COLMERS SCHOOL & SIXTH FORM COLLEGE

Colmers Curriculum Map 2020-2021 Subject: Science

	Autumn 1								Autumn 2							Spring 1						Spring 2						Summer 1						Summer 2					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
13B		**Unit 5 photosynthesis and respiration:** photosynthesis, respiration, ATP, limiting factors, aerobic respiration, energy transfer in ecosystems, farming practices and production, fertilisers and eutrophication										**Unit 8 Gene expression:** Mutation, cancer, stem cells, transcription, translation, epigenetic control of gene expression, phenotypes, genome projects, DNA fragments, amplifying DNA, recombinant DNA technology, gene probes, medical diagnosis, genetic finger printing																									
		Unit 6 stimuli and response: nervous communication, response in plants and animals, receptors, control of heart rate, neurones, synaptic transmission, muscle contraction, homeostasis, control of blood sugar, kidneys, control of water potential										**Unit 7 genetics:** Inheritance, linkage and epistasis, chi-squared test, hardy-Weinberg principle, variation and selection, speciation and genetic drift, ecosystems, variation in population size, investigating populations, succession, conservation																									
13C		Physical Chemistry: thermodynamics, acids and bases, electrode potential and electrochemical cells, rates equations (WJI)										Inorganic Chemistry: transition metals, reactions of ions in aqueous solutions, properties of period 3 elements and their oxides. Equilibrium constant Kp for homogeneous system.																									
		Organic Chemistry: optical isomerism, aldehydes and ketones, carboxylic acids,										Organic Chemistry: Aromatic Chemistry, amines, polymers, amino acids, proteins and DNA, nuclear magnetic resonance spectroscopy, chromatography and organic synthesis.																									
13P		**Fields (cont.):** Electric fields, electric potential. Comparison of fields **Capacitance:** Capacitors, energy stored, dielectrics, charge and discharge, **Magnetic fields:** Magnetic flux density, force on a wire, charged particles, electromagnetic induction, flux linage, Faraday's and Lenz'z laws, alternating current, transformers										**Nuclear Physics:** Rutherford's scattering experiment, nuclear radius and density, properties of nuclear radiation, background radiation and intensity, law of decay, half-life and its applications, nuclear decay, mass defect and binding energy, nuclear fission and fusion, fission reactors **Optional unit:** Light (Newton vs Huygens), electromagnetic waves, photelectric effect wave particle duality, Michelson -Morley experiment, Special relativity																									
		Fields (cont.): Gravitational fields, gravitational field strength, gravitational potential, orbits **Further mechanics:** Circular motion, simple harmonic motion, oscillations and pendulums, forced and fee vibrations										**Thermal Physics:** Energy transfer, gas laws, ideal gas equation, kinetic theory of gas molecules, development of theories **Optional unit:** Discovery of the electron, specific charge on electron, Millikan's experiment, electron microscopes																									
12B		**Unit 1 Biological molecules:** Carbohydrate, lipids, proteins, enzyme action, factors affecting enzyme action, DNA and RNA, DNA replication, water, ATP, inorganic ions														**Unit 4 DNA and classification**: DNA, genes, chromosomes, RNA, protein synthesis, nucleic acids, meiosis, genetic variation, mutation, genetic diversity, natural selection, classification of organisms, selection, DNA technology, classification, diversity, variation, biodiversity																									
		Unit 2 Cells and immunity: Eukaryotic cell, organelles, prokaryotic cells, viruses, cell components, mitosis, membrane structure, diffusion, osmosis, active transport														**Unit 3 Exchange and transport:** Surface area, gas exchange (humans and others), effects of lung disease, digestion and absorption, haemoglobin, circulatory system, heart, cardiovascular disease, transport in plants (xylem and phloem)																									
12C		Physical Chemistry: Atomic structure, amount of substances, energetics, redox, Bonding and Kinetics (WJI)														Inorganic Chemistry: Group 2, group 7 and periodicity																									
		Organic Chemistry: Introduction to organic chem, alkanes, halogenalkanes														Organic Chemistry: Alkenes, alcohols and organic analysis																									
12P		**Unit 1 / 2 Particles:** Atomic structure, stable and unstable nuclei, antiparticles and photons, hadrons and leptons, strange particles and conservation of properties, quarks and antiquarks, particle interactions, photelectric effect, energy levels in atoms, wave-particle duality														**Unit 7 Electricity:** Circuits, current, potential difference, resistance, IV characteristics, resistivity, determine the resistivity of a wire, power and electrical energy, e.m.f. and internal resistance, conservation of energy, charge in circuits, potential divider																									
		Unit 3 Waves: Progressive waves, transverse and longitudinal, wave speed, polarisation, superposition, stationary waves, interference (single source and double), diffraction (diffraction gratings), refraction, reflection, refractive index, resonance, critical angle, optical fibres, total internal reflection, dispersion and attenuation														**Unit 6 Mechanics and materials**: Scalar, vector, linear motion, acceleration, motion graphs, free fall and terminal velocity, moments, stability, centre of mass, Newton's laws, conservation of momentum, momentum and safety, collisions and explosions, work, power, energy conservation, efficiency, density, strain, stress, tension, stored elastic energy, Youngs modulus																									

A Level Revision

A Level Exams

Start of 13 work / buffer time

Start of fields topic / buffer time

Opening Minds & Opening Doors

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11B		Nervous system, brain, eye, endocrine system, contraception, IVF, negative feedback, kidney, blood glucose, DNA, protein synthesis, meiosis, variation, sexual and asexual reproduction, inheritance, disorders, genetic engineering, selective breeding, cloning, speciation, evolution, classification, fossils, extinction Paper 2 assessment																				GCSE REVISION PROGRAMME							GCSE EXAMS										
11C		Purity, formulations, chromatography, gas and flame tests, cations and anions, instrumental methods and chemical methods, composition of the atmosphere, carbon sinks, global warming, impact of human activity, complete and incomplete combustion, using resources, water treatment, bioleaching and phytomining, corrosion vs rusting, metals and alloys, environmental impact of raw materials, polymers, Haber process, salt of the Earth																																					
11P		Electromagnetic spectrum, absorption and emission of infrared, reflection, refraction, ultrasound, seismic waves, lenses (converging and diverging), magnets, magnetic fields, electromagnets, motors, speakers, microphones, electromagnetic induction, transformers, solar system, redshift, big bang, life cycle of stars. Paper 2 assessment																																					
11 Trilogy		**Biology:** Nervous system, brain, eye, endocrine system, contraception, IVF, negative feedback, kidney, blood glucose, DNA, protein synthesis, meiosis, variation, sexual and asexual reproduction, inheritance, disorders, genetic engineering, selective breeding, cloning, speciation, evolution, classification, fossils, extinction Paper 2 assessment																				GCSE REVISION PROGRAMME							GCSE EXAMS										
11 Trilogy		**Chemistry:** Acids, alkalis, neutralisation, making salts, equations, reacting masses, organic chemistry, quantitative chemistry, qualitative chemistry, ionic equations, electrolysis equations																																					
11 Trilogy		**Physics:** Types of wave (transverse and longitudinal) and their characteristics, electromagnetic spectrum (application and impact), absorption and emission of infrared, magnets and magnetic fields, electromagnets. Paper 2 assessment																																					
10 Biology		Diffusion, osmosis, active transport, transpiration and translocation, health and disease, risk factors, monoclonal antibodies, plant disease, plant response. Paper 1 assessment																				Adaptations in plants and animals, competition, food chains and webs, predator-prey cycles, pyramids of biomass, water cycle, carbon cycle, decay cycle, decomposers, deforestation, global warming, biodiversity, sustainability, biotic and abiotic factors, sampling techniques																	
10 Chemistry		Conservation of mass, symbol equations, formula mass, uncertainty, the mole, reacting masses, balancing equations, limiting factors, concentration, percentage yield, volume of gases, oxidation and reduction, displacement reactions, oil-rig, neuralisation, soluble salts, acids, alkalis, neutralisation, strong and weak acids, titrations, electrolysis, exo/endo thermic reactions, temperature and rate, reaction profiles and energy levels, calculating energy of reactions, making electricity from chemicals **Paper 1 assessment**																				Collison theory, effects of temperature, volume, surface area, concentration and catalysts on rate of reaction. Reversible reactions, Le Chanteller's principle and pressure, fractional distillation, alkanes, cracking hydrocarbons, alkenes, properties of hydrocarbons, fermentation, alcohols and carboxylic acids, addition polymerisation, condensation polymerisation, amino acids, proteins and DNA																	
10 Physics		10P1: Models or the atoms and atomic structure, radioactive decay, half-life, contamination and irradiation, back ground radiation, fission and fusion. Paper 1 assessment. Scale and vector quantities, speed and acceleration, graphing motion, resultant forces																				10P2: Forces and acceleration, gravity, terminal velocity, stopping distance, momentum, extension and compression of a spring, moments and gears, atmospheric and fluid pressure. Assessment of Forces unit 5. Types of wave and characteristics, speed of sound, reflection and refraction																	
10 Trilogy		Diffusion, osmosis, active transport, transpiration and translocation, health and disease, risk factors, monoclonal antibodies, plant disease, plant response. Paper 1 assessment																				Adaptations in plants and animals, competition, food chains and webs, predator-prey cycles, pyramids of biomass, water cycle, carbon cycle, decay cycle, decomposers, deforestation, global warming, biodiversity, sustainability, biotic and abiotic factors, sampling techniques																	
10 Trilogy		10C1: Covalent bonding (structure and properties), allotropes of carbon, ionic bonding (structure and properties), metallic bonding, redox reaction, electrolysis, energy of reactions, uncertainty, the mole, limiting factors concentration, conservation of mass																				10C2: Collision theory, effect of concentration, temperature, surface area and catalysts, reversible reactions, purity, formulations, chromatography, gas tests, flame tests, fractional distillation, alkanes, cracking alkanes, alkene, properties of hydrocarbons, resources, water treatment, corrosion vs rusting, metals and alloys, environmental impact of raw materials																	
10 Trilogy		10P1: Models or the atoms and atomic structure, radioactive decay, half-life, contamination and irradiation Paper 1 assessment. Scale and vector quantities, speed and acceleration, graphing motion, resultant forces																				10P2: Forces and acceleration, gravity, terminal velocity, stopping distance, momentum, extension and compression of a spring. Assessment of Forces unit 5 Types of wave and characteristics, speed of sound, reflection and refraction																	
9/1		9B1: Cells (division, specialised, stem), organs, pathogens (viruses, bacteria, fungi, malaria), human defence, antibiotics, vaccinations, developing drugs, enzymes								9C1: Atom (history, structure, isotopes), electron configuration, noble gases, halogens, alkali metals, transition metals, separation techniques, acids, bases						9P1: Energy stores, transfers (conduction, convection) kinetic energy, work and power, density, sources of energy, reducing heat loss from the home, efficiency						9B2: Photosynthesis (limiting factors), respiration (aerobic anaerobic), circulation, blood (vessels), heart disease, body systems (respiratory, digestive) metabolism						9C2: Endo exo thermic reactions, oxidation and reduction, neutralisation, formula mass, atmosphere (composition, global warming, diming, human activity), combustion						9P2: Change of state, specific heat capacity and latent heat, particle motion, current , potential difference, resistance, application of electricity and domestic electricity					
9/2		9C1: Atom (history, structure, isotopes), electron configuration, noble gases, halogens, alkali metals, transition metals, separation techniques, acids, bases								9P1: Energy stores, transfers (conduction, convection) kinetic energy, work and power, density, sources of energy, reducing heat loss from the home, efficiency						9B1: Cells (division, specialised, stem), organs, pathogens (viruses, bacteria, fungi, malaria), human defence, antibiotics, vaccinations, developing drugs, enzymes						9C2: Endo exo thermic reactions, oxidation and reduction, neutralisation, formula mass, atmosphere (composition, global warming, diming, human activity), combustion						9P2: Change of state, specific heat capacity and latent heat, particle motion, current , potential difference, resistance, application of electricity and domestic electricity						9B2: Photosynthesis (limiting factors), respiration (aerobic anaerobic), circulation, blood (vessels), heart disease, body systems (respiratory, digestive) metabolism					
9/3		9P1: Energy stores, transfers (conduction, convection) kinetic energy, work and power, density, sources of energy, reducing heat loss from the home, efficiency								9B1: Cells (division, specialised, stem), organs, pathogens (viruses, bacteria, fungi, malaria), human defence, antibiotics, vaccinations, developing drugs, enzymes						9C1: Atom (history, structure, isotopes), electron configuration, noble gases, halogens, alkali metals, transition metals, separation techniques, acids, bases						9P2: Change of state, specific heat capacity and latent heat, particle motion, current , potential difference, resistance, application of electricity and domestic electricity						9B2: Photosynthesis (limiting factors), respiration (aerobic anaerobic), circulation, blood (vessels), heart disease, body systems (respiratory, digestive) metabolism						9C2: Endo exo thermic reactions, oxidation and reduction, neutralisation, formula mass, atmosphere (composition, global warming, diming, human activity), combustion					

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8		**8U1 Living Systems (Biology Unit)** Building on prior knowledge, pupils will learn about the levels of organisation within Biological and Ecological systems.								**8U2 Scientific Marvels** Pupils will learn about the world of extremes that exist upon Earth and how organisms are adapted for survival in extreme environments.							**8U3 Science: For Good or For Evil?** Pupils will explore Scientific Progress and the potential for Scientific advancements to be used for the benefit or to the detriment of the planet and it's inhabitants.														**8U4 Scientists of The Future** Coming full circle from the start of Year 7, what Scientific innovations and new technologies await?											

Opening Minds & Opening Doors

		How Science Works Safety in Science / Risk Assessments / Scientific equipment / units and measurements / investigating hypotheses / collecting results / writing conclusions / drawing graphs (bar charts and xy scatter graphs) / accuracy / reliability / use of models	***How Science Works*** Investigating hypotheses / collecting results / writing conclusions / drawing graphs (bar charts and xy scatter graphs) / accuracy / reliability	***How Science Works*** Investigating hypotheses / collecting results / writing conclusions / drawing graphs (bar charts and xy scatter graphs) / accuracy / reliability / ethics in Science	***How Science Works*** Investigating hypotheses / collecting results / writing conclusions / drawing graphs (bar charts and xy scatter graphs) / accuracy / reliability / ethics in Science		
		Biology Cell structure and function / animal cells / plant cells / bacterial cells / cell models / human systems: skeletal / functions of the skeleton / muscular system / antagonistic muscle pairs / circulatory system / structure of the heart / heart dissection / respiratory system /diffusion / the effect of exercise / smoking and asthma / anaerobic respiration / digestive system / role of enzymes in digestion / nervous system / reflexes / reproductive systems / the menstrual cycle / a new life / investigating ecological relationships / quadrats / seed dispersal investigation / bioaccumulation in food chains (DDT)	***Biology*** Investigating variation / plant structure / phloem / xylem / transpiration /	***Biology*** Immunity / defence against disease / white blood cells / antibodies / antitoxins / smallpox / vaccination / MMR / antivax / flu vaccinations / antibiotics / MRSA / use and misuse of drugs / dietary energy requirements / diseases of affluence e.g. diabetes, obesity etc. / deficiency diseases e.g. scurvy, rickets etc.	***Biology*** Selective breeding / cloning / genetic engineering		
			Chemistry making salts (acids + metals / metal oxides / metal hydroxides / metal carbonates) / chemical changes / conservation of mass	***Chemistry*** Periodic table / identifying unknown substances / gas tests (hydrogen / oxygen / carbon dioxide / chlorine) / chromatography /	***Chemistry*** Electrochemical cells (batteries) / smart materials (nanoscience / smart alloys / thermochromic materials / photochromic materials)		
			Physics Speed / velocity / calculating velocity / calculating energy transferred / power / mass vs weight / GFS / sound waves / amplitude / frequency / pitch / hearing ranges / sound proofing investigation / speed of light and sound / light / refraction of light / visible spectrum / how we see colours / how filters work / reflection / law of reflection / total internal reflection (and uses of) / refraction of light / pin hole camera /	***Physics*** Investigating forces and their effects / bridge building	***Physics*** Invention of electricity (electromagnetic induction) / circuits basics / circuit components / current in series and parallel / potential difference in series and parallel / electrical resistance		
7		**7U1 The First Scientists** When did humans first start making observations about the world around them and asking questions? Pupils will explore the beginnings of human curiosity and how Scientific Ideas have changed over time.	**7U2 Birmingham's role in the STEM Revolution** Birmingham has always played a role in STEM innovation, pupils will investigate the role that key Scientists and Engineers play(ed).	**7U3 Our Unique Yet Diverse World** Pupils will learn about the structure of the Earth and the diversity of life on this planet.	**7U4 A World In Crisis** Our planet faces new challenges in terms of overpopulation and the damage this is causing to our planet. Pupils will learn about the problems faced and how Scientists are collaborating on possible solutions.		
		How Science Works Safety in Science / Risk Assessments / Scientific equipment / units and measurements / investigating hypotheses / collecting results / writing conclusions / drawing graphs (bar charts and xy scatter graphs) / accuracy / reliability	***How Science Works*** Investigating hypotheses / collecting results / writing conclusions / drawing graphs (bar charts and xy scatter graphs) / accuracy / reliability	***How Science Works*** Investigating hypotheses / collecting results / writing conclusions / drawing graphs (bar charts and xy scatter graphs) / accuracy / reliability / use of models	***How Science Works*** Investigating hypotheses / collecting results / writing conclusions / drawing graphs (bar charts and xy scatter graphs) / accuracy / reliability / evaluating Scientific evidence		
		Biology	***Biology***	***Biology***	***Biology***		

		Micro-organisms / decomposers / decay / conditions for decay / preventing decay	Evolution / Natural Selection (peppered moths) / components of a healthy balanced diet / food tests / food allergies	Habitats / adaptations / variation inherited and environmental variation / extremophiles / DNA / role of Watson, Crick and Franklin /	Food chains / food webs / ecological relationships / structure of plants / flowers / photosynthesis / gene banks / structure of the ear		
		Chemistry Identifying unknown substances / flame tests / precipitation reactions / chromatography / the Periodic Table / Mendeleev / properties of metals and non-metals	***Chemistry*** Combustion / products of combustion / global warming / pH scale / acids and alkalis /acid rain / signs of a chemical reaction / energy changes in reactions / exothermic and endothermic reactions /	***Chemistry*** Structure of the Earth / earthquakes / convection currents / the rock cycle / types of rock / properties of rocks / composition of the atmosphere / evolution of the atmosphere / carbon sources and carbon sinks / global warming	***Chemistry*** Pure vs potable water / separation techniques / filtering / evaporation / distillation		
		Physics Hooke's Law / extension of a spring / levers / moments / calculating moments / simple forces / friction / reducing friction / the solar system / Earth, Sun and Moon / changing seasons / axial tilt / phases of the Moon	***Physics*** Types of energy / energy transfers / calculating efficiency / generating electricity / friction / static electricity / conduction / conductors and insulators / particle model	***Physics*** Magnets / electromagnets / convection / the solar system / Goldilocks Zone	***Physics*** The solar system / comparing conditions on other planets in our solar system / sinking and floating / density / calculating density / simple forces / balanced and unbalanced forces / water pressure		