

KS4 mapping of Biology, Chemistry & Physics

Combined Science	Separate Sciences
2 GCSEs	3 GCSEs
AQA Combined Science (8464)	AQA Biology (8461)
	AQA Chemistry (8462)
	AQA Physics (8463)
6 exam papers	6 exam papers
1 hour 15 minutes per paper	1 hour 45 minutes
10 hours of Science per fortnight	15 hours of Science per fortnight

Combined Science	Separate Sciences
21 equations to recall and use	23 equations to recall and use
7 equations they can select from the Physics data sheet and apply	12 equations they can select from the Physics data sheet and apply
20% of available marks are assigned to mathematical skills	Biology - 10% of available marks are assigned to mathematical skills Chemistry - 20% of available marks are assigned to mathematical skills Physics - 30% of available marks are assigned to mathematical skills

Biology

	Combined Science	Separate Sciences
Paper 1 Content	<p><u>Cell Biology:</u> Cell structure, microscopy, eukaryotic & prokaryotic cells, scale and size, cell transport, cell division, mitosis, cancer and cancer treatment.</p> <p><u>Organisation:</u> Tissues and organs, organ systems. Digestive system. Enzymes, blood, blood vessels, the heart, circulatory system, coronary heart disease, the lungs, non-communicable disease, metabolism, effect of lifestyle</p> <p><u>Infection & Response:</u> communicable disease, human defences including white blood cells, preventing infection, drug trials, vaccination, pathogens</p> <p><u>Bioenergetics:</u> plant tissue, photosynthesis reaction, uses of glucose, transport systems in plants, evaporation and transpiration, fungal diseases,</p>	<p><u>Cell Biology:</u> Cell structure, microscopy, eukaryotic & prokaryotic cells, scale and size, cell transport, cell division, mitosis, cancer and cancer treatment.</p> <p><u>Organisation:</u> Tissues and organs, organ systems. Digestive system. Enzymes, blood, blood vessels, the heart, circulatory system, coronary heart disease, the lungs, non-communicable disease, metabolism, effect of lifestyle</p> <p><u>Infection & Response:</u> communicable disease, human defences including white blood cells, preventing infection, drug trials, vaccination, pathogens, culturing microorganisms, monoclonal antibodies, uses of monoclonal antibodies</p> <p><u>Bioenergetics:</u> plant tissue, photosynthesis reaction, uses of</p>

	aerobic respiration, anaerobic respiration, response to exercise	glucose, transport systems in plants, evaporation and transpiration, fungal diseases, plant diseases, aerobic respiration, anaerobic respiration, response to exercise
Paper 2 Content	<p><u>Ecology</u>: interdependence, field investigations, extremophiles, adaptation, completion, biodiversity, land use, waste management, deforestation and peat bog destruction, carbon and water cycle, global warming</p> <p><u>Homeostasis & Response</u>: homeostasis, negative feedback, hormonal coordination in humans, control of blood glucose, hormones in human reproduction, contraception, infertility treatments, human nervous system, reaction times</p> <p><u>Inheritance</u>: reproduction, evaluating sexual and asexual reproduction, meiosis, DNA & the genome, inheritance, inherited disorders, genetic engineering, selective breeding</p> <p><u>Variation & Evolution</u>: evolution, evidence of evolution, fossils, variation, resistant bacteria, extinction, classification</p>	<p><u>Ecology</u>: interdependence, field investigations, extremophiles, adaptation, completion, biodiversity, land use, waste management, deforestation and peat bog destruction, carbon and water cycle, global warming, impact of environmental change, decay, trophic levels, pyramids of biomass, sustainable food production and farming techniques, role of biotechnology</p> <p><u>Homeostasis & Response</u>: homeostasis, negative feedback, hormonal coordination in humans, control of blood glucose, hormones in human reproduction, contraception, infertility treatments, control of body temperature, maintaining water and nitrogen balance, plant hormones, using plant hormones, human nervous system, reaction times, the brain, the eye</p> <p><u>Inheritance</u>: reproduction, evaluating sexual and asexual reproduction, meiosis, DNA & the genome, DNA structure, inheritance, inherited disorders, understanding genetics, genetic engineering, selective breeding, cloning</p> <p><u>Variation & Evolution</u>: evolution, evidence of evolution, fossils, variation, theory of evolution, resistant bacteria, extinction, speciation, classification,</p>
Available marks per paper	70 marks	100 marks
% of the GCSE	Each paper worth 16.7%	Each paper worth 50%
Type of questions featured in exam papers	multiple choice, structured, closed short answer and open response	multiple choice, structured, closed short answer and open response
Tier of entry	Higher or foundation	Higher only

Chemistry

	Combined Science	Separate Sciences
Paper 1 Content	<p><u>Atomic Structure & Periodic Table:</u> atomic structure, electron configuration, history of the atom, development of periodic table, metals, non-metals and ions, isotopes, separation techniques</p> <p><u>Bonding, Structure & Properties of Matter:</u> States of matter, ionic bonding, covalent bonding, metallic structures,</p> <p><u>Quantitative Chemistry:</u> relative atomic mass, moles, calculating % mass, conservation of mass, balancing equations, concentrations</p> <p><u>Chemical Changes:</u> reactivity series, displacement reactions, extracting metals, electrolysis, acids, alkalis and neutralisation, naming salts</p> <p><u>Energy Changes:</u> exothermic and endothermic reactions, reaction profiles, bond energy calculations</p>	<p><u>Atomic Structure & Periodic Table:</u> atomic structure, electron configuration, history of the atom, development of periodic table, metals, non-metals and ions, isotopes, separation techniques</p> <p><u>Bonding, Structure & Properties of Matter:</u> States of matter, ionic bonding, covalent bonding, metallic structures, nanoparticles</p> <p><u>Quantitative Chemistry:</u> relative atomic mass, moles, calculating % mass, conservation of mass, balancing equations, concentrations, atom economy and yield, titration calculations, volumes of gases</p> <p><u>Chemical Changes:</u> reactivity series, displacement reactions, extracting metals, electrolysis, acids, alkalis and neutralisation, naming salts, titration calculations</p> <p><u>Energy Changes:</u> exothermic and endothermic reactions, reaction profiles, bond energy calculations, chemical cells and batteries, fuel cells</p>
Paper 2 Content	<p><u>Rate & Extent of Chemical Change:</u> calculating rate of reaction, collision theory, factors that affect rate of reaction, reversible reactions, dynamic equilibrium</p> <p><u>Organic Chemistry:</u> crude oil and hydrocarbons, properties and burning hydrocarbons, fractional distillation, cracking of hydrocarbons</p> <p><u>Chemical Analysis:</u> pure substances and mixtures, analysing chromatograms, testing for gases</p>	<p><u>Rate & Extent of Chemical Change:</u> calculating rate of reaction, collision theory, factors that affect rate of reaction, reversible reactions, dynamic equilibrium</p> <p><u>Organic Chemistry:</u> crude oil and hydrocarbons, properties and burning hydrocarbons, fractional distillation, cracking of hydrocarbons, reaction of alkenes, structure, reactions and uses of alcohols, carboxylic acids and esters, addition polymerisation and condensation</p>

	<u>Chemistry of the Atmosphere:</u> history of the atmosphere, greenhouse gases, global climate change, atmospheric pollutants <u>Using Resources:</u> finite and renewable resources, potable water, treating waste water, extracting metals from ores, life cycle assessments, reduce, reuse and recycle,	polymerisation, natural polymers and DNA <u>Chemical Analysis:</u> pure substances and mixtures, analysing chromatograms, testing for gases, testing for positive and negative ions, instrumental analysis <u>Chemistry of the Atmosphere:</u> history of the atmosphere, greenhouse gases, global climate change, atmospheric pollutants <u>Using Resources:</u> finite and renewable resources, potable water, treating waste water, extracting metals from ores, life cycle assessments, reduce, reuse and recycle, Haber process and NPK fertilisers, using materials
Available marks per paper	70 marks	100 marks
% of the GCSE	Each paper worth 16.7%	Each paper worth 50%
Type of questions featured in exam papers	multiple choice, structured, closed short answer and open response	multiple choice, structured, closed short answer and open response
Tier of entry	Higher or foundation	Higher only

Physics

	Combined Science	Separate Sciences
Paper 1 Content	<u>Energy:</u> energy stores and transfers, kinetic energy, elastic energy, gravitational potential energy, power and energy, specific heat capacity, efficiency, energy transfers in a system, renewable and non- renewable energy <u>Electricity:</u> circuit symbols, charge and current, potential difference, resistance and current, IV graphs, thermistors, LDRs, resistors in circuits, parallel and series circuits, AC and DC, mains electricity, power equations, appliances and efficiency, National Grid <u>Particle Model of Matter:</u> density, states of matter,	<u>Energy:</u> energy stores and transfers, kinetic energy, elastic energy, gravitational potential energy, power and energy, specific heat capacity, efficiency, energy transfers in a system, renewable and non- renewable energy, insulation <u>Electricity:</u> circuit symbols, charge and current, potential difference, resistance and current, IV graphs, thermistors, LDRs, resistors in circuits, parallel and series circuits, AC and DC, mains electricity, power equations, appliances and efficiency, National Grid, static charge and electric fields

	<p>internal energy, conduction, specific heat capacity, specific latent heat, particle motion in a gas</p> <p><u>Radioactivity:</u> atomic structure, mass number, atomic number and isotopes, development of atomic model, atoms and nuclear radiation, half-lives, nuclear equations, background radiation, irradiation and contamination</p>	<p><u>Particle Model of Matter:</u> density, states of matter, internal energy, conduction, specific heat capacity, specific latent heat, particle motion in a gas, gas pressure</p> <p><u>Radioactivity:</u> atomic structure, mass number, atomic number and isotopes, development of atomic model, atoms and nuclear radiation, half-lives, nuclear equations, background radiation, irradiation and contamination, uses of radioactive substances, nuclear fission and nuclear fusion</p>
Paper 2 Content	<p><u>Forces:</u> Scalar and vector quantities, contact and non-contact forces, centre of mass, weight and gravity, resultant forces, vector diagrams, work done and energy transfers, forces and elasticity, distance and displacement, speed, velocity, distance-time graphs, acceleration, velocity-time graphs, terminal velocity, Newton's laws of motion, stopping distances, reaction times, momentum, conservation of momentum</p> <p><u>Waves:</u> types and properties of waves, wave speed, electromagnetic waves and their properties, uses and applications of the EM spectrum</p> <p><u>Magnetism:</u> magnetic fields, electromagnets and solenoids, the motor effect, Flemming's left hand rule, magnetic flux density, electric motors</p>	<p><u>Forces:</u> Scalar and vector quantities, contact and non-contact forces, centre of mass, weight and gravity, resultant forces, vector diagrams, work done and energy transfers, forces and elasticity, distance and displacement, speed, velocity, distance-time graphs, acceleration, velocity-time graphs, terminal velocity, Newton's laws of motion, stopping distances, reaction times, momentum, conservation of momentum, moments, levers and gears, pressure in fluids, atmospheric pressure, interpreting velocity-time graphs for terminal velocity, interpreting change in motion, changes in momentum</p> <p><u>Waves:</u> types and properties of waves, wave speed, electromagnetic waves and their properties, uses and applications of the EM spectrum, changes in velocity frequency and wavelength, reflection of waves, soundwaves, ultrasound, seismic and echo used in detection, lenses, visible light and black body radiation</p>

		<p><u>Magnetism</u>: magnetic fields, electromagnets and solenoids, the motor effect, Flemming's left hand rule, magnetic flux density, electric motors, loudspeakers and microphones, induced potential difference, transformers</p> <p><u>Space</u>: formation of Solar System, life cycle of a star, circular orbits, the expanding universe, the beginning and future of the universe</p>
Available marks per paper	70 marks	100 marks
% of the GCSE	Each paper worth 16.7%	Each paper worth 50%
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