micro and nano and interconvert units. | 4.1.3.1 | WS 3.3, 4.4, 4.5, 4.6MS 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 functionscarry out calculations involving magnification, real size and image size including numbers written in standard form (HT)use estimations and make order of magnitude calculationsuse 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 areause a microscope to make observations of biological specimens and produce labelled scientific drawingsuse estimations to judge the relative size or area of sub-cellular structurescarry 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 arearecognise and use expressions in decimal and standard formuse ratios, fractions and percentagesmake estimates for simple calculations. | 4.1.3.2 | WS 3.3, 4.4, 4.5MS 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 diffusionidentify the factors that affect rate of diffusionexplain 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 tissuesidentify 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 hypothesisplan experiments to test a hypothesisdraw 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 databe able to use range bars on graphsunderstand how to estimate uncertainty from a set of measurements. |  | WS 3.4MS 2b |
| Year 9 | Term 2  | 9/10 | 1.3i | Active transport | describe active transportexplain how active transport is different from diffusion and osmosisexplain 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 cycledescribe the role of mitosis in growth and tissue repairdescribe 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 productionexplain how a new cell with the normal number of chromosomes is made at fertilisationunderstand 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 differentiationdescribe 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 reactionsexplain how formulae represent elements and compoundswrite 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 massexplain why a multiplier appears as a subscript in a formulause 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 reactionidentify the mass changes using a balanced symbol equationexplain 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 tablecalculate relative formula masses from relative atomic massesverify the law of conservation of mass in a balanced equation. | 4.5.2.3 | WS 3.3MS 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 4.6MS 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 4.6MS 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 solutioncalculate the mass of solute in solutionexplain 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 massexplain 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 massrearrange 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 forcerecognise the difference between contact and non-contact forcesstate 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 propertiesunderstand how waves can be used to carry informationunderstand 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 wavesdescribe water waves as transverse waves and sound waves as longitudinal wavesdescribe evidence that the wave travels along, but not the medium itselfdescribe 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 methodapply the echo method to waves in waterapply 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 perioddescribe and apply the relationship between wavelength, frequency and speedapply the equation relating period and frequency. | 4.1.4.2 | WS 3.3, 4.6MS 1a, 1b, 1c, 2a, 3b, 3c |
| Year 9 | Term 3  | 3 | 1.4e | Required practical: Measuring thewavelength, frequency and speed of waves in a ripple tank and waves in a solid | develop techniques for making observations of wavesselect suitable apparatus to measure frequency and wavelengthuse data to answer questions. | 4.1.4.1, 4.1.4.2 | WS 2.3, 2.6, 3.8, 4.2, 4.3MS 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 spacedescribe the main groupings of the electromagnetic spectrumrecall and apply the relationship between frequency and wavelength. | 4.1.4.3 | WS 3.3, 4.6MS 1a, 1b, 1c, 2a, 3b, 3c |
| Year 9 | Term 3  | 4 | 1.4g | Uses of electromagnetic waves | give examples of practical uses of electromagnetic wavesshow that the uses of electromagnetic waves illustrate the transfer of energy from source to absorberrecall 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 infraredabsorption and radiation | use appropriate apparatus to observe the interaction of electromagnetic waves with matterexplain methods and interpret resultsrecognise the importance of scientific quantities and understand how they are determineduse 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 equationssubstitute numerical values into equations using appropriate unitschange the subject of an equation. |  | WS 3.3MS 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 energydescribe aerobic respiration as an exothermic reactionwrite 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 humanscompare 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 volumecalculate and compare surface area : volume ratiosknow how to apply ideas about surface area and volumeuse 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 functioncalculate 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 doneexplain the relationship between work done and force appliedidentify the transfers between energy stores when work is done against friction. | 4.6.1.3 | WS 1.2, 4.5MS 1c, 3b, 3c |
| Year 9 | Term 3  | 3 | 6.1e | Mass and weight | identify the correct units for mass and weightexplain the difference between mass and weightunderstand how weight is an effect of gravitational fields. | 4.6.1.4 | WS 1.2MS 3a, 3b, 3c |
| Year 9 | Term 3  | 4 | 6.1f | Gravitational potential energy | describe what is meant by gravitational potential energycalculate the energy stored by an object raised above ground level. | 4.6.1.5 | WS 1.2MS 3c |
| Year 9 | Term 3  | 5 | 6.1g | Elastic deformation | explain why you need two forces to stretch a springdescribe the difference between elastic and inelastic deformationcalculate extension, compression and elastic potential energy | 4.6.1.6, 4.6.1.7 | WS 1.2MS 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 trendsinterpret graphs to form conclusionsapply the equation for a straight line to the graph. | 4.6.1.6 | WS 3.1, 3.2, 3.3, 3.5, 3.8MS 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 bondingexplain how electrons are used in the three types of bondingexplain 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 diagramdraw dot and cross diagrams for ionic compoundswork 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 1.2MS 4a |
| Year 9 | Term 3  | 10 | 6.2c | Ionic compounds | identify ionic compounds from structuresexplain the limitations of diagrams and modelswork 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 compoundsrelate their melting points to forces between ionsexplain 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 heartexplain how the structure of the heart is adapted to its functionexplain the movement of blood around the heartuse simple compound measures such as heart ratecarry 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 systemdescribe functions of parts of the circulatory systemexplain how the structures of the blood vessels are adapted for their functionsdescribe 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 functionsexplain how the different parts of the blood are adapted to their functionsidentify 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 moleculesexplain how the products of digestion can be used in cellsdescribe 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 safelycarry out experiments appropriately having due regard for the correct manipulation of apparatus, and health and safety considerationsinterpret 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 systemexplain 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 actionsdescribe the path of the pain withdrawal reflex arcexplain 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 timecarry out physiological experiments safelytranslate 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 bloodunderstand 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 1.2MS 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 plantsdescribe and explain the use of stem cells from meristemsto 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 plantsunderstand 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 organismsexplain how the structure of the root hair cells in plants relates to their functionexplain 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 transpirationexplain the relationship between transpiration and leaf structureexplain 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 factorsunderstand and use simple compound measures such as rate of transpirationdraw and interpret appropriate graphs, charts and tables. | 4.2.2.3 | WS 3.3MS 1a, 1c, 2c, 4a, 4c |
| Year 10 | Term 1  | 7 | 2.2f | Chlorophyll and other plant pigments | explain how to set up paper chromatographydistinguish pure from impure substancesinterpret chromatograms and determine *Rf* valuescarry out and represent mathematical and statistical analysis. | 4.2.2.4 | WS 3.3MS 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 chromatographyextract and interpret information from charts and tables determine *Rf* values. | 4.2.2.4 | WS 2.4, 2.6, 3.3, 4aMS 1a, 1c |
| Year 10 | Term 1  | 7/8 | 2.2h | Photosynthesis | describe the process of photosynthesis as an endothermic reactionwrite a word equation for photosynthesiswrite 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 photosynthesisinterpret graphs relating different factors to the rate of photosynthesisexplain 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 tablesunderstand 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 hypothesisuse the correct sampling techniques to ensure that readings are representativepresent results in a graph. | 4.2.2.6 | WS 2.1, 2.2, 2.5, 2.6, 3.1, 3.2MS 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 changeuse the gradient of a graph to calculate the rate of change. |  | WS 3.3MS 2g, 4a, 4b, 4c, 4d, 4e |
| Year 10 | Term 1  | 10 | 2.2m | Translocation | describe the movement of sugar in a plant as translocationexplain how the structure of phloem is adapted to its function in the plantexplain 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 diseasesexplain how communicable diseases are spread in plantsexplain 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 diseasedescribe examples of communicable and non-communicable diseasesdiscuss 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 moleculesdeduce molecular formula from models and diagrams. | 4.6.2.4 | WS 1.2MS 1a, 5b |
| Year 10 | Term 1  | 2 | 6.2f | Properties of small covalent molecules | identify small molecules from formulaeexplain the strength of covalent bondsrelate 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 1.2MS 5b |
| Year 10 | Term 1  | 3/4 | 6.2h | Giant covalent structures | recognise giant covalent structures from bonding and structure diagramsexplain the properties of giant covalent structuresrecognise the differences in different forms of carbon. | 4.6.2.5 | WS 1.2MS 5b |
| Year 10 | Term 1  | 2/3/4 | 6.2i | Key concept: Intermolecular forces | recognise the strong covalent bonds within moleculesrecognise the weak intermolecular forces between moleculesdescribe 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 structuresexplain how metal ions are held togetherconsider 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 alloysdescribe the purpose of a lead–tin alloyexplain 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 1.2MS 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 magnetidentify which are magnetic materialsexplain how magnetism is induced. | 4.6.3.1 |  |
| Year 10 | Term 1 | 5 | 6.3b | Magnetic fields | describe the field pattern of a bar magnetplot 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 fieldexplain how a compass worksdescribe 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 currentinvestigate the magnetic field around a conducting wirepredict 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 solenoiddescribe 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 fielduse 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, Bcalculate the force on a current-carrying conductor in a magnetic fieldchange the subject of an equation. | 4.6.3.5 | WS 3.3MS 3c |
| Year 10 | Term 1  | 7 | 6.3h | Electric motors | list equipment that uses motorsdescribe how motors workdescribe 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 quantitiescalculate 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 takeninterpret speed information from a distance-time graphcalculate speed from a distance–time graphmeasure the gradient of a distance–time graph at any point (HT). | 4.7.1.2 | WS 1.2, 3.5, 4.5MS 1c, 3b, 3c, 4a, 4b, 4c, 4d, 4f |
| Year 10 | Term 1 | 9 | 7.1c | Acceleration | describe accelerationcalculate accelerationexplain motion in a circle (HT). | 4.7.1.3, 4.7.1.4 | WS 1.2, 3.3MS 3b, 3c |
| Year 10 | Term 1 | 9 | 7.1d | Using velocity-time graphs | draw velocity–time graphscalculate acceleration using a velocity–time graphcalculate displacement using a velocity–time graph (HT). | 4.7.1.4 | WS 1.2, 3.5MS 4a, 4b, 4c, 4d, 4f, 5c (HT) |
| Year 10 | Term 1 | 9/10 | 7.1e | Using an equation for uniform motion | describe uniform motionuse an equation for uniform motionapply this equation to vertical motion. | 4.7.1.4 | WS 1.2, 3.3MS 3c (HT) |
| Year 10 | Term 1 | 10 | 7.1f | Free fall | State what the value of acceleration due to gravity isExplain what terminal velocity is. | 4.7.1.4 | WS 1.2, 3.5MS 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 outanalyse 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 diagramsexplain what happens to the motion of an object when the resultant force is not zeroexplain what inertia is (HT) | 4.7.1.6 | WS 1.2, 3.3MS 3a, 3c |
| Year 10 | Term 1 | 10/11 | 7.1i | Required practical: Investigating the acceleration of an object | plan an investigation to explore an ideaanalyse results to identify patterns and draw conclusionscompare results with scientific theory. | 4.7.1.6 | WS 2.2, 2.3, 3.2, 3.3. 3.5, 3.8, 4.3MS 2b, 2g, 4a, 4b, 4c |
| Year 10 | Term 1  | 11 | 7.1j | Newton's third law | identify force pairsunderstand 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 momentumapply ideas about rate of change of momentum to safety features in carsuse momentum calculations to predict what happens in a collision. | 4.7.1.8 | WS 1.2, 3.3MS 3c |
| Year 10 | Term 1 | 11 | 7.1l | Kinetic energy | describe how the kinetic energy store of an object changes as its speed changescalculate kinetic energyconsider how energy is transferred. | 4.7.1.9 | WS 1.2, 3.3MS 3c |
| Year 10 | Term 1 | 11 | 7.1m | Stopping distances | explain the factors that affect stopping distanceexplain the dangers caused by large decelerationestimate the forces involved in the deceleration of a road vehicleapply the idea of rate of change of momentum to explain safety features. | 4.7.1.10 | WS 1.5, 2.2, 3.5, 3.6MS 1a, 1c, 4a |
| Year 10 | Term 1 | 11 | 7.1n | Calculations using significant figures | substitute numerical values into equations and use appropriate unitschange the subject of an equationgive 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 diseasesrecall that many non-communicable human diseases are caused by interactions of factorsinterpret and manipulate data about risk factors, | 4.3.1.2 | WS 1.5MS 2c, 2d, 2g, 4a |
| Year 10 | Term 2 | 1/2 | 3.1c | Treatments for cardiovascular disease | identify the causes and symptoms of cardiovascular diseasedescribe 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 tablesuse a scatter diagram to identify a correlation between a risk factor and incidence of a diseaseunderstand the principles of sampling data about risk factorsinterpret data about differences in the incidence of non-communicable diseases in different parts of the world. | 4.3.1.3 | WS 1.5MS 2c, 2g, 4a |
| Year 10 | Term 2 | 2/3 | 3.1e | Homeostasis | understand that homeostasis is maintaining a constant internal environment in the bodyexplain why homeostasis is importantexplain 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 pancreasunderstand how insulin controls the blood glucose levelextract and interpret information about blood glucose control from graphs, charts and tablesunderstand 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 diabetescompare Type 1 and Type 2 diabetesevaluate 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 reproductionextract 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 contraceptionevaluate 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 contraceptionevaluate 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 emittedbe 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 radiationrecall that radioactive decay may change the mass or charge of the nucleus, or bothwrite balanced nuclear equations. | 4.3.2.2 |  |
| Year 10 | Term 2 | 8 | 3.2c | Nuclear equations | understand nuclear equationswrite 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-lifecalculate half-lifecalculate the net decline in radioactive emission after a given number of half-lives (HT). | 4.3.2.3 | WS 3.3MS 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-lifecalculate 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 radiationrecall that atoms can become ions by loss of outer electronsrecall the differences in the penetration properties of alpha particles, beta particles and gamma rayscompare 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 effectscompare 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 tissuesinterpret simple measures of risk showing the probability of harm from radiationgive examples to show that perceived risk can be very different from measured riskdescribe 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 cellsidentify risk factors for cancerdescribe 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 animalsknow 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 diseasesexplain 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 diseasesexplain 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 symbolsrecall that current is a rate of flow of electric chargeexplain how an electric current passes around a circuit. | 4.7.2.1, 4.7.2.4 | WS 3.3MS 3b, 3c |
| Year 10 | Term 2 | 1 | 7.2b | Current, resistance and potential difference | describe what resistance in a conductor isdefine a volt (V)recall that current (I) depends on resistance (R) and potential difference (V). | 4.7.2.2 | WS 3.3MS 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 resistanceinvestigate the changing resistance of a filament lampcompare the properties of a resistor and filament lamp. | 4.7.2.2 | WS 1.2, 3.5MS 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, 3.5MS 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 ideaevaluate how an experimental procedure can yield more accurate datainterpret 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 circuitsdescribe 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 resistancegather valid data to use in calculationsapply 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 Vdescribe 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 powercompare the rate of energy transfer by various machines and electrical appliancescalculate power. | 4.7.2.7 | WS 1.2, 3.3MS 3b, 3c |
| Year 10 | Term 2 | 6 | 7.2k | Power of an electrical device | calculate electrical poweruse power equations to solve problems. | 4.7.2.7 | WS 1.2, 3.3MS 3b, 3c |
| Year 10 | Term 2 | 6/7 | 7.2l | Power and domestic appliances | describe the energy transfers in different domestic appliancesdescribe power as a rate of energy transfercalculate the energy transferred. | 4.7.2.8 | WS 1.2, 1.4, 3.3MS 3c |
| Year 10 | Term 2 | 7 | 7.2m | The National Grid | describe how electricity is transmitted using the National Gridexplain why electrical power is transmitted at high potential differencesunderstand 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 saltwrite full balanced symbol equations for making saltsuse 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 acidsdescribe the test for carbon dioxidepredict 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 techniquesdeduce 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 acidexplain the apparatus, materials and techniques used for making the saltdescribe 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 meaninvestigate 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 hypothesesplan experiments to make observations and test hypothesesevaluate methods to suggest possible improvements and further investigations. | 4.7.3.3 | WS 2.1, 2.2, 2,7MS 1a, 2a, 2b |
| Year 10 | Term 2 | 11 | 7.3g | The pH scale and neutralisation | describe the use of universal indicator to measure pHuse the pH scale to identify acidic or alkaline solutionsinvestigate 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 distributioncalculate the concentration of acidscalculate 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 infectionexplain 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 diseaserecall that the emergence of antibiotic-resistant bacteria is a serious threatexplain 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 testedexplain 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 medicineevaluate 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 sciencebe able to explain different sampling techniques. | 4.3.1.2 | WS 3.7MS 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 reactionexplain how to measure the rate of a reactionread data from graphs to interpret stages of a reaction. | 4.7.4.1 | WS 3.3, 3.5MS 1a, 1c, 4a, 4b, 4c |
| Year 10 | Term 3 | 1 | 7.4b | Calculating rates | calculate the mean rate of a reactiondraw and interpret graphs of reaction timesdraw tangents to the curves as a measure of the rate of reaction (HT). | 4.7.4.1 | WS 3.3, 3.5MS 1a, 1c, 4a, 4b, 4c, 4d, 4e |
| Year 10 | Term 3 | 2 | 7.4c | Factors affecting rates | identify which factors affect the rate of reactionsexplain how rates are affected by different factors. | 4.7.4.1 | WS 3.5MS 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 reactionuse 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 collidingexplain the effects of changes of factors on rates of reaction using collision theoryuse 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 datadraw tangents to the curve to observe how the slope changescalculate the slope of the tangent to identify the rate of reaction. | 4.7.4.1 | WS 3.3, 3.5MS 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 hypothesisplan experiments to test the hypothesis and check datamake and record measurements using gas syringesevaluate methods and suggest improvements and further investigations. | 4.7.4.3 | WS 2.1, 2.2, 2.3, 3.2, 3.5, 3,6, 3.7MS 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 endothermicexplain the energy changes needed for a reaction to occur and calculate energy changes. | 4.7.4.4 | WS 3.2, 3.5MS 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, 3.3MS 1a, 4a |
| Year 10 | Term 3 | 5/6 | 7.4j | Catalysts | identify catalysts in reactionsexplain catalytic actionexplain 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 workexplain the lock-and-key theoryuse the collision theory to explain enzyme action. | 4.7.4.7 | WS 3.3, 3.5MS 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, 3.7MS 1a, 1c |
| Year 10 | Term 3 | 7 | 7.4m | Reversible reactions | identify a reversible reactionexplain how energy changes occur in a reversible reactionconsider 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 reachedexplain what happens to the forward and reverse reactionspredict 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 atmosphereinterpret evidence about the Earth’s early atmosphereevaluate different theories about the Earth’s early atmosphere. | 4.4.1.1  | WS 1.1, 1.3MS 1c |
| Year 11 | Term 1 | 1 | 4.1b | Changes in the atmosphere | identify the processes allowing oxygen levels to increaseexplain the role of algae in the composition of the atmosphererecall 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 dioxideexplain how carbon is recycledinterpret 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 gasesexplain the greenhouse effectexplain 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 methaneevaluate the quality of evidence about global climate changerecognise the uncertainties in predictions about climate change. | 4.4.1.4 | WS 1.3, 1.6MS 2c, 2h, 4a |
| Year 11 | Term 1 | 3 | 4.1f | Effects of climate change | describe four potential effects of global climate changediscuss the scale and risk of global climate changediscuss 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 methanedescribe how emissions of carbon dioxide can be reduceddescribe 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 fuelspredict the products of combustion of a fuel knowing the composition of the fuelpredict 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 cyclesexplain 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 andaccurate measurements are maderecognise when sampling techniques need to be used and made representativeevaluate 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 waterdescribe the differences in treatment of ground water and salty watergive 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 tablesuse 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 ecosystemdescribe the differences between producers and consumersdescribe 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 populationsexplain why animals in the same habitat are in competitiondescribe how one population affects another in a communityexplain the importance of interdependence. | 4.4.2.2 |  |
| Year 11 | Term 1 | 7 | 4.2c | Factors that affect communities | identify factors that affect ecosystemsexplain how biotic and abiotic factors affect communitiesdescribe the effect of interacting factors on species distribution. | 4.4.2.3 | WS 1.2MS 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 distributionplan experiments to test a hypothesisexplain the apparatus and techniques used to sample a populationexplain how a representative sample is taken | 4.4.2.4, 4.4.2.3 | WS 2.1, 2.2, 2.3, 2.7, 3.3MS 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 ecosystemdescribe the benefits of maintaining biodiversityexplain 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 ecosystemexplain 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 biodiversitydescribe some conservation measuresdescribe the impact of breeding programmesexplain 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 genesdescribe the structure of DNAexplain 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 productionexplain how fertilisation restores the chromosome numberdescribe 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 inheritancepredict the results of single gene crossesexplain the difference between dominant and recessive characteristicsexplain homozygous and heterozygous characteristics. | 4.4.3.3 | WS 1.2MS 1c, 2a |
| Year 11 | Term 1 | 11 | 4.3d | Genotype and phenotype | compare the terms genotype and phenotypeexplain how the genome interacts with the environment to influence the phenotypedescribe 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 acidsdeduce an order of reactivity of metals based on experimental resultsexplain 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 electrolysiswrite 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 electrodesexplain how the ions of a molten electrolyte are dischargedpredict the products of electrolysis of molten binary compoundswrite 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 solutionspredict the products of electrolysis of aqueous solutionsrepresent 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 hypothesesplan experiments to make observations and test hypothesesapply a knowledge of the apparatus needed for electrolysis including use of inert electrodes and varying electrolytesmake 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 hardexplain how the properties relate to the bonding structure and in diamondexplain why diamond differs from graphite. | 4.8.1.1 | WS 1.4MS 5b |
| Year 11 | Term 1 | 5 | 8.1b | Graphite | describe the structure and bonding of graphiteexplain the properties of graphiteexplain the similarity to metals. | 4.8.1.1 | WS 1.4MS 5b |
| Year 11 | Term 1 | 6/7 | 8.1c | Graphene and fullerenes | explain the properties of graphene by its structure and bondingrecognise graphene and fullerenes from their bonding and structuredescribe the uses of fullerenes, including carbon nanotubes. | 4.8.1.1 | WS 1.4MS 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 resourceexplain that the ability of carbon to form four covalent bonds leads to the formation of a vast number of compoundsdescribe the structure and formulae of the family of alkanes. | 4.8.1.2 | WS 1.2MS 5b |
| Year 11 | Term 1 | 7/8 | 8.1e | Fractional distillation of crude oil | describe how crude oil is used to provide modern materialsexplain how crude oil is separated by fractional distillationexplain 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 propertiesidentify the properties that influence the use of fuelsexplain 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 combustionbalance equations of combustion of hydrocarbonsexplain 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 crackingbalance chemical equations as examples of crackingexplain 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 1,2MS 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 populationexplain how variants arise from mutationsdescribe 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 selectiondescribe the process of natural selectionunderstand 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 formedunderstand how fossils are used as evidence for evolution of species from simpler life formsexplain 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 Linnaeusdescribe 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 breedingexplain how selective breeding enables humans to choose desirable characteristics in plants and animalsexplain 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 agricultureexplain the risks of using gene technology in agriculturedescribe 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 chartsunderstand how to show sub-groups on bar chartsunderstand 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 electronsexplain 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 oxidesexplain how extraction methods depend on metal reactivityinterpret 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 oxideexplain why a mixture is used and why the anode needs constant replacementwrite 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 energydescribe where there are energy transfers in a systemcalculate the energy changes within a system (HT). | 4.8.2.5 | WS 3.3MS 1a, 1c, 3c |
| Year 11 | Term 2 | 3/4 | 8.2g | Key concept: Energy transfer | understand why energy is a key concept in scienceuse ideas about stores and transfers to explain what energy doesunderstand 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 transferdescribe what affects the rate of cooling of a buildingunderstand thermal conductivity. | 4.8.2.6 | WS 1.4 |
| Year 11 | Term 2 | 4 | 8.2i | Energy efficiency | explain what is meant by energy efficiencycalculate the efficiency of energy transfersfind out about energy-efficient light technology. | 4.8.2.7 | WS 3.3MS 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 informationcarry 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 materialsexplain why recycling, reusing and reducing are neededevaluate 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 numericallyrepresent information from graphs numericallyrepresent 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 |