Science Department - Year 10 Scheme of Work

Term	Title	Unit content	Key vocabulary	Resource links:
Week 1	**Plants and ecosystems**	**Plants and ecosystems** 2A.1 Recall that plants and green algae are organisms that undertake photosynthesis 2A.2 Describe photosynthetic organisms as the main producers of food, and therefore biomass 2A.3 Recall photosynthesis as a reaction that uses light energy to react carbon dioxide and water to produce glucose and oxygen 2A.4 Recall the word equation for photosynthesis 2A.5 Recall that the rate of photosynthesis is affected by: a) temperature b) light intensity c) carbon dioxide concentration **Practical ideas:** • Look at leaves and leaf cells under microscopes • investigate the effect of light intensity on the rate of photosynthesis (link to CS 5.5).	Photosynthesis Organism Carbon Dioxide Glucose Oxygen	FLC - 2A - Paper 1 Biology
Week 2	**Diffusion, Osmosis & Active transport**	**Key knowledge taught:** 2A.6 Describe the process of diffusion as the movement of particles from an area of higher concentration to an area of lower concentration 2A.7 Describe the process of osmosis as the movement of water molecules from an area of higher concentration to an area of lower concentration across a semi-permeable membrane 2A.8 Describe active transport as a process that uses energy to move a substance from an area of lower concentration to an area of higher concentration 2A.9 Recall that diffusion, osmosis and active transport are all used to move substances across a cell membrane into a cell **Practical ideas:**	Diffusion Concentration Osmosis Semi-permeable Membrane Active Transport Cell Membrane	FLC - 2A - Paper 1 Biology

		• Investigate the effect of pollutants on plant germination and plant growth. Investigate osmosis in potatoes and other vegetables (link to CS 1.16)		
Week 3	**Root hair cells, xylem, & Phloem**	**Key knowledge taught:** 2A.10 Describe how the large surface area of the root hair cells helps them to absorb water and mineral ions from the soil 2A.11 Describe the transport of water and mineral ions up the stem of a plant from the roots: a) in a part of the plant called the xylem b) due to loss of water from the surface of the leaf (transpiration) 2A.12 Recall that sugar is transported around the plant in the phloem 2A.13 Recall that plants use sucrose as an energy store **Practical ideas:** • Look at cells of celery stalks left in ink	Root Hair Cell Mineral Ions Xylem Transpiration Phloem Sucrose	FLC - 2A - Paper 1 Biology
Week 4	**communities**	**Key knowledge taught:** 2A.14 Describe the different levels of organisation in an ecosystem from individual organisms, populations, communities, to the whole ecosystem 2A.15 Describe how the organisms in a community can be affected by: a) temperature b) light c) water d) pollutants 2A.16 Explain how communities can be affected by other organisms through: a) competition for resources b) predation 2A.17 Recall that a community often survives because organisms within it depend on each other (interdependence) 2A.18 Describe methods for investigating the number of organisms in a given area, including: a) quadrats b) pitfall-traps **Practical ideas:** • Use quadrats to estimate the number of daisys on the field • Use pitfall traps to investigate range of small living creatures in a habitat	Ecosystem Organisms Populations Communities Pollutants Predation Interdependence Quadrats Pitfall-traps	FLC - 2A - Paper 1 Biology
Week 5	**conservation**	**Key knowledge taught:**	Habitat	FLC - 2A - Paper 1 Biology

		2A.19 Describe the benefits of the conservation of animal species, including: a) preserving the natural habitat b) increasing biodiversity c) promoting wildlife tourism (an economic benefit) 2A.20 Recall the benefits of reforestation, including: a) providing a habitat for organisms b) increasing biodiversity c) reducing the effects of climate change 2A.21 Describe the importance of the carbon cycle, including: a) carbon dioxide entering the atmosphere through respiration or combustion b) carbon dioxide leaving the atmosphere through photosynthesis c) the role of microorganisms as decomposers **Practical ideas:** • IT research task on an endangered species	Biodiversity Reforestation Carbon Cycle Combustion Microorganisms Decomposers	
Week 6	**FLC – Paper 2A**	***Consolidation, revision and assessment.*** *FLC Paper 2: Biology 2A: Plants, ecosystems*		
Week 7	**Group 1**	**Key knowledge taught:** 0.1 Recall the formulae of elements and simple compounds in this specification 0.2 Write word equations 0.3 Describe the use of hazard symbols on containers: a) to indicate the dangers associated with the contents b) to inform people about safe working precautions with these substances in the laboratory 0.4 Recognise the risks in a practical procedure and suggest suitable precautions for a range of practicals, including those mentioned in this specification 2A.1 Recall that some elements are classified as alkali metals (group 1), halogens (group 7) or noble gases (group 0), based on their position in the periodic table 2A.2 Recall that alkali metals a) are soft b) have relatively low melting points 2A.3 Describe the reactions of lithium, sodium and potassium with water 2A.4 Describe the pattern in reactivity of the alkali metals, lithium, sodium and potassium, with water; and use this pattern to predict the reactivity of other alkali metals **Practical ideas:**	Elements Compounds Hazard Symbols Alkali Metals Halogens Noble Gases Reactivity Lithium Sodium Potassium	FLC - 2A - Paper 3 Chemistry

		• Alkali metals demonstration in water		
Week 1	**Halogens & Noble gases**	**Key knowledge taught:** 2A.5 Recall the colours and physical states of chlorine, bromine and iodine at room temperature 2A.6 Describe the pattern in the physical properties of the halogens, chlorine, bromine and iodine, and use this pattern to predict the physical properties of other halogens 2A.7 Describe the chemical test for chlorine 2A.8 Describe the reactions of the halogens, chlorine, bromine and iodine, with metals to form metal halides, and use this pattern to predict the reactions of other halogens 2A.9 Explain why the noble gases are chemically inert, compared with the other elements, in terms of the arrangement of their electrons 2A.10 Describe how the uses of noble gases depend on their inertness, low density and/or non-flammability Practical ideas: • Demo the test for chlorine • Show the colour and physical state of chlorine, bromine and iodine at room temperature	Halogens Chlorine Bromine Iodine Halides Inert Low Density Non-flammability	FLC - 2A - Paper 3 Chemistry
Week 2	**Heat energy changes in chemical reactions**	**Key knowledge taught:** 2A.11 Recall that changes in heat energy accompany the following changes: a) salts dissolving in water b) neutralisation reactions c) combustion and that, when these reactions take place, 2A.12 Describe an exothermic change or reaction as one in which heat energy is given out 2A.13 Describe an endothermic change or reaction as one in which heat energy is taken in **Practical ideas** • Carry out neutralisation reactions	Neutralisation Combustion Exothermic Endothermic	FLC - 2A - Paper 3 Chemistry

		• Carry out exothermic and endothermic reactions		
Week 3 and 4	**Rates of reactions (1)**	**Key knowledge taught:** 2A.14 Explain how reactions occur when particles collide and that rates of reaction are increased when the frequency of collisions is increased 2A.15 Interpret graphs of mass, volume or concentration of reactant or product against time 2A.16 Explain the effects on rates of reaction of changes in temperature, concentration, surface area in terms of frequency of collisions between particles 2A.17 Describe a catalyst as a substance that speeds up the rate of a reaction without altering the products of the reaction, without undergoing a permanent change itself 2A.18 Recall that enzymes are biological catalysts **Practical ideas:** • Show how rate of reaction is affected by temperature, concentration or surface area. E.g. 0.5M and 1M acid with magnesium collecting gas in a gas syringe	Reactions Collisions Catalyst Enzymes Biological Catalysts	FLC - 2A - Paper 3 Chemistry
Week 5	**FLC Paper 3**	***Consolidation, revision and assessment.*** *FLC Paper 3: Chemistry 2A: Chemical reaction, patterns, energy and rates of reaction*		
Week 6	**Circuits**	**Key knowledge taught:** 2A.1 Interpret diagrams that represent electric circuits, using symbols for: a) cells (including batteries) b) switches c) voltmeters d) ammeters e) resistors f) variable resistors g) lamps h) LED 2A.2 Describe the differences between series and parallel circuits 2A.3 Recall that: a) voltmeters are used to measure voltage b) voltmeters are always connected in parallel 2A.4 Recall that: a) ammeters are used to measure current b) ammeters are always connected in series 2A.5 Be able to use: charge flowing in a circuit = current × time	Voltmeters Ammeters Resistors Series Circuit Parallel Circuit Potential Difference	FLC - 2A - Paper 5 Physics

		Practical ideas: • **Use circuit boards to make series and parallel circuits** • **Measure current using ammeters** • **Measure P.D with voltmeters**		
Week 7	**Resistance**	**Key knowledge taught:** 2A.6 Recall that a variable resistor can change the current or voltage in a circuit 2A.7 Be able to use: voltage = current × resistance 2A.8 Recognise the voltage-current graphs for the following: a) filament lamps b) fixed resistors 2A.9 Describe how the resistance changes in a filament lamp when the voltage increases 2A.10 Recall that a wire (or resistor) gets hot when there is an electric current through it **Practical ideas:** • **Carry out practical – how the length of the wire affect resistance** • **Carry out practical measuring resistance in different wires**	Current Voltage Resistance Filament Lamps Fixed Resistors	FLC - 2A - Paper 5 Physics
Week 1	**AC/DC**	**Key knowledge taught:** 2A.11 Recall that when there is an electric current in a circuit, some electrical energy is transferred to the surroundings as thermal energy 2A.12 Be able to use: energy transferred power = time taken 2A.13 Be able to use: electrical power = current × voltage 2A.14 Recall that a current that changes direction continuously is called alternating current (A.C.) 2A.15 Recall that current that moves in only one direction is called direct current (D.C.) and this may come from a cell (battery) **Practical ideas:** • Calculate power in a simple series circuit using an ammeter and voltmeter	Thermal Energy Alternating Current Direct Current	FLC - 2A - Paper 5 Physics

Week 2	Magnets	**Key knowledge taught:** 2A.16 Recall that: a) a magnet has a north pole at one end and a south pole at the other end b) unlike poles of two magnets attract c) like poles of two magnets repel (push away) 2A.17 Recall that there are only a few materials that are magnetic: iron, cobalt, nickel, and some alloys (steel) 2A.18 Describe the shape and direction of the magnetic field around a bar magnet 2A.19 Recall that a wire which carries a current has a magnetic field around it 2A.20 Recall that the magnetic field is stronger nearer the wire and when the current is larger **Practical ideas:** • Draw magnet field lines on a bar magnet • Use plotting compasses to plot the direction of the field lines	North Pole South Pole Attract Repel Magnetic Field	FLC - 2A - Paper 5 Physics
Week 3	**Electricity in the home**	**Key knowledge taught:** 2A.21 Recall that in the UK the mains electricity supply is A.C. and it has a frequency of 50 hertz and a voltage of 230 V 2A.22 Describe the three wires in the mains wiring: a) live b) neutral c) earth 2A.23 Describe how: a) the earth wire is connected to the outer metal case of an appliance b) the earth wire prevents a user from getting a shock c) a fuse or circuit breaker prevents the appliance from overheating if the current gets too high 2A.24 Recall that a fuse and a switch are both placed in the live wire so that they can cut off the current 2A.25 Recall that a transformer can change the size of an A.C. voltage	Hertz Voltage Mains Wiring Live Neutral Earth Fuse Circuit Breaker Transformer National Grid	FLC - 2A - Paper 5 Physics

		2A.26 Describe how electrical energy is transferred from power stations to towns using the National Grid 2A.27 Recall that using the National Grid helps to reduce the energy lost during transmission **Practical ideas:** • **Wire a three pin plug**		
Week 4	**FCL Paper 5**	***Consolidation, revision and assessment.*** *FLC Paper 5: Physics 2A: Electricity and Magnets*		
Week 5	**Hormones / menstrual cycle**	**Key knowledge taught:** 2B.1 Recall that hormones are: a) chemical messengers b) produced in endocrine glands c) transported in the blood 2B.2 Recall the hormones produced in the following endocrine glands: a) ovaries (oestrogen and progesterone) b) testes (testosterone) c) pancreas (insulin) 2B.3 Describe the stages of the menstrual cycle, including the roles of the hormones, oestrogen and progesterone, in the control of the menstrual cycle 2B.4 Recall that contraceptives are used to prevent pregnancy 2B.5 Recall that the (female) contraceptive pill: a) contains hormones (progesterone and oestrogen) b) affects the menstrual cycle by preventing ovulation 2B.6 Describe the use of (male) condoms as: a) a barrier method of contraception b) a method that can prevent the spread of STIs (sexually transmitted infections)	Hormones Endocrine Glands Ovaries Oestrogen Progesterone Testes Testosterone Pancreas Insulin Menstrual Cycle Contraceptives STI – Sexually Transmitted Infections	FLC - 2B - Paper 2 Biology
Week 1	**diabetes**	**Key knowledge taught:** 2B.7 Recall that organisms maintain a constant internal environment in response to internal and external change, including: a) body temperature	Blood Sugar Level Type 1 Diabetes Type 2 Diabetes Aerobic Respiration	FLC - 2B - Paper 2 Biology

		b) water c) blood sugar level 2B.8 Recall that insulin is a hormone that has a role in controlling blood sugar levels 2B.9 Describe type 1 diabetes as a condition that: a) is caused because cells in the pancreas that produce insulin do not function b) is controlled by insulin injections 2B.10 Describe type 2 diabetes as a condition that: a) is often caused because the body does not respond to the insulin produced b) is linked to factors such as diet and obesity c) can be controlled by maintaining a low-sugar diet and taking exercise d) has a number of side-effects, such as blindness 2B.20 Describe respiration as a reaction that occurs continuously in living cells to release energy 2B.21 Recall aerobic respiration as the process where glucose and oxygen react to produce carbon dioxide and water, and release energy **Practical ideas:** ● Investigate the rate of respiration in living organisms (link to CS 8.11).		
Week 2	**enzymes**	**Key knowledge taught:** 2B.11 Recall that enzymes are biological molecules that help the body break down: a carbohydrates into a) simple sugars b) proteins to amino acids 2B.12 Describe the mechanism of enzyme action, including: a) the active site b) enzymes being specific for a particular reaction 2B.13 Describe the effects of temperature on enzyme activity 2B.14 Recall that enzymes can be denatured at high temperatures because of changes in the shape of the active site **Practical ideas:** ● Investigate the effect of pH on enzyme activity (link to CS 1.10).	Enzymes Biological Molecules Amino Acids Denatured Active Site Temperature	FLC - 2B - Paper 2 Biology
Week 3		**Key knowledge taught:** 2B.15 Describe the need to transport substances into and out of a range of organisms, including oxygen, carbon dioxide, water, dissolved food molecules	Organisms Alveoli Diffusion Capillaries	FLC - 2B - Paper 2 Biology

		2B.16 Describe how alveoli are adapted for gas exchange by diffusion between air in the lungs and blood in capillaries 2B.17 Describe how the components of the blood are related to their function: a) red blood cells, for carrying oxygen to muscles b) white blood cells, for immunity to infections c) plasma, for transporting dissolved substances d) platelets, for helping the process of blood clotting	Red Blood Cells White Blood Cells Plasma Platelets	
Week 4	**Blood vessels and the heart**	**Key knowledge taught:** 2B.18 Describe how the structure of the blood vessels is related to their function, including: a) arteries, with thick muscular walls for carrying blood away from the heart under high pressure b) veins, with large diameter to allow flow of blood back to heart, and valves to prevent backflow c)capillaries, with thin walls to allow exchange of materials with cells 2B.19 Describe how the structure of the heart is related to its function, including: a) aorta, to carry oxygenated blood away from the heart into the body b) vena cava, to carry deoxygenated blood from the body back to the heart c) pulmonary artery and vein, to carry blood to and from the lungs d) heart valves, to prevent blood flowing the wrong way round the heart **Practical ideas:** • **Heart dissection**	Arteries Veins Heart Valves Aorta Vena Cava Pulmonary Artery Pulmonary Vein	FLC - 2B - Paper 2 Biology
Week 5	**Science Week**			
Week 6	**FLC – Paper 2 - Biology**	***Consolidation, revision and assessment.*** *FLC Paper 2: Biology 2B: Human Biology*		
Week 1	**Fuels**	**Key knowledge taught:** 2B.1 Recall that hydrocarbons are compounds that contain carbon and hydrogen only	Hydrocarbons Petrochemical Industry	FLC - 2B - Paper 4 Chemistry

		2B.2 Describe crude oil as: a) a complex mixture of hydrocarbons b) an important source of useful substances (fuels and feedstock for the petrochemical industry) c) a finite resource 2B.3 Describe the separation of crude oil into fractions by the process of fractional distillation 2B.4 Recall the names and uses of the following fractions: a) gases, used in domestic heating and cooking b) petrol, used as fuel for cars c) kerosene, used as fuel for aircraft d) diesel oil, used as fuel for some cars and trains e) fuel oil, used as fuel for large ships and in some power stations f) bitumen, used to surface roads and roofs **Practical ideas:** • **Use molymods to build hydrocarbons** • Demo distillation – to help build understanding of fractional distillation	Finite Fractional Distillation Kerosene Bitumen Crude oil Kerosine Bitumen	
Week 2	**Complete combustion**	**Key knowledge taught:** 2B.5 Describe the complete combustion of hydrocarbon fuels as a reaction in which: a) carbon dioxide and water are produced b) energy is given out 2B.6 Recall that the incomplete combustion of hydrocarbon fuels can produce carbon and carbon monoxide **Practical ideas:** • Compare the efficiency of different fuels (spirit burner to measure temperature change over time)	Combustion Carbon Monoxide Water Complete Incomplete	FLC - 2B - Paper 4 Chemistry

Week 3	**Acid rain**	**Key knowledge taught:** 2B.7 Recall that carbon monoxide is a toxic gas 2B.8 Describe the problems caused by incomplete combustion, producing carbon monoxide and soot in appliances that use carbon compounds as fuels 2B.9 Describe how impurities in some hydrocarbon fuels result in the production of sulfur dioxide 2B.10 Describe some problems associated with acid rain, caused when sulfur dioxide dissolves in rainwater **Practical ideas:** • Test the pH of rain water	Toxic Impurities Sulfur Dioxide Acid Rain	FLC - 2B - Paper 4 Chemistry
Week 4		**Key knowledge taught:** 2B.11 Recall that when fuels are burned in engines, oxygen and nitrogen can react together at high temperatures to produce oxides of nitrogen, which are pollutants 2B.12 Describe the advantages and disadvantages of using hydrogen, rather than petrol, as a fuel in cars 2B.13 Recall that petrol, kerosene and diesel oil are non-renewable fossil fuels obtained from crude oil and methane is a non-renewable fossil fuel found in natural gas 2B.14 Describe how cracking involves the breaking down of larger hydrocarbon molecules into smaller, more useful ones. 2B.15 Explain why cracking is necessary **Practical ideas:** • Model cracking using molymods	Oxygen Nitrogen Pollutants Non-renewable Fossil Fuels Natural Gas Cracking	FLC - 2B - Paper 4 Chemistry
Week 5	**atmosphere**	**Key knowledge taught:** 2B.16 Recall that the gases produced by volcanic activity formed the Earth's early atmosphere 2B.17 Describe that the Earth's early atmosphere was thought to contain: a) little or no oxygen b) a large amount of carbon dioxide c) water vapour	Volcanic Activity Atmosphere Water Vapour Condensation Photosynthesis	FLC - 2B - Paper 4 Chemistry

		d) small amounts of other gases and interpret evidence relating to this 2B.18 Recall how condensation of water vapour formed oceans 2B.19 Recall how the amount of carbon dioxide in the atmosphere was decreased when carbon dioxide dissolved as the oceans formed 2B.20 Describe how the amount of oxygen in the early atmosphere gradually increased, as a result of photosynthesis by primitive plants 2B.21 Describe the chemical test for oxygen **Practical ideas:** • Test for oxygen		
Week 6	**Atmosphere**	**Key knowledge taught:** 2B.22 Describe how various gases in the atmosphere, including carbon dioxide, methane and water vapour, absorb heat radiated from the Earth, subsequently releasing energy that keeps the Earth warm: this is known as the greenhouse effect 2B.23 Describe the potential effects on the climate of increased levels of carbon dioxide and methane generated by human activity, including burning fossil fuels and livestock farming 2B.24 Evaluate the evidence for and against human activity causing climate change	Greenhouse Effect Climate Fossil Fuels Climate Change	FLC - 2B - Paper 4 Chemistry
Week 7	**FLC paper 4**	***Consolidation, revision and assessment.*** *FLC Paper 4: Chemistry 2B: Chemistry in our world: Fuels and the Earth's atmosphere*		
Week 1	**Work and energy**	**Key knowledge taught:** 2B.1 Describe how energy can be transferred, including: a) when forces do work b) when electrical equipment is switched on c) when an object is heated 2B.2 Be able to use: work done = force × distance 2B.3 Recall that when work is done there is always some energy transferred which is not useful	Forces Work Done = Force x Distance Frictional Forces Work Done = Power x Time Taken Energy Efficiency	FLC - 2B - Paper 6 Physics

		2B.4 Recall that when a force does some work the object and therefore the surroundings become hotter, due to frictional forces 2B.5 Be able to use: work done = power x time taken 2B.6 Be able to use: energy efficiency equation **Practical ideas:** • Calculate work done moving weights (force x distance)		
Week 2	**States of matter**	**Key knowledge taught:** 2B.7 Recall that matter exists in one of three states: solids, liquids or gases 2B.8 Describe the structure of a solid: a) particles are closely packed in a regular arrangement b) particles vibrate about a fixed position 2B.9 Describe the structure of a liquid: a) particles are closely packed in a random arrangement b) particles can move through the liquid c) particles can move over each other 2B.10 Describe the structure of a gas: a) particles are far apart b) particles move randomly in all directions **Practical ideas:** • Phet states of matter simulation (iPads)	Solids Liquids Gases Particles Structure	FLC - 2B - Paper 6 Physics
Week 3		**Key knowledge taught:** 2B.11 Be able to use: density = mass/volume 2B.12 Recall that generally the density of a solid is greater than that of a liquid and the density of a liquid is greater than that of a gas 2B.13 Recall that: a) a solid melts to form a liquid, which boils to form a gas b) a gas condenses to form a liquid, which freezes to form a solid 2B.14 Recall that the changes of state are reversible and are physical, not chemical, changes 2B.15 Recall that in order to change state, a material must be heated or cooled 2B.16 Recall that if you give the same amount of thermal energy to the same mass of different materials, some will get hotter than others **Practical ideas:** • **Calculate the density of regular solids, irregular solids and liquids**	Density = Mass/Volume Density Changes of State Melts Boils Condenses Freezes Physical Changes	FLC - 2B - Paper 6 Physics
Week 4		**Key knowledge taught:** 2B.17 Explain how a gas exerts a pressure on the sides of a container because the particles collide with the sides of a container	Gas Collide	FLC - 2B - Paper 6 Physics

		2B.18 Describe how, when a gas is heated: a) its particles move faster and hit the walls of the container more often b) this increases the pressure of the gas **Practical ideas:** • Phet simulation of gas pressure (iPads)		
Week 5	**stretching**	**Key knowledge taught:** 2B.19 Recall that some materials stretch when a force is applied to them 2B.20 Recall that the increase in length when a material stretches is called extension 2B.21 Describe that springs return to their original length when they are stretched and released, and that this is called elastic stretching 2B.22 Describe that plastic loops do not return to their original length when they are stretched and released, and this is called inelastic stretching **Practical ideas:** • Investigate how the length changes when you add weights to a spring and a plastic loop (such as loop of plastic bag) (link to CS 15.6).	Force Extension Elastic Stretching Inelastic Stretching	FLC - 2B - Paper 6 Physics
Week 6	**FLC – Paper 6**	***Consolidation, revision and assessment.*** *FLC Paper 6: Physics 2B: Energy and Particles*		
Week 7	Review any topics needed Practical skills workbook			