Curriculum Knowledge Map - Science

Year 10	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	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					
Declarative *What should they know?*	**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* **Phys 6.1 Energy** 6.1.1.1 Energy stores and systems 6.1.1.2 Changes in energy 6.1.1.3 Energy changes in systems 6.1.1.4 Power 6.1.2.1 Energy transfers in a system 6.1.2.2 Efficiency 6.1.3 National and global energy resources **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 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* **Bio 4.2 Organisation** 4.2.3.1 Plant tissues 4.2.3.2 Plant organ systems Biology – 4.3 Infection and response	**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* **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.** **January progress test** **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 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* **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 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* **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 Physics

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		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 4.3.1.7 Vaccination 4.3.1.8 Antibiotics and Pain killers 4.3.1.9 Discovery and development of drugs *4.3.2.2 producing monoclonal antibodies* *4.3.2.2 using monoclonal antibodies* *4.3.3.1 Plant diseases* *4.3.3.2 Plant defence response*				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 **Revision for unit 1 exams in Physics P1 and Chemistry. C1**
Procedural *What should they be able to do?*	**Biology** **4.1 cell biology** MS 1b, 2a, 2h WS 4.4 Use prefixes centi, milli, micro and nano. WS 1.2 Recognise, draw and interpret images of cells. MS 1d, 3a AT 7 Images of cells in videos, bio viewers, photographs and micrographs can be used as comparison for students own drawings. WS 1.2 Use models and analogies to develop explanations of how cells divide.	**Chemistry** **5.1 Atomic structure** Safe use of a range of equipment to separate chemical mixtures. Use SI units /prefix nano. Recognise expressions in standard form. Represent the electronic structures of the first 20 elements of the periodic table in both forms. Explain how testing a prediction can support or refute a new scientific idea.	**Biology** **4.3 infection and response skills:** Evaluate the global use of vaccination in the prevention of disease. Understand that the results of testing and trials are published only after scrutiny by peer review. Students will plan, prepare and deliver speeches on types of pathogens and evaluate each other's work **Physics** **6.2 Electricity**	**Biology** **4.4 Bioenergetics** Solve simple algebraic equations. Use data to relate limiting factors to the cost effectiveness of adding heat, light or carbon dioxide to greenhouses. Investigations into the effect of exercise on the body. burner and a water bath or electric heater. AT 3 Use of appropriate apparatus and techniques for the observation and	**Chemistry** **5.3 Quantitative chemistry** Recognise and use expressions in decimal form / standard form. Use an appropriate number of significant figures. Change the subject of an equation. Substitute numerical values into algebraic equations using appropriate units for physical quantities. Opportunities within investigation of mass changes using various apparatus.	**Physics** **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**

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	WS 1.3 Evaluate the practical risks and benefits, as well as social and ethical issues, of the use of stem cells in medical research and treatments. WS 1.2 Recognise, draw and interpret diagrams that model diffusion. WS 1.5 Use of isotonic drinks and high energy drinks in sport. Recognise, draw and interpret diagrams that model osmosis. **Required practical activity 1: use a light microscope.** **Required practical activity 2: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.** **Triple Required** ***Practical 2 – culturing microorganisms.*** **Physics** **6.1 Energy** Investigate the transfer of energy from a gravitational potential energy store to a kinetic energy store Students should be able to recall and apply equations.	Visualise and represent 2D and 3D forms including 2D representations of 3D objects. **Chemistry** **5.2 Bonding** Visualise and represent 2D and 3D forms including two dimensional representations of 3D objects. Recognise substances as small molecules, polymers or giant structures from bonding diagrams Recognise substances as metallic giant structures from diagrams showing their bonding. **Biology** **4.2 Organisation** Students should be able to develop an understanding of size, scale in relation to cells, tissues, organs and systems. Students should be able to use other models to explain enzyme action. Blood cells seen under a microscope - observations. Evaluate risks related to use of blood products.	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. use circuit diagrams to construct and check series and parallel circuits. Investigate the relationship between the resistance of a thermistor and temperature. Investigate the relationship between the resistance of an LDR and light intensity The application of LDRs in circuits e.g. switching lights on when it gets dark is required. Most electrical appliances are connected to the mains using three core cable. The insulation covering each wire is colour coded for easy identification:	measurement of biological changes and/or processes. **Students will complete:** **Required Practical 5: investigate the effect of light intensity on the rate of photosynthesis.** **Chemistry** **5.4 Chemical Changes** Mixing of reagents to explore chemical changes and/or products. This is an opportunity to investigate pH changes when a strong acid neutralises a strong alkali. An opportunity to measure the pH of different acids at different concentrations. Use ratios, fractions and percentages. Use an appropriate number of significant figures. Make order of magnitude calculations. Understand and use the symbols: =, <>, >, ∝, ~ Change the subject of an equation. Substitute numerical values into algebraic equations using appropriate units for physical quantities.	Recognise and use expressions in decimal form. Use ratios, fractions and percentages. Change the subject of an equation. Substitute numerical values into algebraic equations using appropriate units for physical quantities. Recognise and use expressions in standard form. Use an appropriate number of significant figures. Understand and use the symbols: =, <>, >, ∝ **Chemistry** **5.5 Energy changes** An opportunity to measure temperature changes when substances react or dissolve in water. Recognise and use expressions in standard form. Use ratios, fractions and percentages. Change the subject of an equation. Substitute numerical values into algebraic equations using	Recognise and use expressions in decimal form. **Physics** **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. Why the new evidence from the scattering experiment led to a change in the atomic model The difference between the plum pudding the difference between the plum pudding model of the atom and the nuclear model of the atom.. Students should be able to compare the hazards associated with contamination and irradiation.

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	Investigate thermal conductivity using rods of different materials. Students may be required to calculate or use efficiency values as a decimal or as a percentage.	Interpret data, risk factors for specified diseases. Observation/drawing of a transverse section of leaf. Measure rate of transpiration by the uptake of water. Investigate the distribution of stomata and guard cells. Process data from investigations involving stomata and transpiration rates to find arithmetic means, understand sampling and calculate surface areas and volumes. **Required practical activity 3: use qualitative reagents to test for a range of carbohydrates, lipids and proteins.** **Required practical activity 4: investigate the effect of pH on the rate of reaction of amylase enzyme**	**Students will complete:** **Required practical activity 15: use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits.** **Required practical activity 16: use circuit diagrams to construct appropriate circuits to investigate the I–V characteristics**	**Students will complete:** **Required Practical 8 – salt preparation** **Required practical 9 - electrolysis** **Required practical 10- temperature changes**	appropriate units for physical quantities. 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**	

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Disciplinary Literacy (Tier 3 Vocab	• Bonding • Metallic bonding delocalised ionic bonding covalent bonding properties melting point boiling point conductivity • inter molecular forces • Pathogen • Microorganism • Antiretroviral • Phagocyte • Vaccination	• Alternating / Direct current • Oscilloscope • Frequency • Conductor • Insulator • Characteristics • Transformer • Efficiency • Voltage • Current • Resistance • Charge	• Respiration • Anaerobic • Aquatic • Oxidation • Oxygen debt • Accumulated • Metabolism	• Activation Energy • Reversible • Dynamic • Endothermic • Exothermic • Equilibrium • Le Chatelier • Mole • Concentration • Base • Neutralisation • Soluble • Insoluble • Salt • Electrolysis • Aqueous • Anode • Cathode	• Endothermic • Exothermic • Latent heat of vaporization • Latent heat of fusion • Density • Pressure Reduction oxidation	• Radioactive, • Ionising • Nuclear equation • Contamination • Irradiation • Half-life • Decay

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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 – Units</u>** **8464 B1 paper** **8461 Supplementary questions for triple cohort**	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 – Units</u>** **8464 C1 paper** **8464 P1 paper** **8462 C1 paper** **8463 P1 paper**
HOME LEARNING	Exam questions relevant to the lessons currently taught. Educake quizzes tiered to foundation and higher 1 quiz 10 – 15 marks per syllabus subsection	Exam questions relevant to the lessons currently taught. Educake quizzes tiered to foundation and higher 1 quiz 10 – 15 marks per syllabus subsection	Exam questions relevant to the lessons currently taught. Educake quizzes tiered to foundation and higher 1 quiz 10 – 15 marks per syllabus subsection	Exam questions relevant to the lessons currently taught. Educake quizzes tiered to foundation and higher 1 quiz 10 – 15 marks per syllabus subsection	Exam questions relevant to the lessons currently taught. Educake quizzes tiered to foundation and higher 1 quiz 10 – 15 marks per syllabus subsection	Exam questions relevant to the lessons currently taught. Educake quizzes tiered to foundation and higher 1 quiz 10 – 15 marks per syllabus subsection