

Overview of Year Group Curriculum Information
for JFS Website 2016-17

Subject:

SCIENCE

Key Stage 3			
YG	Autumn Term	Spring Term	Summer Term
<p>Year 7 Taught in a rota so these topics will be in different terms</p>	<p><u>7A Cells</u></p> <ul style="list-style-type: none"> • cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope • the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts • the similarities and differences between plant and animal cells • the role of diffusion in the movement of materials in and between cells • the structural adaptations of some unicellular <p><u>7D States of matter</u></p> <ul style="list-style-type: none"> • The particulate nature of matter • the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure • changes of state in terms of the particle model 	<p><u>7B Reproduction</u></p> <ul style="list-style-type: none"> • reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta • reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms. <p><u>7F The Periodic table</u></p> <ul style="list-style-type: none"> • the varying physical and chemical properties of different elements • the principles underpinning the Mendeleev Periodic Table • <i>make predictions</i> 	<p><u>7C Ecosystems</u></p> <ul style="list-style-type: none"> • the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops • the importance of plant reproduction through insect pollination in human food security • how organisms affect, and are affected by, their environment, including the accumulation of toxic materials. <p><u>7E Atoms, elements and compounds</u></p> <ul style="list-style-type: none"> • a simple (Dalton) atomic model • <i>understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review</i> • differences between atoms, elements and compounds • chemical symbols and formulae for elements and compounds • <i>understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature</i> • conservation of mass changes of state and chemical reactions <p><u>7I Space</u></p>

	<ul style="list-style-type: none"> • 7G Energy • comparing energy values of different foods (from labels) (kJ) • comparing power ratings of appliances in watts (W, kW) • comparing amounts of energy transferred (J, kJ, kW hour) • domestic fuel bills, fuel use and costs • fuels and energy resources. • processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels. • organisms • the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms. • States of Matter 	<p><i>using scientific knowledge and understanding</i></p> <ul style="list-style-type: none"> • the Periodic Table: periods and groups; metals and non-metals <p>7H Magnetism, circuits and particle theory</p> <p>Current electricity</p> <ul style="list-style-type: none"> • electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge <p>Magnetism</p> <ul style="list-style-type: none"> • magnetic poles, attraction and repulsion • magnetic fields by plotting with compass, representation by field lines • Earth's magnetism, compass and navigation • the magnetic effect of a current, electromagnets, D.C. motors (principles only). <p>Particle model</p> <ul style="list-style-type: none"> • atoms and molecules as particles <i>[use of particles to explain current electricity].</i> • 	<p>Space physics</p> <ul style="list-style-type: none"> • gravity force, weight = mass x gravitational field strength (g), on Earth $g=10$ N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only) • our Sun as a star, other stars in our galaxy, other galaxies • the seasons and the Earth's tilt, day length at different times of year, in different hemispheres • the light year as a unit of astronomical distance.
<p>Year 8 (taught in rota)</p>	<p>8A Nutrition</p> <ul style="list-style-type: none"> • content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed • calculations of energy requirements in a healthy daily diet • the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases 	<p>8B Gas Exchange</p> <ul style="list-style-type: none"> • the structure and functions of the gas exchange system in humans, including adaptations to function • the mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume • the impact of exercise, asthma and smoking on the human gas 	<p>8I Heat transfers and matter</p> <p>Energy changes and transfers</p> <ul style="list-style-type: none"> • heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference: use of insulators. <p>Energy in matter</p> <ul style="list-style-type: none"> • changes with temperature in motion and spacing of

	<ul style="list-style-type: none"> the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts) the importance of bacteria in the human digestive system plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots. <p><u>8D Pure and impure substances</u></p> <ul style="list-style-type: none"> the concept of a pure substance mixtures, including dissolving diffusion in terms of the particle model simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography the identification of pure substances <p><u>8G Waves</u> Observed waves</p> <ul style="list-style-type: none"> waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition. <p>Sound waves</p> <ul style="list-style-type: none"> frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound sound needs a medium to travel, the speed of sound in air, in water, in solids sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves 	<p>exchange system</p> <ul style="list-style-type: none"> the role of leaf stomata in gas exchange in plants. <p><u>8E Materials</u></p> <ul style="list-style-type: none"> the order of metals and carbon in the reactivity series the use of carbon in obtaining metals from metal oxides properties of ceramics, polymers and composites (qualitative) the properties of metals and non-metals <p><u>8H Electricity</u> Current electricity</p> <ul style="list-style-type: none"> electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current differences in resistance between conducting and insulating components (quantitative). <p>Static electricity</p> <ul style="list-style-type: none"> separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects the idea of electric field, forces acting across the space between objects not in contact. 	<p>particles</p> <ul style="list-style-type: none"> internal energy stored in materials. <p>Particle model</p> <ul style="list-style-type: none"> the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density, the anomaly of ice-water transition. <p>Physical changes</p> <ul style="list-style-type: none"> conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving similarities and differences, including density differences, between solids, liquids and gases Brownian motion in gases diffusion in liquids and gases driven by differences in concentration the difference between chemical and physical changes. <p><u>8F Earth and atmosphere</u></p> <ul style="list-style-type: none"> the composition of the Earth the structure of the Earth the rock cycle and the formation of igneous, sedimentary and metamorphic rocks Earth as a source of limited resources and the efficacy of recycling the carbon cycle the composition of the atmosphere the production of carbon dioxide by human activity and the impact on climate <p><u>8C Respiration</u></p> <ul style="list-style-type: none"> aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life a word summary for aerobic respiration the process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic
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	<p>are longitudinal</p> <ul style="list-style-type: none"> • auditory range of humans and animals. <p>Light waves</p> <ul style="list-style-type: none"> • the similarities and differences between light waves and waves in matter • light waves travelling through a vacuum; speed of light • the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface • use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye • light transferring energy from source to absorber leading to chemical and electrical effects; photo-sensitive material in the retina and in cameras • colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection. <p>Energy and waves pressure waves transferring energy; use for cleaning and physiotherapy by ultrasound; waves transferring information for conversion to electrical signals by microphone.</p>		<p>respiration</p> <ul style="list-style-type: none"> • the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism.
<p>Year 9 (taught in rota)</p>	<p>9A Health and the Skeleton Health (Structure and function of living organisms)</p> <ul style="list-style-type: none"> • the effects of recreational drugs (including substance misuse) on behaviour, health and life 	<p>9E Acids and alkalis</p> <ul style="list-style-type: none"> • defining acids and alkalis in terms of neutralisation reactions • the pH scale for measuring acidity/alkalinity; and indicators • reactions of acids with metals to produce a salt plus hydrogen 	<p>9F Energetics</p> <ul style="list-style-type: none"> • energy changes on changes of state (qualitative) • exothermic and endothermic chemical reactions (qualitative) • <i>use and derive simple equations and carry out appropriate calculations</i> <p>9I Solids</p>

processes.

The skeletal and muscular systems (Structure and function of living organisms)

- the structure and functions of the human skeleton, to include support, protection, movement and making blood cells
- biomechanics – the interaction between skeleton and muscles, including the measurement of force exerted by different muscles
- the function of muscles and examples of antagonistic muscles.

9D Chemical reactions

- chemical reactions as the rearrangement of atoms
- representing chemical reactions using formulae and using equations
- *understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature*
- combustion, thermal decomposition, oxidation and displacement reactions
- what catalysts do
- conservation of mass changes of state and chemical reactions
- how patterns in reactions can be predicted with reference to the Periodic Table

9G Forces and motion Describing motion

- speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time)
- the representation of a

- reactions of acids with alkalis to produce a salt plus water
- the chemical properties of metal and non-metal oxides with respect to acidity

9H Fluids

Pressure in fluids

- atmospheric pressure, decreases with increase of height as weight of air above decreases with height
- pressure in liquids, increasing with depth; upthrust effects, floating and sinking
- pressure measured by ratio of force over area – acting normal to any surface.

Forces

forces: associated with pushing things out of the way; resistance to motion of air and water.

9C Genetics

- heredity as the process by which genetic information is transmitted from one generation to the next
- a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model
- differences between species
- the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation
- the variation between species and between individuals of the same species means some organisms compete more successfully,

Forces

- moment as the turning effect of a force
- forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces
- forces measured in newtons, measurements of stretch or compression as force is changed
- force-extension linear relation; Hooke's Law as a special case
- work done and energy changes on deformation

Balanced forces

- opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface.

Energy changes and transfers

- simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged.

Changes in systems

- comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions
- using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes.

9B Photosynthesis

- the reactants in, and products of, photosynthesis, and a word summary for photosynthesis
- the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight

	<p>journey on a distance-time graph</p> <ul style="list-style-type: none"> relative motion: trains and cars passing one another. <p>Forces</p> <ul style="list-style-type: none"> forces as pushes or pulls, arising from the interaction between two objects using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces forces measured in newtons, non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity. <p>Forces and motion</p> <ul style="list-style-type: none"> forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only) change depending on direction of force and its size. 	<p>which can drive natural selection</p> <ul style="list-style-type: none"> changes in the environment may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material. 	<p>in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere</p> <ul style="list-style-type: none"> the adaptations of leaves for photosynthesis.
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Key Stage 4

YG	Autumn Term	Spring Term	Summer Term
<p>Year 10 (Taught in rota) New 9-1 course</p>	<p>Biology</p> <ul style="list-style-type: none"> Key concepts in biology Cells and control Genetics Natural selection and genes Health, disease and medicine Plant structure and function 	<p>Chemistry</p> <ul style="list-style-type: none"> Key concepts in chemistry States of matter and mixtures Chemical changes Extracting metals and equilibria Groups in the periodic table 	<p>Physics</p> <ul style="list-style-type: none"> Key concepts in physics Motion and energy Conservation of energy Waves Light and electromagnetic spectrum Radioactivity Astronomy (Triple only) Energy – forces doing work

<p>Year 11 (Taught in rota) Old A*-G course</p>	<p>Unit B2: The components of life Topic 1 The building blocks of cells Topic 2 Organisms and energy Topic 3 Common systems</p>	<p>Unit C2: Discovering chemistry Topic 1 Atomic structure and the periodic table Topic 2 Ionic compounds and analysis Topic 3 Covalent compounds and separation techniques Topic 4 Groups in the periodic table Topic 5 Chemical reactions Topic 6 Quantitative chemistry</p>	<p>Unit P2: Physics for your future Topic 1 Static and current electricity Topic 2 Controlling and using electric current Topic 3 Motion and forces Topic 4 Momentum, energy, work and power Topic 5 Nuclear fission and nuclear fusion Topic 6 Advantages and disadvantages of using radioactive materials</p> <p>Unit ASCA: Additional Science controlled assessment</p>
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SIXTH FORM

YG	Autumn Term	Spring Term	Summer Term
<p>Year 12 Bio</p>	<p>2.1.1 Cell Structure 2.1.2 Biological Molecules 2.1.5 Biological Membranes 2.1.4 Enzymes Starting 2.1.6 Cell Division, Cell Diversity and Cellular Organisation Starting 2.1.3 Nucleotides & Nucleic Acids Practical part of the course is on-going through the lessons</p>	<p>Finishing 2.1.3 Nucleotides & Nucleic Acids Finishing 2.1.6 Cell Division, Cell Diversity and Cellular Organisation 3.1.1 Exchange Surfaces 3.1.3 Transport in Plants 3.1.2 Transport in Animals 4.1.1 Communicable diseases, disease prevention & the immune system Practical part of the course is on-going through the lessons</p>	<p>4.2.2 Classification & Evolution 4.2.1 Biodiversity (Or trip)</p> <p>Different colour represents a different teacher</p> <p>Begin second year of 'A' level course</p>
<p>Year 13 Bio</p>	<p>Finish 4.1.2 Nerves Finish 4.2.1 Excretion 4.1.3 Hormones 4.3.1 Photosynthesis 4.4.1 Respiration 5.1.1 Cellular Control 5.4.1 Plant Responses Begin 5.1.2 Meiosis and Variation Three practical assessments</p>	<p>Finish 5.1.2 Meiosis and Variation 5.4.2 Animal Responses 5.2.1 Cloning in Plants and Animals 5.4.3 Animal Behaviour 5.2.2 Biotechnology 5.3.1 Ecosystems Begin 5.2.3 Genomes and Gene Technologies Begin 5.3.2 Populations and Sustainability Three practical assessments</p>	<p>Finish 5.2.3 Genomes and Gene Technologies Finish 5.3.2 Populations and Sustainability</p> <p>Different colour represents a different teacher</p>

Y12 Chem	0 Introduction 1 Atomic Structure & Periodic Table 2 Bonding and Structure 3 Redox I 4 Inorganic Chemistry & Periodic Table 4A Group 1&2 4B Group 7 4C Analysis 5 Equations & Moles	6 Organic Chemistry I 6A Introduction 6B Alkanes 6C Alkenes 6D Halogenoalkanes 6E Alcohols 7 Modern Analysis I 8 Energetics I 9 Kinetics I 10 Equilibrium I	
Y13 Chem	Term 1: 11 Equilibrium II 12 Acid-base Equilibria 13 Energetics II 14 Redox II 16 Kinetics II 17 Organic II	Term 2: 15 Transition Metals 18 Organic III 18A Benzene 18B Nitrogen 19 Modern Analysis II	
Y12 Phy	Topic 1: 'Working as a Physicist' covering experimental methods and data analysis Topic 2: Mechanics - covering kinematics and dynamics of bodies Topic 4: Materials – covering properties of solids and liquids	Topic 1: 'Working as a Physicist' covering experimental methods and data analysis Topic 3: Electric Circuits - covering DC electricity Topic 5: Waves and Particle Nature of Light – covering wave phenomena and introducing the quantum model of light	Topic 1: 'Working as a Physicist' covering experimental methods and data analysis Topic 5: Waves and Particle Nature of Light – covering wave phenomena and introducing the quantum model of light
Y13 Phy	Topic 1: 'Working as a Physicist' covering experimental methods and data analysis Topic 6: Further Mechanics – covering circular motion and momentum Topic 7: Electric and Magnetic Fields – covering radial and uniform fields, capacitors and induction Topic 8: Nuclear and particle Physics – covering physics of colliders and the standard model	Topic 1: 'Working as a Physicist' covering experimental methods and data analysis Topic 9: Thermodynamics – covering specific and latent heat capacity, internal energy, ideal gas laws, and radiation Topic 11: Nuclear radiation – covering nuclear stability and binding energy and half-life and activity Topic 10: Space – covering distance measurements, stellar evolution and cosmology. Topic 12: Gravitational fields – covering Newtonian gravitation and orbital motion	Topic 1: 'Working as a Physicist' covering experimental methods and data analysis Topic 13: Oscillations – covering simple harmonic motion and free and forced oscillations