



Separate Sciences CURRICULUM MAP YEAR 10

HALF TERM 1: Organisation: - Principles of organisation - Animal tissues, organs and organ systems		Supporting texts or wider reading Research articles on the some uses of covalent substances. Describe the structure of diamond, silicon dioxide and graphite.
1.Explain the terms cell, tissue, organ, organ system and organism, and be able to give examples of each. 2.Describe the main organs/ systems in the human body and their functions. 3.Describe the functions of the digestive system to digest and absorb foods. 4.Explain how the small intestine is adapted for its function. 5.Define the terms 'catalyst' and 'enzyme'. 6.Describe the properties of enzymes. Use the lock and key theory and collision theory to explain enzyme action. 7.Describe the three types of enzymes involved in digestion, including the names of the substrates, products and where the enzymes are produced. 8.Describe the functions of the heart and circulatory system. 9.Describe the flow of blood from the body, through the heart and lungs and back to the body. 10.Describe the function of the pacemaker cells and coronary arteries.		Opportunities for extended writing Extended Response 6 mark exam style question practise. Required Practical 3: Food Tests. Use qualitative reagents to test for a range of carbohydrates, lipids and proteins. Required Practical 4: Enzymes. Investigate the effect of pH on the rate of reaction of amylase enzyme.
Bonding and Structure: - Chemical Bonds, Ionic, Covalent and Metallic 1.Explain chemical bonding in terms of electrostatic forces and the transfer or sharing of electrons. 2.Draw dot and cross diagrams for ionic compounds formed by metals in Groups 1 and 2 with non-metals in Groups 6 and 7. 3.Calculate the charge on the ions of metals and non-metals from the group number of the element, limited to the metals in Groups 1 and 2, and non-metals in Groups 6 and 7. 4.Describe the limitations of using dot and cross, ball and stick, to represent giant structures. 5.Draw dot and cross diagrams for the molecules of hydrogen, chlorine, oxygen, nitrogen, hydrogen chloride, water, ammonia and methane. 6.Deduce the molecular formula of a substance from a given model or diagram in these forms showing the atoms and bonds in the molecule. 7. Nanoscience refers to structures that are 1–100 nm in size, of the order of a few hundred atoms. Nanoparticles, are smaller than fine particles (PM_{2.5}), which have diameters between 100 and 2500 nm (1×10^{-7} m and 2.5×10^{-6} m). Coarse particles (PM₁₀) have diameters between 1×10^{-5} m and 2.5×10^{-6} m. Coarse particles are often referred to as dust.		Speak like an expert Discuss energy wasted by the machines and ways to reduce it. Why does the temperature of a pan of oil increase faster than a pan of water? Investigate ways of reducing the wasted energy transfer in a rollercoaster. Make links between the uses of metal substances, their properties and structure.
Quantitative Chemistry: - Chemical measurements, conservation of mass and the quantitative interpretation of chemical equations 1. Explain the meaning of the law of conservation- how this can be represented by balanced symbol equations. 2. Calculate the relative formula mass (Mr) of a compound from its formula, given the relative atomic masses.		Links to careers, personal development and other subject areas. Political, social, ethical and economic considerations that may arise from the use of different energy resources. Health & Social care – body system Evaluate the use of drugs, mechanical devices and transplants to treat heart problems, including religious and ethical issues. Food technology- food groups and nutrition PE – circulatory and respiratory system Economics- financial cost of non-communicable diseases on individuals, communities, nations and globally. Maths - Use and rearrange electricity equations. Draw and interpret line graphs. Tabulation of data, identify patterns and trends, making inferences and drawing conclusions. Translate disease incidence information between graphical and numerical forms. Understand the principles of sampling as applied to scientific data, including



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3. Represent the distribution of results and make estimations of uncertainty. 4. The atom economy (atom utilisation) is a measure of the amount of starting materials that end up as useful products. It is important for sustainable development and for economic reasons to use reactions with high atom economy. Energy: - Energy Changes in a System, and the ways energy is stored before and after such changes - Conservation and Dissipation of energy 1. Describe, for common situations, the changes involved in the way energy is stored when a system changes. 2. Calculate how energy is redistributed in a system when it changes. 3. Work is done when charge flows in a circuit. Work done = Force x Distance 4. Calculate the kinetic energy of a moving object, stored by a stretched spring and an object raised above ground level. $K.E. = 0.5 \times mass \times (speed)^2$ 5. The amount of elastic potential energy stored in a stretched spring can be calculated using the equation: $Elastic\ potential\ energy = 0.5 \times spring\ constant \times (extension)^2$ 6. The amount of gravitational potential energy gained by an object raised above the ground level can be calculated using the equation: $g.p.e = mass \times gravitational\ field\ strength \times height$ 7. Energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed. 8. Whenever there are energy transfers in a system only part of the energy is usefully transferred. The rest of the energy is dissipated so that it is stored in less useful ways. This energy is often described as being wasted. 9. Unwanted energy transfers can be reduced in several ways, for example, through lubrication and the use of thermal insulation. 10. The rate of cooling of a building is affected by the thickness and thermal conductivity of its walls. 11. The energy efficiency for any energy transfer can be calculated using the equation: $efficiency = \frac{useful\ output\ energy\ transfer}{total\ input\ energy\ transfer}$ 12. Describe ways to increase the efficiency of an intended energy transfer. (HT) 13. Describe the main energy resources available for use on Earth. Include: fossil fuels (coal, oil and gas), nuclear fuel, bio-fuel, wind, hydro-electricity, geothermal, the tides, the Sun and water waves. 14. Distinguish between energy resources that are renewable and energy resources that are non-renewable.		epidemiological data. Translate data between diagrammatic and numeric forms. Visualise and represent 2D and 3D forms of 3D objects.
HALF TERM 2: Infection and Response - Communicable Disease		Supporting texts or wider reading https://www.sciencenews.org/ Microbiology Online – Downloadable resources



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1. Pathogens are microorganisms such as viruses, bacteria, fungi and protists that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. 2. Explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from unusual or dangerous diseases our body's natural system can be enhanced using vaccination. 3. Grow Bacteria in the lab.		BBC Bitesize – Infested with malaria BBC search on Antibiotic resistance ABPI –Developing medicines https://6634.stem.org.uk/medicines4.html
Chemical Changes: - Reactivity of Metals - Reactions of Acids 1. Metals react with oxygen to produce metal oxides. The reactions are oxidation reactions because the metals gain oxygen. 2. Metals can be arranged in order of their reactivity in a reactivity series. A more reactive metal can displace a less reactive metal from a compound. 3. Metals less reactive than carbon can be extracted from their oxides by reduction with carbon. 4. Explain the process of oxidation and reduction. 5. Acids react with some metals, metal oxides, metal hydroxides and metal carbonates to produce salts- name these salts. 6. Describe neutralisation and how it can be measured using universal indicator or a pH probe. $H^+ (aq) + OH^- (aq) \rightarrow H_2O (l)$ 7. Compare strong and weak acids. As the pH decreases by one unit, the hydrogen ion concentration of the solution increases by a factor of 10.		Opportunities for extended writing Extended Response 6 mark exam style question practise. Required Practical 8: Making Salts. Preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate, using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution. Required Practical 15: Resistance. Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits: • the length of a wire at constant temperature • combinations of resistors in series and parallel. Required Practical 16: I-V Characteristics. Use circuit diagrams to construct appropriate circuits to investigate the I-V characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at constant temperature.
Electricity: - Current, potential difference and resistance - Series and Parallel Circuits - Domestic Uses and Safety - Energy Transfers 1. Electric current is a flow of electrical charge. The size of the electric current is the rate of flow of electrical charge. Draw circuit diagrams using standard symbols. 2. The current (I) through a component depends on both the resistance (R) of the component and the potential difference (V) across the component. $V = IR$ 4. Describe the conditions for which Ohm's law is valid. 5. Draw the I-V graphs for a filament lamp and a diode. Explain the shape of the resulting graph in terms of resistance and current. 6. Describe p.d and resistance in series and parallel circuits. 7. Describe the difference between ac and dc. Mains electricity is an ac supply. 8. Construction of a three-core electric cable: live wire, neutral, earth wire		Speak like an expert How does the earth wire help prevent electrocution? Group project using ICT, researching to find out about the symptoms, mode of transmission, prevention and treatment for measles, HIV and AIDS, salmonella and gonorrhoea- prepare class presentations.
		Links to careers, personal development and other subject areas. Health & Social care - health and disease Application of science and personal and social implications related to diseases. Consider the ethical issues and risks associated with Jenner's method. Travel and tourism – prevalence of diseases around the world.



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9. The amount of energy an appliance transfers depends on how long the appliance is switched on for and the power of the appliance. Describe how different domestic appliances transfer energy from batteries or ac mains to the kinetic energy of electric motors or the energy of heating devices. 10. The amount of energy transferred by electrical work can be calculated using the equation: energy transferred = power $\times$ time 11. Explain how the power of a circuit device is related to the potential difference across it and the current through it and the energy transferred over a given time. 12. Describe how electrical power is transferred from the power stations to the consumers via the National Grid- including the types of transformer used and how the potential difference in the wire's changes at each stage of the process. 13. Use the equation: potential difference across primary coil $\times$ current in primary coil = potential difference across secondary coil $\times$ current in secondary coil (HT)		Geography – Origin of Covid-19 and how it spread throughout the world. History - Work of Fleming, Florey, Chain and discuss the impact of their work on society. Compare the year of discovery of a metallic element with its position in the reactivity series. Historical context to show an understanding of why and describe how scientific methods and theories develop over time. Produce a timeline to show how our ideas about atoms have changed since ancient Greek times. Industry – Extraction of aluminium Maths – Use and rearrange electricity equations. Recognise expressions given in standard form. Draw graphs. Tabulation of data, identify patterns and trends, making inferences and drawing conclusions.
HALF TERM 3: Homeostasis - The Human Nervous System 1. explain that homeostasis is the regulation of the internal conditions of a cell or organism to maintain optimum conditions for function in response to internal and external changes. 2. In the human body, these include control of blood glucose concentration, body temperature and water levels. 3. explain how the structure of the nervous system is adapted to its functions. The nervous system enables humans to react to their surroundings and to coordinate their behaviour. 4. The CNS is the brain and spinal cord. The CNS coordinates the response of effectors which may be muscles contracting or glands secreting hormones. 5. explain how the various structures in a reflex arc – including the sensory neurone, synapse relay neurone and motor neurone – relate to their function. Reflex actions are automatic and rapid; they do not involve the conscious part of the brain. 6. The brain controls complex behaviour. It is made of billions of interconnected neurones and has different regions that carry out different functions. 7. The eye is a sense organ containing receptors sensitive to light intensity and colour. Rates: - Rate of Reaction 1. Describe how the rate of a chemical reaction can be found by measuring the quantity of a reactant used or the quantity of product formed over time. 2. Draw and interpret, graphs showing the quantity of product formed or quantity of reactant used up against time.		Supporting texts or wider reading Articles about nuclear disasters: Chernobyl, Fukushima.
		Opportunities for extended writing Extended Response 6 mark exam style question practise. Required Practical 6: Reaction Times. Plan and carry out an investigation into the effect of a factor on human reaction time. Required Practical 11: Rates of Reaction. Investigate how changes in concentration affect the rates of reactions by a method involving measuring the volume of a gas produced and a method involving a change in colour or turbidity.
		Speak like an expert Required Practical 17: Density. Use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids.
		Links to careers, personal development and other subject areas. Historical context to show an understanding of why and how scientific methods and theories develop over time. Produce a timeline to show



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3. Draw tangents to the curves on these graphs and calculate the gradient of a tangent as a measure of the rate of reaction. (HT) 4. Describe how the rate of a reaction is affected by temperature, concentration, temperature, surface area and catalyst. Particle Model of Matter: - Changes of state and the particle model - Particle Model and Pressure 1. Draw simple diagrams to represent the difference between solids, liquids and gases. Describe how substances change state. Explain the differences in density between the different states of matter in terms of the arrangement of atoms or molecules. 2. Describe and explain how changing the temperature of gas increases the gas pressure inside the container Atomic Structure: - Atoms and Isotopes - Atoms and Nuclear Radiation 1. Describe the structure, charge and size of atoms. 2. Atoms of the same element can have different numbers of neutrons; these atoms are called isotopes of that element. 3. New experimental evidence led to the scientific model being changed - describe the work of Dalton, Thomson, Rutherford, Bohr and Chadwick. 4. Some atomic nuclei are unstable- describe radioactive decay. Describe the properties of alpha particles, beta particles and gamma rays- limited to their penetration through materials, their range in air and ionising power. 5. Define half-life. Calculate half-life of a radioactive isotope. (HT) 6. Compare the hazards associated with contamination and irradiation. 7. Know the safety precautions taken when dealing with radioactive sources.		how our ideas about atoms have changed since ancient Greek times. Maths – Link to numeracy with balancing equations and expression in standard and decimal form. Use an appropriate number of significant figures. Use ratios, fractions and percentages. Understand and use the symbols: =, <, <<, >>, >, α, ~. Solve simple algebraic equations. Change the subject of a mathematical equation. Plot and draw appropriate graphs selecting appropriate scale for axes. Translate information between graphical and numeric form.
HALF TERM 4: Inheritance - Reproduction 1. Compare sexual and asexual reproduction. 2. Describe the composition of the genetic material in the nucleus. The genome of an organism is the entire genetic material of that organism. 3. Most characteristics are a result of multiple genes interacting, rather than a single gene. Complete a Punnett square diagram and extract and interpret information from genetic crosses and family trees. 4. Some disorders are inherited. Polydactyly (having extra fingers or toes) is caused by a dominant allele. Cystic fibrosis (a disorder of cell membranes) is caused by a recessive allele. 5. 22 chromosome pairs control characteristics only, but one of the pairs carries the genes that determine sex. In females	  	Supporting texts or wider reading Articles on inherited disorders Opportunities for extended writing Extended Response 6 mark exam style question practise. Speak like an expert Required Practical 18: Force and Extension. Investigate the relationship between force and extension for a spring. Discuss the tests for gases (Oxygen, Carbon dioxide, Hydrogen and Chlorine)



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the sex chromosomes are the same (XX). In males the chromosomes are different (XY). 6. Describe how variation generated by mutations/ sexual reproduction is the basis for natural selection and how species evolve. Describe Darwin's theory. Organic Chemistry: - Carbon Compounds as Fuels and Feedstock 1. Crude oil is a mixture of hydrocarbon compounds formed from the remains of Plankton. 2. Crude oil is separated by fractional distillation. This works by separating fractions based on their different boiling points. 3. Explain how the properties of hydrocarbons depend on the size of their molecules, including boiling point, viscosity and flammability. These properties influence how hydrocarbons are used as fuels. 4. Combustion is a reaction of a fuel with oxygen. Complete combustion is when there is plenty of oxygen. Incomplete combustion is when there is a limited amount of oxygen. 5. Hydrocarbons can be broken down (cracked) to produce smaller, more useful molecules. Cracking can be done by various methods including catalytic cracking and steam cracking. 6. Alkenes are more reactive than alkanes and react with bromine water, which is used as a test for alkenes. Alkenes are used to produce polymers and as starting materials for the production of many other chemicals. 7. Reactions of alkenes and alcohols Chemical Analysis: - Identification of Common Gases 1. To test for hydrogen you use a lit splint. A squeaky pop will be heard. 2. To test for oxygen, place a glowing splint in the gas. It will relight. 3. To test for carbon dioxide, bubble the gas through Limewater. The limewater will turn from colourless to cloudy. 4. To test for chlorine, hold a damp blue piece of litmus paper in the gas. The gas will bleach the blue litmus paper white. Forces: - Forces and their interactions - Work done and energy transfer - Forces and elasticity 1. Define and give examples of scalar and vector quantities. 2. Weight is the force acting on an object due to gravity. The force of gravity close to the Earth is due to the gravitational field around the Earth. $W=mg$. 3. Use free body diagrams to describe qualitatively examples where several forces lead to a resultant force on an object, including balanced forces when the resultant force is zero. 4. A single force can be resolved into two components acting at right angles to each other. Use vector diagrams to illustrate resolution of forces (HT)	Class survey of characteristics – collate results in a table and produce a display of the results in appropriate format. Class discussion- Would you want to know if you had a genetic predisposition to illness that could be linked to environment? Eg, high cholesterol levels in family. Research methods used by the police/council to determine whether motorists are speeding. How can police investigators determine the speed of vehicles before a crash? The impact on fuels, feedstocks and petrochemicals of the depleting stocks of crude oil.
	 Links to careers, personal development and other subject areas. Religious Studies- evolution, genetic engineering, designer babies. Consider the social, economic and ethical implications of selective breeding. Cultural and environmental impact of the oil industry around the world. Maths –Recall and apply equation. Recognise and be able to use the symbol for proportionality $\propto$. Parallelogram of force- Use angular measures in degrees. Interpret data from an investigation of the relationship between force. Gradients and tangents.



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5. The work done by a force on an object can be calculated using the equation: work done = force x distance. Describe the energy transfer involved when work is done. 6. Explain why, to change the shape of an object (by stretching, bending or compressing), more than one force must be applied – limited to stationary objects only. Calculate force = spring constant x extension and elastic potential energy = $0.5 \times \text{spring constant} \times (\text{extension})^2$		
HALF TERM 5: Ecology - Adaptations, interdependence and competition. - Organisation of an ecosystem 1. Describe the relationship between communities and ecosystems. 2. An ecosystem is the interaction of a community of living organisms (biotic) with the non-living (abiotic) parts of their environment. 3. To survive and reproduce, organisms require a supply of materials from their surroundings and from the other living organisms there. A stable community is one where all the species and environmental factors are in balance so that population sizes remain fairly constant. 4. Organisms have features (adaptations) that enable them to survive in the conditions in which they normally live. These adaptations may be structural, behavioural or functional. 5. understand that photosynthetic organisms are the producers of biomass for life on Earth. 6. Feeding relationships within a community can be represented by food chains. All food chains begin with a producer which synthesises molecules. 7. A range of experimental methods using transects and quadrats are used by ecologists to determine the distribution and abundance of species in an ecosystem. Atmosphere: - The Composition and Evolution of the Earth's Atmosphere - Carbon Dioxide and Methane as Greenhouse Gases 1. Describe the Earth's early atmosphere - how the atmosphere was formed, changed and developed over time. 2. Describe the greenhouse effect and the interactions of short and long wavelength radiation with matter. 3. Describe the scale, risk and environmental implications of global climate change and population. Develop solutions that help to reduce the impact of human activity. Waves: - Waves in air, fluids and solids - Electromagnetic Waves 1. Waves may be either transverse or longitudinal- describe how they travel. 2. Define amplitude, wavelength and frequency. 3. Describe methods to measure the speed of sound waves in air, and the speed of ripples on a water surface.		Supporting texts or wider reading Read the Clean Air Act. Read articles about the causes and effects of the greenhouse effect. Read about programmes that could help to maintain biodiversity
		Opportunities for extended writing Extended Response 6 mark exam style question practise. Required Practical 7: Field Investigations. Measure the population size of a common species in a habitat. Use sampling techniques to investigate the effect of a factor on the distribution of this species. Required Practical 13: Water Purification. Analysis and purification of water samples from different sources, including pH, dissolved solids and distillation. Required Practical 20: Waves. Make observations to identify the suitability of apparatus to measure the frequency, wavelength and speed of waves in a ripple tank and waves in a solid and take appropriate measurements. Required Practical 21: Radiation and Absorption. Investigate how the amount of infrared radiation absorbed or radiated by a surface depends on the nature of that surface.
		Speak like an expert Research the process of peer review in reporting results/data. Evaluate the use of models for predicting climate change. Evaluate the reliability of the data available on the internet. Why can I get TV signal at home but not a mobile phone signal? Research the first radio communication sent across the Atlantic.



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4. Electromagnetic (transverse) waves form a continuous spectrum and all electromagnetic wave travel at the same velocity through a vacuum or air. Describe how waves that form the electromagnetic spectrum are grouped in terms of their wavelength and their frequency. 5. Construct ray diagrams to illustrate the refraction of a wave. 6. Different wavelengths of electromagnetic waves are reflected, refracted, absorbed or transmitted differently by different substances and types of surface. (HT). Use wave front diagrams to explain refraction in terms of the change of speed that happens when a wave travels from one medium to a different medium. (HT) 7. Ultra-violet waves, X-rays and gamma rays can have hazardous effects on human body tissue. The effects depend on the type of radiation and the size of the dose. Radiation dose (in Sieverts) is a measure of the damage caused by the radiation in the body. 10. Describe the applications of electromagnetic waves have many practical applications. Explain why each type of electromagnetic wave is suitable for the practical application.		Does sunbathing cause cancer? Are sunbeds safer than sunbathing?
HALF TERM 6: Bioenergetics - Photosynthesis 1. Explore how plants harness the Sun's energy in photosynthesis to make food- identify factors that limit and increase the rate. Using Resources: - Using the Earths Resources and Obtaining Potable Water - Life Cycle Assessment and Recycling 1. Industries use the Earth's natural resources to manufacture useful products. In order to operate sustainably, need to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products. 2. Describe the process to make water potable. 3. Phytomining uses plants to absorb metal compounds. The plants are harvested and then burned to produce ash that contains metal compounds. Bioleaching uses bacteria to produce leachate solutions that contain metal compounds. (HT) 4. Develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised. Pollution, disposal of waste products and changing land use has a significant effect on the environment. 5. Life cycle assessments (LCAs) are carried out to assess the environmental impact of products in each of these stages 6. Study how human activity has affected the Earth's natural cycles, and how damaging effects can be minimised. Magnets: - Permanent and induced magnetism, magnetic forces and fields		Links to careers, personal development and other subject areas. Geography- evolution of atmosphere, global warming, climate change, air pollution. Maths - Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Appropriate number of significant figures. Extract and interpret information about resources from charts, graphs and tables. Use orders of magnitude to evaluate the significance of data.
		Supporting texts or wider reading Reports about climate change global warming, initiatives that encourage the population to reuse and recycling, Role of charities in providing potable water to third world countries.
		Opportunities for extended writing Extended Response 6 mark exam style question practise. Required Practical 5: Photosynthesis. Investigate the effect of light intensity on the rate of photosynthesis.
		Speak like an expert Explain why areas of tropical rain forest are being cleared. Present a bias of choice to suit the article for or against deforestation. Prepare a newspaper article for either: a scientific journal, tabloid newspaper, environmental news or burger chain. Research the process of peer review in reporting results/data. Evaluate the use of models for predicting climate change. Evaluate the reliability of the data available on the internet.



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1. The poles of a magnet are the places where the magnetic forces are strongest. When two magnets are brought close together they exert a force on each other. Two like poles repel each other. Two unlike poles attract each other. Attraction and repulsion between two magnetic poles are examples of non-contact force. 2. The region around a magnet where a force acts on another magnet or on a magnetic material (iron, steel, cobalt and nickel) is called the magnetic field		Links to careers, personal development and other subject areas. Geography- how waste, deforestation and global warming have an impact on biodiversity. Deforestation. Global warming. Maths- Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Make estimates of the results of simple calculations. Translate information between graphical and numeric form. Drawing and interpreting appropriate graphs from data to determine rate of reaction. Determine the slope and intercept of a linear graph. Draw and use the slope of a tangent to a curve as a measure of rate of change. Interpret graphs used to model predator-prey cycles. Understand the terms mean, mode and median and calculate arithmetic means
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