Oasis Media City Subject Curriculum Plan

Subject: Science **Head of Subject**: H Patel **Date updated**: May 2021

This document is an overview of the learning that students will experience within their subject area. This is a working document that provides teachers, students and parents with a map of key content that will be delivered during lessons in each year group.

Year **Half Term:**		**1** (8 weeks)	**2** (7 weeks)	**3** (6 weeks)	**4** (6 weeks)	**5** (5 weeks)	**6** (7 weeks)
7	*Topic(s):*	**Introduction to science** ***1. Routines and Expectations, Mediacity way (2 lessons)*** 2. Variables 3. Using Scientific Equipment ***4. Practise science practical*** 5. Following a Method 6. Drawing Graphs (x2) 7. Maths in Science 8. Particle model – states of matter (inc. density) 9. Changes of state 10. Melting and Boiling points 11. Expansion and contraction (with ice as an exception) **12.** Brownian motion 13. Diffusion, osmosis, active transport 14. Mini-quiz 15. Atoms and elements 16. Compounds and mixtures 17. Symbols and formulae 18. Structure of an atom **Skills/working scientifically:** Introduce accuracy, precision, repeatability, reproducibility Evaluation of risks	**Chemistry**: *Reactions* 1. Physical and Chemical reactions 2. Pure substances and solubility 3. Rates of dissolving 4. Solubility curves (EXT) 5. Filtration 6. Crystallisation (linking to evaporation) 7. Simple Distillation 8. Chromatography 9. Mini-quiz 10. Acids and Alkalis 11. Indicators 12. Neutralisation 13. Ionisation of acids (EXT) 14. The periodic table – structure 15. Metals and non-metals 16. Alloys 17. Ceramics, 18. Composites 19. Polymers, 20. Word and symbol equations ***21. GM scientists*** ***22. Revision (2 lessons)*** ***23. Assessment*** ***24. Assessment review*** 25. Growth lesson. **Skills/working scientifically:** Present data using appropriate methods	**Physics:** *Topic: Forces* 1. Identifying forces – contact vs non-contact 2. Balanced and unbalanced forces 3. Resultant force 4. Newton's Laws (EXT) 5. Hooke's Law- practical and graph skills 6. Friction- advantages and disadvantage 7. Streamlining- everyday examples and linked to particles (EXT) 8. Moments 9. Speed calculations 10. Distance- time graph 11. Velocity-time graph 12. Gravity, weight and mass 13. Solar system 14. Day and night 15. Seasons 16. Galaxies and universe 17. Light year **Skills/working scientifically:** Changing scientific theories Identifying types of variables	**Physics:** **Science week STEM project** *Topic: Energy* 1. Different types of energy stores 2. Energy in food 3. Energy transfers 4. Sankey diagrams (EXT) 5. Efficiency calculations 6. Heating and thermal equilibrium 7. Conduction, convection and radiation 8. Preventing heat loss- practical skills 9. Renewable and non-renewable 10. Renewables- advantages and disadvantages 11. Nuclear energy 12. Calculations: power and energy costs **Skills:** Apply mathematical concepts Present data using appropriate methods Interpret observations and data and draw conclusions Understand use of SI units	**Biology:** *Topic: Interdependence and cells* 1. Living things: MRS NERG 2. 5 Kingdoms and classes 3. Classification and keys 4. Food chains 5. Food webs 6. Pyramids of numbers 7. Pyramids of biomass (EXT) 8. Environment and habitats 9. Competition 10. Sampling techniques (EXT) 11. Animal cells 12. Plant cells 13. Prokaryotic vs eukaryotic 14. Microscopes 15. Microscope calculations (EXT) 16. Specialised cells 17. Stem cells 18. Cells, tissues, organs, systems **Skills/working scientifically:** Apply sampling techniques	**Revision for end of year exams** **End of year exams** *Topic: Reproduction and Variation* 1. Male and female reproductive organs in humans and plants 2. Gametes – humans and plants 3. Fertilisation in humans 4. Pregnancy and gestation 5. Effect of maternal lifestyle 6. Menstrual cycle 7. Pollination and seed dispersal 8. Quantitative investigations of dispersal mechanisms 9. Genetic and environmental variation 10. Genetic cross diagrams (EXT) 11. Genetic diseases and sexual determination (EXT) 12. Variation 13. Adaptation 14. Natural Selection 15. Selective Breeding 16. Endangered species and extinction

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		Introduction of variables Apply mathematical concepts Present data using appropriate methods Interpret observations and data and draw conclusions Understand use of chemical nomenclature • **Literacy lesson** • **Maths skills**	Interpret observations and data and draw conclusions	Use a range of methods to carry out investigations Apply mathematical concepts Present data using appropriate methods Interpret observations and data and draw conclusions Evaluate data showing awareness of sources of error Understand use of SI units ***18. Black and Asian scientists*** **19. Maths skills lesson**	• Use basic data analysis • Growth lessons • Mini-assessment • ***Famous scientists*** • **literacy lesson**	Apply mathematical concepts Understand use of SI units • ***Women in science*** • **Maths skills lesson**	17. Biodiversity 18. Extremophiles (EXT) **Skills/working scientifically:** Apply sampling techniques Changing scientific theories Interpreting graphs • Biology investigation • Chemistry investigation • Physics investigation • Growth lessons • **Literacy lesson**
	Key Words(1 p/wk):	Nucleus, proton, neutron, electron, diffusion, concentration, membrane, osmosis	Neutralisation, filtrate, solvent, solute, solution, ceramics.	Friction, Newtons, streamline, light year, planet, Springs.	Power, Joule, generator, renewable, energy, renewable, non-renewable	Producer, consumer, species, eukaryotic, prokaryotic	Genes, adaptation, testosterone, pollen, fertilisation, extremophile, endangered
	Link to context/ Character/ Big ideas	*BI 1:* *All matter in the Universe is made of very small particles*	*BI 1:* *All matter in the Universe is made of very small particles*	*2. Objects can affect other objects at a distance* *3. Changing the movement of an object requires a net force to be acting on it* *6. Our solar system is a very small part of one of billions of galaxies in the universe*	*4. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event*	*7. Organisms are organised on a cellular basis and have a finite life span* *8. Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms*	*9. Genetic information is passed down from one generation of organisms to another* *10. The diversity of organisms, living and extinct, is the result of evolution*
	Assessment Type:	Pre-post assessment, end of topic assessment, growth lessons	Pre-post assessment, end of topic assessment, growth lessons	Pre-post assessment, end of topic assessment, growth lessons	Pre-post assessment, end of topic assessment, growth lessons	Pre-post assessment, end of topic assessment, growth lessons	Pre-post assessment, end of topic assessment, growth lessons, end of year assessment

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8	*Topic(s):*	**Science skills** **Routines and Expectations, Mediacity way (2 lessons)** Variables Methods Graphs and presenting data Equations *Topic: chemical reactions* 1. Atomic Structure 2. Electronic Configuration 3. Ar and Mr (EXT) 4. Alkali metals (group 1) 5. Halogens (Group 7) 6. Noble Gases (Group 0) 7. Reactivity of Group 1 and 7 (EXT) 8. Naming compounds 9. Writing formulae 10. Exothermic and endothermic reactions 11. Mini-quiz and recap 12. Testing for gases 13. Metals and oxygen 14. Metals and acid reactions 15. Acids and hydroxides 16. Acids and carbonates 17. Word and symbol equations 18. Balancing equations 19. Conservation of mass **Skills/working scientifically:** Changing scientific theories	*Topic: Reactions and the environment* 1. The Reactivity series 2. Displacement reactions 3. Extracting metals 4. Rates of reaction (EXT) 5. Thermal decomposition 6. Catalysts 7. Reaction profiles 8. Combustion 9. Composition of Earth 10. Structure of the Earth 11. The Rock Cycle 12. Igneous rocks 13. Sedimentary rocks 14. Metamorphic rocks 15. Fossil fuel formation 16. The Earth's Atmosphere 17. The carbon cycle 18. Climate change and the greenhouse effect 19. Finite resources and recycling **Skills/working scientifically:** Accuracy, prevision, repeatability, reliability Evaluation of risks Making scientific predictions Carry out scientific enquires to test predictions Types of variables Use basic data analysis Growth lesson **20. Revision (2 lessons)** **21. Assessment.** **22. Assessment review** ***Local context – GM scientists***	**Chemistry and Physics** *Topic: Waves and Pressure* 1. Structure of the Earth 2. The Rock Cycle 3. Igneous rocks 4. Sedimentary rocks 5. Metamorphic rocks 6. Fossil fuel formation *Physics* 7. Producing sounds 8. How sound travels 9. Hearing sounds – structure of the ear 10. Properties of sound waves 11. Wave calculations 12. Using sound: ultrasound and echo waves 13. Waves – EM waves (inc water waves) 14. Transverse and longitudinal (EXT) 15. The eye and light 16. Reflection (diffuse and specular) 17. Refraction (inc. prisms) 18. Seeing colour (EXT) 19. Pressure (over area) 20. Pressure (in liquids) 21. Pressure (in gases) **Skills/working scientifically:** Apply mathematical concepts Present data using appropriate methods Interpret observations and data and draw conclusions Understand use of SI units	*Topic: Electricity and Magnetism* **Science week STEM project** • Static electricity • Conductors and Insulators • Electrical circuits • Current • Potential difference • Measuring potential difference • Series and Parallel circuits • Resistance in a circuit • Power in a circuit • Magnets • Making Magnets • Drawing magnetic fields • Earth's magnetic field • Electromagnets • Using Electromagnets (inc. introduction to D.C. motors) **Skills/working scientifically:** Apply mathematical concepts Changing scientific theories Understand use of SI units • ***Local context – Famous scientists*** • **literacy lesson** • **Revision (2 lessons)** • **Assessment.** • **Assessment review**	**Biology** *Topic: Energy from food* 1. Food groups 2. Balanced and unbalanced diets 3. Energy in food 4. Tissues and organs of the digestive system 5. Digestion 6. Absorption – diffusion, active transport, osmosis (EXT) 7. Enzymes in the digestive system 8. Photosynthesis 9. Leaf adaptations – Gas exchange 10. Root adaptation - Absorption of water 11. Transpiration/translocation (EXT) 12. Testing for starch *Topic: Keeping Healthy* 13. Sub cellular structures (recap) 14. Cells, tissues, organs and systems 15. The lungs 16. Breathing 17. Gas exchange **Skills/working scientifically:** Present data using appropriate methods Interpret observations and data and draw conclusions 18. Growth lesson	**Revision for end of year exams** **End of year exams** 1. The heart and blood 2. The circulatory system 3. The skeletal & muscular system 4. Aerobic respiration 5. Anaerobic respiration 6. Exercise and respiration 7. Communicable vs non communicable diseases 8. Microorganisms 9. Pathogens 10. Antibiotics 11. Human defences 12. Vaccination (EXT) 13. Drugs & lifestyle choices **Skills/working scientifically:** Changing scientific theories Present data using appropriate methods Interpret observations and data and draw conclusions Evaluate data showing awareness of sources of error **literacy lesson**

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		Understand use of chemical non-nomenclature Present data using appropriate methods Interpret observations and data and draw conclusions **Literacy lesson** **Maths skills**		22. Growth lesson ***23. Local context: BAME scientists*** **24. Maths skills lesson**		**19. Maths skills lesson** ***20. Local context – women in science***	
	Key Words (1 p/wk):	Nucleus, Hydrogen, protons, neutrons, electrons, Mendeleev, exothermic, endothermic	Complete combustion, concentration, nuclear, renewable, greenhouse effect, igneous, metamorphic, sedimentary	Decibels, wavelength, spectrum, ultra-violet, Pascals, retina, longitudinal, transverse	Components, electrons, volts, amperes, current, resistance	Surface area, concentration, active site, denatured, chloroplast, palisade.	Pathogen, lactic acid, glucose, antibodies, artery, capillary, atrium, ventricle.
	Link to context/ Character/ Big ideas	*1. All matter in the Universe is made of very small particles*	*1. All matter in the Universe is made of very small particles* *5. The composition of the earth and its atmosphere, and the processes occurring within them, shape the earth's surface and its climate*	*2. Objects can affect other objects at a distance* *3. Changing the movement of an object requires a net force to be acting on it* *4. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event*	*4. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event*	*7. Organisms are organised on a cellular basis and have a finite life span* *8. Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms*	*7. Organisms are organised on a cellular basis and have a finite life span* *8. Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms* *9. Genetic information is passed down from one generation of organisms to another*
	Assessment Type:	Pre-post assessment, end of topic assessment	Pre-post assessment, end of topic assessment	Pre-post assessment, end of topic assessment	Pre-post assessment, end of topic assessment	Pre-post assessment, end of topic assessment	end of year exam

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9	*Topic(s):*	**Science skills** ***Mediacity way*** ***Routines and expectations*** Methods Variables Graphs and presenting data Equations **Chemistry** States of matter Atoms and elements Compounds and formulae Pure substances and mixtures Separation techniques Changing Atomic Theories (Dalton, Bohr) Protons, Neutrons and Electrons Electron configuration Isotopes The periodic table The modern periodic table Mini-quiz Ions of Metals and non-metals Uses of metals Corrosion (EXT) Corrosion prevention (EXT) Transition metals (EXT) Properties of transition metals (EXT) Properties and uses of alloys (EXT) Alloys Periodic table groups 1, 7 and 0 Gas tests **Skills/working scientifically:** Changing scientific theories Understand use of chemical non-nomenclature	**Investigative Chemistry** Ions and ionic bonding Ionic compounds Covalent bonding and structures Giant covalent structures Fullerenes and Graphene Nanoparticles Metallic bonding Comparisons between different types of bonding Mini-quiz Word and symbol equations Conserving mass Balancing equations Metal reactions with water, acid, oxygen The carbon cycle Climate change Greenhouse effect Finite resources and recycling • Growth lesson • Assessment ***Local context: GM scientists***	**Chemistry and Physics** Rocks and Earth's structure; Energy and waves Composition of Earth Structure of the Earth Igneous rocks Sedimentary rocks Metamorphic rocks The Rock Cycle Fossil fuel formation The Earth's Atmosphere *Physics* Energy types and transfers Renewable and non-renewable sources Insulation Comparing energy sources Power and work done Efficiency Kinetic energy and GPE Elastic potential energy Waves Measuring speed of sound EM spectrum Reflection Refraction **5. literacy lesson** ***6. Local context: BAME scientists*** **7. Maths skills lesson**	**Science week** **New Space topic:** **Solar system and day and night recap** **Phases of the moon** **Eclipses** **Gravity on other planets** **Space exploration** KS3 biology recap KS3 Chemistry recap KS3 Physics recap • ***Local context – UK scientists*** • **literacy lesson**	**Biology** **START GCSE PAPER 1** **BIOLOGY - Cell biology** Cells Organisation Microscopes DNA Multiplying bacteria Cell cycle Stem cells Culturing microorganisms (EXT) Antiseptics (EXT) DNA structure (EXT) Protein synthesis (EXT) Diffusion Osmosis Active transport Comparing transport mechanisms ***Local context: Women in science – ROSALIND FRANKLIN DNA*** **8. Maths skills lesson**	**Revision** **End of year exams** ***Organisation (9 lessons)*** Cell organisation Heart Blood and blood vessels Digestive system Food tests Enzymes Enzymes in action pH and enzymes Plant tissues Lungs and Gas exchange in humans Gas exchange in plants Transpiration Translocation (HT) **literacy lesson**

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		Present data using appropriate methods Interpret observations and data and draw conclusions 3. literacy lesson 4. Maths skills					
	Key Words(1 p/wk):	Isotopes, charge, lattice, properties, conductivity, mass number, atomic number.	Reactivity, electrostatic, intermolecular, moles, reactivity, electrode, delocalised.	Joules, watts, spring constant, wavelength, frequency, angle of incidence, energy stores, useful energy.	Newtons, Scale diagram, terminal velocity, stopping distance, field.	Eukaryotic, prokaryotic, organic bases, mitosis, cystic fibrosis, pluripotent.	Protest, virus, antibodies, natural selection, rose black spot fungus, HIV.
	Link to context/ Character/ Big ideas:	*1. All matter in the Universe is made of very small particles*	*1. All matter in the Universe is made of very small particles* *5. The composition of the earth and its atmosphere, and the processes occurring within them, shape the earth's surface and its climate*	*2. Objects can affect other objects at a distance* *4. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event*	*2. Objects can affect other objects at a distance* *3. Changing the movement of an object requires a net force to be acting on it* *4. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event*	*7. Organisms are organised on a cellular basis and have a finite life span* *9. Genetic information is passed down from one generation of organisms to another*	*7. Organisms are organised on a cellular basis and have a finite life span* *9. Genetic information is passed down from one generation of organisms to another* *8. Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms* *10. The diversity of organisms, living and extinct, is the result of evolution*
	Assessment Type:	Pre-post assessment, end of topic assessment	Pre-post assessment, end of topic assessment, required practical assessment	Pre-post assessment, end of topic assessment, required practical assessment	Pre-post assessment, end of topic assessment, required practical assessment	Pre-post assessment, end of topic assessment	end of year exam
10	*Topic(s):* ***Purple text indicates lessons that***	Science skills Mediacity way Science skills ***Infection and response – (16 lessons)***	**Chemistry** ***Periodic table (14 lessons)*** Atoms and elements States of matter Separation techniques	***Quantitative Chemistry (6 lessons)*** **Atomic Mass and Formula Mass,** **Moles,**	 Redox (HT) pH scale Acids and bases Strong and weak acids (HT)	**Physics** ***Energy (12 lessons)*** Energy transfers Energy stores Insulation Renewable energy	**Revision for end of year exams** **End of year exams** **Physics**

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	involves teaching and utilising maths skills	Pathogens Communicable diseases Bacterial, viral diseases Protist and fungal diseases, Developing medicines, Antibiotic resistance, **Analysing data on health and disease** **Using graphs and tables** Vaccinations CHD Non-communicable diseases Plant diseases ***Bioenergetics (6 lessons)*** Photosynthesis **Limiting factors of Photosynthesis** Aerobic respiration Anaerobic respiration Metabolism Fermentation ***Assessment*** ***Growth lessons***	Atomic structure Periodic table development Atomic theories Electron configuration **Isotopes** Ions Alkali metals Halogens Noble gases ***Bonding and structure (11 lessons*** Ionic structures and bonding Covalent bonding Simple covalent Giant covalent Fullerenes and Graphene Metallic bonding Comparing bonding types Alloys Use of metals ***Local context lesson: Famous/BAME scientists*** ***Local context lesson: GM scientists***	**Volume and Concentration,** **Conservation of Mass in Reactions,** **Reacting Masses (HT)** ***Chemical changes (18 lessons)*** Acids and bases pH and neutralisation Reactivity series Extraction of metals Metal reactions with water, acid, oxygen	Displacement reactions Reactivity series Extraction of ores **Electrolysis of molten compounds** **Electrolysis of aqueous compounds (HT)** **Energy changes** Exothermic and endothermic reactions Reaction profiles Bond energies (HT) ***Local context lesson: UK scientists***	Non-renewable energy **Work done and power** **Kinetic energy** **GPE** **Efficiency calculations** **Elastic potential energy** Springs ***Electricity (13 lessons)*** Circuit symbols Series and parallel Current Potential difference Resistance **V = IR** LDRs Thermistors **IV characteristics** **Investigating resistance in wire** Mains electricity Plugs **Power equations** **Electrical energy equations** **Space topic (separate only)** ***Local context lesson: Women in science***	***Particle Model (8 lessons)*** States of matter **Changing states/heating and cooling graphs** **Specific latent heat** **Density** **Specific heat capacity** Particle motion in gases ***Atomic structure (8 lessons)*** Atom structure Isotopes Nuclear radiation **Nuclear equations** Half life Radiation Irradiation and contamination Ionising radiation **Chemistry** Energy changes (4 lessons) Exothermic and endothermic reactions **Exo and endo Reaction profiles** **Measuring energy changes** **Bond energies**
	Key Words (1 p/wk):	Mitosis, meiosis, concentration gradient, lock and key, active site, denature.	Protest, virus, antibodies, rose black spot fungus, HIV, non-communicable, vector	.covalent, metallic, ionic, delocalised, alloy, energy levels.	Reduction, oxidation, displacement, ionisation, ore, reactivity series.	Dissipation, renewable, power, resistance, potential difference, current, charge.	Half life, activation energy, enthalpy, specific heat capacity, alpha, beta, gamma

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	Link to context/ Character/ Big ideas	*7. Organisms are organised on a cellular basis and have a finite life span* *9. Genetic information is passed down from one generation of organisms to another*	*7. Organisms are organised on a cellular basis and have a finite life span* *8. Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms* *9. Genetic information is passed down from one generation of organisms to another*	*1. All matter in the Universe is made of very small particles*	*1. All matter in the Universe is made of very small particles*	*2. Objects can affect other objects at a distance* *4. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event* *6. Our solar system is a very small part of one of billions of galaxies in the universe*	*1. All matter in the Universe is made of very small particles* *2. Objects can affect other objects at a distance*
	Assessment Type:	Pre-post assessment, end of topic assessment, required practical assessment	Pre-post assessment, end of topic assessment, required practical assessment	Pre-post assessment, end of topic assessment, required practical assessment	Pre-post assessment, end of topic assessment, required practical assessment	Pre-post assessment, end of topic assessment, required practical assessment	End of year exam
11	*Topic(s):*	**Baseline** **Physics paper 1 electricity** **Physics paper 1 – Particle Model** **Physics paper 1 Radiation** **Mini assessment paper 1 physics** **Start Biology paper 2 – homeostasis.** **Biology 2** Homeostasis Homeostasis Nervous system	**Revision for PPE exams** **PPE exams** **PPE exam analysis, filling in the gaps.** **Biology 2** Inheritance DNA Reproduction Meiosis XY chromosomes Genetic diagrams Inherited disorders Variation Evolution Natural selection Selective breeding Anti-biotic resistance Genetic engineering	**Chemistry 2** Rates of reaction Factors affecting rates Dynamic Equilibrium **Le Chateliers (H)** Investigating rates 1 Investigating rates 2 Organic Hydrocarbons Crude oil and Uses of crude oil Fractional distillation **Cracking (H)** Chemical analysis Purity and formulations Chromatography Test for common gases Atmosphere	**Revision for PPEs** **PPE exams** **PPE exam analysis** **Filling in the gaps** **GCSE exam revision** **Physics 2** Forces Resultant forces Resolving resultant forces Distance time graphs Terminal velocity Newtons laws Stopping distances Reaction time	**GCSE exam revision** **Biology 1** **Chemistry 1** **Physics 1**	**GCSE exam revision** **Biology 2** **Chemistry 2** **Physics 2**

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		Synapses and reflexes Endocrine system Blood glucose Diabetes Menstrual cycle Controlling fertility.	Fossils Classification **Biology 2** Ecology Competition Biotic factors Adaptations Food chains and webs Predator prey relationships Measuring distribution of species Water cycle Carbon cycle Biodiversity Waste management Global warming Deforestation Conservation techniques	Early and developing atmosphere Greenhouse effect Global warming and climate change Human impact on atmosphere Reducing human impact Using resources Resources used by humans Water treatment **Phytomining/bioleaching (H)** LCA's/reduce,reuse,recycle **Physics 2** Forces Investigating springs Scalars and vectors Distance speed and velocity Acceleration **Physics 2** Magnetism Magnets Permanent and induced Electromagnets and solenoids	Uniform acceleration (H) Inertia (H) Momentum (H) **Physics 2** Waves Intro to waves. wave equations refraction EM waves – uses EM waves – dangers Investigating IR radiation		
	Key Words(1 p/wk):	Equilibrium, Rf value, Phytomining, leachate, Potable, scalar, vector, velocity	Inertia, momentum, terminal velocity, wavelength, frequency, period, wave front.	Homozygous, heterozygous, zygote, sticky ends, glycogen, glucagon	Decomposers, carbon neutral, trophic levels, biotic, abiotic		
	Link to context/ Character/ Big ideas	*1. All matter in the Universe is made of very small particles* *5. The composition of the earth and its atmosphere, and the processes occurring within them, shape the earth's surface and its climate*	*2. Objects can affect other objects at a distance* *3. Changing the movement of an object requires a net force to be acting on it* *4. The total amount of energy in the universe is always the same but can be transferred*	*3. Changing the movement of an object requires a net force to be acting on it* *4. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event*	*5. The composition of the earth and its atmosphere, and the processes occurring within them, shape the earth's surface and its climate* *8. Organisms require a supply of energy and materials for which they*	All big ideas	

			from one energy store to another during an event	*7. Organisms are organised on a cellular basis and have a finite life span* *5. The composition of the earth and its atmosphere, and the processes occurring within them, shape the earth's surface and its climate* *8. Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms* *9. Genetic information is passed down from one generation of organisms to another* *10. The diversity of organisms, living and extinct, is the result of evolution*	*often depend on, or compete with, other organisms* *10. The diversity of organisms, living and extinct, is the result of evolution*		
	Assessment Type:	Pre-post assessment, end of topic assessment, required practical assessment	Pre-post assessment, end of topic assessment, required practical assessment, November mock exam (PPE)	Pre-post assessment, end of topic assessment, required practical assessment	Pre-post assessment, end of topic assessment, required practical assessment, March mock exam (PPE)	GCSE exams	GCSE exams

OCL Science Curriculum: Statement of Intent

Purpose of study

The Oasis Science Curriculum will equip students with the knowledge of the key scientific principles that allow us to make sense of the world around us and the disciplinary knowledge which enables them to be good scientists in their lives – providing opportunities to investigate scientific theories and unpick evidence to derive their own conclusions that will enable them to make good choices for themselves, their families, community and our planet.

We value character, competence and community in our curriculum:

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- **Character:** the curriculum aims to ensure that students feel successful during their science education, that they feel knowledgeable and that they have become curious, critical thinkers that are able to make well informed decisions that they can communicate and justify effectively.
- **Competence**:
  - **Knowledgeable students:** We want our students to be curious learners who can apply their knowledge to the real world. To do this, we equip them with the fundamental substantive and disciplinary knowledge that allows them to ask good questions, evaluate information, access a range of scenarios and communicate their ideas and conclusions effectively and with confidence.
  - **Knowledgeable teachers:** We want to ensure that all teachers are confident in their subject knowledge and potential student misconceptions across all three discipline and that they feel secure in taking ownership of differentiating lessons for the needs of the specific students they teach. We also want to provide lots of opportunities to ensure that our teachers know what their students have mastered and which areas need to be revisited later in the students learning journey. **Our teachers** are knowledgeable about the **science of learning** and are therefore empowered to make impactful decisions in the classroom. We know that student **attention and focus** is essential for learning to take place, so creating a **calm and purposeful** learning environment comes first. Our **consistent approach** to lesson structure and assessment allows teachers to focus on planning and practising excellent **expositions**, **responding** to **errors and misconceptions** and **supporting** students regardless of starting point to experience an ambitious curriculum.
  - **Knowledgeable leaders:** We want to enable our curriculum leaders to be experts in curriculum delivery – able to develop the pedagogy of their teams through effective subject specific CPD, observations and feedback. We also want to ensure that they are confident in tracking the progress of their students, identifying gaps in knowledge and underachievement and putting in place effective support to ensure that every child is successful in their science education.
- **Community:** Our curriculum ensures that our students understand the impact of their decisions on themselves, their families, local communities and our planet. It demonstrates the complexity of these decisions and the importance of individual decisions on the collective. It will encourage students to be advocates for diversity, access to healthcare and a more sustainable way of living.

Core concepts and principles of progression

Our curriculum is designed to ensure that our students are **knowledgeable**. This is made up of substantive and disciplinary knowledge. Our curriculum is **well sequenced** so that students learn the most **fundamental knowledge first**, laying the foundations on which all other understanding rest. Over their science education, students will build on this knowledge in order to gain a deeper understanding of the **big, overarching ideas** in biology, chemistry and physics. Our core concepts are:

- **Secure Substantive Knowledge**: we believe that if they have secure substantive **knowledge**, they will feel confident in explaining the key scientific principles that govern everything that occurs within our universe.
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- Concepts are revisited throughout their curriculum to ensure that fundamental knowledge is mastered first and then developed throughout the schemes of learning. Interleaved do now tasks, and the look cover write check are tasks that are designed to enable student recall memory and encode new facts into their memory respectively. The I do we do you do tasks enable gradual embedding of the new knowledge into long term memory as support and scaffold is reduced gradually. Almost every lesson is planned in this structure and so the routine of rehearsing the key information and providing opportunity for students of all abilities to encode new information into their memory is consistent.
- **Develop Disciplinary Knowledge:** we also want to ensure that students have mastered the disciplinary knowledge **–** they understand how to be '*a scientist'*. We feel it is important that this is taught alongside the substantive knowledge so that students understand how substantive scientific knowledge has been developed over time. For example, in every required practical and the first week of KS3 years are spent learning about key scientific skills e.g. converting units, scientific apparatus, variables and investigations
- **Secure subject specific literacy:** We want to ensure that student are equipped with a wide range of scientific vocabulary, an understanding of how scientific ideas are presented and communicated and an opportunity to engage in scientific literature within the curriculum and at home so that they are able to communicate their ideas effectively. READ lessons are factored into our curriculum, which include opportunities to read a scientific article together as a class, and break down the subject matter of the article for class discussion. Key

words for the topic are discussed in the READ lessons, as well as the lessons themselves. The next step is to break down the key word for each lesson and use this key word and write a sentence within context as part of the lesson exposition. This will help build confidence in the students' use of the word within their own vocabulary.

- **Link the 'Big Ideas' in science**: over their science education, students will build on this knowledge in order to gain a deeper understanding of the **big, overarching ideas** in biology, chemistry and physics. From understanding that all material in the Universe is made of very small particles, to the concept that energy cannot be created or destroyed to the key ethical arguments governing science; knowledge **is constructed and deepened** from the foundations up. These Big Ideas were formulated by Harlen et al 2010, who proposed the Big Ideas as key statements that helped to underpin the subject matter taught within science curricula.
- C**oncrete examples and real life contexts:** students have the opportunity to practice application of knowledge and interact with modelled examples repeatedly so that we ensure it is flexible and that they can apply it to a range of different situations & scenarios both within the classroom and more importantly, their real lives. For example, key lessons in each topic in each year group have a direct careers link, displaying a career linked to that lesson, for example, beekeeper for the pollination lesson and a cardiologist for the heart lesson. Key information regarding that career is discussed and shared with students and a brief question and answer session held for curiosity. We also celebrate the influence of women and black and Asian scientists within our curriculum, typically those who do not get the mention or discussion they deserve. For example, in the DNA lesson we talk about the work of Rosalind Franklin and how her work was not given the credit it deserved, instead going to Watson and Crick who got the Nobel prize. The next step is to factor these influential scientists and factor them into individual lessons where applicable, as standalone lessons already exist and factored into our curriculum.
- **Practical work:** class practicals and teacher demonstrations are integrated into the curriculum so that it builds on and helps to enrich their substantive and disciplinary knowledge. Students complete work **accurately and precisely** in order to develop their procedural knowledge of the **scientific method**, giving deeper meaning to their understanding and providing students with the foundations to study science at a higher level. At KS3, practical skills are built in and introduced right at the start of the curriculum. COVID has meant very few, if any, practical lessons have taken place. However, when practicals do take place, we have adopted the slow practical approach, as proposed by Adam Boxer (The Slow Practical – A Chemical Orthodoxy (wordpress.com)). This helps to break down the practical into bitesize chunks when demonstrating each step, so then it does not overload the working memory and easier on cognitive load for the children to carry out the steps.

Our Vision at Oasis Academy MediaCityUK

We will ensure all our students are entitled to a curriculum and opportunities for personal achievement, which will enable them to:

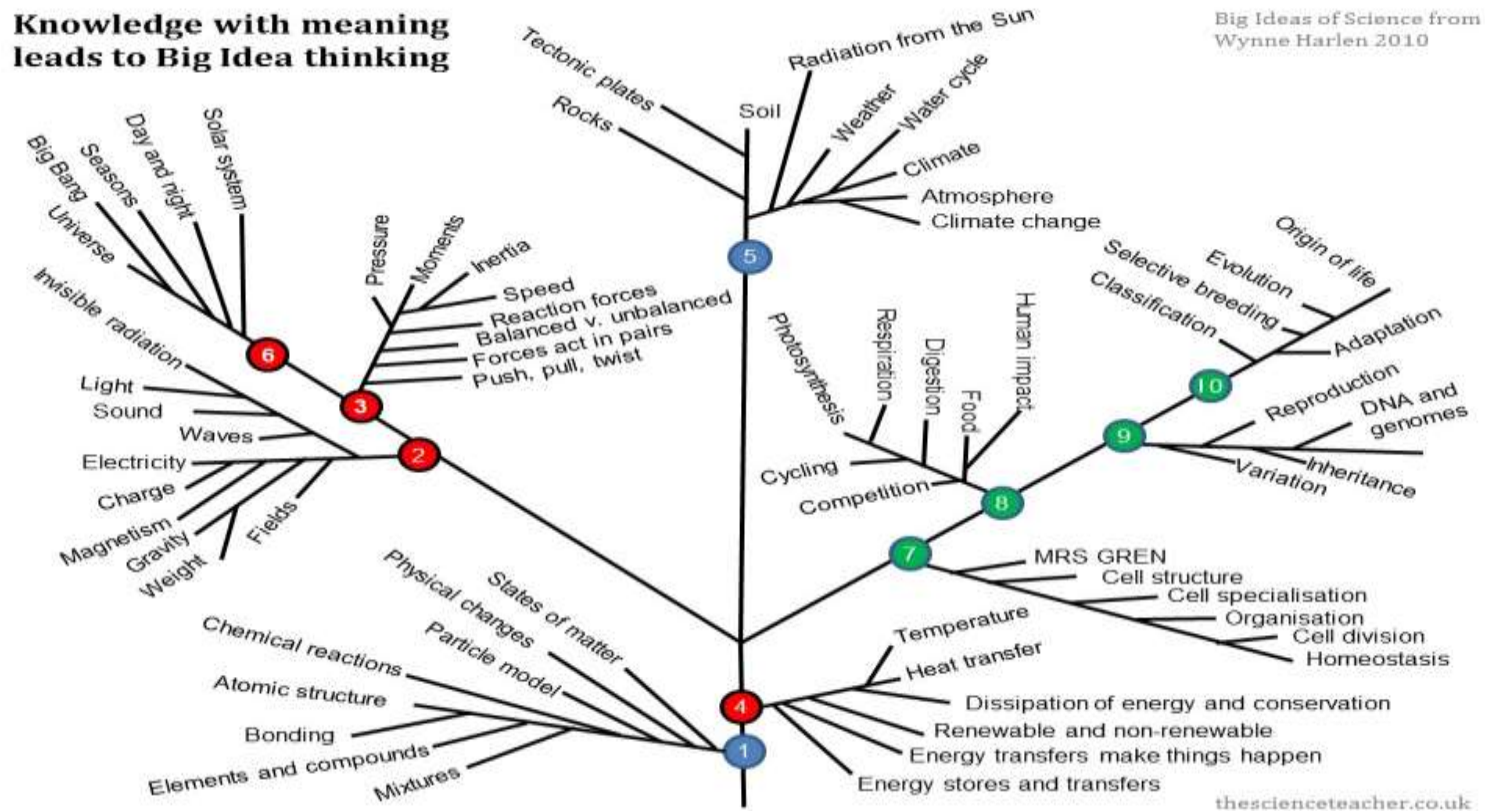
- Be enthusiastic, effective learners who exceed expectations
- Progress to the next stage of learning post 16 and 18
- Develop character, values, personal and social skills to enable them to contribute to their community and succeed in life

In Science, we intend to ensure that all students are equipped with the necessary skills, knowledge and ambitions to understand the world around them and become the scientists of tomorrow

Big ideas of science education

Sometimes as we jump from topic to topic it can be easy for students to see science as a series of endless disconnected facts. Each fact on their own is interesting, but together they represent an overwhelming barrage of information that novices must learn. The expert in contrast has managed to organise all this knowledge into fruitful schemata, based on conceptual principles not salient to the novice. As the expert experiences the intellectual satisfaction of making links, the novice is feeling frustrated and about to give up. The expert has constructed a conceptual framework of big ideas, the novice hasn't.

Oasis Media City Subject Curriculum Plan



What are big ideas?

Big ideas of Science Education were published by Wynne Harlen and others in 2010. These ideas distil down scientific knowledge into ten guiding principles that we can use to explain a diversity of scientific phenomena. The big ideas are lenses by which we can make sense of the world – an important goal for science education.

How can we help our students construct their own ‘lenses’ that hopefully will resemble those described by Harlen? Attempts to re-design the science curriculum to better emulate the big ideas is probably not going to work. Firstly, we can’t teach big ideas directly as they are a product of understanding many different concepts from different topics. You can see this in the tree diagram I’ve made, where an understanding of big idea one is reliant on knowledge from many different topics – we must work from the tips of the tree backwards until understanding coalesces at the big idea itself. Secondly, there are some good utilitarian reasons why science is arranged into different disciplines and not big ideas. It allows books, departments and journals to be structured to facilitate retrieval of information. It allows individuals and organisations to achieve expertise and it also helps us organise knowledge into discrete units that can be more easily learnt and understood. Big idea thinking then is the goal, it's just we can't teach it directly, but surely we can help students get there faster?!

The 10 big ideas of science education

1. All matter in the Universe is made of very small particles

Atoms are the building blocks of all matter, living and non-living. The behaviour and arrangement of atoms explains the properties of different materials. In chemical reactions atoms are rearranged to form new substances. Each atom has a nucleus containing neutrons and protons, surrounded by electrons. The opposite electric charges of protons and electrons attract each other, keeping atoms together and accounting for the formation of some compounds.

2. Objects can affect other objects at a distance

All objects have an effect on other objects without being in contact with them. In some cases the effect travels from the source to the receiver in the form of radiation (e.g. visible light). In other cases, action at a distance is explained in terms of the existence of a field of influence between objects, such as a magnetic, electric or gravitational field. Gravity is a universal force of attraction between all objects, however large or small. It keeps the planets in orbit around the sun and causes terrestrial objects to fall towards the centre of the earth.

3. Changing the movement of an object requires a net force to be acting on it

A force acting on an object is not seen directly but is detected by its effect on the object's motion or shape. If an object is not moving, the forces acting on it are equal in size and opposite in direction, balancing each other. Since gravity affects all objects on earth there is always another force opposing gravity when an object is at rest. Unbalanced forces cause a change in movement in the direction of the net force. When opposing forces acting on an object are not in the same line they cause the object to turn or twist. This effect is used in some simple machines.

4. The total amount of energy in the universe is always the same but can be transferred from one energy store to another during an event

Many processes or events involve changes and require an energy source to make them happen. Energy can be transferred from one body or group of bodies to another in various ways. In these processes some energy becomes less easy to use. Energy cannot be created or destroyed. Once energy has been released by burning a fossil fuel with oxygen, some of it is no longer available in a form that is as convenient to use.

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5**. The composition of the earth and its atmosphere, and the processes occurring within them, shape the earth's surface and its climate**

Radiation from the sun heats the earth's surface and causes convection currents in the air and oceans, creating climates. Below the surface, heat from the earth's interior causes movement in the molten rock. This leads to movement of the plates that form the earth's crust, creating volcanoes and earthquakes. The solid surface is constantly changing through the formation and weathering of rock.

6. Our solar system is a very small part of one of billions of galaxies in the universe

The solar system comprises the sun and the eight planets and other smaller objects orbiting it. Day and night and the seasons are explained by the orientation and rotation of the earth as it moves round the sun. The solar system is part of a galaxy of stars, gas and dust, one of many billions in the universe, enormous distances apart. Many stars appear to have planets.

7. Organisms are organised on a cellular basis and have a finite life span

All organisms comprise one or more cells. Multi-cellular organisms have cells that are differentiated according to their function. All the basic functions of life are the result of what happens inside the cells that make up an organism. Growth is the result of multiple cell divisions.

8. Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms Food provides materials and energy for organisms to carry out the basic functions of life and to grow. Green plants and some bacteria are able to use energy from the sun to generate complex food molecules. Animals obtain energy by breaking down complex food molecules and ultimately depend on green plants as their source of energy source. In any ecosystem there is competition among species for the energy resources and materials they need to live and reproduce.

9. Genetic information is passed down from one generation of organisms to another

Genetic information in a cell is held in the chemical DNA. Genes determine the development and structure of organisms. In asexual reproduction all the genes in the offspring come from one parent. In sexual reproduction half of the genes come from each parent.

10. The diversity of organisms, living and extinct, is the result of evolution

All life is directly descended from a universal common ancestor that was a simple one-celled organism. Over countless generations changes resulting from natural diversity within a species led to the selection of individuals best suited to survive under certain conditions. Species not able to respond sufficiently to changes in their environment become extinct.

Ideas about science

11. Science is about finding the cause or causes of phenomena in the natural world

Science is a search to explain and understand phenomena in the natural world. There is no single scientific method for doing this; the diversity of natural phenomena requires a diversity of methods and instruments to generate and test scientific explanations. Often an explanation derives from the factors that must be present for an event to take place, as shown by evidence from observations and experiments. In other cases, supporting evidence is based on correlations revealed by patterns in systematic observation.

12. Scientific explanations, theories and models are those that best fit the evidence available at a particular time

A scientific theory or model representing relationships between variables of a natural phenomenon must fit the observations available at the time, and lead to predictions that can be tested. Any theory or model is provisional and subject to revision in the light of new data, even though it may have led to predictions that accord with data in the past.

13. The knowledge produced by science is used in engineering and technologies to create products to serve human ends

The use of scientific ideas in engineering and technologies has made considerable changes in many aspects of human activity. Advances in technologies enable further scientific activity; in turn this increases understanding of the natural world. In some areas of human activity, technology is ahead of scientific ideas. In other areas, scientific ideas precede technology.

14. Applications of science often have ethical, social, economic and political implications

The use of scientific knowledge in technologies makes many innovation possible. Whether or not particular applications of science are desirable is a matter that cannot be addressed using scientific knowledge alone. Ethical and moral judgments may be needed, based on such considerations as justice or equity, human safety, and impacts on people and the environment.

Further reading

Oasis Media City Subject Curriculum Plan

- Carey, S., (1986). Cognitive science and science education. American Psychologist, 41(10), p.1123.
- Harlen, W. (Ed.). (2015). Working with big ideas of science education. Association for Science Education.
- Harlen, W. (Ed.). (2010). Principles and big ideas of science education. Association for Science Education.

Aims/outcomes

Through our carefully sequenced and ambitious curriculum we intend that our curriculum will achieve these aims/outcomes, (based on Harlen et al 2010):

1. Equip all students with the **substantive** knowledge:

   Biology:
   - An understanding of the structure, function and classification of living organisms (including microorganisms, plants and animals).
   - That material and energy cannot be created or destroyed, simply converted from one form to another.
   - That organisms are continuously interacting and depending on each other and that a change to one organism (including ourselves) can have a huge impact on others.
   - An understanding of how we have developed as complex organisms including the inheritance of information and the evolution of organisms over time.

   Chemistry:
   - That all matter is created from particles, linking this to the properties, classification and uses of a substance.
   - Knowledge of the structure of an atom, variation between atoms and changes that can occur to atoms.
   - Understanding of the differences between physical and chemical changes and how these can be explained using the particle model.
   - The key chemical reactions that occur, linking these to energy changes and the occurrence of these reactions in our personal lives and within medicine and industry.
   - The development of the periodic table over time and the association between different elements and their properties linking to extraction and use.
   - The composition of the Earth and our Atmosphere and how this is changing over time.

   Physics:
   - An understanding that the total amount of energy in the universe is the same but can be transferred from one store to another and the ability to identify and describe these transfers.
   - Identification of forces acting upon objects and the impact of these forces on the objects (including their effect on their speed, shape and motion).
   - Knowledge of waves including key properties, their ability to transfer energy and their effect and use in a range of scenarios.
   - Understanding of the key properties of electrical circuits, how to measure these properties and how these properties are linked to each other.
   - Knowledge of static fields, magnetism and electromagnetism and the uses of these phenomenon.
   - Understanding of the magnitude of 'space' and the impact of different astronomical bodies on our lives.

2. Ensure students have the **disciplinary** knowledge to be 'good scientists':
   - **Knowledge of methods for answering scientific questions**: a secure knowledge of the different ways that scientists investigate scientific questions so that students will be able to decide on appropriate methods of investigation that will enable them to test **predictions** and **evaluate** scientific theories for themselves.

- **Knowledge of apparatus and techniques**: students will have experience of using a range of different pieces of apparatus and techniques so that they can decide on the most appropriate and evaluate their use in different scenarios in terms of safety, accuracy, precision and errors.
- **Analyse data:** students should be able to analyse data gathered or shared with them using a range of mathematical techniques, tables and graphs. Discuss repeatability and reproducibility of findings and potential sources of error and bias so that they are able to discern between **fact** and **error** and **justify** and **communicate** their conclusions effectively.
- **Apply mathematical concepts:** students will be able to apply mathematical concepts, conventions and skills to identify patterns and describe phenomenon quantitatively.
- **Use standardised units:** students will be able to use standardised units effectively and perform appropriate calculations**.**
- **Respectful conversation**: the curriculum will create a space for students to engage in **respectful conversation** around challenging topics which enables them to develop their understanding of the complexity of decisions made within the field of science and how scientific advances have had an impact on the future of our planet.
- **Continuously evolving**: students will understand that scientific theories, laws, models and methods change over time to take into account new evidence.
- **Impact of science on us, our local and global communities:** students should be able to explain the contribution of science to our past and it's role in our future. They should be able to use their knowledge of science to make **well-informed decisions** that impact themselves and their local and global community and be able to **communicate** and **justify** these to those around them.

Implementation:

At Oasis MediaCityUK, high quality Teaching and Learning underpins all we do.

It is our commitment to provide an exceptional climate for learning and great pedagogy - making focused learning the foundation of every lesson. As an academy and across the trust, the breadth and wealth of research has been studied and used to develop a consistent approach to how we tech lessons. We call this the "MediaCity Lesson".

It all hinges on the next three ideas….

1. Working memory and the importance of a knowledge-based curriculum.

2. Cognitive load

3. Direct instruction

It is these linchpins upon which our lessons are planned. Each MediaCity lesson includes the same three components:

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RESPECT Believe Inspire

MediaCityUK Lesson

Do Now – the best way to introduce learning.

What our teachers do:

1. Place books at the front of class ready for collection. Ensure all are equipped.
2. Stand at the front and scan for compliance.
3. Take the register.
4. Display self-assessment slide and facilitate self-marking and writing of key word.
5. Share the LO for the lesson.

What our students do:

1. Collect equipment & book and sit in seat.
2. Open book, write the date, title, LO & answer Do Now questions.
3. Answer name for register.
4. Self-assess using the mark scheme in red pen. Write down key word.
5. Listen to LO.

I do - We do - You do – a cyclical model for teaching and learning.

What our teachers do:

"I Do" Teacher exposition
Explain key knowledge & concepts to the class in a memorable way and comprehensible to young minds.

"We Do" Teacher guided practice
Show how students how they will apply their learning. Use examples to introduce, analyse or model great learning.

"You Do" Student mastery
Facilitate completion of task(s), check for misconceptions and differentiate work accordingly for either individuals, groups or whole class. Use ongoing assessment to judge the effectiveness of our teaching.

What our students do:

"I Do"
SLANT. (Sit up, Lean forward, Ask and answers questions, Nod your head and Track the speaker).

"We Do"
Complete worked example(s) with teacher. Ask any questions to clarify what is expected or if you do not understand what has be said.

"You Do"
Complete task independently and to the best of your ability, raise hand and ask teacher for support if needed.

Plenary – A structured way to conclude and consolidate learning.

What the teacher does:

1. Display the end of lesson slide & review the objective by reading them aloud again.
2. Deliver a short activity to assess learning.
3. Facilitate collection of equipment and handing of books to the front tables.
4. Direct students to stand behind their desks and hand out postcard to student of the lesson.
5. Dismiss class a row at a time.

What the student does:

1. SLANT
2. Complete plenary activity silently and independently
3. Tidy equipment away and hand books to the front of the class.
4. Stand silently behind chair, ensure uniform is correct, listen silently to the teacher.
5. Walk quietly out of the classroom.

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Key Questions:

1. What is the overarching intent for your curriculum?
   The curriculum is designed to build on knowledge from KS2, with Years 7 and 8 providing both an extension of learning from KS2 and a foundation for the forthcoming years at GCSE level. Y9 students are in a foundation year, preparing for the GCSE curriculum. The use of the 12 Big Ideas, informed by research conducted by Harlen (2010), are a set of 12 diluted outcomes that describe the major understandings for all students to acquire by the time they leave school. The Big Ideas are used as a link through the curriculum, helping to focus the topics and design this curriculum.
   HOW DO WE BUILD THE BIG IDEAS INTO OUR CURRICULUM? Each Half term, a big idea or ideas is explored in each year group. Whilst this is not explicitly shared with students, the curriculum is planned and centred on an idea or ideas so that students learnt he substantive knowledge so that the big idea is explored in depth, with more knowledge and depth explored as the students progress up the years.

2. How does this curriculum build student's knowledge of the world around them both locally and nationally?
   The curriculum is based on the National Curriculum and the AQA Combined Science trilogy specification. The use of the Big Ideas feeds into each topic and students are shown the Big idea in lessons to become familiar with these ideas whilst also helping to inform lesson planning. Real life examples are used in lessons where and when necessary, with the practicals are used to explore learning at greater depth and for students to apply learning into a practical context. News articles, current research and projects are used for students further explore specific concepts in detail, for example, during Science week in March students undergo a project that enables to explore a scientific issue that affects people locally and nationally, such as plastic pollution. We celebrate the influence of women in science e.g. Rosalind Franklin for DNA, local greater Manchester influences in science e.g. John Dalton and James Joule in the atom and energy units respectively. We also celebrate and explore the curriculum through an anti-racist lens, for example the role of black and Asian scientists in the scientific community

Addressing inequalities and decolonising the curriculum

The curriculum has been designed to address the inequalities that are present in the national curriculum. Typically, white and European male scientists are overrepresented in the science curriculum, e.g. the work of Isaac Newton. The work of generally Eurocentric scientists form the main part of the current curriculum, which is considered institutionally racist by many. This curriculum contains lessons which celebrate the influence of women in science, foe example the role of Samara Linton in her work for Black Women's mental health, her work with the BMJ and her work on mental health in general, the local context of Greater Manchester scientists and their work on STEM, and how Black and Asian people have contributed to the development of scientific ideas.

Y7 and Y10 classes will therefore be taught a local context lesson at least once every half term so that they will learn about scientists who they may never have heard of and so the preconceptions of the white race being superior in science and the latest developments can be broken down and greater awareness of other faiths, Black and Asian people and their influences on STEM can be promoted and celebrated in an inclusive and honest manner.

Oasis Media City Subject Curriculum Plan

3. How is this curriculum designed to engage students and develop a passion for the subject?

   Many real life examples are used in lessons and the use of practicals naturally generate a lot of interest in Science. For example, microscopes, investigating speed and investigating rates of reaction are practicals, which commonly generate interest. The link to careers for some lessons will help students to put their science learning into perspective. Various phenomena, such as variation, space and health and disease will enable students to use personal experiences that relate to them whilst lesson sequences will enable progress to be made as we explore a lot of the fundamental knowledge in Y7 and Y8.

4. How does this curriculum cater for the needs of our students?

All students needs are catered for regardless of ability. Misconceptions and questions that students may have are addressed at the start of a new topic so that these misconceptions are not carried forward and, most importantly, corrected. The 7 guidelines proposed by the Education Endowment foundation were used to propose this curriculum, in particular the use of experiments to suit students who learn better by practical means. Content is regularly revisited during lessons. Assessments are reviewed; common topics that students struggled to grasp are then re-taught and revisited, with students then practising questions with various assessment objectives assessing a number of skills such as recall, application and evaluation in lessons to make them confident in answering the exam questions typically posed in exams. The look cover write check task has been adapted for students who need extra support e.g. the number of key facts reduced, revealing 1 fact at a time and then asking students to learn and write from memory so as to not overload working memory.

5. How is assessment used to improve learning?

For summative assessment, all students will complete end of topic tests to assess learning that took place in that topic. This is assessed by the teacher and then reviewed by students to identify strengths and areas to learn further. The lesson that follows will involve the teacher re-teaching the content they have identified as an area to develop, with students completing growth tasks created by the teacher, which are designed to consolidate knowledge of the weaker areas. Regular low-stake recall quizzing is used for students to assess the learning that week and for previous knowledge, with the gaps in learning identified so that students then complete tasks that build their confidence and knowledge in those topics.

We are moving forward to shorter and more frequent assessment model where students have a mini-assessment after a topic (about once every 3 weeks). We then use data from the assessment to do a QLA type task, do a walking talking mark style lesson where we expose thinking behind the question, and students complete a growth task, bespoke to them, based on the question they struggled on. This takes place after the teacher has marked their assessment and given what went well and even better if feedback. The assessments themselves are designed in such a manner that each question addresses a specific mini topic e.g. question 1 on photosynthesis. Then the growth tasks are made relative to each question, so if they did not do well on Q1, then they complete the growth task 1 which will be on photosynthesis. The growth tasks themselves are not the same question, but an adaptation or alternative question relative to that topic.

Our book marking policy involves a similar mechanism with students being given meaningful feedback based what skills and knowledge they are good at and what they need a bit more help with. After books are marked to check for spelling errors, misconceptions, presentation of work and grammar errors, a marking task is given to students which is a brief assessment type task no longer than 15 mins to complete and covers the content that has recently been taught to our students.

This is then marked by the teacher, given a score, and specific knowledge criteria based on the task is shared with the students in the form of WWW and EBI for example, if they did very well on question 1 which was about atomic structure, the teacher will highlight this on the marking task after marking it, and similar with the EBI. The student is then made clear what their WWW and EBI is, and based on their EBI they then complete a growth task based on this marking task.

Growth task lessons are dedicated for students to make improvements to their work, reflect on learning, and complete growth tasks to fill in gaps in knowledge. The teacher delivers this lesson with a normal start – date, title, LO and do now task focused on previous knowledge. Then the key misconceptions and strengths are shared with the class. The teacher then reteaches these misconceptions in the lesson and reinforces any weaker areas based on their performance in a marking task or an assessment.

6. What skills will students develop that can be used in other subject areas and beyond their school life?

A multitude of skills learnt in Science can be applied to other subjects and beyond school life. These include the ability to summarise large pieces of information into succinct points, interpreting diagrams, reading and drawing graphs and tables to present data, using and processing numbers to calculate numerical responses, using practical skills to accurately measure, observe, record data and draw conclusions to test hypotheses. The ability to argue for and against, justifying conclusions and providing alternative arguments for a product or concept is a valued skill along with the other skills mentioned. A lot of the skills are used regularly in other subjects, such as calculating skills, presenting and interpreting data in Maths, forming and justifying an argument in English.

Examples of topics with British values: diet, genes and variation, contraception.

7. How is learning planned to progressively develop pupil's knowledge and understanding over time?

A large portion of knowledge required to access the GCSE curriculum is covered at a foundation level at KS3, including cells, chemical reactions, acids and alkalis and energy stores. As the student's progress through the year groups they will learn and encounter new phenomena as well as revisiting previous content covered through interleaved practice at starts of lessons (discussed in Q8). As students move into KS4, with a large portion of basic knowledge covered at KS3, then explore them at GCSE level, and the lessons will involve revisiting KS3 content for that lesson to activate prior knowledge to access the deeper content.

The sequence of lessons is also planned so that key knowledge is taught first in a lesson before going deeper. For example, the structure of the atom is taught first before students learn about elements in Y7 and Y8. Cell structure is taught first before stem cells and organ systems so that students understand that all organ systems are made up of specialised cells. This way, confusion and insecure knowledge of sophisticated terminology and phenomena are minimised as students are instructed to use their prior and current knowledge.

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8. How is learning sequenced over time to ensure students retain knowledge and are more successful at recalling?
   Regular low-stake quizzing (Knowledge organisers) are used for students to revise and revisit previously taught material. This is assessed in a low stake quiz each week which students self-mark, set themselves feedback and act upon the feedback to fill in the gaps in their learning. This normally takes 30 minutes of a lesson. Every lesson will also have an interleaved 'Do now' task which includes current and previous knowledge, giving students the opportunity to revisit previous content. This strengthens the ability to recall facts, practice mathematical skills and use their knowledge to make progress in the next lesson.
   Teachers review assessments and identify gaps in learning. Growth tasks are used as part of the marking policy to provide students the opportunity to address their gaps in learning, using their knowledge and understanding of the content to answer the questions.
   Specific lessons within topics are sequenced deliberately. For example, Y7 start with chemistry as it is essential for students to learn about particles and atoms before other scientific phenomena are explored. In Y8, cells are explored again as with Y7 but with a great focus on tissues and how these tissues work together within organ systems in plants and animals, which then lead to the Y8s learning about how diseases affect these organ systems caused by pathogens.
   Y7 learn about different energy types and this is explored further

9. How is this curriculum adapted to cater for the needs of students with different starting points?
   Effective differentiation will be used in lessons to enable teachers to pitch their lesson to all students regardless of ability. A One-size-fits-all approach is not the correct method – students will have access to a number of support structures from teachers in lessons, for example, modelling is a frequent technique used in lessons to show what a good answer looks like. More able students will be encouraged to complete exam questions and other tasks independently with limited, if any, access to the modelling support. Students requiring extra support will be able to take advantage of the modelling so that they become aware of the question requires, how to build answers, and gain confidence and independence to access deeper knowledge.

10. How will you ensure teachers have the relevant knowledge, expertise and practical skills to deliver your curriculum effectively?
    All teachers are expected to regularly review the specification to ensure subject knowledge is up to date, relevant and strong. Team meetings are used to share good practice in teaching and learning, for example book looks, ways to teach certain topics and how the practical elements of the Science curriculum can be delivered in an effective way. Teachers will also have access to support directly from the exam board, Lead practitioners, access to feedback from previous exams to inform future planning and so students are taught effective exam practice, how to answer required practical questions and explore sophisticated phenomena.
    Teachers also attend in-house CPD and CPD ran by other oasis colleagues within the trust, for example, an NQT has attended a subject knowledge and pedagogy course earlier in the academic year, and the curriculum lead has attended external courses by the STEM association on effective delivery of the separate science curriculum and conferences ran by PIXL which has covered effective teaching on exam questions, which has led to the development of the decoding exam question strategy – used for Y11 assessment preparation and looks to break down command words used in typical AQA exam questions e.g. describe, evaluate etc.