

# Key Stage 4 Science Curriculum map

## AQA Trilogy GCSE Science - 8464

Biology	Chemistry	Physics
Cell Biology Organisation Infection and response Bioenergetics Homeostasis and response Inheritance, variation and evolution Ecology	Atomic structure and the periodic table Bonding, structure and the properties of matter Quantitative chemistry Chemical changes Energy changes The rate and extent of chemical change Organic chemistry Chemical analysis Chemistry of the atmosphere Using resources	Energy Electricity Particle model of matter Atomic structure Forces Waves Magnetism and electromagnetism

## Key Ideas

The complex and diverse phenomena of the natural and man-made world can be described in terms of a small number of key ideas throughout the three scientific areas. They underpin many aspects of the science assessment and will therefore be assessed across all papers

### Biology

- life processes depend on molecules whose structure is related to their function
- the fundamental units of living organisms are cells, which may be part of highly adapted structures including tissues, organs and organ systems, enabling living processes to be performed effectively
- living organisms may form populations of single species, communities of many species and ecosystems, interacting with each other, with the environment and with humans in many different ways
  - living organisms are interdependent and show adaptations to their environment
- life on Earth is dependent on photosynthesis in which green plants and algae trap light from the Sun to fix carbon dioxide and combine it with hydrogen from water to make organic compounds and oxygen
  - organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life
  - the chemicals in ecosystems are continually cycling through the natural world
  - the characteristics of a living organism are influenced by its genome and its interaction with the environment
- evolution occurs by a process of natural selection and accounts both for biodiversity and how organisms are all related to varying degrees.

### Chemistry

- matter is composed of tiny particles called atoms and there are about 100 different naturally occurring types of atoms called elements
  - elements show periodic relationships in their chemical and physical properties
- these periodic properties can be explained in terms of the atomic structure of the elements
- atoms bond by either transferring electrons from one atom to another or by sharing electrons
  - the shapes of molecules (groups of atoms bonded together) and the way giant structures are arranged is of great importance in terms of the way they behave
    - there are barriers to reaction so reactions occur at different rates
      - chemical reactions take place in only three different ways:
        - proton transfer • electron transfer • electron sharing

- energy is conserved in chemical reactions so can therefore be neither created or destroyed.

## Physics

- the use of models, as in the particle model of matter or the wave models of light and of sound
- the concept of cause and effect in explaining such links as those between force and acceleration, or between changes in atomic nuclei and radioactive emissions
- the phenomena of 'action at a distance' and the related concept of the field as the key to analysing electrical, magnetic and gravitational effects
  - that differences, for example between pressures or temperatures or electrical potentials, are the drivers of change
- that proportionality, for example between weight and mass of an object or between force and extension in a spring, is an important aspect of many models in science
  - that physical laws and models are expressed in mathematical form.

Week	Year 10
1	4.1 Cell Biology
2	Cell structure - Eukaryotes and prokaryotes, animal and plant cells, cell specialisation, cell differentiation, microscopy Cell division - Chromosomes, Mitosis and the cell cycle, Stem cells Transport in cells - Diffusion, Osmosis, Active transport
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5	5.1 Atomic Structure and the Periodic Table
6	A simple model of the atom, symbols, relative atomic mass, electronic charge and isotopes - Atoms, elements and compounds, Mixtures, The development of the model of the atom (common content with physics), Relative electrical charges of subatomic particles, Size and mass of atoms, Relative atomic mass, Electronic structure The periodic table - The periodic table, Development of the periodic table, Metals and non-metals, Group 0, Group 1, Group 7
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9	6.1 Energy
10	Energy changes in a system, and the ways energy is stored before and after such changes - Energy stores and systems, Changes in energy, Energy changes in systems, Power Conservation and dissipation of energy - Energy transfers in a system, Efficiency National and global energy resources
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13	4.2 Organisation
14	Principles of organisation Animal tissues, organs and organ systems - The human digestive system, the heart and blood vessels, blood, coronary heart disease: a non-communicable disease, health issues, the effect of lifestyle on some non-communicable diseases, cancer Plant tissues, organs and systems - Plant tissues, Plant organ system
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17	5.2 Bonding, structure and the properties of matter
18	Chemical bonds, ionic, covalent and metallic - Chemical bonds, Ionic bonding, Ionic compounds, Covalent bonding, Metallic bonding How bonding and structure are related to the properties of substances - The three states of matter, State symbols, Properties of ionic compounds, Properties of small molecules, Polymers, Giant covalent structures, Properties of metals and alloys, Metals as conductors Structure and bonding of carbon - Diamond, Graphite, Graphene and fullerenes
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21	6.2 Electricity
22	Current, potential difference and resistance - Standard circuit diagram symbols, Electrical charge and current, Current, resistance and potential difference, Resistors
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	<p>Series and parallel circuits</p> <p>Domestic uses and safety - Direct and alternating potential difference, Mains electricity</p> <p>Energy transfers - Power, Energy transfers in everyday appliances, The National Grid,</p>
19	<p>4.3 Infection and response</p> <p>Communicable diseases - Communicable (infectious) diseases, Viral diseases, Bacterial diseases, Fungal diseases, Protist diseases, Human defence systems, Vaccination, Antibiotics and painkillers, Discovery and development of drugs,</p>
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22	<p>5.3 Quantitative Chemistry</p> <p>Chemical measurements, conservation of mass and the quantitative interpretation of chemical equations - Conservation of mass and balanced chemical equations, Relative formula mass, Mass changes when a reactant or product is a gas, Chemical measurements</p> <p>Use of amount of substance in relation to masses of pure substances - Moles (HT only), Amounts of substances in equations (HT only), Using moles to balance equations (HT only), Limiting reactants (HT only), Concentration of solutions</p>
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25	<p>6.3 Particle model of matter</p> <p>Changes of state and the particle model - Density of materials, Changes of state</p> <p>Internal energy and energy transfers - Internal energy, Temperature changes in a system and specific heat capacity, Changes of state and specific latent heat</p> <p>Particle model and pressure - Particle motion in gases</p>
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28	<p>4.4 Bioenergetics</p> <p>Photosynthesis - Photosynthesis reaction, Rate of photosynthesis, Uses of glucose from photosynthesis</p> <p>Respiration - Aerobic and anaerobic respiration, Response to exercise, Metabolism</p>
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31	<p>5.4 Chemical changes</p> <p>Reactivity of metals - Metal oxides, The reactivity series, Extraction of metals and reduction, Oxidation and reduction in terms of electrons (HT only)</p> <p>Reactions of acids - Reactions of acids with metals, Neutralisation of acids and salt production, Soluble salts, The pH scale and neutralisation, Strong and weak acids (HT only)</p> <p>Electrolysis - The process of electrolysis, Electrolysis of molten ionic compounds, Using electrolysis to extract metals, Electrolysis of aqueous solutions, Representation of reactions at electrodes as half equations HT only)</p>
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34	<p>6.4 Atomic Structure</p>

35	Atoms and isotopes - The structure of an atom, Mass number, atomic number and isotopes, The development of the model of the atom (common content with Chemistry) Atoms and nuclear radiation - Radioactive decay and nuclear radiation, Nuclear equations, half-lives and the random nature of radioactive decay, Radioactive contamination
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Week	Year 11
1	4.5 Homeostasis and response
2	Homeostasis
3	The human nervous system Hormonal coordination in humans - Human endocrine system, Control of blood glucose concentration, Hormones in human reproduction, Contraception, The use of hormones to treat infertility (HT only), Feedback systems (HT only)
4	5.5 Energy changes
5	Exothermic and endothermic reactions - Energy transfer during exothermic and endothermic reactions, Reaction profiles, The energy change of reactions (HT only),
6	
7	6.5 Forces
8	Forces and their interactions - Scalar and vector quantities, Contact and non-contact forces, Gravity, Resultant forces
9	Work done and energy transfer Forces and elasticity Forces and motion - Describing motion along a line - Distance and displacement, Speed, Velocity, The distance-time relationship, Acceleration Forces and motion - Forces, accelerations and Newton's Laws of motion - Newton's First Law, Newton's Second Law, Newton's Third Law Forces and motion - Forces and braking - Stopping distance, Reaction time, Factors affecting braking distance 1, Factors affecting braking time 2 Momentum (HT only) - Momentum is a property of moving objects, Conservation of momentum
10	4.6 Inheritance, variation and evolution
11	Reproduction - Sexual and asexual reproduction, Meiosis, DNA and the genome, Genetic inheritance, Inherited disorders, Sex determination
12	Variation and evolution - Variation, Evolution, Selective breeding, Genetic engineering The development of understanding of genetics and evolution - Evidence for evolution, Fossils, Extinction, Resistant Bacteria Classification of living organisms
13	5.6 The rate and extent of chemical change
14	Rate of reaction - Calculating rates of reaction, Factors which affect the rates of chemical reactions, Collision theory and activation energy, Catalysts
15	Reversible reactions and dynamic equilibrium - Reversible reactions, Energy changes and reversible reactions, Equilibrium, The effect of changing conditions on equilibrium (HT only), The effect of changing concentration (HT only), The effect of temperature changes on equilibrium (HT only), The effect of pressure changes on equilibrium (HT only)
16	6.6 Waves
17	Waves in air, fluids and solids - Transverse and longitudinal waves,
18	Properties of waves

	Electromagnetic waves - Types of electromagnetic waves, Properties of electromagnetic waves 1, Properties of electromagnetic waves 2, Uses and application of electromagnetic waves
19	4.7 Ecology
20	Adaptation, interdependence and competition - Communities, Abiotic factors, Biotic factors, Adaptations
21	Organisation of an ecosystem - Levels of organisation, how materials are cycled Biodiversity and the effect of human interaction on ecosystems - Biodiversity, Waste management, Land use, Deforestation, Global warming, Maintaining biodiversity
22	5.7 Organic chemistry
23	Carbon compounds as fuels and feedstock - Crude oil, hydrocarbons and alkanes, Fractional distillation and petrochemicals, Properties of hydrocarbons, Cracking and alkenes
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25	6.7 Magnetism and electromagnetism
26	Permanent and induced magnetism, magnetic forces and fields - Poles of a magnet, Magnetic fields
27	The motor effect - Electromagnetism, Fleming's left-hand rule (HT only), Electric motors (HT only)
28	5.8 Chemical Analysis
29	Purity, formulation and chromatography - Pure substances, Formulations, Chromatography
30	Identification of common gases - Test for hydrogen, Test for oxygen, Test for carbon dioxide, Test for chlorine
31	5.9 Chemistry of the atmosphere
32	The composition and evolution of the Earth's atmosphere - The proportions of different gases in the atmosphere, The Earth's early atmosphere, how oxygen increased, how carbon dioxide decreased
33	Carbon dioxide and methane as greenhouse gases - Greenhouse gases, Human activities which contribute to an increase in greenhouse gases in the atmosphere, Global climate change, The carbon footprint and its reduction Common atmospheric pollutants and their sources - Atmospheric pollutants from fuels, Properties and effects of atmospheric pollutants
	5.10 Using resources
	Using the Earth's resources and obtaining potable water - Using the Earth's resources and sustainable development, Potable water, Waste water treatment, Alternative methods of extracting metals (HT only)
	Life cycle assessment and recycling - Life cycle assessment, Ways of reducing the use of resources
34	Exams
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