

KEY 4 STAGE OVERVIEW (Long Term Planning)

Subject: GCSE Combined Science

Year 10

Week/ Lesson	Term	Topic	Knowledge	Skills
1	Autumn T1	1 - Energy	Way energy is stored when a system changes. Work done. Kinetic, Gravitational and Elastic Potential energy calculations.	Investigations looking into finding the speed of a trolley that travels down a ramp. Calculate the g.p.e. at the top of the ramp and the kinetic energy at the bottom.
2			Calculate energy changes in a system. Specific Heat capacity. Power Rating.	Required practical: Investigation to determine the specific heat capacity of one or more materials
3			Conservation of Energy. Calculating Energy Efficiency. National Grid.	Investigations into output of a model wind turbine or solar cell.
4		2 - Organisation	Principles of organisation The human digestive system Properties of enzymes	Required practical: Investigate the effect of pH on the rate of reaction of amylase enzyme. Investigate the action of amylase on starch using a model gut
5			The heart and blood vessels Structure and function of arteries, veins and capillaries Coronary heart disease	Required practical: Food tests Dissection: hearts with vessels

			<p>How the lungs are adapted for efficient gas exchange.</p> <p>The four main components of blood</p>	<p>Sheep lungs and trachea (PLUCK)</p> <p>Observe prepared blood smears</p>
6			<p>Health issues and Effect of lifestyle</p> <p>Cancers (malignant tumours)</p> <p>Plant organs and Plant tissues.</p> <p>Plant transport systems - Xylem & Phloem</p> <p>Active transport</p>	<p>Collect, present and analyse data</p> <p>examine leaf sections</p> <p>Calculate stomatal density using data provided or from direct observations.</p>
7		2 - Bonding, Structure and the Properties of Matter	<p>Chemical bonds- ionic,covalent and metallic</p> <p>Properties of ionic and small molecules</p> <p>How bonding and structure are related to the properties of substances</p>	<p>Recognise substances as small molecules, polymers or giant structures from diagrams showing their bonding.</p> <p>Extended writing: describe the bonding in the sodium chloride lattice using the correct terms, eg electrostatic forces of attraction.</p>
8			<p>Three states of matter</p> <p>HT: Limitations of the simple model include that there are no forces between the spheres, that all particles are represented as spheres and that the spheres are solid.</p> <p>State symbols</p> <p>Polymers</p> <p>Giant covalent structures</p> <p>Properties of metals and alloys</p> <p>Metals as conductors</p>	<p>Extended writing: explain how ethene polymerises</p>

9	Autumn T2		Structure and bonding of carbon -Diamond - Graphie - Graphene and fullerenes	Extended writing: Link the properties of Diamond/Graphite/ Graphene and fullerenes with its structure
10		2 - Electricity	Drawing electric circuits (Series) Charge and current flow Resistance Ohm's Law Current vs PD graphs.	Extended writing Set up simple circuits from circuit diagrams. Circuits need to include voltmeters and ammeters so that students are aware of how these devices are connected.
11			Electric circuits - Parallel and series Resistors in parallel and series. Domestic uses and safety	Investigate the current at various points within a series and parallel circuit. Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include: <ul style="list-style-type: none"> • the length of a wire at constant temperature • combinations of resistors in series and parallel Research the use of direct and alternating potential differences.
12			Power Energy transfers in everyday appliances Word done when charge flows.	Investigate a number of electrical appliances, either around the lab or well-known devices, eg a TV, to look at the energy transfers that occur.
13			Energy Transferred $\text{energy transferred} = \text{power} \times \text{time}$ $[E = P t]$ $\text{energy transferred} = \text{charge flow} \times \text{potential difference}$ $[E = Q V]$ National Grid	Investigate how the amount of energy transferred to an electrical appliance depends on the amount of time that it is on for by connecting the appliance to a joulemeter

14		3 - Infection and Response	Communicable diseases Viral, bacterial and fungal diseases in humans Protist diseases – malaria	Carry out research and explain application of science and personal and social implications related to diseases.
15			Human defence systems Vaccination	Interpret graph showing primary and secondary response to a pathogen; explain the responses.
16	Spring T1		Antibiotics Painkillers Discovery and development of drugs	interpret data about antibiotics, painkillers and other medicines. Use secondary evidence from text books, the internet and other sources to draw a timeline
17		3 - Quantitative Chemistry	Conservation of mass and balanced chemical equations Relative formula mass Mass changes when a reactant or product is a gas Chemical measurements HT: Moles HT: Amount of substances in equation Using moles to balance equations HT: Limiting reactants	Extended writing: describe the equations given in terms of number of moles, reactants and products. Extended writing: write instructions to another student on how to calculate the concentration, or how to rearrange the equation to calculate mass. Discuss the differences of the word 'concentration' and 'strength' in science and everyday language.
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20		4 - Chemical Changes	Metal oxides The reactivity series Extraction of metals and reduction HT: Oxidation and reduction in terms of electrons	Required practical 1: Prepare a salt from an insoluble metal carbonate or oxide Required practical 2: Investigate the electrolysis of a solution
21	Spring T2		Reactions of acids and metals Neutralisation of acids and salt production Soluble salts The pH scale and neutralisation	Extended writing: Describe how to make a pure, dry sample of a soluble salt.

			HT: Strong and weak acids	
22			The process of electrolysis Electrolysis of molten ionic compounds Using electrolysis to extract metals Electrolysis of aqueous solutions HT: Representation of reactions at electrodes as half equations	Required practical 3: Investigate what happens when aqueous solutions are electrolysed using inert electrodes.
23		3 - Particle Model of Matter	Density The particle model of matter Changing the state of a substance.	Required practical Use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids.
24			Specific heat capacity. Specific latent heat.	
25				Make models of solids, liquids and gases using plasticine. Draw diagrams to show the particle arrangements in solids, liquids and gases
26		4 - Bioenergetics	Photosynthetic reaction Word and symbol equation for photosynthesis. Rate of photosynthesis Limiting factors Use of glucose To produce proteins plants also use nitrate ions from the soil	Required Practical: Photosynthesis Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed Debate – are underground or vertical farms the answer to providing food in cities?
27	Summer T1		Aerobic respiration Respiration is an exothermic reaction. Word and symbol equation for aerobic respiration. Anaerobic respiration Word and symbol equation for anaerobic respiration in some plant and yeast cells.	
28			Response to exercise Metabolism	Investigate the effect of exercise on heart rate, breathing rate, depth of breathing and temperature.

29		5 -Energy Changes	Energy transfer during exothermic and endothermic reactions	Required practical 4: Investigating temperature changes
30			Reaction profiles	
31			HT: The energy change reactions	
32		4 - Atomic Structure		
33	Summer T2			
34				
35		5 - Homeostasis & Response	<p>Introduction to homeostasis</p> <p>Automatic control systems involve nervous responses and chemical responses.</p> <p>Control systems have receptors, a coordination centre and effectors.</p> <p>Structure and function of the nervous system.</p>	<p>Draw a flow diagram to show the main components of a control system and label with the function of each component.</p> <p>Colour code and annotate given diagrams of body with functions related to homeostasis.</p>
36			<p>Reflex actions</p> <p>Human endocrine system</p> <p>Control of blood glucose concentration</p> <p>HT: Glucagon is also produced by the pancreas to convert stored glycogen back into glucose when blood glucose levels fall.</p> <p>HT: The use of hormones to treat infertility.</p> <p>HT: Negative feedback.</p>	<p>Required practical:</p> <p>Reaction time. Plan and investigate the effect of a factor on human reaction time</p> <p>Research and produce a report to explain the cause, effects, treatment and problems associated with Type 1 diabetes. diabetes.org.uk is a good resource.</p>
37			<p>Hormones in human reproduction</p> <p>HT: more detail is required for the roles of these hormones.</p> <p>Contraception</p>	Produce a report for a teen magazine on the advantages and disadvantages of different types of contraceptives.

38		6 - The Rate & Extent of Chemical Change	Calculating rates of reactions Factors which affect the rate of reactions Collision theory and activation energy Catalysts	Maths skills: Recognise and use expressions in decimal form. Use ratios, fractions and percentages 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. Required practical 5: Investigating the effect of concentration on rate of reaction
39			Reversible reactions Energy changes and reversible reactions Equilibrium HT: Effect of changing conditions on equilibrium	
40			HT: Effect of changing concentration HT: Effect of temperature on equilibrium HT: Effect of pressure changes on equilibrium	

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Year 11

Week/ Lesson	Term	Topic	Knowledge	Skills Reading and writing tasks:
1	Autumn T1	5 - Forces		
2				
3				
4		6 - Inheritance, Variation and Evolution	Sexual and asexual reproduction Meiosis Sex determination	Use a Punnett square and a genetic cross diagram to illustrate the inheritance of sex

			<p>DNA is a polymer made up of two strands forming a double helix.</p> <p>The human genome has been studied and will be important for medicine in the future.</p>	<p>Debate: research and discuss 'DNA profiling' for health.</p> <p>practical to extract DNA.</p>
5			<p>Genetic inheritance and Inherited disorders</p> <p>HT: Construct Punnet squares and genetic crosses.</p> <p>Genetic engineering involves modifying the genome of an organism to introduce a desired characteristic.</p> <p>HT: enzymes are used to cut the gene from a chromosome; gene is inserted into a vector</p>	<p>Complete Punnett squares and genetic crosses. Interpret the results and describe the offspring.</p> <p>Produce a leaflet for a doctor's surgery to explain how human insulin is produced by bacteria and discuss the advantages of this over porcine insulin.</p>
6			<p>Variation</p> <p>Selective breeding</p> <p>Evolution</p> <p>The main stages of natural selection.</p> <p>Mutations are changes in the DNA code.</p> <p>Evidence for evolution – Fossils and Resistant bacteria.</p> <p>Extinction</p>	<p>Draw a flow diagram to explain the steps involved in selective breeding.</p> <p>Draw a flow diagram to explain natural selection</p> <p>Research causes of extinction and write a report/ PowerPoint presentation to present to the class.</p>
7		7 - Organic Chemistry	Crude oil hydrocarbons and alkanes	Make models of alkane molecules using molecular modelling kits
8			Fractional distillation and petrochemicals	Research uses of the fractions of crude oil.
9	Autumn T2		Properties of hydrocarbons Cracking and alkenes	
10		6 - Waves		
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14		8 - Chemical Analysis	Pure substances Formulations	
15			Chromatography	Required practical 6 : Calculate R_f values
16	Spring T1		Test for hydrogen Test for oxygen Test for carbon dioxide Test for chlorine	
17		7 - Magnetism & Electromagnetism		
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20		9 - Chemistry of the Atmosphere	History of our atmosphere Our evolving atmosphere Greenhouse gases Global climate change Carbon footprints and reduction Atmospheric pollutants	Research the process of peer review in reporting results/data.
21	Spring T2			
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23		10 - Using Resources	Using earth's resources and sustainable development Potable water Wastewater treatment HT: Alternative methods of extracting metals Life cycle assessment Ways of reducing the use of resources	Translate information between graphical and numeric form. Required practical 7: Purity and test water
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27	Summer T1	7 - Ecology	Classification Communities	Look at the variety of names given to the same plant and discuss why the binomial system is more useful.

			<p>Biotic factors and Abiotic factors</p> <p>Distribution of organisms</p> <p>Adaptations</p>	<p>Investigate the effect of planting density on the height of seedlings.</p> <p>Measure height and calculate means. Present and analyse the results.</p> <p>Required practical: Field investigations</p> <p>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.</p>
28			<p>Levels of organisation</p> <p>Feeding relationships can be represented by food chains.</p> <p>How materials are cycled</p>	<p>Construct food chains and identify the producer and consumers.</p>
29			<p>Biodiversity is the variety of all life on Earth.</p> <p>Waste management</p> <p>Rapid growth in the human population means more resources are used and more wastes are produced,</p>	<p>Evaluate environmental effects and ethical issues related to human activities.</p> <p>Interpret graphs showing human population growth globally and in different parts of the world.</p>
30			<p>Pollution kills plants and animals which can reduce biodiversity</p> <p>Waste may pollute land with toxic chemicals such as pesticides and herbicides, which may be washed from the land into water.</p>	<p>Discuss the Clean Air Act.</p>
31			<p>Land use and Deforestation</p> <p>Global warming</p> <p>Maintaining biodiversity</p>	<p>Discuss the effects deforestation has on the environment.</p> <p>Describe the possible effects of global warming.</p>
32		Revision		

33	Summer T2	Potential Study Leave		
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