

Subject Curriculum Overview for Academic Year 2022/2023

Subject: Combined Science		Subject Leader: Leo Roberts	Year Group: 11	AUTUMN TERM
Topic	Key Learning Points		Key Vocabulary	Assessments
Biology: Exchange and transport	<p><i>End Point: To know how exchange surfaces enable efficient exchange of substances.</i></p> <ul style="list-style-type: none"> Understand the general features of exchange surfaces. Know that smaller organisms with a large SA:V can obtain reactants for chemical processes via simple diffusion whereas the larger an organism gets the smaller the SA:V is meaning they require specialised exchange surfaces. Know the function and constituent parts of the circulatory system. Know the aerobic and anaerobic respiration equation. Be able to prepare and carry out an experiment to measure the rate of respiration of different organisms. 		<ul style="list-style-type: none"> Diffusion Concentration gradient Surface area Circulatory system Aerobic Anaerobic Respirometer 	<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. <p>Summative Assessment:</p> <ul style="list-style-type: none"> Students sit two mock exams, one in the Autumn term and one in Spring. These consist of full past papers. <p>Homework: GCSE pod quizzes set weekly, other remedial work set at teacher discretion.</p>
Chemistry: Fuels and Earth's Atmosphere	<p><i>End Point: To understand how we process fuels and the impact using them has on the environment. To know how the earth's atmosphere has changed over time.</i></p> <ul style="list-style-type: none"> Know how the process of fractional distillation allows us to obtain more useful mixtures of hydrocarbons from crude oil. Understand the link between hydrocarbon chain length, volatility and applications in the real world. Know what complete and incomplete combustion are. Know the different forms of pollution given off by combustion. Know the composition of the Earth's atmosphere when it first formed and how it has changed over time until present day. 		<ul style="list-style-type: none"> Crude oil Fractional distillation Hydrocarbons Alkanes Alkenes Cracking Combustion Carbon dioxide Carbon monoxide Photosynthesis Climate change 	
Physics: Electricity and Electromagnetic Induction	<p><i>End Point: To know how electrical circuits and electromagnets function.</i></p> <ul style="list-style-type: none"> Know the components in an electrical circuit and how they function. Know that current is the flow of electrons in a circuit and that potential difference is the energy difference between two points in a circuit. Know that resistance resists the current and leads to heating of components. Know calculations involving current, potential difference, resistance and power. Know that magnets exert a force on magnetic objects within the forcefield surrounding the magnet. Know that an electromagnet is where a current is passed through a coil of wire surrounding an iron core creating a magnetic field. 		<ul style="list-style-type: none"> Alpha Beta Gamma Penetration Ionising Geiger-Müller tube Half-life Current Potential difference Resistance Ohms 	

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Topic	Key Learning Points		Key Vocabulary	Assessments
Biology: Plant Structure and Function and Animal Coordination and Control	<p><i>End Point: To understand transport systems in plants and how photosynthesis can be measured. To understand homeostasis in animals.</i></p> <ul style="list-style-type: none"> Know how to describe photosynthesis and factors that affect photosynthesis. Know how water is transported in xylem vessels through transpiration. Know how sucrose is transported in phloem vessels through translocation. Know the structure and general function of the endocrine system to include names of glands and hormones in the menstrual cycle and control of metabolism. Know how blood glucose is regulated and how diabetes occurs. 		<ul style="list-style-type: none"> Photosynthesis Xylem Phloem Transpiration Translocation Glands Hormones Diabetes Menstrual cycle 	<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. <p>Summative Assessment:</p> <ul style="list-style-type: none"> Students sit two mock exams, one in the Autumn term and one in Spring. These consist of full past papers. <p>Homework:</p> <p>GCSE pod quizzes set weekly, other remedial work set at teacher discretion.</p>
Chemistry: Rates of Reaction and Dynamic Equilibrium	<p><i>End Point: To understand the features of chemical reactions.</i></p> <ul style="list-style-type: none"> Know that the rate of a reaction is the speed at which reactants are converted into products. Know that reaction rate can be measured by measuring change in mass of the reactants or products in a reaction. Know how factors such as concentration, temperature, pressure, surface area and the presence of a catalyst can affect the rate of reactions. Know that reactions can be classed as endothermic or exothermic depending on whether they absorb or release energy. Know that dynamic equilibrium occurs in a reversible reaction where forward and backward reactions balance each other in a closed system. 		<ul style="list-style-type: none"> Reactants Products Concentration Pressure Surface area Catalyst Endothermic Exothermic Activation energy 	
Physics: Particle Model and Energy calculations	<p><i>End point: To understand how particles interact to create forces and energy transfers.</i></p> <ul style="list-style-type: none"> Know how to calculate the density of solids and liquids. Know how pressure is calculated and factors that affect pressure. Know the term specific heat capacity as the amount of energy it takes to increase the temperature of 1 kilogram of the substance by 1°C. Know how to manipulate and rearrange formulas for physics equations including energy calculations and force equations. Know the terms elastic and inelastic when describing materials. Know how Hooke's Law describes a proportional increase in extension as a deforming force is applied to a material. 		<ul style="list-style-type: none"> Attract Repel Induced Permanent Solenoid Electromagnet Magnetic flux Fleming Electromagnetic induction Transformers Specific heat capacity 	

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Revision	<p><i>End point: To synthesise content taught over the last two years with exam technique. To use embedded routines for revision to consolidate key knowledge and ensure it can be retrieved in an exam setting.</i></p> <ul style="list-style-type: none"> Students are guided to structure their revision using the memory clock – a time partitioning tool that ensures students spend time revisiting key knowledge before practising recall and exam technique. Students have access to a Year 11 Science Revision Team on Microsoft Teams. Here they will find lesson resources if they need to go back to the original source as well as past paper questions, full past papers for timed practice and extra resources such as a guided revision workbook. These should be used for practising recall. To help structure their revision students are provided with an exemplar revision timetable and checklist of content. They also have access to a Science specific Revision technique guide which outlines different revision techniques and how to structure them. Students are given a list of purchasable revision resources and class teachers will guide parents at parents evening to the ones that are most helpful for their child. For example the 10-minute tests book focuses on chunked exam question practice, the exam practice work booklet gives more in-depth exam question practice, the Grade 8-9 Targeted Exam Practice Workbook provides higher attaining students with examples of the more challenging questions. Students are guided to a wealth of online resources to help support their revision. For example: <ul style="list-style-type: none"> BBC bitesize GCSE Edexcel GCSE Pod (Edexcel) SENECA OAK Academy The morning of exams there are laser point exam tips sessions run by subject specialists. Attendance is optional and sessions are focused on reinforcing key points for the specific exam of the day as well as boosting confidence. 			<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. <p>Summative Assessment:</p> <ul style="list-style-type: none"> GCSE exams <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.