

Year 9 Science Topics

SB1 Key Concepts in Biology

In this unit you will learn about some of the central ideas in biology, including ideas about cells, microscopy, enzymes, nutrition, diffusion, osmosis and active transport.

Builds upon:

From KS3:

- How to use a microscope
- The differences between cells for different organisms
- How some cells are specialised and adapted to their functions
- How enzymes help to digest food in the digestive system
- How substances can move by diffusion

Introduces:

- How developments in microscopy have allowed us to find out more about sub-cellular structures
- The importance of enzymes in nutrition, growth and development
- How chemical tests can be used to identify substances in food
- How enzymes are affected by pH and temperature and why each enzyme only works on a certain type of molecule
- How substances are carried by diffusion, osmosis and active transport

Assessment

- End of topic test
- Six mark question

SB2 Cells and Control

In this unit you will discover how plants and animals develop from single cells the size of full stops to become complex organisms made of many different types of cells, which all need to be controlled and coordinated.

Builds upon:

From KS3:

- That cells divide
- The structure of plant and animal cells (including the chromosomes in their nuclei)
- How your nervous system helps to coordinate your actions

Introduces:

- Mitosis and its importance in growth repair and asexual reproduction
- How cells become specialised, and the importance of stem cells
- The structure and function of the brain and eyes
- How to identify different specialised cells in the nervous system and explain how the system works

Assessment

- End of topic test
- Six mark question

CC1-2 States of Matter / Methods of Separating and Purifying Substances

In this unit you will learn how materials can be separated from one another using their properties.

Builds upon:

From KS3:

- How particles are arranged in solids, liquids and gases and how their energy changes with change of state
- How mixtures differ from pure substances
- How to separate some mixtures using filtration, distillation and chromatography

Introduces:

- How to use information to predict the state of a substance
- How the arrangement, movement and energy of particles change during changes of state
- How to use melting points to tell the differences between mixtures and pure substances
- How to identify substances using melting points and chromatography
- How different methods of separation work
- How to choose a separation method based on the properties of the substances in a mixture

Assessment

- End of topic test
- Six mark question

CC3-4 Atomic Structure / The Periodic Table

In this unit you will find out more about atoms and their structure and how to use the periodic table.

Builds upon:

From KS3:

- The particle model of matter
- Chemical symbols
- How elements are arranged in the periodic table, periods and groups
- The properties of metals and non-metals in the periodic table

Introduces:

- How our ideas about atoms have changed
- How to calculate relative atomic mass
- How Mendeleev arranged the elements into a periodic table, predicting the existence and properties of undiscovered elements
- How to use the periodic table to predict and model the arrangement of electrons in atoms

Assessment

- End of topic test
- Six mark question

CC5-7 Ionic Bonding / Covalent Bonding / Types of Substance

In this unit we will look at the fundamental forces of attraction that hold atoms and molecules together. These are essential to understand physical changes and chemical reactions.

Builds upon:

From KS3:

- The particle model of matter
- How Dalton's ideas about atoms and molecules helped explain the properties of matter
- How elements are arranged in the periodic table

From KS4 CC4:

- How to use the periodic table to predict and model the arrangement of electrons in atoms

Introduces:

- How ionic, covalent and metallic bonds are formed
- The formation of lattice and molecular structures
- How the physical properties of a substance are linked to its bonding and structure

Assessment

- End of topic test
- Six mark question

CP1 Motion

In this unit you will learn about quantities that have direction. You will find out how to calculate speeds and accelerations, and how to represent changes in distance moved and speed on graphs.

Builds upon:

From KS3:

- What forces are and the effects of balanced and unbalanced forces
- How average speed, distance and time are related
- How to represent a journey on a distance-time graph

Introduces:

- The difference between vector and scalar quantities
- How to calculate speed and acceleration
- How to represent journeys on distance-time and velocity-time graphs
- How to use graphs to calculate speed, acceleration and distance travelled

Assessment

- End of topic test
- Six mark question

CP2 Forces and Motion

In this unit we will learn about forces and how they determine the motion of objects. We will look at applying these ideas to car safety.

Builds upon:

From KS3:

- What forces are and the effects of balanced and unbalanced forces
- What a resultant force is
- Gravity as a non-contact force

Introduces:

- Newton's laws of motion
- How to calculate an object's weight from its mass
- The factors that affect the stopping distance of a vehicle
- The dangers of large decelerations
- How to calculate momentum and apply ideas about momentum to collisions (H)

Assessment

- End of topic test
- Six mark question

CP3 Conservation of Energy

In this unit you will learn about the ways in which energy can be transferred and stored, how to reduce energy transfers and the renewable and non-renewable resources we use in everyday life.

Builds upon:

From KS3:

- Temperature differences lead to energy transfers
- How energy can be transferred by conduction, convection and radiation
- Ways of reducing energy transferred by heating
- That energy is conserved

Introduces:

- How energy is stored and transferred
- How to represent energy transfers using diagrams
- How to calculate efficiency
- How to reduce transfers of wasted energy
- How to calculate gravitational potential energy and kinetic energy
- Different renewable and non-renewable energy resources

Assessment

- End of topic test
- Six mark question

Year 10 Combined Science Topics

CB3 Genetics

In this unit we learn about the DNA code that produces our features and the processes that allow features to be passed on from parents to their offspring.

Build upon:

From KS3:

- The differences between environmental and inherited variation
- How two gametes fuse during fertilisation to produce a single zygote
- How the nuclei of eukaryotic cells contain chromosomes which contain DNA

Introduces:

- How gametes are produced by mitosis
- The structure of DNA
- Mutations and how genes cause genetic variation
- Why certain characteristics are passed down through families

Assessment

- End of topic test
- Six mark question

CB4 Natural Selection and Genetic Modification

In this unit you will find out more about how organisms are changed genetically by natural selection and by humans.

Builds upon:

From KS3:

- Evolution - that organisms change over time
- That Darwin came up with a theory to explain evolution
- How DNA contains instructions for the characteristics of organisms

Introduces:

- Darwin's Theory of evolution by natural selection
- How different methods such as genetic analysis are being used to investigate evolution
- How organisms are classified
- Selective breeding
- Genetic modification

Assessment

- End of topic test
- Six mark question

CB5 Health, Disease and the Development of Medicines

This unit will help you define health, learn about some pathogens and the diseases they cause, medicines and about the immune system.

Builds upon:

From KS3:

- That imbalances in diet can lead to obesity and deficiency diseases
- That recreational drugs can affect behaviour, health and life processes

From KS4 CB1:

- The structure of bacteria

Introduces:

- How we define health
- Some pathogens and the diseases they cause
- How the spread of pathogens can be reduced or prevented
- How the body is protected against infection
- The immune system
- How antibiotics work
- How new medicines are developed

Assessment

- End of topic test
- Six mark question

CB6 Plant Structures and their Functions

This unit will help you learn about the process of photosynthesis and its importance, how plant structures are adapted to their functions and how water, mineral ions and sugar are transported through plants.

Builds upon:

From KS3:

- That plants make their own food using photosynthesis
- How light and chlorophyll are necessary for photosynthesis

From KS4 CB1:

- How certain plant cells are specialised and adapted to their function

Introduces:

- More about photosynthesis and how different factors affect its rate
- How the rate of water uptake by a plant is affected by different factors
- How the reactants and products of photosynthesis are transported
- More specialised cells: palisade, root hair, xylem and phloem

Assessment

- End of topic test
- Six mark question

CB7 Animal Coordination Control and Homeostasis

This unit introduces you to hormones, metabolic rate, the menstrual cycle, blood glucose and diabetes.

Builds upon:

From KS3:

- How obesity is caused
- The structure and function of human reproductive systems
- The menstrual cycle

From KS4 CB1:

- The structure of sperm and egg cells
- How enzymes help digest food molecules

Introduces:

- Endocrine glands
- How hormones are transported to their target organs
- How the menstrual cycle is controlled by hormones
- How hormones are used in contraception
- About diabetes and how blood glucose is controlled
- How Thyroxine and adrenaline affect the body (H)
- What a negative feedback mechanism is (H)

Assessment

- End of topic test
- Six mark question

CC8 Acids and Alkalis

In this unit we explore the nature of acidic and alkaline solutions, and investigate their most important reactions properties and uses.

Builds upon:

From KS3:

- Solubility, solutes, solvents and solutions
- Common international hazard symbols
- The use of indicators to test the pH of solutions
- What happens during simple neutralisation reactions

Introduces:

- The ions in acids and alkalis and how their concentrations are linked to pH
- The reactions between acids and different types of bases
- Different indicators that can be used in titrations
- How soluble and insoluble salts can be prepared in the laboratory

Assessment

- End of topic test
- Six mark question

CC9 Calculations involving Masses

This unit will help you to use relative atomic masses to calculate relative formula masses of elements and compounds, calculate the concentration of a solution and work out empirical and molecular formulae of compounds.

Builds upon:

From KS3:

- How to represent elements and compounds using symbols
- How mass is conserved during changes of state and chemical reactions
- How to show chemical reactions using equations

Introduces:

- How to calculate relative formula masses of elements and compounds
- How to work out empirical and molecular formulae of compounds
- How to calculate the mass of reactants or products in a reaction
- How to calculate the concentration of a solution
- The Avogadro constant (H)

Assessment

- End of topic test
- Six mark question

CC10-12 Electrolytic Processes / Metals / Reversible Reactions and Equilibria

This unit will help you learn more about reactivity, oxidation and reduction, the advantages of recycling, about the Haber process and what happens during electrolysis.

Builds upon:

From KS3:

- Oxidation and displacement reactions
- The reactivity series

From KS4 CC4, CC5 and CC8:

- Anions and cations in ionic compounds
- Writing balanced chemical equations with state symbols
- How the elements are arranged in the periodic table

Introduces:

- More about reactivity, oxidation and reduction
- How metals can be extracted
- The advantages of recycling metals
- The factors involved in a life-cycle assessment of a product
- What happens during electrolysis
- Equilibria in chemical reactions
- The Haber process
- Half equations (H)

Assessment

- End of topic test
- Six mark question

CC13-15 Groups / Rates of Reaction / Heat Energy Changes in Reactions

This unit looks at some typical reactions of certain elements and general ideas about how chemical reactions can be controlled and used.

Builds upon:

From KS3:

- Elements, compounds and the periodic table
- What happens during chemical reactions

From KS4 CC3, CC5 and CC8:

- The nature of atoms and ions
- Writing balanced chemical equations including state symbols

Introduces:

- The properties and reactions of the elements in groups 1, 7 and 0
- How changes in conditions can affect the rates of reactions
- The energy transfers that can occur during chemical reactions

Assessment

- End of topic test
- Six mark question

CP4 Waves

This unit introduces you to waves characteristics and how they transfer energy and information.

Builds upon:

From KS3:

- Light and sound waves and how they can be described
- How sound waves are produced and detected
- Some uses of sound waves
- How light can be absorbed, scattered and reflected
- Different colours of light

Introduces:

- How waves transfer energy and information
- How to describe the characteristics of waves
- How the speed of a wave is related to its frequency and wavelength
- How the speed of a wave is related to time and distance
- How waves are refracted at boundaries between different materials

Assessment

- End of topic test
- Six mark question

CP5 Light and the Electromagnetic Spectrum

This unit will help you learn about the electromagnetic spectrum, harmful effects of waves from this spectrum and that light is part of this family of waves which all have some properties in common.

Builds upon:

From KS3:

- How light transfers energy
- How different colours are absorbed and reflected

Introduces:

- That light is part of the electromagnetic spectrum
- Uses of the waves in the electromagnetic spectrum
- Harmful effects of waves in the electromagnetic spectrum

Assessment

- End of topic test
- Six mark question

CP6 Radioactivity

This unit looks at the structure of atoms, types of radiation and their effect on atoms, and the dangers of radioactive substances and sources.

Builds upon:

From KS3:

- The particle model of matter
- That atoms contain electrons

Introduces:

- How the particles inside atoms are arranged
- How to represent atoms using symbols
- The different types of radiation and how they affect atoms
- Background radiation
- The dangers of radiation and how we can protect ourselves

Assessment

- End of topic test
- Six mark question

CP7-8 Energy and Forces

This unit introduces you to the ways in which energy can be changed in a system, and how to calculate power and work done.

Builds upon:

From KS3:

- How energy can be stored and transferred
- Balanced and unbalanced forces

From KS4 CP1 and CP3:

- The difference between vector and scalar quantities
- How to calculate GPE and KE
- Energy transfer diagrams and calculating efficiency

Introduces:

- How the energy in a system can be changed
- How to calculate power and work done
- Force fields and contact forces
- Using vector diagrams to work out the effects of forces on an object (H)

Assessment

- End of topic test

Year 11 Combined Science Topics

CB8 - Exchange and Transport in Animals

This unit introduces you to diffusion, different kinds of respiration, how the lungs are adapted to their functions, and calculating cardiac output.

Builds upon:

From KS3:

- How the digestive system gets glucose and other food molecules in the blood
- How the respiratory system gets oxygen into the blood

From KS4 CB1:

- Diffusion
- Different animal cells and their adaptations

Introduces:

- More about diffusion, gas exchange and the surface area : volume ratio
- More about the different types of respiration
- How the lungs, heart, blood vessels and blood are adapted for their functions
- How to calculate cardiac output

Assessment

- End of topic test
- Six mark question

CB9 Ecosystems and Material Cycles

This unit introduces you to ecosystems, abiotic and biotic factors and communities, parasitism, biodiversity, and the water, carbon and nitrogen cycles.

Builds upon:

From KS3:

- How life on earth depends on photosynthesis in plants and algae
- The interdependence of organisms, including food webs and insect pollination
- How organisms affect and are affected by their environment, including the accumulation of toxic materials

Introduces:

- How ecosystems are organised
- How communities are affected by abiotic and biotic factors
- How the abundance and distribution of organisms are measured
- Parasites and mutualism
- Human effects on ecosystems
- The benefits of maintaining biodiversity
- How materials cycle through ecosystems
- The importance of the carbon, water and nitrogen cycles

Assessment

- End of topic test
- Six mark question

CC16-17 Fuels / Earth and Atmospheric Science

This section introduces you to crude oils and natural gas, hydrocarbons, fractional distillation, the alkane homologous series, combustion, pollution, the earth's atmosphere and climate change.

Builds upon:

From KS3:

- That mixtures may be separated using fractional distillation
- Fuels and energy resources
- The acidity of non-metal oxides
- The production of carbon dioxide by human activity and the impact on climate

Introduces:

- The hydrocarbons found in crude oil and natural gas
- How crude oil is separated into useful fractions
- The alkanes as an homologous series
- The problems caused by some atmospheric pollutants
- The cracking of oil fractions
- The advantages and disadvantages of different fuels for cars
- How the Earth's atmosphere has changed in the past and how it is changing now
- More about the causes and effects of climate change

Assessment

- End of topic test
- Six mark question

CP9 Electricity and Circuits

This unit introduces you to electric circuits, current and potential difference, charge and energy, resistance, transferring energy, and power.

Builds upon:

From KS3:

- That current is measured in Amps and potential difference is measured in volts
- That components can be connected in series or parallel
- That conductors have low resistance and insulators have high resistance

Introduces:

- Current, charge and potential difference
- How to calculate resistance, power and energy transferred
- Components with changing resistance
- The UK domestic electricity supply and safety features

Assessment

- End of topic test
- Six mark question

CP10-11 Magnetism and the Motor Effect / Electromagnetic Induction

CP10 introduces you to magnets and magnetic fields, electromagnetism and magnetic forces. CP11 covers transformers and energy.

Builds upon:

From KS3:

- How to plot the shape of a magnetic field and that the Earth has a magnetic field
- That electric currents cause electric fields, including electromagnets and motors

Introduces:

- Permanent and induced magnets, and how to represent a magnetic field
- The magnetic field around a current in a wire
- The magnetic field in a solenoid
- The power equation for transformers
- How transformers are used in the national grid
- How current can be induced in a wire (H)
- How to calculate the force on a wire in a magnetic field (H)
- How to work out the direction of the force on a wire in a magnetic field (H)

Assessment

- End of topic test
- Six mark question

CP12-13 Particle Model / Forces and Matter

This unit introduces you to particles and density, energy and changes of state, energy calculations, and gas temperature and pressure. It also covers bending and stretching, and extension and energy transfers.

Builds upon:

From KS3:

- That mass is conserved during changes of state
- The properties of solids, liquids and gases
- How particles are arranged in solids, liquids and gases, and how this is affected by temperature

From KS4 CP2:

- The effects that forces have on objects

Introduces:

- How to calculate densities of substances
- How to calculate specific heat capacity and specific latent heat
- How changing the temperature of a gas affects its pressure
- The Kelvin and Celsius temperature scales
- Elastic and inelastic distortion
- The relationship between force, extension and the spring constant
- How to calculate the work done when stretching a spring

Assessment

- End of topic test
- Six mark question