Science Curriculum Map 2021/22

Term 1 to 6

Year 7

Topic 1 Science Safety	• Lab safety rules • Using lab equipment • Using a Bunsen Burner • Graphs – presenting scientific data • Carry out a Science investigation
Topic 2 Matter	• The particle model • States of matter • Melting and freezing • Boiling • Diffusion • Investigations • Gas Pressure • Pure substances and mixtures • Evaporation and Distillation • Separating substances • Chromatography
Topic 3 Cells	• Observing cells • Using microscopes • Plant and animal cells • Specialised cells • Movement in and out of cells • Uni-cellular organisms
Topic 4 Forces	• balanced and unbalanced forces • speed • distance time graphs • gravity • friction and drag • turning forces
Topic 5 The body	• gas exchange • breathing • alcohol • smoking • nutrients • food tests • unhealthy diets • digestive system • respiration • biotechnology
Topic 6 Acids and Alkalis	• Chemical reactions • Acids and alkalis • Indicators and pH • Acids Strength • Neutralisation • Making salts • Measuring pH
Topic 7 Waves	• Sound waves and speed • Loudness and amplitude • Frequency and pitch • The ear and hearing • Light • Reflection • Refraction • colour • Sound waves, water waves, and energy • Radiation and energy • Modelling waves
Topic 8 Reproduction	• Reproductive systems • Fertilisation and implantation • Development of a fetus • The menstrual cycle

Year 8

Topic 1 Elements	• Atoms • Elements • Compounds • Chemical formula • Periodic table
Topic 2 Magnets	• Magnets • Magnetic fields • Electromagnets
Topic 3 Reactions	• Elements • Metals and non-metals • Metals and acid • Metals and oxygen • Metals and water • Displacement • Chemical reactions • Combustion • Thermal decomposition • Conservation of mass • Exothermic and endothermic
Topic 4 Energy	• Energy and power • Energy calculations • Dissipation • Work and energy • Energy and temperature • Convection • Conduction • Radiation
Topic 5 Genetics	• Variation and adaptation • Inheritance • DNA • Genetics • Genetic modification
Topic 6 Electricity	• Potential difference • Resistance • Series circuits • Parallel circuits • Current
Topic 7 Ecosystems	• Food chains and webs • Ecosystems • Competition • Photosynthesis • Leaves

Year 9

Biology	Ecology • Communities • Biotic and Abiotic factors • Sampling • Competition in animals • Competition in plants • Adaptations for survival • Animal adaptations • Plant adaptations • Environmental Change	Organising the ecosystem • Feeding relationships • Tropic levels • Materials cycling • Carbon cycle • Decomposition • Human population • Air pollution • Land pollution • Water pollution • Deforstation • Impact of change on biodiversity • Efficient food production • Sustainable food production
	Cell Structure • Animals cells • Plant cells • Prokaryotic cells • Eukaryotic cells • Specialised cells • Magnification	Communicable Disease • Pathogens • Spread of disease • Culturing microbes • Preventing diseases from spreading • Body defences • Vaccines • Antibiotics and painkillers • Drug discovery • Developing medicines • Monoclonal antibodies
	Non-communicable disease • Smoking and risk • Diet and exercise • Alcohol • Cancer	
Chemistry	Atomic structure • Reactions • The atom • History of the atom • Periodic table • Electron config • Alkali metals • Transition metals • Comparing metals halogens	Separation • Elements mixture compounds • Filtration • Crystallisation • Distillation • Chromatography • Rf values
	Bonding and structure • States of matter • Cooling • Forming ions • Ionic bonding • Ionic strcutures • Covalent bonding • Covalent structures • Fullerenes and graphene • Metallic bonding • Properties of metals	Extraction of metals • Equations • Metals and non-metals • Redox • Reactivity • Extraction • Rusting and alloys • Electrolysis • Al extraction
Physics	Generating electricity • Energy needs and resources • Environmental impacts • Geography and sites of power plants • Renewable energy • Solar • Energy use • Nuclear debate	Waves • Properties • Equations • Wave speed • Reflection • Refraction • Sound and music • Ultrasound • Seismic waves • EM spectrum • Colour • IR radiation • Lenses and ray diagrams • Communication • Medical physics
	Forces and Motion • Motion • Speed and velocity • Acceleration • Forces • Resolving forces • Newtons law • Friction • Road safety • Weight and mass • Falling objects • Hookes law	

Year 10

Biology	Transport in and out of Cells • Diffusion • Osmosis • Active Transport	Organs and Systems • Blood • Blood vessels • The heart • Treatments for cardiovascular disease • The lungs & Gas exchange • Aerobic respiration • Anaerobic respiration
	Enzymes and Digestion • Cells, Tissues, organs • Digestive system • Digestive enzymes • Enzyme action • Enzymes, pH and temp. • Making digestion efficient	Homeostasis • Homeostasis • Nervous system • Reflex arc • Endocrine system • Control of blood sugar • Diabetes • Negative feedback • Reproductive system • Menstrual cycle
	Homeostasis (triple) • Plant hormones • The brain • The eye • Body temp • The kidney	Plants for life • Leaf structure • Transport in xylem and phloem • Transpiration • Photosynthesis • How plants use glucose • Making the most of photosynthesis • Plant disease and defences • Anaerobic respiration in yeast
Chemistry	Reactions of acids • Metals and acids • Neutralisation • pH • reactions of acids • production of salts • strong and weak acids	Energy changes • Endo exothermic • Reaction profiles • Bond energy
	Chemical calculations • Measurements • Conservation of mass • RAM • RFM • Mole • Reacting masses • Limiting reactants • Concentrations • Titrations • Gas volume • % yield • Atom economy	Rates of reaction • Monitoring rates • Rates from graphs • Surface area • Temperature • Concentration • Catalysts • Reversible reactions • Dynamic equilibrium • Haber process • Fertilisers
	Crude oils • Distillation or crude oil • Fractional distillation • Hydrocarbons • Cracking and alkenes • Pollutants and global warming • atmosphere	Organic reactions (triple) • Functional groups • Reactions of alkanes and alkenes • Reactions of alcohols • Carboxylic acid • Esterification • Polymerisation • Condensation • Natural polymers • DNA
Physics	Energy • Energy types • Conservation • Energy and work • GPE • Elastic • Wasted energy • Efficiency • Electrical efficiency • Appliances and power	Particle model • Density • States of matter • Changes of state • Conduction • Internal energy • Specific heat capacity • Latent heat • Insulation • Pressure and temp • Pressure and volume
	Atomic structure • History of the atom • Atomic structure • Radioactive decay • Types of radiation • Half life • Uses of radiation • Gamma rays • Nuclear fission • Nuclear fusion	Forces in action • Circular motion • Centre of gravity • Centre of mass • Moments and balance • Pressure • Momentum • Explosions • Impact forces

Year 11

Biology	Reproduction • Meiosis • Types of reproduction • Variation • DNA and the genome • Protein synthesis • Mutations • History of genetics • Inheritance • Inherited diseases • Genetic screening	Evolution and Genetic manipulation • Theories of evolution • Natural selection • Speciation • Antibiotic resistance • Extinction • Fossils • Classification and evolution • Selective breeding • Genetic modification • Cloning
Chemistry	Chemical analysis • Pure substances and mixtures • Chromatograms • Testing for gases • Positive ions • Negative ions • Instrumental analysis	Earth resources • Renewable and finite • Drinking water • Waste water • Plastic life cycle • Reduce reuse recycle • Corrosion • Useful alloys • Polymers • Glass, ceramics and compounds

Year 12

Physics	Electrical circuits • Static electricity • Circuit symbols • Series • Parallel • Voltage • Resistors and Ohms law • Resistors • Resistance and length • Resistance and I-V graphs • LDR and thermistors				Mains electrical • AC / DC • Electrical plug • Electrical power • Power and energy • National grid • Mains electricity				Magnetism and electromagnetism • Magnetic fields • Electromagnets • Motor effect • Induction • Transformers	Space (Triple) • Solar system • Life of a star • Expanding universe • Big bang • Red shift • Exploring space	
Biology	Biological molecules • Carbohydrates • Polysaccharides • Lipids • Protein • Enzymes	Nucleic Acids • Structure of RNA and DNA • DNA replication • Energy and ATP • Functions of water • Inorganic ions	Cell Structure • Magnification • Cell fractionation • Eukaryotic cells • Cell organisation • Cell specialisation • Mitosis • Cell cycle	Membranes and Transport • Membrane structure • Diffusion • Facilitated diffusion • Osmosis • Serial dilutions • Active transport • Absorption in the small intestine • Oral rehydration	Cell recognition and the immune system • Defence mechanisms • Phagocytosis • Cell mediated immunity • Humoral immunity • Antibodies • Vaccinations • HIV	Exchange • Exchange with the environment • Gas exchange in single celled organisms • Gas exchange in fish • Gas exchange in a leaf • Limiting water loss • Human gas exchange • Breathing • Lung disease • Gas exchange • Enzymes and digestion	Mass Transport • Haemoglobin • Transport of oxygen • Circulatory system • Human heart • CVD • Cardiac cycle • Blood vessels • Xylem in plants • Transport in plants	DNA, Genes and Protein Synthesis • DNA • Genes • Chromosomes • Structure of RNA • Transcription of protein • Translation of protein	Genetic Diversity and Adaptation • Gene mutation • Meiosis • Genetic variation • Genetic diversity • Adaptation • Types of selection	Biodiversity • Species • Taxonomy • Diversity within a community • Species diversity • Quantifying diversity	
Chemistry	Atoms, ions, compounds • Handling Numbers & SI units • Quantitative & Qualitative observations • Atomic Structure & Isotopes • Molecular & Formula Mass • Isotopic Mass • Formulae & Equations	The mole - amount of substance • Avogadro's constant • Moles in solutions • Moles in solutions • Gas volume - moles • Ideal gas equation & units • Gas equation • Empirical Formula • Different types of formula • Water of Crystallisation - calculations • Water of Crystallisation - Practical & errors • Reacting Masses - Solids • Reacting Masses - Gas • Percentage Yield • Atom Economy	Acids and redox • Basics of Acids • Standard Solutions - making them • Practical Titration • Calculations with titration • Practical preparation • Identification of a Carbonate	Bonding • Electron orbitals • Electron shells • Sub shells for ions • Sub shells for ions • Ionic Bonding • Ionic lattice properties • Covalent Bonding • Dative covalent bonding	Shapes of Molecules • Shapes of molecules & ions • Electronegativity & polarity • Permanent dipoles & symmetrical shapes • Temporary dipoles • Hydrogen bonding	Periodicity • Developing the periodic table • Trends in electron config • Ionisation • Trends in bonding & structures	Reactivity trends • Assigning Oxidation numbers • Group 2 reactions • Practical - group 2 trends • Group 7 - halide reactions • Group 7 Displacement reactions • Chlorine reactions • Testing for ions	Core organic chemistry •Organic Nomenclature□ •Organic Formulae□ •Isomerism□ •Bond fission & types of reactions□	Alkanes & Alkenes •Fractional Distillation□ •Properties of Alkanes□ •Reactions of Alkanes□ •Free radical substitution with alkanes□ •The C=C bond□ •Stereoisomerism□ •Electrophilic addition□ •Addition polymerisation□ •Polymers & the environment□	Haloalkanes & Alcohols •Haloalkanes□ •Nucleophilic substitution□ •Elimination□ •CFCs and ozone depletion□ •Properties of alcohols□ •Reactions of alcohols□	Synthetic Routes & Analysis •Synthetic Routes□ •Testing for Organic Functional Groups •Mass Spectroscopy□ •Infrared Spectroscopy□
Physics	Motion • Distance and speed • Displacement and velocity • Acceleration • Time graphs • Motion equations • Stopping distances • Free fall and g • Projectile motion	Forces in action • Force, mass, weight • Centre of mass • Free body diagrams • Drag and terminal velocituy • Momnets and eq • Couples and torques • Trianglel of forces • Density and pressure • Archimedes principle	Work energy power • Work done • Conservation • Kinetic energy and GPE • Power and efficency	Materials • Springs and Hookes law • Elastic potential • Deforming materials • Stress/strain and Youngs modulus	Laws of motion • Newtons 1st and 3rd law • Linear momnetum • Newtons 2nd law • Impulse • Collisions in 2D	Charge and current • Current and charge • Moving charges • Kirchhoffs 1st law • Mean drift veocity	Energy power resistance • Circuit symbols • Potential difference and electromotive force • Electron gun • Resitance • IV characteristics • Diodes • Resistance • Thermistors • LDR • Electrical energy and power • Paying for elec	Electrical circuits • Kirchoffs law • Combing resistors • Analysis circuits • Internal resistance • Potential dividers • Sensing circuits	Waves1 • Progressive waves • Properties • Reflection/refraction • Diffraction and polarisation • Intensity • EM waves • Polarisation of EM waves • Refractive undex • Total internal reflection	Waves2 • Superposition • Interference • The Young slit experiment • Stationary waves • Harmonics • Stationary waves in air columns	Quantum physics • Photon model • Photoelectric effect • Einsteins photoelectric effect equation • Wave-particle duality	
Applied Science	Unit 1 - Key Concepts in Science • Cell structure, Transport mechanisms, The heart, Homeostasis, Breathing and cellular respiration, Photosynthesis and food chain productivity. • Atomic structure, The Periodic Table, Amount of substance, Bonding and structure, Enthalpy changes. • Useful energy and efficiency, Electricity and circuits, Dynamics			Unit 2 – Applied Experimental Techniques • Rate of respiration, Light-dependent reaction in photosynthesis (the Hill reaction): • Volumetric analysis, Colorimetric analysis • Resistivity, Specific heat capacity		Unit 3 – Science in the Modern World Topical scientific issues obtained from a variety of media sources. • The public perception of science and the influence that the media have. • The ethical, moral, commercial, environmental, political and social issues involved in scientific advances, and how these are represented in the media. • The roles and responsibilities that science personnel carry out in the science industry					

Year 13

Biology	Photosynthesis • Leaf structure • Chloroplasts • Adaptations to photosythesis • Light dependend stage • Light independent stage	Respiration • Glycolysis • Link reaction • Krebs cycle • Chemiosmotic theory	Energy and the ecosystem • Food chains • Energy transfer • Farming • Nitrogen cycle • Phosphorus cycle • Fertilisers • Environmental issues	Response to Stimuli • Tropisms • Nervous system • Receptors • Receptors in the eye • Control of heart rate	Nervous Coordination and Muscles • Neurones • Resting potentials • Action potentials • Speed of nerve impulses • Synpases • Transmission across a synapse • Skeletal muscle • Muscle contraction	Homeostasis • Positive/Negative feedback • Control of glucose • Diabetes • Kidney • Osmoregulation • hormones	Inherited change • Inheritacne • Monohybrid • Genetic crosses • Dihybrid • Codominance • Multple alleles • Sex linkage • Autosomal linkage • Epistasis • Chi-squared	Populations and Evolution • Population genetics • Variation • Selection • Isolation • Speciation	Populations in an ecosystem • Variation in population size • Logarithams • Inter/intra species competition • Preadation • Sampling • Mark, capture, release • Succession • conservation	Gene expression • Gene mutations • Stems cells • Regulation of transcriptio • Epigentics • Gene expression • Cancer • Sequencing genes	Recombinant DNA Technology • DNA fragments • In vivo cloning • In vitro gene cloning • Locating genes/screening • Genetic finger printing	
Chemistry	Enthalpy and entropy • Enthalpy Review • Lattice Enthalpy • Born-Haber Cycles • Born-Haber Exam Practice • Born-Haber Consolidation • Enthalpy Change in Solution • Factors affecting lattice enthalpy and hydration • Entropy • Free energy	Redox and electrode potentials • Redox and half equations • Balancing Half Equations • Mangante(VII) redox titration • Titration analysis • Iodine/Thiosulphate titration • Titration analysis • Electrode Potential Theory • Measuring Cell Potential practical • Predictions from electrode potentials • Fuel Cells	Transition elements • Transition Metals and electron configuration • Transition Metal Properties • Complex Ions • Stereoisomerism • Ligands and Complex Shapes • Ligand Substitution • Precipitation Reactions • Redox Reactions • Identifying Ions & revision	Amines, amino acids and polymers • Amines and reactions • Preparing amines • Amino acids and reactions • Stereoisomersim and chiral carbons • Polyesters and polyamides • Polyesters and Polyamides	Organic synthesis • Nitriles reactions • Preparation of an organic solid • Synthetic routes	Chromatography and spectroscopy • TL Chromatography and Rf values • Gas chromatography and chromatograms • Calibration curves • NMR Spectroscopy • Carbon -13 NMR • Proton NMR • Proton NMR interpreting spectra • Predicting NMR • Combined techniques unknown compounds	Rates of reaction • Rate equation & orders • Calculating K and Units • Concentration time graphs & colorimetry & initial rate • Practical - Initial Rate • Half life (plotting graphs) • Orders from Experimental Data Theory • Practical and orders from experimental data • Rate concentration graphs • Iodine clock and accuracy • Rate determining step • Arrhenius Equation Theory • Arrhenius Equation Application	Equilibrium • Calculating Kc and units • Equilibrium Values • Heterogenous equilibria • Kc practical pg 32 • Kp - gas equilibria • Kp - gas equilibria & heterogeneous • Equilibrium position	Acids and bases • Conjugate acid-base pairs • Reactions of acids • pH scale and calculating pH • Ka and Pka • Ka and Pka - strong and weak acids • Kw and strong bases	Buffers and Neutralisation • Buffers • Buffers calculations • Buffers in the body • PH curves and titrations	Aromatic chemistry • Kekule and structure of benzene • Naming aromatic compounds • Electrophilic substitution recap • Halogenation • Nitration • Reactivity of alkenes • Friedel-crafts • Phenols • Directing Groups	Carbonyls and carboxylic acids • Oxidising carbonyl compounds • Reducing carbonyl compounds • Identifying carbonyl compounds • Identifying carbonyl compounds practical • Carboxylic Acids • Esters • Carboxylic acid derivatives	
Physics	Thermal Physics • Temperature • Solid, liquid and gas • Internal energy • Specific heat capacity • Specific latent heat	Ideal gasses • Kinetic theory • Gas laws • Root mean square speed • Boltzmann constant	Circular motion • Angular velocity • Centripetal acceleration • Centripetal forces	Oscillations • Simple harmonic motion • Motion and energy • Damping and driving • Resonance	Gravitational fields • Newtons law • Field strength for a point of mass • Kelpers laws • Satellites • Gravitational potential • GPE	Stars • Objects in the universe • Life cycle of stars • Hertzsprung Russell diagram • Energy levels in atoms • Spectra • Starlight • Stellar luminosity	Cosmology • Astronomical distances • Doppler effect • Hubbles law • Big Bang • Universe	Capacitance • Circuits • Energy stored • Discharging • Charging • Uses	Electric fields • Coulombs law • Uniform electric fields and capacitance • Charged particles • Electrical potential energy Magnetic fields • Charged particles • Electromagnetic induction • Faradays law • Lenzs law • Transformers	Particle Physics • Alpha particles • The Nucleus • Antiparticles, hadrons and leptons • Quarks • Beta decay	Radioactivity • Nuclear decay • Half life • Decay • Modelling dating	Nuclear physics • Einsteins mass-energy equation • Binding energy • Nuclear fission • Nuclear fusion	Medical imaging • X rays • CAT scans • Gamma camera • PET scans • Ultrasound • Acoustic impedance • Doppler imaging
Applied Science	Unit 4 The Human Body • The digestive system and diet • The musculoskeletal system and movement • How oxygen is transported in the blood and how physiological measurements can be applied • The structure and function of the nervous system and brain • Nerve impulses			Unit 5 – Investigating science • Prepare, carry out, analyse and evaluate a scientific investigation.		Unit 6 – Option B Medical Physics • Imaging methods • Radiotherapy techniques and the use of radioactive tracers • Working with radioisotopes in the laboratory • The medical uses of optical fibres and lasers					