SUBJECT: BTEC Level 3 Applied Science

NESTON HIGH SCHOOL

KS5 CURRICULUM PLAN 2020-21

KS5 Knowledge and key skills

YEAR 12	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
TOPIC	**Atomic structure, Cells, Waves**	**Amount of substance, Microscopy**	**Bonding, Cell specialisation, Waves**	**Periodicity, tissues, Waves**	**Chemical reactions, tissues, Waves**	**Science investigation skills**
Knowledge	Understand the periodic table and the electronic structure of atoms. Understand the following: balanced equations, relative atomic mass, atomic number and relative molecular mass, moles, molar masses and molarities. Know that cell theory is a unifying concept stating that cells are a fundamental unit of structure, function and organisation in all living organisms. Understand the ultrastructure and function of organelles in prokaryote and eukaryotic cells Recognise cell organelles from electron micrographs and and the use of light microscopes Understand the features common to all waves and use the following terms as applied to waves: periodic time, speed, wavelength, frequency, amplitude, oscillation. Graphical representation of wave features.	Understand the quantities used in chemical reactions, mass, volume of solution, concentration, reacting quantities, percentage yields Understand the similarities and differences between plant and animal cell structure and function. Understand how to distinguish between gram-positive and gram-negative bacterial cell walls and why each type reacts differently to some antibiotics. Calculate magnification and size of cells and organelles from drawings or images. Understand the difference between the two main types of wave, transverse, longitudinal Understand concepts of displacement, coherence, path difference, phase difference, superposition as applied to diffraction gratings.	Understand ionic, covalent and metallic bonding Understand the following intermolecular forces, van der Waals, dipole-dipole and hydrogen bonding. Understand cell specialisation in terms of structure and function, to include: • palisade mesophyll cells in a leaf • sperm and egg cells in reproduction • root hair cells in plants • white blood cells • red blood cells Understand the industrial application of diffraction gratings, to include: emission spectra and identifying gases. Be able to use the wave equation: $v = f\lambda$ Understand the concept and applications of stationary waves resonance and musical instruments.	Understand the physical properties of elements, first ionisation energy, electron affinity, atomic radius, ionic radius, electronegativity, type of bonding, trends in melting point and boiling point and the physical properties of metals. Understand the structure and function of epithelial tissue and endothelial tissue Understand the principles of fibre optics: refractive index total internal reflection calculation of critical angles at a glass–air interface: Understand the applications of fibre optics in medicine to include endoscopes. Understand the applications of fibre optics in communication, to include: o analogue and digital signals: analogue-to-digital conversion, broadband.	Understand the chemical properties of elements in period 2 and 3 Understand the position of metals in the reactivity series Understand oxidation and reduction in terms of electrons including the variable oxidation states of transition metals ions Understand displacement reactions of metals/halogens Understand the structure and function of muscular tissue and nervous tissue Understand that all electromagnetic waves travel with the same speed in a vacuum. Be able to use the inverse square law in relation to the intensity of a wave Understand how the regions of the electromagnetic spectrum are grouped according to the frequency. Understand how the applications of electromagnetic waves in communications are related to frequency	Use of electrical symbols to design circuits, Battery, Ammeter, Voltmeter, Bulbs, Resistors., Diodes Use and understand the following Equations • Power = VI (voltage × current). • Power = work done time • Work done = energy supplied or transformed Consider different domestic appliances to calculate energy usage and relate fuse size to power Factors affecting the rate of diffusion • Concentration gradient. • Shape and size of molecules. • Temperature. • Distance. • Surface area. Arrangement and movement of molecules • Random movement of molecules in liquids and gases. • Diffusion takes place along a concentration gradient until dynamic equilibrium is reached.
Skills	Undertake chromatographic techniques to identify components in mixtures	Undertake titration and colorimetry to determine the concentration of solutions	Undertake calorimetry to study cooling curves	Review personal development of scientific skills for laboratory work.	Review personal development of scientific skills for laboratory work.	Planning a scientific investigation Developing a hypothesis for an investigation Selection of appropriate equipment, techniques and standard procedures
Key Vocab	**Protons, neutrons, electrons, eukaryotic, prokaryote, speed, frequency, wavelength**	**delocalised electrons, postive metal ions, cell organelles, magnification, longitudinal, transverse**	**Intermolecular forces, specialised cells , diffraction gratings**	**Ionisation energy, electronegativity, tissues, fibre optics, total internal reflection**	**Oxidation, reduction, nerve impulse, neurotransmitter, electromagnetic spectrum**	**Power, work done, diffusion, dynamic equilibrium**

YEAR 13	SUMMER 2	SUMMER 1	SPRING 2	SPRING 1	AUTUMN 2	AUTUMN 1
TOPIC		**Fuels**	**Fuels and Diseases**	**Sampling techniques and Diseases**	**Plants and Diseases**	**Enzymes in action and Diseases**
Knowledge	Revision	Units of energy Define – joules, kJ, calories (1 g by 1 oC), kilocalories, kWh. Calculate heat energy supplied by a fuel to water Calculate heat energy released from a fuel in kJ mol-1.	Fuels Petrol, paraffin, food, cooking oil, methanol, ethanol, propan-1-ol, butan-1-ol, pentan-1-ol, wax temperature. Hazards associated with fuels • Flammability. • Toxicity. • Risk of explosion. • Harmful effects of products of incomplete combustion. • Pollution from sulphur impurities Understand how the human body responds to diseases and infections	Sampling techniques Understand the importance of random sampling in collecting reliable and valid data for analysis. Select appropriate ecological sampling techniques to investigate the effect of abiotic factors on plant populations, including: transects, quadrats (open and gridded), point frames. Sampling sizes Select sample sizes for investigation with regards to practical constraints and the need to collect sufficient data to make valid conclusions Understand how infectious diseases can be treated and managed	Plants and their environment Factors that can affect plant growth and/or distribution Human effects – trampling. Soil pH and aeration. Light intensity – shaded and unshaded areas. Temperature. Presence of water – moisture and rainfall. Mineral ions Examine the transmission of infectious diseases and how this can be prevented	Enzymes in action Protein structure Peptide linkage, Active sites, Denaturation. Enzymes as biological catalysts in chemical reactions Collision theory, Formation of enzyme-substrate complex. Specificity of enzymes brought about by the need for matching of substrate and active site. Lowering of activation energy. Changing substrate concentration changes the rate at which substrate molecules will join active sites. Importance of measuring initial rates of reaction. Factors that can affect enzyme activity, Temperature, pH, Substrate and enzyme concentration Investigate different types of diseases and infections that can affect humans
Skills	Review	Evaluation Be able to make any recommendations for improvements to the investigation Be able to discuss sources of error Be able to explain anomalous data	Interpretation and analysis of data Identify trends/patterns in data Compare primary and secondary data Be able to use data to draw valid conclusions	Processing data Be able to carry out relevent calculations involving mean, standard deviation and statistical tests Be able to display data in an appropriate format	Data collection, processing and analysis/interpretation Collection of data	Planning a scientific investigation Health and safety Variables in the investigation Method for data collection and analysis
Key Vocab	**Review key vocab**	**Energy, specific heat capacity**	**Fuels, complete and incomplete combustion**	**Standard deviation, t-test, chi-squared**	**Quantitative and qualitative data**	**Independent, dependent and control variables, enzymes**

Key Knowledge Transfer