The Ellesmere Port C of E College

Science (Combined)

Part of the Frank Field Education Trust

KS4 Curriculum Plan 2024-2025

Year 10

	LP1	LP2	LP3	LP4	LP5
TOPIC	***Atomic structure and the periodic table Cell structure and transport, Cell division Energy***	***Bonding and structure Organisation in plants and animals, The digestive system Electricity***	***Chemical calculations Communicable diseases, preventing and treating diseases Electricity in the home***	***Chemical changes and electrolysis Non-communicable, diseases, photosynthesis Molecules and matter***	***Energy changes Respiration Radioactivity***
Knowledge	Ions, Isotopes, Size of atoms, Atomic theory, Explaining trends in periodic table groups, Displacement reactions of the halogens. The microscope, how to use and comparison between the light and electron microscope. The structure of animal cells and the function the organelles. The structure of plant cells and the function of the organelles. Description of structure and function of specialised cells. Describe and explain the transport mechanisms between cells. Energy stores and transfers. Conservation of energy. Specific Heat Capacity. Conduction. Convection. Kinetic, gravitational potential, elastic potential energy and work done. Calculating efficiency. Renewable and non-renewable energy resources.	Ionic bonding, properties of ionic compounds, covalent bonding, properties of simple covalent substances, polymers, properties of giant covalent substances, metallic bonding, alloys, properties of metallic substances, allotropes of Carbon. Describe the organisation of living things. Describe the role of the human digestive system in maintaining life. Describe the organs and functions of these organs in the alimentary canal. Describe the accessory organs and functions of these organs. Describe how the digestive system is adapted for exchanging materials. Circuit symbols and circuit diagrams. Current as the rate of flow of charge. Using the equation Q=It. Current and potential difference in series and parallel circuits. Resistance. Calculating resistance using V=IR. Resistors in series and parallel. IV graphs for resistors, lamps and diodes. Behaviour of thermistors and LDRs.	Formula Mass, Moles, Avogadro's constant, balancing equations using masses, using balanced equations to find masses, limiting reactants, concentration. To understand how communicable disease can spread and the defence mechanisms the body has to reduce this. Understand that disease can be caused by bacteria, viruses, fungi or protists and the differences, symptoms and examples of each of these diseases. To understand that plants can also get diseases and some common ones and the problems they cause for the plant. A.c. and d.c. circuits. Mains electricity, wiring a plug and electrical safety. Use of equations P=IV, P=I^2R, E=QV and E=Pt. The National Grid.	Oxidation and reduction, OILRIG, Acid reactions with: metals, metal oxides, alkalis and carbonates. Strong and weak acids, pH and H+ ion concentration, electrolysis, electrolysing molten ionic compounds, electrolysing aqueous ionic compounds, extracting Aluminium. To understand that lifestyle can cause some diseases and these are examples of non-communicable diseases. How smoking and drinking alcohol increases the risk of developing a non-communicable disease. How diet and exercise can lead to obesity and deficiency diseases as examples of non-communicable diseases. To understand what cancer is, risk factors, how it causes illness and how it can be treated. Describe the process of photosynthesis. Understand how leaves are adapted for photosynthesis. . Particles in solids, liquids and gases. Changes of state. Calculating density. Measuring density of regular and irregular objects. The difference between heat and temperature. Explaining changes in the energy of particles during heating and cooling. Latent heat. Kinetic theory and particles in gases.	Exothermic and endothermic reactions, Using energy transfers from reactions, reaction profiles, bond energy calculations. Understand the process of aerobic respiration in humans and microbes. The impact of aerobic respiration on the carbon cycle. The process of anaerobic in humans and the formation of oxygen debt. How the circulatory system, digestive system and respiratory system work together to ensure that respiration can take place in every cell. Structure of the atom. Mass number and atomic number. Isotopes. How the model of the atom has changed over time. Radioactive decay. Alpha, beta and gamma radiation. Decay equations. The nature of radioactive decay. Half life and activity. Contamination and irradiation. Risks of radioactivity and precautions taken.
Skills	Skills include standard form, unit conversions, rearranging equations, taking accurate measurements, determining gradients, sketching graphs, and interpreting graphs. It also covers experimental techniques, such as graph drawing, analysis of data, and making ethical, social, and economic judgments. Skills also covers the structure of living things, food passage, enzymes, and investigative techniques. It also discusses the importance of good hygiene, aseptic technique, and the use of discrete data in experiments. Chemistry skills include the importance of using qualitative and quantitative data to draw conclusions, as well as the use of ionic formulae, separating mixtures, and understanding the limitations of scientific models. It also covers the use of ionic half equations, making salts, neutralisation titration, electrolysing aqueous solutions, investigating temperature changes, and interpreting reaction profiles.				
Key Vocab	Atom, electron, proton, neutron, nucleus, shells, Dalton, Rutherford, Thompson, Bohr, Chadwick, isotopes, ions, ionic Organelle, ribosome, mitochondria, nucleus, cell membrane, cytoplasm, chloroplasts, vacuole, cell wall, plasmid, flagellum, slime capsule, eukaryote, prokaryote, diffusion, osmosis, active transport, Energy, joule, kinetic, potential, gravitational, elastic, efficiency, renewable, non-renewable, conservation.	Atom, molecule, ion, metal, non-metal, ionic bonding, covalent bonding, ionic lattice, simple molecular, giant molecular, properties, metal, dot-cross diagram, Organelle, cell, tissue, organ, organ system, organism, digestive system, alimentary canal, accessory organs, mouth, oesophagus, stomach, small intestine, large intestine, rectum, anus, liver, pancreas, gastric juices, bile, absorption, villi, emulsification, specificity Current, charge, potential difference, resistance, ampere, coulomb, volt, ohm, thermistor, diode, dependent.	Atomic mass, formula mass, moles, limiting reactant, percentage yield, atom economy, titration, error, concentration, displacement, ionic equation, reactivity series, acid, alkali, neutralisation. Communicable, non-communicable, pathogen, disease, aseptic technique, petri dish, agar, incubator, inoculating loop, hygiene, defence mechanisms, immune system, monoclonal antibodies, antibiotics, antitoxins Alternating, oscillation, frequency, direct, power, watts, hertz, transformer, fuse.	Oxidation, Reduction, OILRIG, Metal reactivity series, Metal oxide base, metal salt, alkali, Metal carbonate, electrolysis, electrode, anode, cathode, aqueous, molten carcinogens, lifestyle, cancer, tumour, malignant, benign, photosynthesis, chlorophyll, palisade, mesophyll, spongy, waxy cuticle, epidermis, stomata, guard cells, transpiration, gas exchange, xylem, phloem, roots, root hair cells, minerals Particles, state, density, regular, irregular, displacement, volume, mass, heat, temperature, specific heat, latent heat, kinetic, internal, potential.	Exothermic reaction, endothermic reaction, reaction profile, activation energy, bond enthalpy Respiration, glucose, oxygen, energy, mitochondria, cytoplasm, aerobic, anaerobic, lactic acid, oxygen debt, ethanol, carbon dioxide, diffusion, recovery time, fermentation. Decay, mass, atomic, radioactive, alpha, beta, gamma, nucleus, proton, neutron, electron, half-life, random,

Year 11

	LP1	LP2	LP3	LP4	LP5
TOPIC	***Rates of reaction and equilibrium Hormonal and nervous control and homeostasis in action Forces***	***Crude oil, fuels and polymers Genetics Forces & Waves***	***Chemical analysis and the Earth's atmosphere Variation and Evolution Waves & Electromagnetism***	***Earth's resources Adaptations, organising an ecosystem and biodiversity and ecosystems Electromagnetism***	
Knowledge	Factors which affect the rate of reaction Activation energy Catalysts Surface area Concentration Collision theory Reversible reactions Le Chatelier's principle Dynamic equilibrium Describe the structure of the nervous system and the location of the endocrine glands. Understand how the nervous system and endocrine system work together in automatic responses. Describe the structure and function of nerve cells and synapses. Describe the structure and function of the reflex arc. Explain the importance of and investigate reflex actions. Understand how and why blood glucose needs to be regulated in the body. The role of hormones in the body - diabetes and menstrual cycle. Vectors and scalars. Resolving forces into vertical and horizontal components. Scale diagrams. Distance-time graphs. Velocity-time graphs. Acceleration. Calculating acceleration. Newton's laws. Weight and gravity. Terminal velocity. Forces and breaking.	Formation of crude oil, hydrocarbons, alkanes, alkenes, fractional distillation, cracking, polymers. Understand that some characteristics are inherited or due to the environment. Describe the structure and function of DNA in the nucleus. Understand that the human genome has been mapped out in the HGP and discuss the advantages and disadvantages of this. Understand how DNA is composed of nucleotides with complementary base pairs forming the double helix.. Understand that some chemicals make mutations more likely although it is mostly random. Describe the process of meiosis to form gametes. Understand how genetic screening can take place and the ethical and economic considerations of these processes. Describe how genetic engineering in carried out and the advantages and disadvantages of this procedure. Momentum. Conservation of momentum. Collisions and explosions. Forces and elasticity. Hooke's Law. Wave diagrams. Wavelength, frequency and amplitude. Transverse and longitudinal waves. The wave equation.	Earths early atmosphere How the atmosphere developed Climate change Global warming Atmospheric pollutants Explain how variation arises and the importance of variation to living things. Understand how to interpret evolutionary trees and how they have developed over time. Define speciation and how it occurs as well as what a species actually is. Explain Darwin's theory of evolution by natural selection and why it was not widely accepted at the time. Use the complete fossil record of a horse to explain the evolution of this animal as well as applying evolution to the peppered moth. Understand how genetic engineering is carried out and the possible benefits and issues with genetically modified crops. Reflection, absorption and refraction. Ray diagrams. The uses and dangers of the electromagnetic spectrum.	Finite and renewable resources Potable water Waste water treatment Alternative methods of extracting metals Lifecycle assessment Reduce, reuse and recycle To know the important of communities in maintaining biodiversity Describe some factors which affect organisms in their environment. Describe feeding relationships using food webs and chains. Use pyramids of numbers and biomass to represent feeding relationships. Describe the carbon cycle and the importance of this in an environment. Explain how and why the human population has increased and some impact this has on biodiversity. Describe how human activities pollute the land and water. How a motor works (using the left hand rule). How a generator works.	
Skills	The skills in year 11 are various mathematical concepts such as gradient calculation, tangent finding, scale vector diagrams, equation rearranging, unit conversions, and ray diagrams. Also covers genetic diseases, DNA structure, protein synthesis, evolution, and ethical judgements. Practical skills include constructing graphs and pyramids, calculating population size, and calculating reaction rates. It also covers applying general formulas, drawing formulas, and interpreting data for climate change, water purity, renewable resources, and sustainability.				
Key Vocab	Rate of reaction, Temperature, Concentration, Surface area, Catalyst, Collision theory, Reversible reaction, Dynamic equilibrium, Le Chatelier's principle Homeostasis, endocrine, nervous, synapses, reflex arc, myelinated sheaf, impulse, neurotransmitter, reflex arc, stimulus, response, effector, sensory, receptor, relay, CNS, motor, gland, hormone, target cell, thermoregulation. Glucoregulation, osmoregulation, kidneys, urea, urine Vector, scalar, distance, displacement, speed, velocity, resultant, component, resolve, acceleration, gravitational field strength, acceleration, terminal, resistance, drag.	Organic molecule, Hydrocarbon, alkane, alkene, fractional distillation, cracking, polymerisation, alcohol, functional group, carboxylic acid, ester, natural polymer, condensation polyme DNA, nucleotide, complementary base pairs, codon, mutations, transcription, translation, , mitosis, meiosis, chromosomes, human genome project, cystic fibrosis, genetic engineering. Elastic, inelastic, proportionality, plastic, deformation, permanent, conservation, transverse, longitudinal, amplitude, frequency, wavelength, period.	Ion , flame test, early atmosphere, modern atmosphere, pollutant, greenhouse gas, particulates, acid rain Evolution, fittest, natural selection, artificial selection, fossil record, evidence, Darwin, la Marck, Wallace, Linneaus, Woese, Mendel, classification, kingdom, phylum, class, order, genus, species, evolutionary trees, genetic modification, selective breeding, fossils, evidence Electromagnetic, radio, microwave, infrared, visible, ultraviolet, x-ray, gamma, ionising, radiation, reflection, refraction, absorption, transmission, refraction, current,	Finite, renewable, potable water, pure water, waste water, sludge, effluent, phytomining, bioleaching, ore, lifecycle assessment Habitat, biotic, abiotic, predator, prey, trophic levels, biomass, numbers, pyramids, graphs, sustainability, human population, food security, genetic engineering, genetically modified crops, deforestation, peat bog destruction, carbon cycle, global warming, climate change, Generator, motor, transformer. induction, permanent, induced, magnetised.	