Curriculum Knowledge Map - Science

SUCCESSFUL: An education where imagination, curiosity and resilience enable us to ignite our learning.

CREATIVE: A shared belief that optimism, empathy and responsibility are the foundations for a respectful, safe and inclusive community.

HAPPY: Individuals who are ready to learn, practise being reflective, and are motivated to become champions.

CHS Curriculum Area Framework for Learning – Year 10

SUBJECT	Science
INTENT	The Scientific area of learning is concerned with increasing pupils' knowledge and understanding of our world, and with developing skills associated with Science as a process of enquiry. It will develop the natural curiosity of the child, encourage respect for living organisms and the physical environment and provide opportunities for critical evaluation of evidence. At CHS we aim to create Scientists that are curious about the natural world and understand the importance of scientific process. We are passionate about developing a curriculum that is accessible to all and one that enriches through cultural capital and extra-curricular opportunities which are provided throughout the 5-year course. We encourage students to be inquisitive throughout their time at the school and beyond. The curriculum is designed to ensure that students can acquire key scientific knowledge through practical experiences, using equipment, conducting experiments, building arguments and explaining concepts confidently. The school's approach to science takes account of the school's own context, ensuring access to people with specialist expertise and places of scientific interest as part of the school's commitment to learning outside the classroom.

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Year Group	**10**
Rationale/ Narrative	**In year 10, pupils will continue to develop the skills and key ideas they have already learnt in biology, chemistry and physics.** The complex and diverse phenomena of the natural world can be described in terms of a small number of key ideas in biology, chemistry and physics: Key ideas in 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 • organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life • the characteristics of a living organism are influenced by its genome and its interaction with the environment Key ideas in 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 • energy is conserved in chemical reactions so can therefore be neither created or destroyed.

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	Key ideas in 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 **Students will cover a wide range of topics described below (which can be found in the unit 1 AQA trilogy specification). This will help to equip the students with the knowledge base and skills to pursue further education in science and hopefully a future career in STEM.** **The material underlined in italics is the separate science material that will be taught to the top set, with the premise that they will study separate sciences with specialist teachers in year 11.** **The numbers below reference the AQA specification which can be accessed via this link (this is the programme of study followed in years 10 and 11) : https://filestore.aqa.org.uk/resources/science/specifications/AQA-8464-SP-2016.PDF**

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2

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Declarative *What should they know?*	**Chem 5.1 Atomic structure and the periodic table** 5.1.2.2 Development of the periodic table 5.1.2.3 Metals and nonmetals 5.1.2.4 Group 0 5.1.2.5 Group 1 5.1.2.6 Group 7 *Chemistry* *4.1.3.1 Properties of transition metals* **Chem 5.2 Bonding, structure, and the properties of matter** 5.2.1.1 Chemical bonds	**Bio 4.1 Cell Biology** 4.1.3.1 Eukaryotes and prokaryotes 4.1.2.1 Chromosomes and mitosis 4.1.3.3 active transport *Biology* *4.1.1.6 culturing microorganisms* **Bio 4.2 Organisation** 4.2.3.1 Plant tissues 4.2.3.2 Plant organ systems	**Biology 4.4 Bioenergetics** 4.4.1.1 Photosynthetic reaction 4.4.1.2 Rate of photosynthesis 4.4.1.3 Use of glucose 4.4.2.1 Aerobic and Anaerobic 4.4.2.2 Response to exercise 4.4.2.3 Metabolism **Revision for unit 1 exam. Unit 1 Biology.**	**Chem 5.4 Chemical changes** 5.4.1.1 Metal oxides 5.4.1.2 The reactivity series 5.4.1.3 Extraction of metals 5.4.1.4 Oxidation and reduction 5.4.2.1 Reaction of acids with metals 5.4.2.2 Neutralisation of acids and salts 5.4.2.3 Soluble salts 5.4.2.4 The pH scale 5.4.2.5 Strong and weak acids 5.4.3.1 The process of electrolysis	**Chemistry 5.5 Energy changes** 5.5.1.1 Exo and Endothermic reactions 5.5.1.2 Reaction profiles 5.5.1.3 Energy change of reactions *Chemistry* *4.5.2.1 Cells and batteries* *4.5.2.2 Fuel cells* **Phys 6.3 Particle model of matter** 6.3.1.1 of materials 6.3.1.2 Changes of state 6.3.2.1 Internal energy 6.3.2.2 Temperature changes and specific heat capacity	**Revision for unit 1 exam. Chemistry.** **Phys 6.4 Atomic structure and radiation** 6.4.1.1 The structure of an atom 6.4.2.1 Mass number, atomic number and isotopes 6.4.1.3 The development of the model of the atom 6.4.2.1 Radioactive decay and nuclear radiation 6.4.2.2 Nuclear equations 6.4.2.3 Half life 6.4.2.4 Radioactive contamination

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	5.2.1.2 Ionic bonding 5.2.1.3 Ionic compounds 5.2.1.4 Covalent bonding 5.2.1.5 Metallic bonding 5.2.2.1 The three states of matter 5.2.2.2 State symbols 5.2.2.3 Properties of ionic compounds 5.2.2.4 Properties of small molecules 5.2.2.5 Polymers 5.2.2.6 Giant covalent structures 5.2.2.7 Properties of metals and alloys 5.2.2.8 Metals as conductors 5.2.3.1 Diamond 5.2.3.2 Graphite 5.2.3.3 Graphene and fullerenes *Chemistry* *4.2.4.1 Sizes of particles and their properties* *4.2.4.2 Uses of nano particles* **Biology – 4.3 Infection and response** 4.3.1.1 communicable diseases 4.3.2.1. 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	**Phys 6.2 Electricity** 6.2.1.1 Circuit diagrams 6.2.1.2 Electrical charge and current 6.2.1.3 Current, resistance and potential difference 6.2.1.4 Resistors 6.2.2 Series and parallel circuits 6.2.3.1 AC and DC 6.2.3.2 Mains Electricity 6.2.4.1 Power 6.2.4.2 Energy transfers in everyday appliances 6.2.4.3 The national grid *Physics* *4.2.5.1 Static charge* *4.2.5.2 Electric fields*		5.4.3.2 Electrolysis of ionic compounds 5.4.3.3 extraction using electrolysis *Chemistry* *4.4.2.5 titrations* **Chem 5.3 quantitative chemistry** 5.3.1.1 Conservation of mass and balanced chemical equations 5.3.1.2 Relative formula mass 5.3.1.3 Mass changes 5.3.1.4 Chemical measurements 5.3.2.1 Moles 5.3.2.2 Amount of substances in equations 5.3.2.3 Using Moles to balance equations 5.3.2.4 Limiting reactions 5.3.2.5 Concentration of solutions *Chemistry* *4.3.3. Yield and atom economy* *4.3.4 Using concentrations* *4.3.5 Use of amount of substance in relation to volume of gas*	6.3.2.3 Changes of state and latent heat 6.3.3.1 Particle motion of gases *Physics* *4.3.3.2 Pressure in gases* *4.3.3.3 Increasing the pressure of a gas*	*Physics* *4.4.3.1 Background radiation* *4.4.3.2 Different half lives* *4.4.3.3 Uses of nuclear radiation* *4.4.4.1 Nuclear fission* *4.4.4.2 Nuclear fusion*

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	4.3.1.8 Antibiotics and Pain killers 4.3.1.9 Discovery and development of drugs *Biology* *4.3.2.2 producing monoclonal antibodies* *4.3.2.2 using monoclonal antibodies* *4.3.3.1 Detection and identification of plant diseases* *4.3.3.2 Plant defence response*					

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Procedural *What should they be able to do?*	**5.2 Bonding and 4.3 infection and response skills:** Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. WS 1.2, 1.4, 1.6 WS 1.2 MS 4a MS 1a, 1c Recognise substances as small molecules, polymers or giant structures from diagrams showing their bonding. Students will plan, prepare and deliver speeches on types of pathogen and evaluate each other's work.	**Phys 6.2 Electricity** Students should be able to recall and apply the following equations: Q=It V= IR P= VI $P= I^2R$ E= Pt E= QV Physics AT 1 – use appropriate apparatus to measure and record length accurately. Physics AT 6 – use appropriate apparatus to measure current, potential difference and resistance. Physics AT 7 – use circuit diagrams to construct and check series and parallel circuits.	**Biology 4.4 Bioenergetics** MS 3d Solve simple algebraic equations. MS 1a, 1c, 2c, 3d, 4a, 4c MS 3a, 3d (HT only) WS 1.4 Use data to relate limiting factors to the cost effectiveness of adding heat, light or carbon dioxide to greenhouses. AT skills covered by this practical activity: biology AT 1, 2, 3, 4 and 5. AT1 Use of appropriate apparatus to make and record a range of measurements accurately. AT 2 Safe use of appropriate heating devices and techniques including use of a Bunsen	**Chem 5.3 and 5.4 Chemical changes and Energy Changes** AT 1, 2,6 Opportunities within investigation of mass changes using various apparatus. AT 3 This is an opportunity to investigate pH changes when a strong acid neutralises a strong alkali. AT 6 Mixing of reagents to explore chemical changes and/or products. MS 1a Recognise and use expressions in decimal form. MS 1b Recognise and use expressions in standard form.	**Phys 6.3 Particle model of matter** A large part of the unit will focus on mathematical skills, students will be required to recall and use the following equations. $\rho = m / V$ $\Delta E = m c \Delta \theta$ $E = m L_v$ $E = m L_f$ **Students will complete:** • **Required Practical 17 – density** • **Required Practical 13 – Specific Heat Capacity** MS 1a Recognise and use expressions in decimal form.	**Phys 6.4 Atomic structure and radiation** MS 1b WS 4.4 Students should be able to recognise expressions given in standard form WS 1.1, 1.6 This historical context provides an opportunity for students to show an understanding of why and describe how scientific methods and theories develop over time. WS 1.1 Why the new evidence from the scattering experiment led to a change in the atomic model WS 1.2 The difference between the plum pudding

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		AT 6 Investigate the relationship between the resistance of a thermistor and temperature. Investigate the relationship between the resistance of an LDR and light intensity MS 1c Use ratios, fractions and percentages. MS 3b Change the subject of an equation. MS 3c Substitute numerical values into algebraic equations using appropriate units for physical quantities. MS 3d Solve simple algebraic equations WS 1.2, 1.4: The application of LDRs in circuits e.g. switching lights on when it gets dark is required. WS 1.5: Most electrical appliances are connected to the mains using three core cable. The insulation covering each wire is colour coded for easy identification: **Students will complete:** • **Required *Practical 2 – culturing microorganisms.*** • **Required practical activity**	burner and a water bath or electric heater. AT 3 Use of appropriate apparatus and techniques for the observation and measurement of biological changes and/or processes. **Students will complete:** • **Required Practical 5: investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed.**	MS 1c Use ratios, fractions and percentages. MS 2a Use an appropriate number of significant figures. MS 2h Make order of magnitude calculations. MS 3a Understand and use the symbols: =, <>, >, ∝ , ~ MS 3b Change the subject of an equation. MS 3c Substitute numerical values into algebraic equations using appropriate units for physical quantities. **Students will complete:** • **Required Practical 8 – salt preparation** • **Required practical 9 - electrolysis** • **Required practical 10- temperature changes**	MS 1b Recognise and use expressions in standard form. MS 1c Use ratios, fractions and percentages. MS 3b Change the subject of an equation. MS 3c Substitute numerical values into algebraic equations using appropriate units for physical quantities. MS 4a Translate information between graphical and numeric form AT 5 Perform an experiment to measure the latent heat of fusion of water **Students will complete:** • **Required practical 10- temperature changes**	model of the atom and the nuclear model of the atom. WS 1.5 Students should be able to compare the hazards associated with contamination and irradiation

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		15: use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include: • The length of a wire at constant temperature • Combinations of resistors in series and parallel.				
ASSESSMENTS	Students will be assessed on: EOT with teacher assessment - **Writing a comparison for groups 1,7 and 0** EOT with teacher assessment - **Writing a comparison for Bonding (ionic / covalent and metallic)** Group presentation – types of pathogen	Students will be assessed on: EOT with teacher assessment - **Writing a comparison for eukarotic and prokaryotic cells** EOT with teacher assessment – **writing a method for required prac (resistance in a wire).**	Students will be assessed on: EOT with teacher assessment – **graph and conclusion for pond weed investigation.** **<u>Progress test – Unit 1 Biology</u>**	Students will be assessed on: EOT with teacher assessment – **correcting a method for the production of a soluble salt from an insoluble metal oxide or carbonate.** EOT with teacher assessment – **explaining the products of electrolysis.**	Students will be assessed on: EOT with teacher assessment – **explaining the how to measure the specific heat capacity of a metal safely.** **EOT** with teacher assessment – **Plan an experiment to determine the density of an object.**	Students will be assessed on: EOT with teacher assessment – **explaining the difference between alpha, beta and gamma** **<u>Progress test – Unit 1 (Physics or Chemistry)</u>**

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HOME LEARNING	Weekly homework – Unit 1 Exam questions relevant to the topic being taught. One per week	Weekly homework – Unit 1 Exam questions relevant to the topic being taught. One per week	Weekly homework – Unit 1 Exam questions relevant to the topic being taught. One per week	Weekly homework – Unit 1 Exam questions relevant to the topic being taught. One per week	Weekly homework – Unit 1 Exam questions relevant to the topic being taught. One per week	Weekly homework – Unit 1 Exam questions relevant to the topic being taught. One per week