

Biology AQA Specification

4.1 Cell biology	4.1.1. Cell Structure	4.1.1.1 Eukaryotes and prokaryotes
		4.1.1.2 Animal and plant cells
		4.1.1.3 Cell specialisation
		4.1.1.4 Cell differentiation
		4.1.1.5 Microscopy
		4.1.1.6 Culturing microorganisms (biology only)
	4.1.2 Cell division	4.1.2.1 Chromosomes
		4.1.2.2 Mitosis and the cell cycle
		4.1.2.3 Stem cells
	4.1.3 Transport in cells	4.1.3.1 Diffusion
4.1.3.2 Osmosis		
4.1.3.3 Active transport		
4.2 Organisation	4.2.1 Principles of organisation	
	4.2.2 Animal tissues, organs and organ systems	4.2.2.1 The human digestive system
		4.2.2.2 The heart and blood vessels
		4.2.2.3 Blood
		4.2.2.4 Coronary heart disease: a non-communicable disease
		4.2.2.5 Health issues
		4.2.2.6 The effect of lifestyle on some non-communicable diseases
		4.2.2.7 Cancer
	4.2.3 Plant tissues, organs and systems	4.2.3.1 Plant tissues
		4.2.3.2 Plant organ system
4.3 Infection and response	4.3.1 Communicable diseases	4.3.1.1 Communicable (infectious) diseases
		4.3.1.2 Viral diseases
		4.3.1.3 Bacterial diseases
		4.3.1.4 Fungal diseases
		4.3.1.5 Protist diseases
		4.3.1.6 Human defence systems
		4.3.1.7 Vaccination
		4.3.1.8 Antibiotics and painkillers
		4.3.1.9 Discovery and development of drugs
	4.3.2 Monoclonal antibodies (biology only) (HT only)	4.3.2.1 Producing monoclonal antibodies
		4.3.2.2 Uses of monoclonal antibodies
	4.3.3 Plant disease (biology only)	4.3.3.1 Detection and identification of plant diseases
4.3.3.2 Plant defence responses		
4.4 Bioenergetics	4.4.1 Photosynthesis	4.4.1.1 Photosynthetic reaction
		4.4.1.2 Rate of photosynthesis
		4.4.1.3 Uses of glucose from photosynthesis
	4.4.2 Respiration	4.4.2.1 Aerobic and anaerobic respiration
		4.4.2.2 Response to exercise
		4.4.2.3 Metabolism
4.5 Homeostasis and response	4.5.1 Homeostasis	
	4.5.2 The human nervous system	4.5.2.1 Structure and function
		4.5.2.2 The brain (biology only)
		4.5.2.3 The eye (biology only)
		4.5.2.4 Control of body temperature (biology only)
	4.5.3 Hormonal coordination in humans	4.5.3.1 Human endocrine system
		4.5.3.2 Control of blood glucose concentration
		4.5.3.3 Maintaining water and nitrogen balance in the body (biology only)
		4.5.3.4 Hormones in human reproduction
		4.5.3.5 Contraception
		4.5.3.6 The use of hormones to treat infertility (HT only)
4.5.3.7 Negative feedback (HT only)		
4.5.4 Plant hormones (biology only)	4.5.4.1 Control and coordination	
	4.5.4.2 Use of plant hormones (HT only)	
4.6 Inheritance	4.6.1 Reproduction	4.6.1.1 Sexual and asexual reproduction
		4.6.1.2 Meiosis
		4.6.1.3 Advantages and disadvantages of sexual and asexual reproduction (biology only)
		4.6.1.4 DNA and the genome

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4.6 Inheritance, variation and evolution		4.6.1.5 DNA structure (biology only)
		4.6.1.6 Genetic inheritance
		4.6.1.7 Inherited disorders
		4.6.1.8 Sex determination
	4.6.2 Variation and evolution	4.6.2.1 Variation
		4.6.2.2 Evolution
		4.6.2.3 Selective breeding
		4.6.2.4 Genetic engineering
		4.6.2.5 Cloning (biology only)
	4.6.3 The development of understanding of genetics and evolution	4.6.3.1 Theory of evolution (biology only)
		4.6.3.2 Speciation (biology only)
		4.6.3.3 The understanding of genetics (biology only)
		4.6.3.4 Evidence for evolution
4.6.3.5 Fossils		
4.6.3.6 Extinction		
4.6.3.7 Resistant bacteria		
4.6.4 Classification of living organisms		
4.7 Ecology	4.7.1 Adaptations, interdependence and competition	4.7.1.1 Communities
		4.7.1.2 Abiotic factors
		4.7.1.3 Biotic factors
		4.7.1.4 Adaptations
	4.7.2 Organisation of an ecosystem	4.7.2.1 Levels of organisation
		4.7.2.2 How materials are cycled
		4.7.2.3 Decomposition (biology only)
		4.7.2.4 <i>Impact of environmental change (biology only) (HT only)</i>
	4.7.3 Biodiversity and the effect of human interaction on ecosystems	4.7.3.1 Biodiversity
		4.7.3.2 Waste management
		4.7.3.3 Land use
		4.7.3.4 Deforestation
		4.7.3.5 Global warming
		4.7.3.6 Maintaining biodiversity
	4.7.4 Trophic levels in an ecosystem (biology only)	4.7.4.1 Trophic levels
		4.7.4.2 Pyramids of biomass
		4.7.4.3 Transfer of biomass
	4.7.5 Food production (biology only)	4.7.5.1 Factors affecting food security
		4.7.5.2 Farming techniques
4.7.5.3 Sustainable series		
4.7.5.4 Role of biotechnology		

Chemistry AQA Specification

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4.1 Atomic structure and the periodic table	4.1.1 A simple model of the atom, symbols, relative atomic mass, electronic charge and isotopes	4.1.1.1 Atoms, elements and compounds
		4.1.1.2 Mixtures
		4.1.1.3 The development of the model of the atom (common content with physics)
		4.1.1.4 Relative electrical charges of subatomic particles
		4.1.1.5 Size and mass of atoms
		4.1.1.6 Relative atomic mass
		4.1.1.7 Electronic structure
	4.1.2 The periodic table	4.1.2.1 The periodic table
		4.1.2.2 Development of the periodic table
		4.1.2.3 Metals and non-metals
		4.1.2.4 Group 0
		4.1.2.5 Group 1
		4.1.2.6 Group 7
4.1.3 Properties of transition metals (chemistry only)	4.1.3.1 Comparison with Group 1 elements	
	4.1.3.2 Typical properties	
4.2 Bonding, structure, and the properties of matter	4.2.1 Chemical bonds, ionic, covalent and metallic	4.2.1.1 Chemical bonds
		4.2.1.2 Ionic bonding
		4.2.1.3 Ionic compounds
		4.2.1.4 Covalent bonding
		4.2.1.5 Metallic bonding
		4.2.2.1 The three states of matter
		4.2.2.2 State symbols
		4.2.2.3 Properties of ionic compounds
		4.2.2.4 Properties of small molecules
		4.2.2.5 Polymers
		4.2.2.6 Giant covalent structures
		4.2.2.7 Properties of metals and alloys
		4.2.2.8 Metals as conductors
	4.2.3 Structure and bonding of carbon	4.2.3.1 Diamond
		4.2.3.2 Graphite
		4.2.3.3 Graphene and fullerenes
4.2.4 Bulk and surface properties of matter including nanoparticles (chemistry only)	4.2.4.1 Sizes of particles and their properties	
	4.2.4.2 Uses of nanoparticles	
4.3 Quantitative chemistry	4.3.1 Chemical measurements, conservation of mass and the quantitative interpretation of chemical equations	4.3.1.1 Conservation of mass and balanced chemical equations
		4.3.1.2 Relative formula mass
		4.3.1.3 Mass changes when a reactant or product is a gas
		4.3.1.4 Chemical measurements
	4.3.2 Use of amount of substance in relation to masses of pure substances	4.3.2.1 Moles (HT only)
		4.3.2.2 Amounts of substances in equations (HT only)
		4.3.2.3 Using moles to balance equations (HT only)
		4.3.2.4 Limiting reactants (HT only)
		4.3.2.5 Concentration of solutions
	4.3.3 Yield and atom economy of chemical reactions (chemistry only)	4.3.3.1 Percentage yield
		4.3.3.2 Atom economy
		4.3.4 Using concentrations of solutions in mol/dm ³ (chemistry only) (HT only)
		4.3.5 Use of amount of substance in relation to volumes of gases (chemistry only) (HT only)
4.4 Chemical changes	4.4.1 Reactivity of metals	4.4.1.1 Metal oxides
		4.4.1.2 The reactivity series
		4.4.1.3 Extraction of metals and reduction
		4.4.1.4 Oxidation and reduction in terms of electrons (HT only)
	4.4.2 Reactions of acids	4.4.2.1 Reactions of acids with metals
		4.4.2.2 Neutralisation of acids and salt production
		4.4.2.3 Soluble salts
		4.4.2.4 The pH scale and neutralisation
		4.4.2.5 Titrations (chemistry only)
		4.4.2.6 Strong and weak acids (HT only)
	4.4.3 Electrolysis	4.4.3.1 The process of electrolysis
		4.4.3.2 Electrolysis of molten ionic compounds
		4.4.3.3 Using electrolysis to extract metals
		4.4.3.4 Electrolysis of aqueous solutions
		4.4.3.5 Representation of reactions at electrodes as half equations (HT only)
	4.5.1.1 Energy transfer during exothermic and endothermic reactions	

4.5 Energy changes		4.5.1.2 Reaction profiles
	4.5.1 Exothermic and endothermic reactions	4.5.1.3 The energy change of reactions (HT only)
	4.5.2 Chemical cells and fuel cells (chemistry only)	4.5.2.1 Cells and batteries 4.5.2.2 Fuel cells
4.6 The rate and extent of chemical change	4.6.1 Rate of reaction	4.6.1.1 Calculating rates of reactions
		4.6.1.2 Factors which affect the rates of chemical reactions
		4.6.1.3 Collision theory and activation energy
		4.6.1.4 Catalysts
	4.6.2 Reversible reactions and dynamic equilibrium	4.6.2.1 Reversible reactions
		4.6.2.2 Energy changes and reversible reactions
		4.6.2.3 Equilibrium
	4.6.2.4 The effect of changing conditions on equilibrium (HT only)	
	4.6.2.5 The effect of changing concentration (HT only)	
	4.6.2.6 The effect of temperature changes on equilibrium (HT only)	
	4.6.2.7 The effect of pressure changes on equilibrium (HT only)	
4.7 Organic chemistry	4.7.1 Carbon compounds as fuels and feedstock	4.7.1.1 Crude oil, hydrocarbons and alkanes
		4.7.1.2 Fractional distillation and petrochemicals
		4.7.1.3 Properties of hydrocarbons
		4.7.1.4 Cracking and alkenes
	4.7.2 Reactions of alkenes and alcohols (chemistry only)	4.7.2.1 Structure and formulae of alkenes
		4.7.2.2 Reactions of alkenes
		4.7.2.3 Alcohols
		4.7.2.4 Carboxylic acids
	4.7.3 Synthetic and naturally occurring polymers (chemistry only)	4.7.3.1 Addition polymerisation
		4.7.3.2 Condensation polymerisation (HT only)
4.7.3.3 Amino acids (HT only)		
4.7.3.4 DNA (deoxyribonucleic acid) and other naturally occurring polymers		
4.8 Chemical analysis	4.8.1 Purity, formulations and chromatography	4.8.1.1 Pure substances
		4.8.1.2 Formulations
		4.8.1.3 Chromatography
	4.8.2 Identification of common gases	4.8.2.1 Test for hydrogen
		4.8.2.2 Test for oxygen
		4.8.2.3 Test for carbon dioxide
		4.8.2.4 Test for chlorine
	4.8.3 Identification of ions by chemical and spectroscopic means (chemistry only)	4.8.3.1 Flame tests
		4.8.3.2 Metal hydroxides
		4.8.3.3 Carbonates
		4.8.3.4 Halides
		4.8.3.5 Sulfates
		4.8.3.6 Instrumental methods
4.8.3.7 Flame emission spectroscopy		
4.9 Chemistry of the atmosphere	4.9.1 The composition and evolution of the Earth's atmosphere	4.9.1.1 The proportions of different gases in the atmosphere
		4.9.1.2 The Earth's early atmosphere
		4.9.1.3 How oxygen increased
		4.9.1.4 How carbon dioxide decreased
	4.9.2 Carbon dioxide and methane as greenhouse gases	4.9.2.1 Greenhouse gases
		4.9.2.2 Human activities which contribute to an increase in greenhouse gases in the atmosphere
		4.9.2.3 Global climate change
		4.9.2.4 The carbon footprint and its reduction
	4.9.3 Common atmospheric pollutants and their sources	4.9.3.1 Atmospheric pollutants from fuels
		4.9.3.2 Properties and effects of atmospheric pollutants
4.10 Using resources	4.10.1 Using the Earth's resources and obtaining potable water	4.10.1.1 Using the Earth's resources and sustainable development
		4.10.1.2 Potable water
		4.10.1.3 Waste water treatment
		4.10.1.4 Alternative methods of extracting metals (HT only)
	4.10.2 Life cycle assessment and recycling	4.10.2.1 Life cycle assessment
		4.10.2.2 Ways of reducing the use of resources
	4.10.3 Using materials (chemistry only)	4.10.3.1 Corrosion and its prevention
		4.10.3.2 Alloys as useful materials
		4.10.3.3 Ceramics, polymers and composites
	4.10.4 The Haber process and the use of NPK fertilisers (chemistry only)	4.10.4.1 The Haber process
4.10.4.2 Production and uses of NPK fertilisers		

Physics AQA Specification

Topic	Subtopic	Description
4.1 Energy	4.1.1 Energy changes in a system, and the ways energy is stored before and after such changes	4.1.1.1 Energy stores and systems
		4.1.1.2 Changes in energy
		4.1.1.3 Energy changes in systems
		4.1.1.4 Power
	4.1.2 Conservation and dissipation of energy	4.1.2.1 Energy transfers in a system
		4.1.2.2 Efficiency
		4.1.3 National and global energy resources
4.2 Electricity	4.2.1 Current, potential difference and resistance	4.2.1.1 Standard circuit diagram symbols
		4.2.1.2 Electrical charge and current
		4.2.1.3 Current, resistance and potential difference
		4.2.1.4 Resistors
	4.2.2 Series and parallel circuits	
	4.2.3 Domestic uses and safety	4.2.3.1 Direct and alternating potential difference
		4.2.3.2 Mains electricity
	4.2.4 Energy transfers	4.2.4.1 Power
		4.2.4.2 Energy transfers in everyday appliances
		4.2.4.3 The National Grid
	4.2.5 Static electricity (physics only)	4.2.5.1 Static charge
		4.2.5.2 Electric LEDs
	4.3 Particle model of matter	4.3.1 Changes of state and the particle model
4.3.1.2 Changes of state		
4.3.2 Internal energy and energy transfers		4.3.2.1 Internal energy
		4.3.2.2 Temperature changes in a system and specific heat capacity
		4.3.2.3 Changes of heat and specific latent heat
4.3.3 Particle model and pressure		4.3.3.1 Particle motion in gases
		4.3.3.2 Pressure in gases (physics only)
		4.3.3.3 Increasing the pressure of a gas (physics only) (HT only)
4.4 Atomic structure	4.4.1 Atoms and isotopes	4.4.1.1 The structure of an atom
		4.4.1.2 Mass number, atomic number and isotopes
		4.4.1.3 The development of the model of the atom (common content with chemistry)
	4.4.2 Atoms and nuclear radiation	4.4.2.1 Radioactive decay and nuclear radiation
		4.4.2.2 Nuclear equations
		4.4.2.3 Half-lives and the random nature of radioactive decay
		4.4.2.4 Radioactive contamination
	4.4.3 Hazards and uses of radioactive emissions and of background radiation (physics only)	4.4.3.1 Background radiation
		4.4.3.2 Different half-lives of radioactive isotopes
		4.4.3.3 Uses of nuclear radiation
4.4.4 Nuclear fission and fusion (physics only)	4.4.4.1 Nuclear fission	
	4.4.4.2 Nuclear fusion	
4.5 Forces	4.5.1 Forces and their interactions	4.5.1.1 Scalar and vector quantities
		4.5.1.2 Contact and non-contact forces
		4.5.1.3 Gravity
		4.5.1.4 Resultant forces
	4.5.2 Work done and energy transfer	
	4.5.3 Forces and elasticity	
	4.5.4 Moments, levers and gears (physics only)	
	4.5.5 Pressure and pressure differences in fluids (physics only)	4.5.5.1 Pressure in a fluid
		4.5.5.2 Atmospheric pressure
	4.5.6 Forces and motion	4.5.6.1 Describing motion along a line
4.5.6.2 Forces, accelerations and Newton's Laws of motion		
4.5.6.3 Forces and braking		
4.5.7.1 Momentum is a property of moving objects		
4.5.7.2 Conservation of momentum		
4.5.7.3 Changes in momentum (physics only)		
4.6 Waves	4.6.1 Waves in air, liquids and solids	4.6.1.1 Transverse and longitudinal waves
		4.6.1.2 Properties of waves
		4.6.1.3 Reflection of waves (physics only)
		4.6.1.4 Sound waves (physics only) (HT only)
		4.6.1.5 Waves for detection and exploration (physics only) (HT only)
	4.6.2 Properties of electromagnetic waves	4.6.2.1 Types of electromagnetic waves
		4.6.2.2 Properties of electromagnetic waves 1
4.6.2.3 Properties of electromagnetic waves 2		

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		4.6.2.4 Uses and applications of electromagnetic waves
		4.6.2.5 Lenses (physics only)
	4.6.2 Electromagnetic waves	4.6.2.6 Visible light (physics only)
		4.6.3.1 Emission and absorption of infrared radiation
	4.6.3 Black body radiation (physics only)	4.6.3.2 Perfect black bodies and radiation
4.7 Magnetism and electromagnetism	4.7.1 Permanent and induced magnetism, magnetic forces and fields	4.7.1.1 Poles of a magnet
		4.6.3.2 Perfect black bodies and radiation
		4.7.2.1 Electromagnetism
		4.7.2.2 Fleming's left-hand rule (HT only)
		4.7.2.3 Electric motors (HT only)
	4.7.2 The motor effect	4.7.2.4 Loudspeakers (physics only) (HT only)
		4.7.3.1 Induced potential (HT only)
	4.7.3 Induced potential, transformers and the National Grid (physics only) (HT only)	4.7.3.2 Uses of the generator effect (HT only)
		4.7.3.3 Microphones (HT only)
		4.7.3.4 Transformers (HT only)
4.8 Space physics (physics only)		4.8.1.1 Our solar system
		4.8.1.2 The life cycle of a star
	4.8.1 Solar system; stability of orbital motions; satellites (physics only)	4.8.1.3 Orbital motion, natural and artificial satellites
		4.8.2 Red-shift (physics only)