

Year 12 Biology

<p>Term 1 Knowledge:</p> <ul style="list-style-type: none"> • <u>Biological molecules</u> – water, carbohydrates, lipids and proteins • <u>Cell structure</u> – ultra structure of prokaryotic and eukaryotic cells, microscopy, resolution • <u>Biological membranes</u> – fluid mosaic model, factors affecting membrane permeability, movement of molecules across membranes <p>Skills:</p> <ul style="list-style-type: none"> • Use models to represent ideas, visualise and represent 2D and 3D structures, qualitative testing of biochemicals, using a colorimeter for quantitative analysis of glucose concentration, chromatography • Use of a microscope, specimen staining, use of eye piece graticule and manipulation of magnification equation • Use models to represent ideas, visualise and represent 2D and 3D structures 	<p>Term 2 Knowledge:</p> <ul style="list-style-type: none"> • <u>Nucleotides and nucleic acids</u> – RNA, DNA, semi-conservative replication, protein synthesis • <u>Biological membranes</u> (ctd) • <u>Cell division, diversity and organisation</u> – regulation of the cell cycle, mitosis and meiosis, hierarchy within organisms, specialised cells, stem cells • <u>Enzymes</u> – mechanism of enzyme action, factors that affect rate, inhibitors <p>Skills:</p> <ul style="list-style-type: none"> • Purification of DNA by precipitation, computer modelling using Rasmol programme • Investigating the rate of diffusion using Betalain, use of artificial membranes to investigate osmosis • Using a microscope to study mitosis, scientific drawings • Investigating the effect of pH, temperature, substrate concentration and enzyme concentration, calculating rate of reaction. 	<p>Term 3 Knowledge:</p> <ul style="list-style-type: none"> • <u>Exchange surfaces</u> – features of efficient exchange surfaces, mammalian gaseous exchange system, comparisons of ventilation systems in insects and bony fish • <u>Transport in animals</u> – types of circulatory systems, heart structure, the cardiac cycle, role of haemoglobin, dissociation curves • <u>Cell division, diversity and organisation</u> (ctd) • <u>Communicable diseases, disease prevention and the immune response</u> – pathogens, methods of transmission, primary and secondary immune responses, autoimmune diseases, evaluating the use of antibiotics <p>Skills:</p> <ul style="list-style-type: none"> • Use of spirometer traces to measure vital capacity, tidal volume, breathing rate and O₂ uptake, fish head dissection • Dissection of mammalian heart, analysis of cardiac cycle traces and ECGs • Microscope drawing of the cells in a blood smear.
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<p>Term 4</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • <u>Transport in plants</u> – vascular system in roots, stems and leaves, transport of water through plant, transpiration and translocation • <u>Communicable diseases, disease prevention and the immune response</u> (ctd) • <u>Classification and evolution</u> – classification of organisms in the five kingdoms, domains, natural selection and evolution • <u>Biodiversity</u> – sampling, measurement of biodiversity, genetic diversity, in situ and ex situ conservation, conservation agreements <p>Skills:</p> <ul style="list-style-type: none"> • Microscope examination of stained plant tissue, using a potometer to measure the rate of transpiration • Investigating the effect of different antibiotics on bacterial growth using zones of inhibition • Sampling methods to assess biodiversity, use and interpretation of Simpson's index of diversity 	<p>Term 5</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • <u>Biodiversity</u> (ctd) • <u>Classification and evolution</u> (ctd) <p>Skills:</p> <ul style="list-style-type: none"> • <u>Maths skills</u> – standard deviation, Spearman's rank co-efficient, Chi squared 	<p>Term 6</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • <u>Communication and homeostasis</u> – principles of homeostasis, temperature control in endo and ectotherms • <u>Excretion</u> – importance of excretion in the metabolism, structure and functions of the mammalian liver <p>Skills:</p> <ul style="list-style-type: none"> • Microscope examination of liver tissue and scientific drawing
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Year 12 Chemistry

<p>Term 1</p> <p>Knowledge:</p> <ul style="list-style-type: none">• Enthalpy Change• Formulae and equations and the mole... <p>Skills:</p> <ul style="list-style-type: none">• Calorimetry and Hess' law calculations• Balancing equations• Calculating quantities for solids, solutions and gases.• Manipulation of equations and use of standard units• Titration method and calculations	<p>Term 2</p> <p>Knowledge:</p> <ul style="list-style-type: none">• Organic chemistry hydrocarbons.• Atomic structure• Bonding <p>Skills:</p> <ul style="list-style-type: none">• Drawing chemical structures and mechanisms for reactions• Comparison of the different models of the atom• Analysis of data to support accepted atomic structure model• Writing electron configurations• Use data to support understanding of different intermolecular forces and their effect on boiling point and solubility• Draw bonding diagrams to explain the three dimensional shapes of molecules	<p>Term 3</p> <p>Knowledge:</p> <ul style="list-style-type: none">• Organic Chemistry Functional groups: alkenes, alcohols, halogenoalkanes• Structure and bonding <p>Skills:</p> <ul style="list-style-type: none">• Consider bonding in different functional groups and how affect reactivity.• Draw mechanisms to show reaction pathways.• Apply IUPAC nomenclature rules for naming organic compounds.• Comparison of the physical properties of ionic and covalent compounds and how this comes about from their bonding• Justification of bonding using experimental data
<p>Term 4</p> <p>Knowledge:</p> <ul style="list-style-type: none">• Instrumental methods: mass spectrometry and infra red spectroscopy• Redox chemistry• Inorganic chemistry: group 1 and 2 <p>Skills:</p> <ul style="list-style-type: none">• Interpret spectra of simple organic compounds using mass spec and IR	<p>Term 5</p> <p>Knowledge:</p> <ul style="list-style-type: none">• Kinetics• Inorganic: Group 7 <p>Skills:</p> <ul style="list-style-type: none">• Application of collision theory to explain factors affecting rates of reaction• Explain how temperature and the addition of a catalyst affect the rate of a	<p>Term 6</p> <p>Knowledge:</p> <ul style="list-style-type: none">• Equilibrium• Advanced organic chemistry <p>Skills:</p> <ul style="list-style-type: none">• Application of the Le Chatelier principle• Calculations for equilibrium constants• Predicting and explaining the effect of equilibrium of changing factors and its effect on feasibility.

<ul style="list-style-type: none"> • Explain the physical and chemical properties of group 1 and 2 metals based on their electronic configuration • Write chemical equations for the reactions of group 1 and 2 metals. • Predict the properties of metals based on their position in the periodic table. • Assigning oxidation numbers • Explaining oxidation, reduction and disproportionation within reactions and writing half equations to show these. • Balancing ionic equations 	<p>reaction using the Maxwell Boltzman distribution</p> <ul style="list-style-type: none"> • Calculate the initial rate of reaction from a rate graph. 	<ul style="list-style-type: none"> • Identification of optical isomerism and the interaction of enantiomers with biological molecules
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Year 12 Physics

<p>Term 1 Knowledge:</p> <ul style="list-style-type: none"> • Working as a Physicist. • Maths: Trigonometry, Standard form, Scale factors, SI units, Prefixes, Using a calculator. • Mechanics: Velocity and acceleration, Motion graphs, Adding forces, Moments, Newton's laws of motion, Kinematics equations, Resolving vectors, Projectiles. • Electricity: Electric current, Energy transfer, Current and voltage relationships, Resistivity, Conduction and resistance, Semiconductors. <p>Skills:</p> <ul style="list-style-type: none"> • Building electrical circuits, Investigating acceleration, Find the acceleration due to free-fall 	<p>Term 2 Knowledge:</p> <ul style="list-style-type: none"> • Energy: Gravitational potential and kinetic energies, Work and Power. • Momentum: Conservation of linear momentum. • Materials: Fluids, Density and upthrust, Fluid movement, Drag, Terminal velocity. • Complete electrical circuits: Series and parallel circuits, Electrical circuit rules, Potential dividers, Emf and internal resistance, Power in electrical circuits. <p>Skills:</p> <ul style="list-style-type: none"> • Studying fluid flow, Streamlining. • Using physical equations to solve problems. 	<p>Term 3 Knowledge:</p> <ul style="list-style-type: none"> • Solid material properties: Hooke's law, Stress, strain and the Young modulus, Stress-strain graphs. • Waves and the particle nature of light: Wave basics, Wave types. <p>Skills:</p> <ul style="list-style-type: none"> • Investigating Hooke's law, practising past paper questions, Safe and reliable practical work. • Finding the emf and internal resistance of a cell by a graphical method.
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<ul style="list-style-type: none"> Analyzing Voltage-current characteristics, Drawing graphs, Using the gradient of a graph, Rearranging equations. 		
<p>Term 4 Knowledge:</p> <ul style="list-style-type: none"> The behaviour of waves: Wave phase and superposition, Stationary waves, Diffraction, Wave interference. Optics: Total internal reflection, Lenses, Image formation, Polarisation. <p>Skills:</p> <ul style="list-style-type: none"> Using ray boxes and lenses to produce images. Using phase relationships in terms of phase and wavelength. Drawing ray diagrams to solve optical problems 	<p>Term 5 Knowledge:</p> <ul style="list-style-type: none"> Quantum physics: Wave-particle duality, The photoelectric effect, Electron diffraction and interference, Atomic electron energies Practice using all the techniques so far and past papers <p>Skills:</p> <ul style="list-style-type: none"> Exam technique. 	<p>Term 6 Knowledge:</p> <ul style="list-style-type: none"> Further mechanics: Energy in collisions, More collisions, Circular motion basics, Centripetal force. Electrical and magnetic fields: Electric fields, Millikan’s oil drop experiment, Radial electric fields, Coulomb’s law. <p>Skills:</p> <ul style="list-style-type: none"> Solving problems using known physics equations. Investigating the law of conservation of momentum in two dimensions.

Year 13 Biology

<p>Term 1 Knowledge:</p> <ul style="list-style-type: none"> <u>Mock examinations – Breadth and Depth papers</u> <u>Communication and homeostasis</u> – principles of homeostasis, temperature control in endo and ectotherms <u>Excretion</u> – importance of excretion in the metabolism, structure and functions of the mammalian liver, the kidney and its role in maintaining the water potential of blood, kidney failure 	<p>Term 2 Knowledge:</p> <ul style="list-style-type: none"> Neuronal communication – structure and function of neurones, transmission of the nervous impulse, synapses <u>Photosynthesis</u> - stages of photosynthesis, use of products, factors affecting the rate of photosynthesis <u>Plant and animal responses</u> – roles and uses of plant hormones, mammalian nervous system, nervous and endocrine systems, muscle contraction 	<p>Term 3 Knowledge:</p> <ul style="list-style-type: none"> <u>Respiration</u> – stages of aerobic respiration, chemiosmosis, anaerobic respiration in eukaryotic organisms, RQ values <u>Cellular control</u> – mutations and their effects, gene regulation, development of body plans, apoptosis <u>Plant and animal responses</u> (ctd)
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<ul style="list-style-type: none"> • Hormonal communication – the structure and function of the adrenal glands and pancreas, control of blood glucose, diabetes <p>Skills:</p> <ul style="list-style-type: none"> • Microscope examination of liver tissue and scientific drawing, kidney dissection • Maths skills – standard deviation, Spearman’s rank co-efficient, Chi squared • Practical investigations into photo and geotropisms, factors affecting heart rate in an organism 	<p>Skills:</p> <ul style="list-style-type: none"> • Microscope examination of pancreas tissue and scientific drawing • Use of thin layer chromatography and calculation of Rf values • Practical investigations into photo and geotropisms, factors affecting heart rate in an organism • Standard deviation and t test 	<ul style="list-style-type: none"> • Cloning and biotechnology – clones and their use in horticulture, the production of clones (plants - micropropagation, tissue culture, animals – artificial embryo twinning, enucleation, SCNT), culturing and using microorganisms <p>Skills:</p> <ul style="list-style-type: none"> • Investigating the respiration rate of <i>Saccharomyces cerevisiae</i> – planning the investigation, selecting relevant literature and citing sources • Microscope examination of skeletal muscle tissue and scientific drawing • Use of aseptic techniques, use of a haemocytometer to estimate the size of bacterial populations
<p>Term 4 Mock exams – paper 1</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Patterns of inheritance – variation, different patterns of inheritance including mono and dihybrid, linkage, sex linkage, codominance, epistasis, Hardy-Weinberg, mechanisms of speciation, artificial selection and ethics • Manipulating genomes – DNA sequencing and its applications, DNA profiling, polymerase chain reactions, electrophoresis, genetic engineering, gene therapy • Cloning and biotechnology (ctd) 	<p>Term 5 Knowledge:</p> <ul style="list-style-type: none"> • Manipulating genomes (ctd) • Ecosystems transfer of biomass and energy, sampling techniques, carbon and nitrogen cycles, primary succession • Populations and sustainability – factors affecting population size, conservation and preservation, management of an ecosystem • Cloning and biotechnology (ctd) <p><u>Examination preparation</u></p>	<p>Term 6 Examinations</p>

<p>Skills:</p> <ul style="list-style-type: none"> • Constructing and interpreting Punnett squares, Chi squared calculations, use of Hardy-Weinberg principle to calculate allele frequencies • Use of aseptic techniques, use of a haemocytometer to estimate the size of bacterial populations 	<p>Skills:</p> <ul style="list-style-type: none"> • Using gel electrophoresis to separate proteins or nucleic acids • Measuring the distribution and abundance of organisms within an ecosystem • Use of aseptic techniques, use of a haemocytometer to estimate the size of bacterial populations 	
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Year 13 Chemistry

<p>Term 1</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Entropy • Lattice enthalpy • Advanced organic chemistry <p>Skills:</p> <ul style="list-style-type: none"> • Determine the feasibility of reactions by calculating total entropy change and Gibbs free energy • Use Born Haber cycles to calculate Lattice enthalpy • Construct Born Haber cycles • Constructing mechanisms for the oxidation of alcohols • Predicting the product of a reaction • Using chemical tests to identify and unknown organic chemical 	<p>Term 2</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Kinetics II... • Organic Synthesis • Acid Base Equilibria... <p>Skills:</p> <ul style="list-style-type: none"> • Analyse experimental data to determine the rate equation. • Use the rate equation to determine rate determining steps. • Analyse graphs to determine orders of reactions. • Using graphs and the Arrhenius equation to determine activation energy. • Combining reactions to suggest synthetic pathways to make compounds. • Write equations to show chemicals acting as acids and bases. • Calculate pH of strong acids and bases and weak acids. • Interpreting and drawing graphs for acid base titrations and relating this to the behaviour of the solutions. 	<p>Term 3</p> <p>Knowledge:</p> <ul style="list-style-type: none"> • Organic analysis • Transition Metals • Redox Equilibria <p>Skills:</p> <ul style="list-style-type: none"> • Interpret spectra of simple organic compounds using mass spec and IR • Identifying an unknown chemical from NMR spectra • Writing equations for the reactions of transition metals in solution • Predicting the colour of transition metal complexes. • Measuring the emf of an electrochemical cell in order to predict the feasibility of reactions • Preparing a sample of a transition metal salt
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Term 4 Revision and examination preparation	Term 5 Revision and examination preparation	Term 6 Examinations
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Year 13 Physics

Term 1 Knowledge: <ul style="list-style-type: none"> • Capacitors: Capacitor basics, Charging and discharging capacitors. • Electromagnetic effects: Magnetic fields, Electric motors, Magnetic forces, Generating electricity, Alternating current. Skills: <ul style="list-style-type: none"> • Using Fleming’s LHR and RHR to find the direction of motion or sign of emf produced in varying magnetic fields • The use of the exponential function to describe capacitor charge and discharge. 	Term 2 Knowledge: <ul style="list-style-type: none"> • Nuclear and particle physics: A nuclear atom, Electrons from atoms, Particle accelerators, Particle detectors, The Large Hadron Collider. • Thermodynamics: Heat and temperature, Internal energy, Heat transfer, Ideal gas behaviour, Kinetic theory equations. Skills: <ul style="list-style-type: none"> • Investigating the latent heat of fusion of ice. • Using known physics equations along with first principles to derive additional useful physics equations. 	Term 3 Knowledge: <ul style="list-style-type: none"> • Particle physics: The standard model, Particle interactions, Particles and forces, Particle reactions. • Nuclear radiation: Types of nuclear radiation, Rate of radioactive decay, Fission and fusion, Nuclear power stations. Skills: <ul style="list-style-type: none"> • Use laws of conservation to establish the validity of potential particle interactions. • Link work within topics via the exponential function. Link half-life to the discharge of a capacitor.
Term 4 Knowledge: <ul style="list-style-type: none"> • Gravitational fields: Gravitational forces and fields, Gravitational potential. • Oscillations: Simple harmonic motion, SHM mathematics, SHM energy, Resonance and damping. Skills: <ul style="list-style-type: none"> • Use the work on circular motion, extending it to describe SHM. 	Term 5 Knowledge: <ul style="list-style-type: none"> • Space: Starshine, Stellar classification, Distances to the stars, The age of the Universe, The fate of the Universe. • Preparation for the summer examinations. Skills:	Term 6 Examinations

- Use the definition of velocity and acceleration to derive suitable expressions for SHM.
- Use the properties of a spring and SHM mathematics to find the unknown mass of an oscillating object.

- Use mathematical methods to find approaches for finding the distances to nearby and to more distant stars.
- Use past papers to practise techniques studied during the course.