

Subject Curriculum Overview for Academic Year 2022/2023

Subject: Triple Science		Subject Leader: Abigail Harker, Hugo Crossley		Year Group: 10		AUTUMN TERM	
Topic	Key Learning Points			Key Vocabulary		Assessments	
Biology: Key concepts part 2 and Cells and Control	<p><i>End Point: Know the action of enzymes. Know how growth of organisms occurs and how the nervous system allows the body to respond to stimuli.</i></p> <ul style="list-style-type: none"> • Know how enzymes work and factors affecting them. • Know how plants and animals grow through cell division, cell differentiation and, in plants, cell elongation. • Know the process of mitosis and its stages • Know what stem cells are and understand their uses • Know the structure of the nervous system, neurones and synapses. • Know how neurotransmission occurs including across a synapse. • Know the structure of the eye and how to treat eye malfunctions. 			<ul style="list-style-type: none"> • Enzyme • Substrate • Denature • Mitosis • Differentiation • Motor neurone • Sensory neurone • Relay neurone • Electrical impulse • Synapse 		<p>Formative Assessment:</p> <ul style="list-style-type: none"> • Each lesson starts with a review starter, the teacher provides feedback and students mark in green pen. • Teachers constantly assess students, (for example using questioning, mini-whiteboards, short quizzes and true or false activities) and provide immediate verbal feedback during the lesson. • At the end of each lesson there is a short plenary to review learning. Students review their own work in green pen. 	
Chemistry: The Periodic table, Bonding and Tests for Ions.	<p><i>End Point: To understand how the periodic table is organised and how different substances are formed through bonding.</i></p> <ul style="list-style-type: none"> • Know the origin and organisation of the periodic table. • Know what the mass number and atomic number of an element is. • Know the properties of group 1, group 7 and group 0 in the periodic table. • Know that an ionic bond forms when electrons are donated or accepted • Know the properties of an ionic lattice. • Know that a covalent bond is formed when atoms share electrons. • Know how to draw diagrams of ionic and covalent bonds. • Know that metallic bonding arises from the electrostatic attraction of positive metal ions delocalised electrons. 			<ul style="list-style-type: none"> • Mendeleev • Groups • Periods • Mass number • Atomic number • Alkali metal • Halogen • Noble gas • Ionic bond • Covalent bond • Metallic bond • Delocalised electrons 		<p>Summative Assessment:</p> <ul style="list-style-type: none"> • At the end of each half-term students complete a summative assessment. This will be a 60-mark exam paper (20 marks from each topic). 	
Physics: Energy and forces and Motion	<p><i>End Point: To understand how motion can be calculated and represented graphically. To describe the interactions of different forces using Newton's Laws.</i></p> <ul style="list-style-type: none"> • Know that quantities that have a size and a direction are defined as vectors and that quantities with just a size are scalars. • Know how to calculate speed and acceleration. • Know how to interpret a distance time graphs and velocity time graphs. • Know Newton's Laws of motion and how to apply them. • Know different stores and transfers of energy and how to calculate them. • Know how to calculate momentum given the mass of an object, change in velocity and time. 			<ul style="list-style-type: none"> • Vector • Scalar • Energy store • Energy transfer • Kinetic energy • Gravitational potential energy • Spring constant • Momentum • Thinking distance 		<p>Homework:</p> <p>GCSE pod quizzes set weekly, other remedial work set at teacher discretion.</p>	

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Topic	Key Learning Points		Key Vocabulary	Assessments	
Biology: Genetics and Natural Selection	<p><i>End Point: To understand how sexual reproduction leads to genetic variation and explain how genetic variation is the key to evolution through natural selection.</i></p> <ul style="list-style-type: none"> • Know the process of meiosis to produce gametes for sexual reproduction. • Know the structure of DNA and how to extract DNA. • Know the process of protein synthesis. • Know the mechanisms of Mendelian and non-Mendelian genetics. • Know that evolution occurs due to competition and natural selection. • Know the evidence for human evolution and how human tools give correlating evidence for an increase in intelligence over time. • Know how we can modify organisms through selective breeding and genetic modification. 		<ul style="list-style-type: none"> • Meiosis • Gametes • DNA • Double helix • Alleles • Dominant • Recessive • Natural selection • Inheritance • Resistant 	<p>Formative Assessment:</p> <ul style="list-style-type: none"> • Each lesson starts with a review starter, the teacher provides feedback and students mark in green pen. • Teachers constantly assess students, (for example using questioning, mini-whiteboards, short quizzes and true or false activities) and provide immediate verbal feedback during the lesson. • At the end of each lesson there is a short plenary to review learning. Students review their own work in green pen. 	
Chemistry: Electrolytic processes, Fuel cells and Using and Obtaining Metals	<p><i>End Point: To be able to describe the process of electrolysis and its applications. To understand extraction methods for metals.</i></p> <ul style="list-style-type: none"> • Describe the process of electrolysis including the oxidation and reduction reactions that occur at each electrode. • Know that displacement reactions are redox reactions because one substance is oxidised and another is reduced. • Know that an ore is a rock containing metal compounds. • Know that metals can be extracted by heating with carbon or electrolysis depending on their reactivity. • Know that bioleaching and phytoextraction are biological methods of extracting metals. 		<ul style="list-style-type: none"> • Ore • Native • Blast furnace • Electrolysis • Bioleaching • Phytoextraction • Recycling • Anode • Cathode • Electrolyte • Migration 	<p>Summative Assessment:</p> <ul style="list-style-type: none"> • At the end of each half-term students complete a summative assessment. This will be a 60-mark paper (20 marks for each topic). 	
Physics: Waves and Electromagnetic Spectrum	<p><i>End point: To describe the features of waves and apply these features when describing the Electromagnetic Spectrum.</i></p> <ul style="list-style-type: none"> • Know the difference between longitudinal and transverse waves. • Know the features of a wave to include amplitude, wavelength, frequency. • Know how to use equations that describe wave speed. • Know that sound waves are caused by vibrating particles and understand the principles of ultrasound and infrasound in relation to human hearing. • Know how to use ray diagrams to investigate refraction. • Know the names and properties of waves on the electromagnetic spectrum. • Know the uses and dangers of waves on the electromagnetic spectrum. 		<ul style="list-style-type: none"> • Compression • Rarefaction • Amplitude • Wavelength • Frequency • Lambda • Longitudinal • Transverse • Oscillation • Hertz 	<p>Homework:</p> <p>GCSE pod quizzes set weekly, other remedial work set at teacher discretion.</p>	

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Topic	Key Learning Points		Key Vocabulary	Assessments
Biology: Health and Disease	<p><i>End Point: To know how different pathogens can cause us harm and understand the bodies' various defence mechanisms to infectious disease.</i></p> <ul style="list-style-type: none"> Know the different facets of health including social, mental, emotional. Know that non-communicable diseases develop due to a number of factors including genetics, diet and lifestyle. Know the different types of pathogen and how they can cause disease. Know how diseases are spread and the body's defences against infection. Know how immunity develops and that vaccinations are a safe way of exposing the immune system to pathogens. Know how new medicines such as antibiotics are developed safely. 		<ul style="list-style-type: none"> Health Pathogen Infection Disease Communicable Non-communicable Lymphocyte Antigen Antibody Immune 	<p>Formative Assessment:</p> <ul style="list-style-type: none"> Each lesson starts with a review starter, the teacher provides feedback and students mark in green pen. Teachers constantly assess students, (for example using questioning, mini-whiteboards, short quizzes and true or false activities) and provide immediate verbal feedback during the lesson. At the end of each lesson there is a short plenary to review learning. Students review their own work in green pen.
Chemistry: Calculations involving masses, Transition metals and Acids and Alkalis	<p><i>End Point: To be able to perform calculations involving masses</i></p> <ul style="list-style-type: none"> Know that the empirical formula of a substance is the whole number ratio of atoms of each element and that the molecular formula is the actual number of atoms of each element. Know the properties of the transition metals and their uses with alloys. Know how corrosion occurs and how to prevent it including electroplating. Know that acids produce excess hydrogen ions when dissolved and alkalis produce excess hydroxide ions in water. Know the difference between a concentration and strength. Know that bases neutralise acid to form a salt and water. Know that metal carbonates react with acids to produce a salt, water and carbon dioxide 		<ul style="list-style-type: none"> Moles Avogadro's constant Alloy Electroplating Acid Base Hydrogen ions Hydroxide ions Strength Concentration Neutralise Salt 	<p>Summative Assessment:</p> <ul style="list-style-type: none"> At the end of each half-term students complete a summative assessment. This will be a 60-mark paper (20 marks for each topic).
Physics: Radiation and Astronomy	<p><i>End Point: To know the properties of radiation and be able to describe celestial bodies.</i></p> <ul style="list-style-type: none"> Know how atomic models have changed over time due to new evidence. Know the types of radiation and their properties. Be able to describe radioactive decay in terms of half life and through the use of equations. Understand the dangers of radioactivity and know how to mitigate them. Know the processes of nuclear fission and fusion and how we use them. Know the structure of the solar system and how gravity acts to create orbits. Know the lifecycle of stars. Understand the evidence for the origin of the Universe including red-shift. 		<ul style="list-style-type: none"> Alpha Beta Gamma Ionising Half-life Fission Fusion Stars Gravity Orbit Red-Shift 	<p>Homework:</p> <ul style="list-style-type: none"> GCSE pod quizzes set weekly, other remedial work set at teacher discretion.

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How parents can support learning in the subject this academic year

- All students are provided with revision guides for home use but there are a variety of other good resources available on the CGP website including revision workbooks, knowledge retrievers, revision question cards, 10-minute tests. Please contact your child's Science Teacher if you would like any direction to the appropriate workbook to buy.
- Remind students to regularly review their own learning, especially in the run up to end of half termly assessments. Parents can offer disciplined rehearsal time of key knowledge in the form of quizzing students or simply asking children to explain a concept to them. To structure this use checklists of key knowledge in student books, revision guides, and other revision materials provided in the lead up to assessments at the end of every half term.
- Ensure students have a quiet space for working and revising. This space should be free from distractions and should ideally not be associated with any other activity e.g. sleeping, socialising, relaxing. Consider encouraging students to give you their mobile phone for a set period of deep work every evening.

Recommended Reading

Please find below some suggested Science books/magazines/websites that students may find interesting. These are linked to the topics that are covered in school and so may extend and strengthen their knowledge but are primarily focused on instilling a sense of curiosity and wonder:

- A Short History of Nearly Everything – Bill Bryson
- The Blind Watchmaker – Richard Dawkins
- Bad Science – Ben Goldacre
- The Gene – Siddhartha Mukherjee
- Women in Science: 50 Fearless Pioneers Who Changed the World – Rachel Ignotofsky
- The Boy Who Harnessed the Wind – Bryan Mealer and William Kamkwamba
- The Universe in Your Hand: A Journey Through Space, Time, and Beyond – Christophe Galfard
- Fun Science: A Guide to Life, The Universe & Why Science Is So Awesome – Charlie McDonnell
- Focus magazine (sciencefocus.com)
- Catalyst magazine (catalyst-magazine.org)
- New Scientist (newscientist.com)

Points to note

The Key Stage 4 Science Curriculum at JMHS is based on the National Curriculum for Science and the Edexcel exam specification which aims to develop a deep understanding of the big ideas in Science. This is split into the three disciplines of Biology, Chemistry and Physics which are taught on a rotational basis.

In addition, students learn how to work scientifically, which involves:

- Procedural Knowledge – tasks that students should be able to do as scientists, such as measuring volume.
- Disciplinary Knowledge – knowledge of the scientific method, such as making predictions and recording results.
- Mathematical Knowledge – knowledge of mathematics, such as being able to calculate the average.