

Subject: Physics

Year group: 13

Department Curriculum Vision: Department Curriculum Vision: Northwood students will be scientifically literate adults who:

- Can make informed personal decisions
- Engage with scientific news throughout their lives
- Have secure foundational knowledge that can be applied to any context.

	Autumn Term 1	Autumn Term 2
Content: (Know what...)	<u>Section 6: Further mechanics and thermal physics cont.</u> Ch 19: Thermal physics Ch 20: Gases <u>Section 7: Fields</u> Ch 21: Gravitational fields Ch 22: Electric fields	<u>Section 7: Fields</u> Ch 23: Capacitors Ch 24: Magnetic fields Ch 25: Electromagnetic induction

Skills: (know how...)	Investigate the factors that affect the change in temperature of a substance using an electrical method or the method of mixtures. Students should be able to identify random and systematic errors in the experiment and suggest ways to remove them. The ideas of gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications considered include: planetary and satellite orbits, capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction	The ideas of gravitation, electrostatics and magnetic field theory are developed within the topic to emphasise this unification. Many ideas from mechanics and electricity from earlier in the course support this and are further developed. Practical applications considered include: planetary and satellite orbits, capacitance and capacitors, their charge and discharge through resistors, and electromagnetic induction
Key vocabulary	Specific heat capacity, Latent heat, Brownian motion, Intermolecular forces, Boiling point, Moles, Molecules	charges, permittivity, fields, radial, radians, potential, equipotentials, orbital
Mid Term Assessment	End of chapter assessments	End of chapter assessments
End Term Assessment		PPE round 1 for year 13
	Spring 1	Spring 2

Content: (Know what...)	<u>Section 8: Nuclear physics</u> Ch 26: Radioactivity Ch 27: Nuclear energy	Section 9: Options units Students will study one of the following units: - <u>Astrophysics- Current option</u> - Medical physics - Engineering physics - Turning points in physics - Electronics
Skills: (Know how...)	This section builds on the work of Particles and radiation to link the properties of the nucleus to the production of nuclear power through the characteristics of the nucleus, the properties of unstable nuclei, and the link between energy and mass. Students should become aware of the physics that underpins nuclear energy production and also of the impact that it can have on society. Investigate the decay equation using a variety of approaches (including the use of experimental data, dice simulations etc) and a variety of analytical methods.	Fundamental physical principles are applied to the study and interpretation of the Universe. Students gain deeper insight into the behaviour of objects at great distances from Earth and discover the ways in which information from these objects can be gathered. The underlying physical principles of the devices used are covered and some indication is given of the new information gained by the use of radio astronomy. The discovery of exoplanets is an example of the way in which new information is gained by astronomers.
Key vocabulary	Electron diffraction, nuclear density, nucleons, background radiation	Refraction, converging, charged coupled devices, reflectors, resolving power, parallax and parsecs, black body radiation
Mid Term Assessment	End of chapter assessments	End of chapter assessments
End Term Assessment		PPE round 2 for year 13

	Summer 1	Summer 2
Content: (Know what...)	<u>Revision and revisiting of content in preparation</u>	<u>Public exams</u>
Skills: (Know how...)		
Key vocabulary		
Mid Term Assessment		
End Term Assessment		
Additional information		
Homework	Students will be set questions that are in line with the new content being taught. This is supported by recall and practice questions so that foundation knowledge can be cemented. Students will then be required to complete Exam questions once students are comfortable with the foundational skills.	
Extra curricular and enrichment	Students will complete practicals that allow them opportunities to apply the knowledge they have gained.	

opportunities	
Useful links that will support learning	https://www.physicsandmathstutor.com/physics-revision https://www.physicsandmathstutor.com/past-papers/a-level-physics/ https://www.savemyexams.com/a-level/physics/aqa/17/ https://senecalearning.com/en-GB/
How parents can support learning	Please support students by making sure they are spending time going over key knowledge and revisiting key definitions. Students should be doing at least 2 hours of extra work on top for each lesson.

Subject:
Biology

Year group:
13

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	Autumn Term 1	Autumn Term 2
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Content: (Know what...)	<u>Section 6: Organisms respond to changes in their environments</u> Ch 14: response and stimuli Ch15: nervous coordination and muscles	<u>Section 7 Genetics, population, evolution and ecosystems</u> Ch17: Inherited Change. Ch18: Populations & evolution
Skills: (know how...)	-Use information provided to predict and explain the effects of specific drugs on a synapse. (Recall of the names and mode of action of individual drugs will not be required.) - Interpret information relating to examples of negative and positive feedback. -Evaluate the positions of health advisers and the food industry in relation to the increased incidence of type II diabetes.	-Explain why individuals within a population of a species may show a wide range of variation in phenotype -Explain why genetic drift is important only in small populations - Explain how natural selection and isolation may result in change in the allele and phenotype frequency and lead to the formation of a new species - Explain how evolutionary change over a long period of time has resulted in a great diversity of species. - show understanding of the need to manage the conflict between human needs and conservation in order to maintain the sustainability of natural resources - Evaluate evidence and data concerning issues relating to the conservation of species and habitats and consider conflicting evidence - Use given data to calculate the size of a population estimated using the mark-release-recapture method

Key vocabulary	NADP, catalysed, light-independent, simple sugar, limiting factors, Glycolysis, biomass	dominant, recessive, and codominant alleles, dihybrid inheritance, natural selection, frequencies, genotype and phenotype
Mid Term Assessment	End of chapter assessments	End of chapter assessments
End Term Assessment		PPE
	Spring 1	Spring 2

Content: (Know what...)	<u>Section 7 Genetics, population, evolution and ecosystems</u> Ch 19: Populations in Ecosystems	<u>Section 8: The control of gene expression</u> Ch 20: Gene expression Ch 21: Recombinant DNA technology
Skills: (Know how...)	- Explain why individuals within a population of a species may show a wide range of variation in phenotype - Explain why genetic drift is important only in small populations - explain how natural selection and isolation may result in change in the allele and phenotype frequency and lead to the formation of a new species - Explain how evolutionary change over a long period of time has resulted in a great diversity of species. - show understanding of the need to manage the conflict between human needs and conservation in order to maintain the sustainability of natural resources - Evaluate evidence and data concerning issues relating to the conservation of species and habitats and consider conflicting evidence - Use given data to calculate the size of a population estimated using the mark-release-recapture method	- Evaluate the use of stem cells in treating human disorders. interpret data provided from investigations into gene expression - Evaluate appropriate data for the relative influences of genetic and environmental factors on phenotype. evaluate evidence showing correlations between genetic and environmental factors and various forms of cancer - Interpret information relating to the way in which an understanding of the roles of oncogenes and tumour suppressor genes could be used in the prevention, treatment and cure of cancer. interpret information relating to the use of recombinant DNA technology - Evaluate the ethical, financial and social issues associated with the use and ownership of recombinant DNA technology in agriculture, in industry and in medicine - Balance the humanitarian aspects of recombinant DNA technology with the opposition from environmentalists and anti-globalisation activists - Relate recombinant DNA technology to gene therapy. evaluate information relating to screening individuals for genetically determined conditions and drug responses. explain the biological principles that underpin genetic fingerprinting techniques - Interpret data showing the results of gel electrophoresis to

		separate DNA fragments - Explain why scientists might use genetic fingerprinting in the fields of forensic science, medical diagnosis, animal and plant breeding.
Key vocabulary	environment, biotic, abiotic,ecosystem, intraspecific competition, biosphere, succession and climax community	gene mutation, totipotency, transcription, gene expression, epigenetics, epigenome
Mid Term Assessment	End of chapter assessments	End of chapter assessments
End Term Assessment		PPE
	Summer 1	Summer 2

Content: (Know what...)	<u>Revision of content and preparation for Public exams</u>	<u>Public exams</u>
Skills: (Know how...)		
Key vocabulary		
Mid Term Assessment		
End Term Assessment		
Additional information		
Homework	Students will be set questions that are in line with the new content being taught. This is supported by recall and practice questions so that foundation knowledge can be cemented. Students will then be required to complete Exam questions once students are comfortable with the foundational skills.	
Extra curricular and enrichment opportunities	Students will complete practicals that allow them opportunities to apply the knowledge they have gained.	

Useful links that will support learning	https://senecalearning.com/en-GB/ https://www.physicsandmathstutor.com/biology-revision/
How parents can support learning	Please support students by making sure they are spending time going over key knowledge and revisiting key definitions. Students should be doing at least 2 hours of extra work on top for each lesson.

Subject: Chemistry

Year group: 13

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Content: (Know what...)	<u>Organic Chemistry</u> Nomenclature and Isomerism • Naming organic compounds • Optical isomerism NMR • Interpreting H-NMR • Interpreting C-NMR <u>Physical Chemistry</u> Kinetics • Rate equations • Determination of rate equation Thermodynamics • Born-Haber cycles • Gibbs free energy change and entropy change	<u>Organic Chemistry</u> Carbonyls • Aldehyde and ketones • Carboxylic acids and esters • Acylation Aromatics • Bonding • Electrophilic substitution Amines • Preparation of amines • Base properties • Nucleophilic properties <u>Physical Chemistry</u>

	Electrode potentials • Electrode potential and cells • Commercial application of electrochemical cells	Equilibrium constant • Equilibrium constant for homogeneous systems <u>Inorganic Chemistry</u> Periodicity • Reactions of period 3 elements • Oxides of Period 3
Skills: (know how...)	• perform calculations of an enthalpy change using Born-Haber cycles. • calculate entropy changes from absolute entropy values • use the relationship $\Delta G = \Delta H - T\Delta S$ to determine how ΔG varies with temperature • use the relationship $\Delta G = \Delta H - T\Delta S$ to determine the temperature at which a reaction becomes feasible. • perform calculations using the rate equation • understand that the equation $k = Ae^{-E_a/RT}$ can be rearranged into the form $\ln k = -E_a/RT + \ln A$ and know how to use this rearranged equation with experimental data to plot a straight line graph with slope $-E_a/R$. • use concentration–time graphs to deduce the rate of a reaction • use initial concentration–time data to deduce the initial rate of a reaction • use rate–concentration data or graphs to deduce the order (0, 1 or 2) with respect to a reactant • derive the rate equation for a reaction from the orders with respect to each of the reactants • use the orders with respect to reactants to provide	• derive partial pressure from mole fraction and total pressure • construct an expression for K_p for a homogeneous system in equilibrium • perform calculations involving K_p • predict the qualitative effects of changes in temperature and pressure on the position of equilibrium • predict the qualitative effects of changes in temperature on the value of K_p. • write overall equations for reduction reactions using $[H]$ as the reductant • outline the nucleophilic addition mechanism for reduction reactions with $NaBH_4$ (the nucleophile should be shown as H^-) • write overall equations for the formation of hydroxynitriles using HCN • outline the nucleophilic addition mechanism for the reaction with KCN followed by dilute acid • use thermochemical evidence from enthalpies of hydrogenation to account for this extra stability of benzene.

	information about the rate determining/limiting step of a reaction. • use $E^\ominus$ values to predict the direction of simple redox reactions • calculate the EMF of a cell • write and apply the conventional representation of a cell. • use given electrode data to deduce the reactions occurring in non-rechargeable and rechargeable cells • deduce the EMF of a cell	
Key vocabulary	Optical isomerism, enantiomers, chiral, Born-Haber cycle, Hydration, polarised, rate expression, rate constant, order of reaction, Arrhenius equation, rate-determining step	Triglycerides, acid derivatives, acylation, inductive effect, protonated
Mid Term Assessment	End of chapter assessments	End of chapter assessments
End Term Assessment		PPE round 1 for year 13
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Content: (Know what...)	<u>Physical Chemistry</u> Acids and bases • Bronsted-Lowry acid-base equilibria in aqueous solution • Definition and determination of pH • The ionic product of water • Weak acids and bases • pH curves and titration and indicators • Buffer action <u>Organic Chemistry</u> Amino acids • Amino acids • Proteins • Enzymes • DNA • Action of anticancer drugs Chromatography • TLC • GC	<u>Inorganic Chemistry</u> Transition metals • General properties of transition metals • Substitution reactions • The shape of complex ions • Formation of coloured ions • Variable oxidation states • Catalysts Aqueous ions • Reaction of aqueous ions <u>Organic Chemistry</u> Polymerisation • Condensation polymers • Biodegradability and disposal of polymers Organic synthesis • Synthetic routes • Organic analysis
Skills: (Know how...)	• calculate the pH of a solution of a strong acid from its concentration. • use K_w to calculate the pH of a strong base from its concentration. • construct an expression for K_a • perform calculations relating the pH of a weak acid to the concentration of the acid and the dissociation constant, K_a • convert K_a into pK_a and vice versa. • perform calculations for these titrations based on experimental results. • sketch and explain the shapes of typical pH curves • use pH curves to select an appropriate indicator. • calculate the pH of acidic buffer solutions.	• Perform calculation for redox titrations. • draw the repeating unit from monomer structure(s) • draw the repeating unit from a section of the polymer chain • draw the structure(s) of the monomer(s) from a section of the polymer • explain the nature of the intermolecular forces between molecules of condensation polymers. • use reactions in this specification to devise a synthesis, with up to four steps, for an organic compound.

	- draw the structure of a peptide formed from up to three amino acids - draw the structure of the amino acids formed by hydrolysis of a peptide - identify primary, secondary and tertiary structures in diagrams . - calculate Rf values from a chromatogram - compare retention times and Rf values with standards to identify different substances.	
Key vocabulary	Strong acids, weak acids, equivalence point, endpoint, buffers,	Ligand, coordination number, co-ordinate, hydrolysis, chelation
Mid Term Assessment	End of chapter assessments	End of chapter assessments
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