NOTTINGHAM GIRLS' ACADEMY

KS3 Science Curriculum

Purpose of Study

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

Aims

The Nottingham Girls' Academy curriculum for science aims to ensure that all pupils:

- develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics
- develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them
- are equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future

Scientific knowledge and conceptual understanding

The programmes of study describe a sequence of knowledge and concepts. While it is important that pupils make progress, it is also vitally important that they develop secure understanding of each key block of knowledge and concepts in order to progress to the next stage. Insecure, superficial understanding will not allow genuine progression: pupils may struggle at key points of transition (such as between primary and secondary school), build up serious misconceptions, and/or have significant difficulties in understanding higher-order content.

Pupils should be able to describe associated processes and key characteristics in common language, but they should also be familiar with, and use, technical terminology accurately and precisely. They should build up an extended specialist vocabulary. They should also apply their mathematical knowledge to their understanding of science, including collecting, presenting and analysing data. The social and economic implications of science are important but, generally, they are taught most appropriately within the wider school curriculum: teachers will wish to use different contexts to maximise their pupils' engagement with and motivation to study science.

The nature, processes and methods of science

'Working scientifically' specifies the understanding of the nature, processes and methods of science for each year group. It should not be taught as a separate strand. The notes and guidance give examples of how 'working scientifically' might be embedded within the content of biology, chemistry and physics, focusing on the key features of scientific enquiry, so that pupils learn to use a variety of approaches to answer relevant scientific questions. These types of scientific enquiry should include: observing over time; pattern seeking; identifying, classifying and grouping; comparative and fair testing (controlled investigations); and researching using secondary sources. Pupils should seek answers to questions through collecting, analysing and presenting data. 'Working scientifically' will be developed further at key stages 3 and 4, once pupils have built up sufficient understanding of science to engage meaningfully in more sophisticated discussion of experimental design and control

Curriculum-at-a-Glance: KS3 Science

	Half Term 1	Half Term 2	Half Term 3	Half Term 4	Half Term 5	Half Term 6
Year 7	Good scientist Organisms 1	Forces 1 Matter 1	Energy 1 Ecosystems 1	Waves 1 Electromagnets 1	Reactions 1 Earth 1	Genes 1
Year 8	Reactions 2 Genes 2	Waves 2 Organisms 2	Electromagnets 2 Earth 2	Ecosystems 2 Forces 2	Energy 2	Matter 2
Year 9	Reproduction Working scientifically skills	Space	GCSE P4 Atomic structure C1 Periodic table	GCSE P3 Particles C2 Bonding	GCSE C2 Bonding P1 Energy	GCSE C2 Bonding B1 Cells

To maximise opportunities for practical work the topics are taught in a rotation during each half term. This allows for several assessment checkpoints throughout the course. These are detailed on the teaching rota (hyperlink here)

Commented [AM1]: @S Bates what're you doing?

Medium Term Plan: KS3 Science

Year 7 Science

Knowledge, Qualifications and Assessment
What pupils will study during Year 7, our ambition for the knowledge they retain and subject specific skill they will develop and how learning will be assessed formatively and summatively.

Learning Challenge *What will pupils produce at the end of a unit to demonstrate their learning?*		***Students are assessed formatively throughout each topic to ensure understanding. They are encouraged to write, discuss and practice using their prior and developing knowledge in both theory and practical lessons. Y7 knowledge builds upon KS2 science, Y8 builds upon Y7 science etc.*** ***The challenges take the form of Checkpoint activities which inform the students of What Went Well (WWW), along with an Even Better If/Direct Response Task (EBI/DRT).***
Learning Consolidation *What prior learning will pupils consolidate using spaced retrieval and spaced practice?*		***Staff use various methods to tie in and retrieve knowledge from across the science spectrum of topics throughout the journey, however up to 10 minutes of retrieval is expected at the beginning of every lesson.*** ***The main assessment is completed at the end of the following topic. This allows familiarisation with revision techniques and opportunities to practice retrieval skills. Students will sit either a higher or foundation exam-style test and receive a Step point along with a directed task (DRT) to aid improvement.***
		Topics may be taught on a rota basis to maximise practical opportunities. See the teaching rota for more specific information (hyperlink here)
Unit Title	***Periods***	***Learning Journey*** *What knowledge and subject specific skills will pupils learn in order to complete the Learning Challenge?*
Good scientist	***10***	***Key concept:*** *Learning how to use laboratory equipment in a safe manner and in the appropriate context* ***Subconcept****: Take readings using a thermometer, measure volumes of liquid, making observations and focusing a microscope to view an image.* ***Facts****: solids are measured in grams and liquids and measured in* cm^3.
Forces 1	***8***	***Key concept:*** *Balanced and unbalanced forces: When the net force on an object is zero, it is in equilibrium and its motion is constant* ***Subconcepts:*** *Gravity, friction, reaction, tension, compression, net force* ***Key concept:*** *Friction is caused by the interaction of surfaces moving over one another, and acts to resist this* ***Subconcept****: air resistance*

		Key concept: *Density is a material property which describes the mass of a specific volume of the matter.* ***Facts****: Objects float in fluids with equal density* *Density = mass/volume* ***Key concept:*** *Every object exerts a gravitational force. Gravity holds planets and moons in orbit around larger bodies but depends on distance and mass* ***Facts****: Gravity decreases with distance* ***Key concept:*** *Compare the weight of 1kg on different planets, to test a relationship between weight and mass* ***Subconcept:*** *Gravitational field strength* ***Facts:*** *Weight = mass x g (field strength)* *Weight is in N, mass in kg* ***Key concept:*** *The solar system is modelled as planets rotating on tilted axes, orbiting the Sun. It explains day and year length, seasons and how planets and moons appear* ***Subconcept****: Planet, orbit, satellite* ***Facts****: Axis, day and year length*
Electromagnets 1	***6***	***Key concept:*** *Electric current is the movement of electrons from a source through a conductor and back, around a complete circuit* ***Subconcept****: Series circuit, parallel circuit* ***Facts****: ammeter measure current in amps, A* *Circuit symbols: buzzer, bulb, resistor, cell, switch, ammeter*
Energy 1	***5***	***Key concept:*** *When there is a change, energy is transferred from one store at the start to another at the end* ***Subconcept****: Energy stores, kinetic energy, gravitational energy* ***Facts****: Other energy stores: thermal (hot), elastic (stretched), electrical (current), chemical (fuel, food or battery)* *Total energy is same before and after* *Energy is measured in Joules (J)* ***Key concept:*** *Energy moves from warmer objects to cooler objects, until both reach the same temperature* ***Subconcept****: Temperature, thermal equilibrium, temperature-time graph* ***Facts****: Heat is a movement of energy between objects* *Temperature measured in °C* ***Key concept:*** *When energy is transferred, some energy is wasted, reducing the useful energy* ***Subconcept****: Input & output, efficiency* ***Facts****: Energy can be useful or wasted* *Efficiency = output/input energy x 100*

KS3 Science

Waves 1	*10*	***Key concept:*** *Reflection* *We see objects by reflected light. When a light ray strikes a reflective surface, it changes direction, and the angle of the incident and reflected rays are equal* ***Subconcept****: Ray Model, Image* ***Facts****: Definition of: Scattering, incident ray, reflected ray, angle of incidence, angle of reflection, total internal reflection* *The difference between absorption and transmission* ***Key concept****: Refraction* *When light passes into a different material, light changes direction. It bends towards the normal for a denser substance, and away for a less dense substance.* ***Subconcept****: lenses* ***Facts****: Definition of: Dispersion, retina, spectrum* *The difference between converge and diverge* *How light rays are affected by convex lenses*
Matter 1	***15***	***Key concept****: Substances can be modelled as small particles in motion. Their energy and arrangement differ between states of matter* ***Subconcept****: Solid, liquid, gas* ***Facts****: Particles in a solid are tightly packed, usually in a regular pattern, close together with no regular pattern and are far about with no regular pattern* ***Key concept:*** *Mixtures can be separated due to differences in the physical properties of the individual substances* ***Subconcept****: Filtration, evaporation, distillation, chromatography* ***Facts****: Examples of each of the method* ***Key concept****: Solubility is how much of a substance dissolves in a fixed volume of solvent and depends on temperature* ***Subconcept****: Dissolving* ***Facts****: Definitions of terms: soluble, insoluble, solvent, solute, solution*
Reactions 1	***12***	***Key concept:*** *The pH scale measures how acidic or alkaline a solution is. Indicators are substances whose colour depends on pH* ***Subconcept****: Acid, alkali* ***Facts****: Neutral substances have pH 7* ***Key concept****: Neutralisation is a chemical change when acid and alkali (or base) react to produce neutral substances* ***Subconcept****: Base* ***Facts****: When an acid and an alkali mix together, a chemical reaction takes place, and two different products are formed; a salt and water.*
Earth 1	***10***	***Key concept:*** *The three rock types that make up Earth's crust were formed by processes that link together in a never-ending cycle*

		***Subconcept**: Igneous rock, sedimentary rock, metamorphic rock, weathering, erosion* ***Facts**: A mineral is a naturally occurring element or compound* *Crystals are non-metal minerals whose atoms are arranged in a giant structure* *Definitions of permeable/porous and impermeable* *The rock layers inside Earth are the crust, the mantle and the core.* ***Key concept**: The water cycle moves water through Earth's systems and is driven by energy from the sun and gravity* ***Subconcept**: Evaporation, condensation* ***Facts**: Water falls to Earth as precipitation (rain, snow, hail, sleet)* *Transpiration is losing water from leaves via evaporation*
Organisms 1	***9***	***Key concept**: Cells are the smallest elements of life that are alive. They have parts that play different roles in life functions.* *Multicellular organisms have specialised cells with adaptations to allow them to carry out specific functions* ***Subconcept**: Animal cell, plant cell, unicellular and multicellular.* *Sperm cell, nerve cell, muscle cell, root hair cell, palisade cell.* ***Facts**: Functions of: nucleus, cell membrane, cytoplasm, mitochondria, ribosomes, cell wall, vacuole, chloroplasts* *Bacterial cell parts* *How to use a light microscope*
Ecosystems 1	***7***	***Key concept:** Food webs link together several food chains and show how energy is transferred between organisms* ***Subconcept**: Food chain, ecosystem, population, producer, consumer* ***Facts:** Decomposers (fungi and bacteria) carry out decay* *Predators catch and eat prey* ***Key concept**: Competition between organisms occurs when resources are limited* ***Subconcept**: Pollination, seed dispersal* ***Key concept**: Abiotic and biotic factors affect the population of an organism* ***Subconcept**: Environment* ***Facts**: Examples of abiotic and biotic factors* *A community is all the different organisms that live in an ecosystem*
Genes 1	***10***	***Key concept**: Reproduction involves mixing genetic material from two parents, or copying cells from one parent* ***Subconcept** Fertilisation* ***Facts**: Sperm, eggs, pollen and ovules are gametes* *Female organs: ovary, fallopian tube (oviduct), uterus (womb), vagina* *Male organs: testes, penis* ***Key concept:** The menstrual cycle prepares the female body for fertilisation and development of the embryo* ***Subconcept:** Ovulation, menstruation, embryo* ***Facts:** The menstrual cycle lasts around 28 days*

		Key concepts: *Embryo development happens in the uterus. The embryo needs substances from the mother to grow* ***Subconcepts:*** *Placenta, amniotic fluid, umbilical cord* ***Facts:*** *When all the organs have developed, the embryo is known as a foetus*

Qualities

During Year 7, pupils will have opportunities to develop the following BUILD qualities:

BUILD Quality	***How the KS3 Science curriculum contributes to developing this quality:***
Respect	***Environmental concerns,***
Kindness	***Practicals and group work***
Tolerance	***Practicals and group work, class discussions***
Resilience	***Graphing skills***
Creativity	***Making models***
Positivity	***Static electricity***
Integrity	***Class discussions - puberty***
Aspiration	
Empathy	***Class discussions***

Skills

During Year 7, pupils will have opportunities to develop the following wider skills:

Skill Area	***How the KS3 Science curriculum contributes to developing this skill area:***
Literacy & Numeracy	Correctly use some SI units, Present data using a bar graph, rearrange and substitute values in equations
Communication	*Presenting data*
Problem Solving	Ask questions based on behaviour of the world
Leadership	
Collaboration	*Teamwork when carrying out practicals*
Metacognition	*Interleaving of assessments & retrieval*
Physical, Practical and Technical	Conduct experiments to test predictions, Identify some hazards. make and record simple observations in a table, make predictions using scientific language and understanding
Digital Literacy	*Use of Onenote and Teams*

KS3 Science

Enrichment
During Year 7, the following events, visits, and trips will enrich the Science curriculum:

Event, Visit or Trip	***Linked unit(s) of study***	***How the event, visit or trip enriches the curriculum:***
Biology week	***Theme dependent***	*Developing skills related to working scientifically to themed lessons outside of the curriculum content. Looking at the wider world and how science plays a role.*
Chemistry	***Theme dependent***	*Developing skills related to working scientifically to themed lessons outside of the curriculum content. Looking at the wider world and how science plays a role.*
Science week	***Theme dependent***	*Developing skills related to working scientifically to themed lessons outside of the curriculum content. Looking at the wider world and how science plays a role.*
Women in engineering week	***Theme dependent***	*Developing skills related to working scientifically to themed lessons outside of the curriculum content. Looking at the wider world and how science plays a role. Making links with careers in engineering/ STEM.*
CREST awards	***Dependent on student project choice***	*Development of research and scientific investigation skills to present a project. Students link topics from the classroom to real world problems, examining ways to solve current issues in a scientific way.*
Eco group	***Various***	
STEM club	***Industrial strategy challenges***	

Year 8 Science

Knowledge, Qualifications and Assessment
What pupils will study during Year 8, our ambition for the knowledge they retain and subject specific skill they will develop and how learning will be assessed formatively and summatively.

Learning Challenge *What will pupils produce at the end of a unit to demonstrate their learning?*		***Students are assessed formatively throughout each topic to ensure understanding. They are encouraged to write, discuss and practice using their prior and developing knowledge in both theory and practical lessons. Y7 knowlY8 builds upon Y7 science etc.*** ***The challenges take the form of Checkpoint activities which inform the students of What Went Well (WWW), along with an Even Better If/Direct Response Task (EBI/DRT).***
Learning Consolidation *What prior learning will pupils consolidate using spaced retrieval and spaced practice*		***Staff use various methods to tie in and retrieve knowledge from across the science spectrum of topics throughout the journey, however up to 10 minutes of retrieval is expected at the beginning of every lesson.*** ***The main assessment is completed at the end of the following topic. This allows familiarisation with revision techniques and opportunities to practice retrieval skills. Students will sit either a higher or foundation exam-style test and receive a Step point along with a directed task (DRT) to aid improvement.***
		Topics may be taught on a rota basis to maximise practical opportunities. See the teaching rota for more specific information (hyperlink here)
Unit Title	***Periods***	***Learning Journey*** *What knowledge and subject specific skills will pupils learn in order to complete the Learning Challenge?*
Forces 2	***8***	***Key concept:*** *When the net force on an object is zero, it is in equilibrium and its motion is constant* ***Subconcept:*** *Gravity, friction, reaction, tension, compression, net force* ***Key concept:*** *Friction is caused by the interaction of surfaces moving over one another, and acts to resist this* ***Subconcept:*** *Air resistance* ***Key concept:*** *Density is a material property which describes the mass of a specific volume of the mater* ***Subconcept:*** *Upthrust, mass* ***Facts:*** *Objects float in fluids with equal density Density = mass/volume* ***Key concept:*** *Every object exerts a gravitational force. Gravity holds planets and moons in orbit around larger bodies but depends on distance and mass* ***Subconcept:*** *Gravity, friction, reaction, tension, compression, net force* ***Facts:*** *Gravity decreases with distance*

		Key concept: *Compare the weight of 1kg on different planets, to test a relationship between weight and mass* ***Subconcept:*** *Gravitational field strength* ***Facts:*** *Weight = mass x g (field strength) Weight is in N, mass in kg* ***Key concept:*** *The solar system is modelled as planets rotating on tilted axes, orbiting the Sun. It explains day and year length, seasons and how planets and moons appear* ***Subconcept:*** *Planet, orbit, satellite* ***Facts:*** *Axis, day and year length*
Electromagnets 2	***4***	***Key concept:*** *A magnetic field is a region around a magnet, where a magnetic object feels a force. The field is represented by lines.* ***Subconcept:*** *Drawing magnetic field* ***Facts:*** *The poles of a magnet are the places where the magnetic forces are strongest Rules of attraction and repulsion* *The difference between permanent and induced magnet*
Energy 2	***10***	***Key concept:*** *When there is a change, energy is transferred from one store at the start to another at the end* ***Subconcept:*** *Energy stores, kinetic energy, gravitational energy* ***Facts:*** *Other energy stores: thermal (hot), elastic (stretched), electrical (current), chemical (fuel, food or battery)* *Total energy is same before and after Energy is measured in Joules (J)* ***Key concept:*** *Energy moves from warmer objects to cooler objects, until both reach the same temperature* ***Subconcept:*** *Temperature, thermal equilibrium, temperature-time graph* ***Facts:*** *Heat is a movement of energy between objects Temperature measured in °C* ***Key concept:*** *When energy is transferred, some energy is wasted, reducing the useful energy* ***Subconcept:*** *Input & output, efficiency* ***Facts:*** *Energy can be useful or wasted Efficiency = output/input energy x 100*
Waves 2	***4***	***Key concept:*** *Waves are a transfer of energy and can be used for communication.* ***Subconcept:*** *Electromagnetic spectrum* ***Facts:*** *The electromagnetic spectrum is composed of 7 bands of waves.* *The energy of the wave depends on its frequency.* *Light and other electromagnetic radiation can damage living cells.* *Each band of the electromagnetic spectrum can be utilised for specific functions.* ***Key concept:*** *Waves can interact with each other and their surroundings* ***Subconcept:*** *transverse, longitudinal* ***Facts:*** *Transverse waves are waves that oscillate at right angles to the energy transfer.*

		Longitudinal waves are waves that oscillate parallel to the energy transfer. *Wave can add up if they are put together, this is called superposition.* *Waves can be modelled in multiple ways, slinkys and water waves can be used to demonstrate reflection, refraction, superposition etc.*
Matter 2	***10***	***Key concept:*** *A pure substance can be an element or compound. The properties of a compound are different to its constituent elements.* ***Subconcept:*** *Element, compound, formula, molecule* ***Facts:*** *An atom is the smallest particle that makes up an element* *Each element has a shortened name called a symbol Rules for naming compounds* ***Key concept:*** *In some substances atoms are joined as separate molecules and in others the atoms all join to form one giant structure* ***Subconcept:*** *Simple structure, giant structure* ***Facts:*** *Boiling point is the temperature a substance boils at, and changes from liquid to a gas* *Melting point is the temperature a substance melts, and changes from solid to liquid*
Reactions 2	***7***	***Key concept:*** *A chemical change makes a new substance. It is identified by changes in appearance, energy, mass, or chemical tests* ***Subconcept:*** *Chemical change, physical change* ***Facts:*** *Chemical change is any change that results in the formation of new chemical substances. At the molecular level, chemical change involves making or breaking of bonds between atoms.* *Physical change rearranges molecules but doesn't affect their internal structures. It might change the appearance, but not the identity.* ***Key concept:*** *All chemical reactions involve energy. Energy is used to break bonds in reactants, and energy is released when new bonds form in products.* ***Subconcept:*** *Exothermic and endothermic* ***Facts:*** *In an exothermic reaction, it takes less energy to break bonds in the reactants so some energy is released as heat.* *In an endothermic reaction, it takes more energy to break bonds in the reactants so some of the energy from the surroundings is absorbed. This makes the temperature decrease.*
Earth 2	***5***	***Key concept:*** *The three rock types that make up Earth's crust were formed by processes that link together in a never-ending cycle* ***Subconcept:*** *Igneous rock, sedimentary rock, metamorphic rock, weathering, erosion* ***Facts:*** *A mineral is a naturally occurring element or compound Crystals are non-metal minerals whose atoms are arranged in a giant structure* *Definitions of permeable/porous and impermeable The rock layers inside Earth are the crust, the mantle and the core.* ***Key concept:*** ***T****he water cycle moves water through Earth's systems and is driven by energy from the sun and gravity* ***Subconcept:*** *Evaporation, condensation* ***Facts:*** *Water falls to Earth as precipitation (rain, snow, hail, sleet) Transpiration is losing water from leaves via evaporation*
Organisms 2	***10***	***Key concept:*** *Multicellular organisms are composed of cells which are organised into tissues, organs and systems to carry out life processes* *In gas exchange, oxygen and carbon dioxide move between alveoli in the lungs and the blood* ***Subconcept:*** *Tissue, organ, organ system* *Balanced diet, nutrients, digestion. Breathing*

		Facts: *The digestive system contains the mouth, oesphagus, stomach, pancreas, liver, gall bladder, small intestine, large intestine, rectum and anus Enzymes are proteins that speed up the breakdown of large food molecules. The gas exchange system contains the trachea, bronchi, alveoli and lungs*
Ecosystems 2	***7***	***Key concept:*** *Aerobic respiration is a series of chemical reactions in cells, where oxygen reacts with glucose to release energy* ***Facts:*** *Heart rate can be measured in beats per minute (BPM)* ***Key concept:*** *Respiration without oxygen is anaerobic respiration, or fermentation. It releases less energy than aerobic respiration* ***Subconcept:*** *Fermentation, oxygen debt*
Genes 2	***10***	***Key concept:*** *There are differences in characteristics between individuals of the same species. This is caused by inheritance or the environment* ***Facts:*** *Characteristics may be visible e.g. eye colour, or not e.g. blood group* ***Key concept:*** *Selective breeding, or artificial selection, is used to produce livestock with favoured characteristics* ***Key concept:*** *Natural selection is a theory that explains how species evolve* ***Subconcept:*** *Evolution* ***Facts:*** *Organisms of the same species are able to breed and produce fertile offspring*

Qualities

During Year 8, pupils will have opportunities to develop the following BUILD qualities:

BUILD Quality	***How the KS3 Science curriculum contributes to developing this quality:***
Respect	*Diet, smoking, alcohol & exercise*
Kindness	*Diet, smoking, alcohol & exercise*
Tolerance	*Diet, smoking, alcohol & exercise*
Resilience	
Creativity	*Models of DNA, ecosystem in a box*
Positivity	
Integrity	
Aspiration	
Empathy	*Preserving biodiversity*

Skills

During Year 8, pupils will have opportunities to develop the following wider skills:

Skill Area	***How the KS3 Science curriculum contributes to developing this skill area:***
Literacy & Numeracy	*Conservation of mass*
Communication	*Listening, discussions*
Problem Solving	*Mutations*
Leadership	*Group work*
Collaboration	*Climate change, recycling, extraction of resources*
Metacognition	*Interruption activities, interleaving of assessments*
Physical, Practical and Technical	*Conduct experiments to test predictions, Identify some hazards. make and record simple observations in a table, make predictions using scientific language and understanding*
Digital Literacy	*Use of OneNote and Teams, dataloggers*

Enrichment
During Year 8, the following events, visits, and trips will enrich the Science curriculum:

Event, Visit or Trip	***Linked unit(s) of study***	***How the event, visit or trip enriches the curriculum:***
Biology week	*Theme dependent*	*Developing skills related to working scientifically to themed lessons outside of the curriculum content. Looking at the wider world and how science plays a role.*
Chemistry week	*Theme dependent*	*Developing skills related to working scientifically to themed lessons outside of the curriculum content. Looking at the wider world and how science plays a role.*
Science week	*Theme dependent*	*Developing skills related to working scientifically to themed lessons outside of the curriculum content. Looking at the wider world and how science plays a role.*
Women in engineering week	*Theme dependent*	*Developing skills related to working scientifically to themed lessons outside of the curriculum content. Looking at the wider world and how science plays a role. Making links with careers in engineering/ STEM.*
CREST awards	*Dependent on student project choice*	*Development of research and scientific investigation skills to present a project. Students link topics from the classroom to real world problems, examining ways to solve current issues in a scientific way.*
Eco group	***Various***	
STEM club	***Industrial strategy challenges***	

KS3 Science

Year 9 Science

Knowledge, Qualifications and Assessment
What pupils will study during Year 9, our ambition for the knowledge they retain and subject specific skill they will develop and how learning will be assessed formatively and summatively.

Learning Challenge *What will pupils produce at the end of a unit to demonstrate their learning?*	***Students are assessed formatively throughout each topic to ensure understanding. They are encouraged to write, discuss and practice using their prior and developing knowledge in both theory and practical lessons. Y7 knowledge builds upon KS2 science, Y8 builds upon Y7 science etc.*** ***The challenges take the form of Checkpoint activities which inform the students of What Went Well (WWW), along with an Even Better If/Direct Response Task (EBI/DRT).***
Learning Consolidation *What prior learning will pupils consolidate using spaced retrieval and spaced practice?*	***During each topic students are encouraged to write, discuss and practice using their prior and developing knowledge in both theory and practical lessons. Y7 knowledge builds upon KS2 science, Y8 builds upon Y7 science etc.*** ***Staff use various methods to tie in and retrieve knowledge from across the science spectrum of topics throughout the journey, however up to 10 minutes of retrieval is expected at the beginning of every lesson. See the teaching rota document for more specific information (hyperlink here)***
	Topics may be taught on a rota basis to maximise practical opportunities. See the teaching rota for more specific information (hyperlink here)

Unit Title	***Periods***	***Learning Journey*** *What knowledge and subject specific skills will pupils learn in order to complete the Learning Challenge?*
Reproduction	***19***	***Key concept:*** *Facts about puberty, the changing adolescent body and menstrual wellbeing. The main changes which take place in males and females, and the implications for emotional and physical health.* ***Subconcept:*** *the facts about the full range of contraceptive choices, efficacy and options available. How the different sexually transmitted infections (STIs), including HIV and AIDs, are transmitted, how risk can be reduced through safer sex (including through condom use) and the importance of and facts about testing.* ***Facts:*** *Details on the menstrual cycle, information on prophylactics and structure and function of the female and make reproductive organs.* ***Key concepts:*** *development of the foetus and stages of pregnancy.* ***Subconcepts:*** *the facts about reproductive health, including fertility and the potential impact of lifestyle on fertility for men and women and menopause. that there are choices in relation to pregnancy (with medically and legally accurate, impartial*

		information on all options, including keeping the baby, adoption, abortion and where to get further help). the facts around pregnancy including miscarriage ***Facts:*** *Development of the foetus and stages of pregnancy**.***
Space	***15***	***Key concept:*** ***Subconcept:*** ***Facts:***

Please note: Specific GCSE working scientifically (WS) skills (Chapter 3) and maths (MS) skills (Chapter 7) and can be found in more detail by clicking the links to the relevant AQA Specifications listed below:

Biology only | **Chemistry only** | **Physics only** | **Combined Science**

Learning Challenge *What will pupils produce at the end of a unit to demonstrate their learning*		***Students are assessed formatively throughout each topic to ensure understanding. Assessments may include exam questions, presentations, posters etc. Staff use various methods to tie in and retrieve knowledge from across the science spectrum of topics throughout the journey, however up to 10 minutes of retrieval is expected at the beginning of every lesson.***
Learning Consolidation *What prior learning will pupils consolidate using spaced retrieval and spaced practice?*		***During each topic students are encouraged to write, discuss and practice using their prior and developing knowledge in both theory and practical lessons.*** ***See the teaching rota document for more specific information (hyperlink here)*** ***The main assessment is completed at the end of the following topic. This allows familiarisation with revision techniques and opportunities to practice retrieval skills. Students will sit either a higher or foundation exam-style Kerboodle test and receive a score along with a directed task (DRT) to aid improvement.***
	Periods	
Physics 6.4 Atomic Structure 6.4.1 Atoms and isotopes	***4***	The structure of an atom MS 1b, WS 4.4 Mass number, atomic number and isotopes WS 4.1 The development of the model of the atom WS 1.1, 1.2, 1.6
Physics 6.4 Atomic Structure 6.4.2 Atoms and nuclear radiation	***4***	Radioactive decay and nuclear radiation WS 1.4, 1.5 Nuclear equations WS 1.2, 4.1, MS 1b, 1c, 3c Half-lives and the random nature of radioactive decay WS 1.2, MS1c, 3d, 4a
Physics 6.4 Atomic Structure 6.4.3 Hazards and uses of	***4***	Radioactive contamination WS 1.5, 1.6 Background radiation WS 4.4

Radioactive emissions and of background radiation		Different half-lives of radioactive Isotopes MS 1b Uses of nuclear radiation WS 1.4, 1.5
Physics 6.4 Atomic Structure 6.4.4 Nuclear fission and fusion	***2***	Nuclear fission Nuclear fusion
Chemistry 5.1 Atoms & Periodic table 5.1.1 A simple model of the atom, symbols, relative atomic mass, electronic charge and isotopes	***7***	Atoms, elements & compounds Mixtures WS 2.2, 2.3 Development of the model of the atom (common with physics) WS 1.1, 1.2, 1.6 Relative electrical charges of the subatomic particles WS 1.2 Size & mass of atoms WS 4.3, 4.4 MS 1b 1d Relative atomic mass Electronic structure WS 1.2, MS 5b
Chemistry 5.1 Atoms & Periodic table 5.1.2 The Periodic Table	***6***	The periodic table WS 1.2 Development of the periodic table WS 1.1, 1.6 Metals & non metals Group 0, 1 & 7 WS 1.2
Chemistry 5.1 Atoms & Periodic table 5.1.3 Transition Metals	***2***	Transition metals: comparison with group 1 & typical properties
Physics 6.3 Particle model of matter 6.3.1 Changes of state and the particle model	***5***	Density of materials MS 1a, 1b, 1c, 3b, 3c, WS 1.2 Changes of state
Physics 6.3 Particle model of matter 6.3.2 Internal energy and energy transfers	***4***	Internal energy Temperature changes in a system and specific heat capacity MS 1a, 3b, 3c, 3d Changes of heat and specific latent heat MS 1a, 3b, 3c, 3d, 4a WS 3.5
Physics 6.3 Particle model of matter 6.3.3 Particle model and pressure	***3***	Particle motion in gases WS 1.2 Pressure in gases WS 1.2, MS 3b, 3c Increasing the pressure of a gas (HT only) WS 1.2
Chemistry 5.2 Bonding, structure & properties	***6***	Chemical bonds

5.2.1 Chemical bonds; ionic, covalent & metallic		Ionic bonding & compounds WS 1.2, MS 1a, 1c, 4a, 5b Covalent bonds WS 1.2 MS 5b Metallic bonds WS 1.2 MS 5b
Chemistry 5.2 Bonding, structure & properties 5.2.2 How bonding & structure relate to properties	***8***	Three states of matter MS 5b WS 1.2 State symbols Properties of ionic compounds Properties of small molecules WS 1.2 Polymers Giant covalent structures MS 5b WS 1.2 Properties of metals and alloys WS 1.2 Metals as conductors
Chemistry 5.2 Bonding, structure & properties 5.2.3 Structure & bonding of carbon	***1***	Diamond MS 5b WS 1.2 Graphite WS 1.2 Graphene WS 1.2, 1.4 MS 5b Fullerenes
Chemistry 5.2 Bonding, structure & properties 5.2.4 Bulk & surface properties of matter	***2***	Sizes of particles and their properties WS 1.2, 1.4, 4.1, 4.2, 4.3, 4.4, 4.5 MS 1b, 1c, 1d, 2h, 5c Uses of nanoparticles WS 1.3, 1.4, 1.5
Physics 6.1 Energy 6.1.1 Energy changes in a system, and the ways energy is stored before and after such changes	***8***	Energy stores and systems WS 1.2, 4.3, 4.5, 4.6, MS 1a, 1c, 3b, 3c Changes in Energy WS 1.2, 4.3, 4.4, 4.6, MS 1a, 1c, 3b, 3c Energy changes in systems MS3b, 3c Power MS 3b, 3c
Physics 6.1 Energy 6.1.2 Conservation and dissipation of energy	***5***	Energy transfers in a system WS 1.4 Efficiency MS 1a, 1c, 3b, 3c WS 1.4
Physics 6.1 Energy 6.1.3 National and global energy resources	***3***	National & global energy resources WS 1.3, 1.4, 3.5, 4.4, MS 1c, 2c, 4a
Chemistry 5.3 Quantitative 5.3.1 Chemical measurements, conservation of mass and	***3***	Conservation of mass and balanced chemical equations WS 1.2 Relative formula mass Mass changes with gases

the quantitative interpretation of chemical equations		Chemical measurements WS 3.4
Chemistry 5.3 Quantitative 5.3.2 Use of amount of substance in relation to masses of pure substances	***5***	Moles (HT only) WS 4.1, 4.2, 4.3, 4.5, 4.6 MS 1a, 1b, 1c, 2a, 3a, 3b Amounts of substance in equations (HT only) Using moles to balance equations (HT only) Limiting reactants (HT only) Concentrations of solutions (HT only)
Chemistry 5.3 Quantitative 5.3.3 Yield & atom economy	***2***	Percentage yield MS 1a, 1c, 2a, 3b WS 4.2, 4.6 Atom economy MS 1a, 1c, 3b, WS 4.2, 4.6
Chemistry 5.3 Quantitative 5.3.4 Using concentrations	***2***	Concentrations in moldm^{-3} WS 4.2, 4.3, 4.6, MS 1a, 1c, 3b, 3c
Chemistry 5.3 Quantitative 5.3.5 Amount of substance & gases	***2***	Amount of substance & volumes of gases WS 1.2, 4.1, 4.2, 4.3, 4.6 MS 1a, 1c, 3b, 3c
Biology 4.1 Cell Biology 4.1.1 Cell Structure	***10***	Eukaryotes and prokaryotes MS 1b, 2a, 2h, WS 4.4 Animal cells and plant cells WS 1.2 MS 1d, 3a Cell specialisation Cell differentiation Microscopy WS 1.1, 4.4, MS 1a, 1b, 2h, 3b Culturing microorganisms MS 1a, 1b, 1d, 2a, 2h, 5c WS 2.2, 2.4
Biology 4.1 Cell Biology 4.1.2 Cell division	***4***	Chromosomes WS 1.2 Mitosis and the cell cycle Stem cells WS 1.3
Biology 4.1 Cell Biology 4.1.3 Transport in cells	***4***	Diffusion WS 1.2, 1.5 MS 1c, 5c Osmosis WS 1.2, MS 1a, 1c, 4a, 4b, 4c, 4d Active transport

KS3 Science

Qualities
During Year 9, pupils will have opportunities to develop the following BUILD qualities:

BUILD Quality	***How the Year 10 Science curriculum contributes to developing this quality:***
Respect	***Menstrual cycle, alcohol & smoking during pregnancy, designer babies, IVF, contraception***
Kindness	***Menstrual cycle, alcohol & smoking during pregnancy, designer babies, IVF***
Tolerance	***Menstrual cycle, alcohol & smoking during pregnancy, designer babies, IVF, solar system – changing ideas***
Resilience	***Menstrual cycle,***
Creativity	***Journey of a sperm, solar systems modelling, building rockets, telescopes***
Positivity	***Contraception, IVF***
Integrity	***IVF & designer babies - debates***
Aspiration	***Space & exploration - careers***
Empathy	***Menstrual cycle, alcohol & smoking during pregnancy, designer babies, IVF, STIs, contraception***

Skills
During Year 9, pupils will have opportunities to develop the following wider skills:

Skill Area	***How the Year 9 Science curriculum contributes to developing this skill area:***
Literacy & Numeracy	*Budgeting, graph, monthly cycles (for GCSE see the MS links)*
Communication	*Debates – designer baby*
Problem Solving	*Vaccination programmes*
Leadership	
Collaboration	*Modelling activities*
Metacognition	
Physical, Practical and Technical	*Contraception*
Digital Literacy	*Use of OneNote, Teams and dataloggers*

Enrichment
During Year 9, the following events, visits, and trips will enrich the Science curriculum:

Event, Visit or Trip	***Linked unit(s) of study***	***How the event, visit or trip enriches the curriculum:***

KS3 Science

Space Centre trip	***Space***	
Eco group	***Various***	
STEM club	***Industrial strategy challenges***	