Science Department - Year 9 Scheme of Work

National Curriculum/ AAA links:
https://www.gov.uk/government/publications/national-curriculum-in-england-science-programmes-of-study
Combined Science Syllabus
https://qualifications.pearson.com/content/dam/pdf/GCSE/Science/2016/Specification/GCSE_CombinedScience_Spec.pdf

Term	Title	Unit content	Key vocabulary	Resource links:
AUTUMN 1 (7 weeks)				
ELC – Paper 1A - Cells, genetics, inheritance and modification				
Week 1	**Eukaryotic cells / Prokaryotic cells**	**Key knowledge taught:** **(also look at combined science syllabus – page 13- 1.1,1.2,1.3, 1.4, 1.5,1.6,)** 1A.1 Describe the functions of the: a) nucleus b) cell membrane C) cytoplasm in animal cells 1A.2 Describe the functions of the: a) nucleus b) cell membrane c) cytoplasm d) chloroplast in plant cells 1A.3 Describe how growth takes place in organisms by: a cell division in animals and plants b cell elongation in plants 1A.4 Describe the importance of cell differentiation in the development of specialised cells 1A.5 Describe how the following specialised cells are adapted to their function: a) sperm cells b) egg cells c) nerve cells d muscle cells **Practical ideas:** • **Prepare onion cells** • **Investigate animal and plant cells using a light microscope**	Nucleus Cell membrane Cytoplasm Chloroplast Cell division Cell elongation Cell differentiation Specialised cells	ELC - 1A - Paper 1 Biology
Week 2	**Nerve Cells /reflex arc**	**Key knowledge taught:** 1A.7 Recall the functions of the following nerve cells: a sensory neurones b relay neurones in the spinal cord c motor neurones 1A.8 Describe the role of neurotransmitters in allowing an impulse to cross a synapse 1A.9 Recall the function of the myelin sheath to insulate neurones A.10 Describe the processes involved in a reflex arc, including: a receptor cells detecting a stimulus b the path taken by the impulse through sensory, relay and motor neurones c the impulse arriving at the effector	Nerve cells Sensory neurones Relay neurones Motor neurones Myelin sheath Reflex arc	ELC - 1A - Paper 1 Biology

		Practical ideas: • Reaction time practical		
Week 3	**DNA / Inheritance**	**Key knowledge taught:** **(also look at combined science syllabus –** **(page 17 3.3,3.4,3.5,3.6, 3.12,3,13,3.14,3.15,3.16,3.16,3.19,3.20,3.21, 3.22, 3.23)** 1A.11 Recall the structure of DNA as: a two strands b coiled to form a double helix 1A.12 Recall that: a DNA is found in a) cell's nucleus, packaged into chromosomes b) each chromosome contains several genes c) a gene is a section of a DNA molecule d) a gene contains the information needed to make a protein 1A.13 Define the terms allele, dominant and recessive 1A.14 Use genetic diagrams and Punnett squares to show monohybrid inheritance 1A.15 Recall that a person's sex is determined at fertilisation by the inheritance of an X chromosome from the mother, and either: a) an X chromosome (in girls) or b) a Y chromosome (in boys) from the father **Practical ideas:** • Build a model of DNA	DNA Cell nucleus Chromosomes Genes Allele Dominant Recessive Monohybrid inheritance Fertilisation	ELC - 1A - Paper 1 Biology
Week 4	**Natural selection**	**Key knowledge taught:** **(also look at combined science syllabus – page 19- 4.2,4.3,4.4,4.5,4.7,4.8,4.10,4.11,4.14)** 1A.16 Recall that differences in characteristics within organisms in a species is called variation 1A.17 Describe genetic variation as the variation that arises because organisms inherit different combinations of alleles from their parents 1A.18 Recall that genetic variation mostly occurs because of small changes to the structure of DNA, known as a mutation	Organisms Genetic variation Mutations	ELC - 1A - Paper 1 Biology
Week 5	**Variation/national selection**	1A.19 Describe environmental variation as the variation that arises because an organism's environment makes it develop different characteristics 1A.20 Explain Darwin's theory of evolution by natural selection 1A.21 Describe the process of selective breeding, including: a) producing wheat that is resistant to disease b) producing cows with a high yield of milk **Practical ideas** • Dawrin finches – bird beak experiment	Environmental variation Natural selection Selective breeding	ELC - 1A - Paper 1 Biology

Week 6	**Genetic Variation / genetic engineering**	**Key knowledge taught:** 1A.22 Describe genetic engineering as a process that involves modifying the DNA of an organism to introduce desirable characteristics 1A.23 Describe the benefits and risks of genetic engineering **Practical ideas:** • Extract DNA from fruit	Genetic engineering.	ELC - 1A - Paper 1 Biology
Week 7	**Assessment**	***Consolidation, revision and assessment.*** *ELC Paper 1: Biology 1A: Cells, genetics, Inheritance and modification*		
Paper 3 – Chemistry 1A: **Atoms, compounds and states and matter**				
Week 8	**Atomic structure**	**Atoms, compounds and states and matter *(atomic structure, the periodic table, ionic bonding, covalent bonding, metallic bonding, states of matter)*** **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 to: a indicate the dangers associated with the contents b 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 the specification 1A.1 Describe the structure of an atom as: a a nucleus containing protons and neutrons b a nucleus surrounded by electrons arranged in shells (of the first 20 elements of the periodic table) 1A.2 Describe the nucleus of an atom as very small compared to the overall size of the atom 1A.3 Recall the relative charge and relative mass of: a a proton b a neutron c an electron 1A.4 Recall that most of the mass of an atom is concentrated in the nucleus 1A.5 Describe atoms of a given element as having the same number of protons in the nucleus and that this number is unique to that element and known as the atomic number 1A.6 Recall the meaning of the term mass number of an atom 1A.7 Recall that atoms of the same element with different numbers of neutrons are called isotopes **Practical ideas:** • Build atomic models	Elements Simple compounds Hazards Atoms Protons Neutrons Electrons Nucleus Mass number of an atom Isotopes	ELC - 1A - Paper 3 Chemistry

AUTUMN 2				
Week 1	**The periodic table**	**Key knowledge taught:** 1A.8 Describe how Mendeleev arranged the elements, known at that time, in a periodic table by using properties of these elements and their compounds 1A.9 Describe how Mendeleev used his table to predict the existence and properties of some elements not then discovered 1A.10 Describe that in the periodic table elements: a) are arranged in order of increasing atomic number, in rows called periods b) with similar properties are placed in the same vertical columns called groups 1A.11 Identify elements as metals or non-metals according to their position in the periodic table 1A.12 Describe most metals as shiny solids that have high melting points, high density and are good conductors of electricity, whereas most non-metals have low boiling points and are poor conductors 1A.13 Explain how the arrangement of electrons in an element is related to its position in the periodic table 1A.14 Recall that when elements react, their atoms join with other atoms to form compounds **Practical ideas:** • Research task on previous versions of periodic table (iPads)	Periodic table Atomic number Periods Groups Metals Non-metals Melting points Density Conductors Compounds	ELC - 1A - Paper 3 Chemistry
Week 2	**Ionic Bonding**	**Key knowledge taught:** 1A.15 Describe how ionic bonds are formed: a between a metal atom and a non-metal atom b by the transfer of electrons to produce positive and negative ions, including the use of dot-and-cross diagrams 1A.16 Describe the formation of ions in ionic compounds from their atoms, limited to compounds of elements in groups 1 and 7 1A.17 Describe the structure of an ionic compound as a giant structure of positive and negative ions 1A.18 Describe the properties of ionic compounds limited to: a) high melting points and boiling points, because energy is needed to overcome the strong forces between the ions b) solubility in water c) whether or not they conduct electricity as solids, when molten and in aqueous solution 1A.19 Describe how a covalent bond is formed when a pair of electrons is shared between two non-metal atoms	Ions Ionic bonds Electrons Molten Aqueous solution Covalent bond Simple molecules	ELC - 1A - Paper 3 Chemistry

		1A.20 Recall that covalent bonding usually results in the formation of simple molecules 1A.21 Describe the formation of simple molecular, covalent substances using dot-and-cross diagrams, including: a hydrogen b hydrogen chloride c water (double bonds are not required) 1A.22 Describe the properties of typical covalent, simple molecular compounds limited to: a low melting points and boiling points, because of weak forces between molecules (intermolecular forces) b poor conduction of electricity **Practical ideas:** • Molymods to make covalently bonded molecules		
Week 3	**Covalent / Metallic Bonding**	**Key knowledge taught:** 1A.23 Recall that covalent bonding sometimes results in the formation of giant molecules 1A.24 Describe the properties of giant covalent compounds, limited to: a high melting and boiling point b poor conduction of electricity (except graphite) c insoluble in water 1A.25 Recall that graphite and diamond are different forms of carbon and that they are examples of giant covalent substances 1A.26 Describe the uses of graphite in electrodes or as a lubricant, and diamond in cutting tools, and relate them to their properties 1A.27 Describe, using poly(ethene) as the example, that simple polymers consist of large molecules containing chains of carbon atoms 1A.28 Describe the properties of metals, including: a) the ability to conduct electricity, because of free moving electrons b) malleability, because layers of metal atoms can slide over each other **Practical ideas:** • Use molymods to make monomers and polymers • Making nylon	Giant molecules Giant covalent compounds Graphite Diamond Poly(ethene)	ELC - 1A - Paper 3 Chemistry
Week 4	**States of Matter**	**Key knowledge taught:** 1A.29 Describe the arrangement and movement of particles in each of the three states of matter: solid, liquid and gas 1A.30 Recall the names used for the interconversions between the three states of matter 1A.31 Describe the changes in arrangement and movement of particles during these interconversions	Solid Liquid Gas Interconversions	ELC - 1A - Paper 3 Chemistry

		1A.32 Recognise that these interconversions are physical changes, unlike chemical reactions that result in chemical changes **Practical ideas:** • Phet states of matter simulation		
Week 5		***Consolidation, revision and assessment.*** *ELC Paper 3: Chemistry 1A: Atoms, compounds and states of matter*		ELC - 1A - Paper 3 Chemistry
Paper 5 – Physics 1A: Forces, Movement and energy				
Week 6		**Paper 5 - Forces, Movement and energy** **Key knowledge taught:** 1A.1 Recall that all forces have size and direction, including friction which acts in the opposite direction to a moving object 1A.2 Be able to use: speed = 1A.3 Be able to relate speed to the steepness of the gradient on a distance-time graph 1A.4 Recall that large acceleration means large speed changes or small times or both 1A.5 Be able to use: time taken change in speed 1A.6 Be able to relate acceleration to the steepness of the gradient on a speed-time graph 1A.7 Be able to relate the distance travelled to the area under a speed-time graph 1A.8 Understand relative speeds for everyday contexts such as walking, running, cycling, for a car, for a train, for an airplane and the speed of sound **Practical ideas:** • Be able to measure speed in a laboratory and in everyday situations (links to CS 2.19). • Measure the speed of sound in air by direct methods	Forces Friction Speed Acceleration	ELC - 1A - Paper 5 Physics
Week 7	**Forces**	**Key knowledge taught:** 1A.9 Recall that (unbalanced) forces cause a change of: a) position b) speed c) shape 1A.10 Recall that the forces acting on an object are balanced or zero when the object: a) is not moving b) moves at constant speed 1A.11 Recall that forces cause objects to speed up or slow down 1A.12 Be able to use: weight of an object in Newton (N) = its mass in kilogram (kg) × 10 1A.13 Be able to use: the stopping distance of a vehicle = the thinking distance + the braking distance	Forces Newton Mass	ELC - 1A - Paper 5 Physics

		1A.14 Recall that the stopping distance of a vehicle is changed by the: a mass of the vehicle b speed of the vehicle c driver's reaction time d condition of the vehicle's brakes and tyres e state of the road 1A.15 Recall that a driver's reaction time is increased when using drugs (medicines and alcohol) or when being distracted **Practical ideas:** • Measure student reaction times, compared to when distracted (e.g watching a video)		
SPRING 1				
Week 1	**Energy**	**Key knowledge taught:** 1A.16 Be able to use: a simple Sankey diagrams b energy transfer diagrams 1A.17 Recall that energy cannot be created or destroyed 1A.18 Understand that energy can be transferred from one form to another, including when: a a vehicle slows down b water is heated by an electric kettle c a moving object hits another object 1A.23 Be able to use: 100 useful energy output efficiency = total energy input %	Sankey diagrams Energy	ELC - 1A - Paper 5 Physics
Week 2	**Wasted energy**	**Key knowledge taught:** 1A.19 Understand that energy can be wasted or lost to the surroundings when an object: a gets hot b has a resistance force acting on it 1A.20 Recall that energy lost to the surroundings is not useful energy 1A.21 Understand that every time energy is transferred, some energy is always lost to the surroundings 1A.22 Describe how to reduce unwanted energy transfers, including using lubrication or thermal insulation	Resistance force Energy transfer Lubrication Thermal insulation	ELC - 1A - Paper 5 Physics
Week 3	**Energy sources**	**Key knowledge taught:** 1A.24 Describe the main energy sources that we can use on Earth, including: a fossil fuels b nuclear fuel c biofuel d wind e hydroelectric f the tides g the Sun 1A.25 Classify sources of energy as either renewable or non-renewable 1A.26 Explain why both renewable and non-renewable sources are used **Practical ideas:** • Build wind turbines and test solar panels • Research task comparing renewable and non-renewable energy sources	Fossil fuels Nuclear fuels Biofuel Hydroelectric Tides Renewable Non-renewable	ELC - 1A - Paper 5 Physics

Week 4	**ELC – Paper 5**	***Consolidation, revision and assessment.*** *ELC Paper 5: Physics 1A: Force, movement and energy (1 week)*		ELC - 1A - Paper 5 Physics
Paper 2: Biology 1A: Health, disease and the development of medicines				
Week 5	**Communicable and non-communicable diseases**	**Health, disease and the development of medicines** **Key knowledge taught:** 1B.1 Describe the difference between communicable and non-communicable diseases 1B.2 Describe a pathogen as a disease-causing organism 1B.3 Recall that pathogens can be bacteria, fungi, protists or viruses 1B.4 Describe bacteria as single-cell organisms, with a: a circular chromosome of DNA, instead of a nucleus b flagellum, for movement 1B.5 Describe fungi as organisms that: a may be single-celled (yeast) or multi-cellular (mushrooms) b digest food outside the organism and then absorb it 1B.6 Describe viruses as non-living particles that: a contain genetic material b can only reproduce inside living cells **Practical ideas:** * show spread of pathogens with luminous powder and UV light	Communicable diseases Non-communicable diseases Pathogen Bacteria Fungi Protists Viruses	ELC - 1B - Paper 2 Biology
SPRING 2				
Week 1	**pathogens**	**Key knowledge taught:** 1B.7 Describe some common infections, including: a cholera (bacteria) – causes diarrhoea b tinea (fungus) – causes athlete's foot c malaria (protist) – causes damage to blood and liver d influenza (virus) – causes fever and cold-like 'flu' symptoms 1B.8 Describe how pathogens are spread, including: a cholera (bacteria) – water b tinea (fungus) – direct contact, or through contaminated surfaces c malaria (protists) – mosquito vector d influenza (virus) – airborne 1B.9 Describe methods for reducing or preventing the spread of pathogens, including: a simple hygiene, such as washing hands b treatment of water c control of vectors **Practical ideas:** • Research task on ways to reduce the spread of disease, could be used to make a poster about the importance of washing hands regularly	Infections Chlora Tinea Protist Influenza Pathogens	ELC - 1B - Paper 2 Biology
Week 2	**STI**	**Key knowledge taught:** 1B.10 Describe how sexually transmitted infections (STIs) are spread through sexual contact, including: a Chlamydia (bacteria) b HIV (virus)	Sexually transmitted infections	ELC - 1B - Paper 2 Biology

		1B.11 Describe how STIs can be reduced or prevented by: a avoiding unprotected sexual activity b regular testing for infections 1B.12 Describe how physical barriers of the human body provide protection from pathogens, including the skin (preventing pathogens entering the body) and mucus (trapping pathogens) 1B.13 Describe how chemical defences of the human body provide protection from pathogens, including hydrochloric acid (in the stomach) and lysozymes (in tears, preventing infections through the eye) 1B.14 Describe the role of the immune system of the human body in defence against disease, including the role of: a white blood cells that ingest pathogens b white blood cells that produce antibodies c memory white blood cells in preventing reinfection 1B.15 Recall that antibiotics can only be used to treat bacterial infections 1B.16 Describe how the process of developing new medicines has many stages, including: a discovery and development b preclinical and clinical testing	Chlamydia HIV Hydrochloric acid Lysozymes White blood cells Antibiotics	
Week 3	**Non-communicable le diseases**	**Key knowledge taught:** 1B.17 Recall that many non-communicable human diseases, such as cancer, are caused by the interaction of a number of factors, such as diet, lifestyle and genetics 1B.18 Describe cancer as the result of changes in cells that lead to uncontrolled cell division 1B.19 Describe the effect of exercise and diet on obesity 1B.20 Describe the use of BMI (body mass index) as a measure of obesity and perform simple BMI calculations **Practical ideas:** • Calculate BMI	Cancer Cell division Obesity Body mass index	ELC - 1B - Paper 2 Biology
Week 4	**Lifestyle (2)**	**Key knowledge taught:** 1B.21 Describe the harmful effects of smoking on the: a lungs, leading to lung cancer b heart and circulatory system, leading to cardiovascular diseases 1B.22 Recall that cardiovascular disease can be treated by: a life-long medication b surgical procedures c lifestyle changes	Cardiovascular disease	ELC - 1B - Paper 2 Biology
Week 5 – SCIENCE				
Week 6		***Consolidation, revision and assessment.*** *ELC Paper 2: Biology 1B: Health, disease and the development of medicines* *(1 week)*		ELC - 1B - Paper 2 Biology
SUMMER 1				

Paper 4: Chemistry 1B: Separating mixtures, breaking down substances, acids and metals				
Week 1	**Methods of separating and purifying substances**	**Separating mixtures, breaking down substances, acids and metals** **Key knowledge taught:** 1B.1 Recall that a mixture contains two or more substances that are not chemically combined 1B.2 Describe the experimental techniques for separation of mixtures by: a simple distillation b fractional distillation c filtration d crystallisation e paper chromatography 1B.3 Describe an appropriate experimental technique to separate a mixture, knowing the properties of the components of the mixture 1B.4 Interpret a paper chromatogram to: a distinguish between pure and impure substances b identify substances by comparison with known substances 1B.5 Describe how waste and ground water can be made drinkable, including the need for sedimentation, filtration and chlorination **Practical ideas:** • Chromatography • Demo distillation • Making copper sulfate crystals	Mixture Simple distillation Fractional distillation Filtration Crystallisation Paper Chromatography	ELC - 1B - Paper 4 Chemistry
Week 2	Breaking down ionic compounds	**Key knowledge taught:** 1B.6 Describe electrolysis as a process in which electricity decomposes ionic compounds in the molten state or dissolved in water 1B.7 Recall the formation of the products in the electrolysis, using inert electrodes, of some electrolytes, including: a copper chloride solution b water acidified with sulfuric acid c molten lead bromide (demonstration) 1B.8 Predict the products of electrolysis of other binary, ionic compounds in the molten state **Practical ideas:** • Investigate the composition of inks using simple distillation and paper chromatography (links to CS 2.11). ● Investigate the electrolysis of copper sulfate solution (links to 3.31)	Electrolysis Molten Dissolved Electrolytes	ELC - 1B - Paper 4 Chemistry
Week 3	**Acid**	**Key knowledge taught:** 1B.9 Recall that a neutral solution has a pH of 7, acidic solutions have lower pH values and alkaline solutions higher pH values	Acid Alkali Neutralise Indicator	ELC - 1B - Paper 4 Chemistry

		1B.10 Recall the effect of acids and alkalis on indicators, including litmus, pH indicator pap er/universal indicator solution 1B.11 Recall that acids are neutralised by: a metals b metal oxides c metal carbonates to produce salts 1B.12 Recall that: a hydrochloric acid produces chloride salts b nitric acid produces nitrate salts c sulfuric acid produces sulfate salts 1B.13 Describe the chemical test for: a hydrogen b carbon dioxide (using limewater) 1B.14 Describe the process of preparing a soluble salt from an acid and an insoluble reactant, including: a excess of the reactant is added b the excess reactant is removed c the solution remaining is only salt and water d the salt is obtained by evaporation/crystallisation **Practical ideas:** • Measure the pH of everyday substances and common laboratory reagents using pH indicator paper/universal indicator (links to CS 3.6). • Carry out tests for hydrogen and carbon dioxide.	Carbonate Reactant Product	
Week 4 and 5	**Metals**	**Key knowledge taught:** 1B.15 Deduce the relative reactivity of some metals by their reactions with water, acids and salt solutions 1B.16 Recall that: a most metals are extracted from ores found in the Earth's crust b unreactive metals are found in the Earth's crust as the uncombined elements 1B.17 Explain why the method used to extract a metal from its ore is related to its position in the reactivity series and the cost of the extraction process, illustrated by: a heating with carbon (including iron) b electrolysis (including aluminium) (knowledge of the blast furnace and the aluminium electrolysis cell are not required) 1B.18 Describe the uses of metals in relation to their properties, including: a) aluminium b) copper c) gold d) steel 1B.19 Describe the advantages of recycling metals, including economic implications and how recycling can preserve both the environment and the supply of valuable raw materials **Practical ideas** * organise metals by reactivity by using their reactions in water and acid	Reactivity Reactivity series Recycling Electrolysis Extracted Blast furace	ELC - 1B - Paper 4 Chemistry
Week 6		***Consolidation, revision and assessment.*** *ELC Paper 4: Chemistry 1B: Separating mixtures, breakdown substances, acids and metals.* *(1 week)*		ELC - 1B - Paper 4 Chemistry

SUMMER 2				
Paper 6: Physics 1B: *Waves and radiation*				
Week 1	**waves**	***Waves and radiation*** **Key knowledge taught:** 1B.1 Recall that waves transfer energy and information 1B.2 Describe a wave using the terms: a) frequency b) wavelength c) amplitude d wave speed 1B.3 Be able to use: wave speed = frequency × wavelength 1B.4 Recall that waves change direction and speed at a boundary (refraction) **Practical ideas:** * phet light simulation to show refraction and how wave speed is effected	Transverse wave Amplitude Wavelength Frequency	ELC - 1B - Paper 6 Physics
Week 2	Electromagnetic spectrum	**Key knowledge taught:** 1B.5 Recall that electromagnetic waves travel at the same speed in a vacuum 1B.6 Recall the order of electromagnetic spectrum: radio waves, microwaves, infrared, visible, ultraviolet, x-rays and gamma rays 1B.7 Describe the pattern in the frequency, wavelength and energy of waves in electromagnetic spectrum: radio waves (long wavelength, low frequency, low energy) to gamma rays (very short wavelength, very high frequency, very high energy) 1B.8 Recall that electromagnetic waves travel more slowly in some materials than in others 1B.9 Describe the harmful effects on people of excessive exposure to electromagnetic radiation, including: a microwaves – internal heating of body cells b infrared – skin burns c ultraviolet – damage to surface cells and eyes, leading to skin cancer and eye conditions d x-rays and gamma rays – mutation or damage to cells in the body 1B.10 Describe some uses of electromagnetic radiation a radio waves – broadcasting, communications and satellite transmissions b microwaves – cooking, communications and satellite transmissions c infrared – cooking, thermal imaging and television remote controls d visible light – vision, photography and illumination e ultraviolet – security marking (detecting forged bank notes), fluorescent lamps and disinfecting water f x-rays – observing the internal structure of objects, airport security scanners and medical x-rays g gamma rays – sterilising food and medical equipment, and the detection of cancer and its treatment **Practical ideas:** • Investigate refraction in glass blocks in terms of the interaction of electromagnetic waves with matter (links to CS 5.9).	Vacuum Electromagnetic spectrum Frequency Gamma UV Radio Microwave Visible Satellite Ionising sterlising	ELC - 1B - Paper 6 Physics

Week 3	**Atoms**	**Key knowledge taught:** 1B.11 Describe the structure of an atom as: a a positively charged nucleus made up of protons and neutrons b negatively charged electrons surrounding the nucleus c most of the mass in the nucleus 1B.12 Understand that atoms of each element have the same number of protons in their nuclei 1B.13 Recall that each element has a different number of protons in the nuclei of its atoms and that this is called the atomic number 1B.14 Recall that atoms of the same element, with different numbers of neutrons, are called isotopes 1B.15 Recall that the total number of protons and neutrons in an atom is called the atomic mass 1B.16 Recall that: a protons have a mass of 1 and a charge of +1 b neutrons have a mass of 1 and no charge c electrons have a charge of −1 1B.17 Recall that in an atom the number of protons equals the number of electrons and so the atom has no overall charge (is neutral)	Proton Neutron Electron Nucleus Isotope Charge	ELC - 1B - Paper 6 Physics
Week 4	**Radiation**	**Key knowledge taught:** 1B.18 Recall that when an unstable atom decays it emits an alpha particle, a beta particle or gamma rays and this is called radioactive decay 1B.19 Recall that radioactive decay is random 1B.20 Recall that when: a an alpha particle is emitted from a nucleus, the atom has become a different element b a beta particle is emitted from a nucleus, the atom has become a different element c a gamma ray is emitted from a nucleus, the atom stays the same element 1B.21 Recall that the number of radioactive decays in a second is called the activity of a radioactive source **Practical ideas:** • Simulation of radioactive decay of different sources (link to CS 10.17).	Alpha Beta Gamma Radioactive decay	ELC - 1B - Paper 6 Physics
Week 5		**Key knowledge taught:** 1B.22 Describe how the activity of a radioactive source decreases with time 1B.23 Describe how the activity of a radioactive source can be shown on a graph that never gets to zero 1B.24 Understand that the half-life of a radioactive isotope is the time it takes for the activity to halve 1B.25 Recall that radioactive isotopes can cause cells in the body to: a be damaged b die c mutate 1B.26 Describe methods to minimise the exposure to radioactive isotopes, including: a no direct contact b increased distance from source c reduced time of exposure	Half-life Isotope Source Activity Irradiation Contamination	ELC - 1B - Paper 6 Physics

		1B.27 Recall that irradiation is when alpha, beta or gamma radiation passes through an object, and contamination is when an object becomes in contact with a radioactive source **Practical ideas:** • Model half life using dice / skittles		
Week 6		***Consolidation, revision and assessment.*** *ELC Paper 6: 1B: Physics 1B – Waves and Radiation*		ELC - 1B - Paper 6 Physics
Week 7		**Key knowledge taught:** Review assessment and reteach where needed		