King James's School – Science Revision Plan – Mock Exams

October - November

How do I use this plan?

- **This is the minimum amount of work you should be doing.** If you are wanting to do Science or Health and Social Care at A Level, or want a top grade, you should be doing a lot more

- **Each session should be approximately 35 minutes long**. Some sessions may be longer or shorter depending on the contents. If you struggle with a topic, you may wish to spend longer on it. If you find a topic easy you may wish to spend less time on it. If a session does not go that well, try it again, another way on a different day or speak to your teacher for help!

- **Do not skip any sessions!** This will lead to a backlog of work which will make revision more stressful. If you cannot do a session on a day, rearrange it with a break day.

- **Customise this plan to suit you.** This is a generic plan which may not be the best for all people. There are lots of other useful strategies you can try.

- **Break Days?** It is very important that you take break days. It helps your brain relax and allows you to do other things. (Mr McDonagh recommends having Friday evenings as your break day for all your subjects then you can have a full evening of relaxation)

- **What should I do each day?** This plan gives you a week-by-week guide as the the topics you should be studying. There is more detailed breakdown of the content in your Learning Journeys. If you don't have one, ask you science teacher!

What strategies should I use?

- The most useful way of revising Science for most people is a combination of note making and answering past paper questions.
- These notes should be on a range of topics. This could be lesson content, key words, formulae practise, required practicals or anything else.
- The past paper questions are crucial! They allow you to practise giving answers in the same style as you would in an exam. And, when you mark them, you can see what the examiners are looking for!

What Content is on my Mock?

You will be sitting a full Paper 1 exam in each of the sciences. The content below is what you need to revise.

	Biology	Chemistry	Physics
All Students	• **Cell Biology** • **Organisation** • **Infection and Response** • **Bioenergetics**	• **Atomic Structure and the Periodic Table** • **Bonding, Structure and Properties of Matter** • **Quantitative Chemistry** • **Chemical Changes** • **Energy Changes**	• **Energy** • **Electricity** • **Particle Model of Matter** • **Atomic Structure and Radiation**

	Biology	Chemistry	Physics
30th September	Cell Biology	Atomic Structure	Energy and Matter (Y9)
7th October	Organisation (Digestion)	Ionic and Metallic Bonding	Electricity (Circuits)
14th October	Bioenergetics (Respiration)	The Periodic Table	Energy and Matter (Y10)
21st October	Organisation (Heart and Lungs)	Covalent Bonding	Atomic Structure and Radiation
28th October	Bioenergetics (Photosynthesis)	Quantitative Chemistry	Electricity (Mains)
4th November	Organisation (Plants)	Chemical Changes	Maths Skills and Formula Practise
11th November	Infection and Response	Energy Changes	*Your Choice from above topics*
18th November (mock week 1)	**Past Papers**	**Past Papers**	**Past Papers**
25th November (mock week 2)	**Past Papers**	**Past Papers**	**Past Papers**

In Depth Content – Cell Biology

	I can…
L1	list the main parts of animal cells describe the similarities and differences between plant and animal cells
L2	describe how cells differentiate to form specialised cells describe and explain how the structure of different types of animal cells relates to their function describe and explain how the structure of different types of plant cells relates to their function
L3	describe how microscopy techniques have developed over time state the differences in magnification and resolution between a light microscope and an electron microscope
L4	Set up a light microscope and use it to draw cells (required practical)
L5	Use a light microscope, stage micrometer and eyepiece graticule to measure cells (required practical)
L6	describe the size and scale of cells using order of magnitude calculations calculate the magnification, real size and image size of a specimen express the answers to these calculations in standard form
L7	describe the similarities and differences between eukaryotic cells and prokaryotic cells state how bacteria compare with animal and plant cells
L8	describe the role of the chromosomes in cells
L9	explain the importance of the cell cycle describe how cells divide by mitosis
L10	compare stem cells to other body cells describe the functions of stem cells in embryos, in adult animals and in plants describe how treatment with stem cells may be used to treat people with different medical conditions describe the process of therapeutic cloning discuss some of the potential benefits, risks and social and ethical issues of the use of stem cells in medical research and treatments
L11	describe how diffusion takes place and why it is important in living things state what affects the rate of diffusion
L12	describe how the surface area to volume ratio varies depending on size explain why large multicellular organisms need special systems for exchanging materials with the environment
L13	explain why osmosis is important in animal cells explain why osmosis is important in plant cells
L14	describe an investigation into the effect of osmosis on plant tissues
L15	Present and interpret data from osmosis experiments compare and contrast osmosis and diffusion
(L16)	describe how active transport works to transport substances against a concentration gradient describe the need for active transport of mineral ions into root hair cells, and for the transport of glucose in the small intestine. (may be taught in organisation as part of plant transport)

In Depth Content – Infection and Response

	I can…
L01	define what pathogens are.
L02	describe how pathogens cause disease.
	list the way that pathogens are spread.
L03	list examples of plant and animal diseases caused by viruses.
	list examples of plant and animal diseases caused by bacteria.
	list examples of animal diseases caused by fungi.
	list examples of animal diseases caused by protists.
L04	describe how the spread of diseases can be reduced or prevented.
	describe how my body stops pathogens getting in.
L05	explain how my white blood cells protect me from disease.
	describe how my immune system works.
L06	explain how vaccination protects me against disease.
L07	explain what medicines are and how some of them work.
L08	describe the ways in which antibiotics can and cannot be used.
L09	describe how painkillers and other medicines treat disease symptoms but do not kill pathogens.
L10 & 11	name some drugs traditionally extracted from plants.
	describe how penicillin was discovered.
	discuss how scientists look for new drugs.
	name the stages involved in testing and trialling new drugs.
	explain why testing new drugs is important.
L12	Describe how monoclonal antibodies are produced (HT)
L13	Describe ways in which monoclonal antibodies are used
L14	Describe how plant diseases can be detected (stunted growth, spots on leaves, areas of decay, growths, malformed stems and leaves, discolouration, presence of pests) (HT)
	Describe how plant diseases are identified (reference book or website, laboratory identification of pathogen, testing kits using monoclonal antibodies) (HT)
	Describe symptoms of plant diseases such as tobacco mosaic virus and black spot)HT)
	Recall that plants can be damaged by ion deficiencies for example nitrate deficiency leads to stunted growth and magnesium ions are needed to make chlorophyll (HT)

In Depth Content – Organisation

	I can…
LO1	describe how specialised cells become organised into tissues
	describe how several different tissues work together to form an organ
LO2	describe how to test for different food nutrients. carry out food tests
LO3	identify the main organs of the human digestive system. describe how the food I eat is digested in my body. describe how hydrochloric acid and bile make digestion more efficient
	describe the basic structures of carbohydrates, proteins and lipids
	describe what the metabolism of the body involves
LO4	define what a catalyst is. describe enzymes as biological catalysts. describe how temperature and pH affect enzyme action
	describe how substances are transported to and from cells
LO8	identify parts of the human gas exchange system describe how gases are exchanged in the alveoli of the lungs
LO9	describe the structure and functions of the heart. explain the importance of a double circulatory system. describe how the heart keeps its natural rhythm. explain how artificial pacemakers work

L10	list the different components in the blood and give their function. list the different types of blood vessel. describe why valves are important
L11	describe ways of solving problems with the blood supply to the heart and problems with valves describe what artificial hearts can do
L12	define non-communicable disease. define casual mechanism. describe the effect of diet and exercise on the development of obesity and cardiovascular disease. recall that obesity is a risk factor for type 2 diabetes. recall that alcohol affects liver and brain function and may harm unborn babies. explain how smoking affects the risk of developing cardiovascular disease, lung disease and lung cancer and its effect on unborn babies
L13	list some carcinogens. describe what a tumour is. describe how cancer spreads
L14	describe the roles of organs in the plant organ system for the transport of substances around the plant
	list the substances that are transported in plants
	describe how transport in the xylem tissue differs from transport in the phloem tissue
L15	describe what transpiration is
	describe the role of stomata and guard cells in controlling gas exchange and water loss
L16	list the factors that affect transpiration. suggest ways of investigating the effect of environmental factors on rates of water uptake in the plant. describe what translocation is.

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In Depth Content – Bioenergetics

Lesson	Topic: BIOENERGETICS (Respiration & Photosynthesis)
PHOTOSYNTHESIS	
1	write the word equation for photosynthesis as: light carbon dioxide + water → glucose + oxygen
	recognise the chemical symbols: CO_2, H_2O, O_2 and $C_6H_{12}O_6$.
	describe photosynthesis as a reaction where energy is taken in (an endothermic reaction) - light energy is transferred from the environment to the chloroplasts.
2 - 4	measure and calculate rates of photosynthesis (required practical investigates the effect of light intensity on rate of PS)
	(HT only) use inverse proportion – the inverse square law and light intensity in the context of photosynthesis. (e.g. Light intensity = $1/\text{distance}^2$)
5 - 6	interpret graphs of photosynthesis rate involving one limiting factor
	(HT only) explain graphs of photosynthesis rate involving two or three factors and decide which is the limiting factor.
	explain the effects of temperature, light intensity, carbon dioxide concentration, and the amount of chlorophyll on the rate of photosynthesis.
	(HT only) describe how these factors interact and that any one of them may be the factor that limits photosynthesis (the one in shortest supply will be the limiting factor)
	(HT only) explain how limiting factors can be manipulated in to gain the maximum rate of photosynthesis while still maintaining profit – economics
7	give examples of how the glucose produced in photosynthesis may be: • used for respiration • converted into insoluble starch for storage • used to produce fat or oil for storage • used to produce cellulose, which strengthens the cell wall • used to produce amino acids for protein synthesis
	state that, to produce proteins, plants also use nitrate ions that are absorbed from the soil.

RESPIRATION	
8	describe cellular respiration as an <u>exothermic</u> reaction which is continuously occurring in living cells (heat energy is released during respiration)
	state that energy transferred from glucose in respiration supplies all the energy needed for living processes (MRSGREN)
	state that respiration in cells can take place using oxygen (aerobically) or without oxygen (anaerobically.
	write the word equation for aerobic respiration as: glucose + oxygen → carbon dioxide + water
	Describe how the human body reacts to the increased demand for energy during energy.
	Explain that our heart rate, breathing rate and breath volume increase during exercise to supply the muscles with more oxygenated blood.
	If insufficient oxygen is supplied anaerobic respiration takes place in muscles. The incomplete oxidation of glucose causes a build up of lactic acid and creates an oxygen debt.
	During long periods of vigorous activity muscles become fatigued and stop contracting efficiently.
10	write the word equation for anaerobic respiration in muscles: glucose → lactic acid
	compare the processes of aerobic and anaerobic respiration in: • their need for oxygen, • the products of respiration • the relative amounts of energy transferred
	know that anaerobic respiration in yeast cells is called fermentation and has economic importance in the manufacture of bread and alcoholic drinks.
	write the word equation for Anaerobic respiration in plant and yeast cells as: glucose → ethanol + carbon dioxide
11	state that metabolism is the sum of all the reactions in a cell or the body.
	know that metabolism includes: • conversion of glucose to starch, glycogen and cellulose • the formation of lipid molecules from glycerol and fatty acids • the use of glucose and nitrate ions to form amino acids which in turn are used to synthesise proteins • respiration • breakdown of excess proteins to form urea for excretion.

In Depth Content – Atomic Structure and Periodic Table

I can…	
AP.01	write down the definition of an element
	use the periodic table to write down the chemical symbols of the elements
AP.02	describe how the periodic table was developed over time
AP.03	write down the definition for a mixture
	write down the definition for a pure substance
	sort substances into elements and compounds
AP.04	name compounds containing two elements
	name compounds containing oxygen and two other elements
AP.05	write an arrow to show a reaction is taking place
	write a word equation
	describe the reactants and products in chemical reactions
AP.06	write a symbol equation
	balance a symbol equation
AP.07	explain how and why the atomic model has changed over time
	give examples to show how scientific theories are revised or replaced by new ones when the new evidence
	write down the estimates of the size and scale of atoms, using SI units and the prefix ‘nano’

AP.08	**describe the position in the atom, the relative charge and the relative mass of protons, neutrons and electrons**	
	explain what the atomic number and mass number of an atom represent	
	explain why atoms have no overall charge	
	write down that atoms of a particular element have the same number of protons	
	calculate the numbers of protons, neutrons and electrons in an ion	
	write down the definition of an isotope	
	describe the structure of an atom	
AP.09	describe how the electrons are arranged in an atom	
	write down and draw the electronic structures of the first 20 elements in the periodic table	
	explain how metals and non-metals differ, including their electronic structures and their positions in the periodic table	
	explain how atomic structure is linked to the periodic table	
AP.10	explain why the noble gases are unreactive	
	describe and explain how the properties of group 1 elements change going down the group	
AP.11	describe how group 7 elements behave	
AP.12	describe and explain how the properties of group 7 elements change going down the group	
	use ideas about electron structure to explain trends in reactivity in groups 1 and 7	

In Depth Content – Bonding, Structure and Properties

	I can…
CB.01	distinguish between molecules and compounds
	state why elements form compounds
	describe what a covalent bond is
CB.02	represent covalent bonds in 3 ways: ball & stick, dot-cross, 2d structure
	describe the limitations of using models such as dot and cross, to represent molecules or giant structures.
	define simple molecular structures and give examples e.g. NH_3, H_2O
CB.03	explain why substances made of simple molecules have low melting points and boiling points.
CB.04	recognise polymers from diagrams and the monomer that makes it.
CB.05	Triple only Understand that the properties of polymers depend on their monomers and the conditions they are made under.
	Explain how HDPE and LDPE are made from ethene.
	Explain the difference between thermosetting and thermosoftening polymers in terms of structure.
CB.06	explain the structure, bonding and properties of giant covalent structure; diamond, graphite and silicon dioxide.
CB.07	explain the structure, bonding and properties of carbon allotropes including graphene, fullerenes and carbon nanotubes.
CB.08	Triple Only understand the sizes, properties and uses of nanoparticles, including the relevance of the large surface area:volume ratio
CB.09	recall examples of composites, including borosilicate glass and clay ceramics.

I can…	
IM.01	recall the four states of matter
	use appropriate state symbols
	predict the states of substances at different temperatures, given appropriate data
IM.02	describe the three types of bonding
	define what an ion is and link its charge to its position in the Periodic Table
IM.03	explain how metals bond with non-metals
	explain how atoms form positive and negative ions
IM.04	explain ionic bonding in terms of electrostatic forces and giant lattice structure
	describe the limitations of using models such as dot & cross/2D structure/ball & stick, to represent molecules or giant structures
IM.05	state the properties of ionic compounds.
	explain why ionic compounds conduct electricity when molten or dissolved in water
	explain how the melting and boiling points of a substance depend on the nature of its particles and the forces between particles
IM.06	describe how the atoms, in metals are bonded to each other
	explain how metals conduct electricity and heat
	explain why metals can be bent into shape without breaking
	explain why alloys are harder than pure metals
IM.07	describe the properties of transition metals
IM.08	describe the different methods of preventing corrosion
	explain sacrificial protection in terms of relative reactivity
IM.09	recall the composition and use of the alloys: bronze, brass, gold, steel, aluminium

In Depth Content – Chemical Changes

	I can…
EL.01	explain why some metals are extracted with carbon and others by electrolysis.
	describe what happens in electrolysis
	label the set-up for electrolysis.
	explain why an ion is attracted to each electrode
EL.02	list the types of substances that can be electrolysed
	state why substances need to be molten or dissolved during electrolysis
	predict the products of electrolysis of a molten compound
EL.03	describe and explain the process of extracting aluminium from its ore.
EL.04	define oxidation and reduction in terms of electrons
	represent the reactions at each electrode by using half equations (HT)
	identify the reactions in half equations as reduction or oxidation (HT)
EL.05	state how water affects the products of electrolysis
	predict the products of electrolysis of an aqueous solution
	state the rules for what is produced at the anode (+ve) and cathode (-ve).
	write half equations for the reactions that occur at each electrode during the electrolysis of an aqueous solution (HT)
EL.06	Required practical: describe how to investigate the electrolysis of a solution using inert electrodes.

	I can…
AS.01	describe how some common metals react with water
	describe how some common metals react with dilute hydrochloric acid
	use experimental results to deduce an order of reactivity of metals
AS.02	explain reduction and oxidation in terms of loss or gain of electrons
	predict reactions of unfamiliar metals given information about their relative reactivity
	use the reactivity series to predict displacement reactions
	explain how the reactivity of a metal is related to the tendency of the metal to form its positive ion
	write ionic equations for displacement reactions (HT)
AS.03	evaluate and interpret information to describe how to extract different metals
AS.04	describe the process of metal extraction how to extract metals such as copper from low-grade ores bioleaching (using bacteria) and phytomining (using plants)
AS.05	identify which species are oxidised and which are reduced in terms of electron transfer (HT)
	explain why reactions of metals with acids are classed as redox reactions (HT)
	work out which species are oxidised and which are reduced in given chemical reactions, in terms of electron transfer (HT)
AS.06	Understand the terms acid, base and salt
	explain H+ ions makes a solution acidic, and OH- ions make a solution alkaline
	describe the reactions of acids with alkalis, metal oxides and carbonates and predict the products formed
	use the formulae of common ions to deduce the formulae of salts
As.07	describe how to use universal indicator or another wide-range indicator to measure the approximate pH of a solution
	describe how to investigate pH changes when a strong acid neutralises a strong alkali
	describe the reaction between an acid and a base
AS.09 (HT)	use and explain the terms dilute and concentrated in relation to acids (HT)
	use and explain the terms weak and strong in relation to acids (HT)
	state how the concentration of hydrogen ions in a solution affects the numerical value of pH (HT)
AS.10	describe the reactions of magnesium, zinc and iron with hydrochloric and sulfuric acids and how to collect the salts formed
	Required practical: describe how to prepare pure., dry crystals of the salts formed in neutralisation reactions between acids and insoluble bases
AS.11	Revision: describe how to make pure, dry samples of a named soluble salt

In Depth Content – Energy Changes

	I can…	
EC.01	describe energy transfers to and from the surroundings in exothermic and endothermic reactions	
	identify exothermic and endothermic reaction from given information/data	
	draw energy profile for exothermic and endothermic reactions	
	define activation energy	
EC.02	RP 1 – Zinc and copper sulphate describe how to carry out an investigation into energy changes in chemical reactions	
	record data and plot a graph to show the energy change in a reaction	
EC.03	RP 2 – Neutralisation describe how to carry out an investigation into energy changes in chemical reactions	
	plot a graph and analyse result by extrapolation	
EC.04 (HT)	recall that bond breaking absorbs energy and bond forming releases energy	
	calculate energy change using equation: Energy change = energy absorbed to break the bonds of all reactants – energy released when bonds of all products are formed	
	explain if the reaction is exothermic or endothermic using bond energy	
EC.05	identify components of a simple chemical cells	
	explain how redox reaction leads to generation of a current in a simple chemical cell	
EC.06	practical: Chemical cells	
	interpret data for reactivity of metals using voltages of cells	
EC.07	describe and explain how a hydrogen fuel cell work	
	write half equations for the electrode reactions in the hydrogen fuel cell	
	evaluate the use of hydrogen fuel cells compared to rechargeable cells and batteries	

In Depth Content – Quantitative Chemistry

	I can…
From MQ: Separating Techniques and Quantitative Chemistry	write down the meaning of the term relative atomic mass
	calculate the relative atomic mass of an element
	calculate the relative formula mass of a compound
	apply the law of conservation of mass to calculate mass of reactants/ products in a reaction
	explain the change of mass of a reaction
	calculate the percentage by mass of an element in a substance
QC.01 (HT)	recall that the number of atoms, molecules or ions in a mole of a given substance is the Avogadro constant, which is 6.02×10^{23} per mole.
	calculate the number of moles given the mass of substance (HT)
	calculate the mass of substance given the number of moles (HT)
QC.02 (HT)	convert mass to mole to balance equations (HT)
QC.03 (HT)	use balanced symbol equations to calculate masses of reactants and products (HT)
QC.04 (HT)	identify the limiting agent in a reaction (HT
	explain why limiting quantity of reactant affects the amount of product it is possible to obtain (HT)
QC.05	calculate yield using
	calculate atom economy using
QC.06	explain how the mass of a solute and the volume of a solution is related to the concentration of the solution
	calculate the concentration of a solution in g/dm^3
QC.07 (HT)	calculate the concentration of a solution in mol/dm^3 (HT)
	calculate the number of mole of substances in a certain volume of known concentration (HT)
	calculate the mass of solute in a certain volume of known concentration (HT)
QC.08	titration required practical (carried out in AS.08) recap the method for a titration
QC.09	determine the volumes of acid and alkali solutions that react with each other by titration using a suitable indicator. Calculate the concentration of the acid/ alkali using data from titration
QC.10	know that the volume of one mole of any gas at room temperature and pressure (20 °C and 1 atmosphere pressure) is 24 dm^3.
	calculate the volume or the no. of mole of gas

In Depth Content – Electricity (Circuits)

Covered in year 9 Introduction to Electricity 9EL	
9EL.1	Identify circuit symbols for: Cell, Battery, Diode, Resistor, Variable Resistor, LED, Lamp, Fuse, Voltmeter, Ammeter, Thermistor, LDR.
	Construct a circuit using the above components using a circuit diagram.
9EL.2	Identify that Current is the rate of flow of charged particles
	Identify that Current has symbol I and is measured in Amps (A)
	Identify that Charge has symbol Q and is measured in Coulombs (C)
	Identify that time has the symbol t and is measured in seconds (s)
	Calculate Current, Charge and Time using the equation Q=It
9EL.3	Describe what happens to Current as Resistance increases
	Describe what happens to Current as Potential Difference increases
	Recall that Potential Difference (PD) is the scientific term for Voltage
	Identify that Resistance has symbol R and is measured in Ohms (Ω)
	Identify that Potential Difference has symbol V and is measured in Volt (V)
	Calculate PD, Current and Resistance using the equation V=IR
9EL.4	Plan and carry out an investigation to see how the resistance of a wire depends on its length. Required practical.
	Identify the risks of the above investigation and take steps to reduce them

Covered in year 10 Circuit Electricity CEL	
CEL.1	Recall how to measure the current in a circuit including drawing the placement of the ammeter.
	Describe how current behaves in series and in parallel circuits.
	Explain in terms of charges how current behaves in series and parallel.
CEL.2	Identify that potential difference has symbol V and is measured in volts (V).
	State that potential difference is a measure of the energy transferred per unit charge.
	Identify that potential difference is the amount of energy transferred for each coulomb of charge as it passes through a component.
	Calculate PD, Energy and Charge using the equation V=E÷Q
CEL.3	Recall how to measure the pd in a circuit including drawing the placement of the voltmeter.
	Describe how pd behaves in series and in parallel circuits.
	Explain in terms of charges how pd behaves in series and parallel.
CEL.4	Investigate how combining resistors in series and parallel affects the overall resistance of a circuit. Required practical.
	Describe how adding resistors in series increases the total resistance (the resistances add up).
	Describe how adding resistors in parallel reduces the total resistance.
CEL.5	Investigate the I-V (current – pd) characteristics for a fixed resistor. Required practical.
	Draw an I-V graph for a fixed resistor.
	Describe the relationship between I and V as directly proportional.
	Recognise that a fixed resistor (at constant temperature) is an ohmic conductor because current is directly proportional to PD.
CEL.6	Investigate the I–V characteristics of a filament lamp. **Required practical.**
	Draw an I – V graph for a filament lamp.
	Explain why the resistance of a filament lamp varies.
	Recognise that a filament lamp is NOT an ohmic conductor because current is NOT directly proportional to PD.
CEL.7	Investigate the I–V characteristics of a diode. **Required practical.**
	Draw an I – V graph for a diode.
	Describe how the resistance of a diode varies.
	Recognise that a diode is NOT an ohmic conductor because current is NOT directly proportional to PD.
CEL.8	Investigate the relationship between the resistance of a light dependent resistor (LDR) and light intensity.
	Recall that the resistance of a LDR decreases as the light intensity increases.
	Explain the application of LDRs in circuits as sensors.
CEL.9	Investigate the relationship between the resistance of a thermistor and temperature.
	Recall that as the temperature of the thermistor increases the resistance decreases.
	Explain the application of thermistors in circuits as sensors.

In Depth Content – Electricity (Mains and Static)

Mains and Static Electricity MEL	
MEL.1	Explain the difference between direct and alternating potential difference and current.
	Identify that mains electricity is an ac supply.
	Recall that in the United Kingdom the domestic electricity supply has a frequency of 50 Hz and is about 230 V.
MEL.2	Describe the structure of a 3 core cable.
	Identify that the insulation covering each wire is colour coded: live wire – brown; neutral wire – blue; earth wire – green and yellow stripes.
	Recall that the live wire carries the alternating potential difference from the Supply and the potential difference between the live wire and earth (0 V) is about 230 V.
	Recall that the neutral wire completes the circuit and the neutral wire is at, or close to, earth potential (0 V).
	Recall that the earth wire is a safety wire to stop the appliance becoming live and the earth wire is at 0 V, it only carries a current if there is a fault.
MEL.3	Explain that a live wire may be dangerous even when a switch in the mains circuit is open
	Explain the dangers of providing any connection between the live wire and earth.
MEL.4	explain how the power transfer in any circuit device is related to the potential difference across it and the current through it, and to the energy changes over time.
	Identify that Power has symbol P and is measured in Watts (W)
	Calculate Power, Pd and Current using the equation P=IV
	Calculate Power, Current and resistance using the equation $P=I^2R$
MEL.5	**Identify that the amount of energy an appliance transfers depends on how long the appliance is switched on for and the power of the appliance.**
	Calculate Power, Energy Transferred and Time using the equation P=Et
	Describe how different domestic appliances transfer energy from batteries or ac mains to the kinetic energy of electric motors or the energy of heating devices.
	Identify that Work is done when charge flows in a circuit.
	Calculate Energy Transferred, Pd and Charge using the equation E=QV
MEL.6	Identify that the National Grid is a system of cables and transformers linking power stations to consumers.
	Identify that step-up transformers are used to increase the potential difference from the power station to the transmission cables
	Identify that step-down transformers are used to decrease, to a much lower value, the potential difference for domestic use.
	Explain why the National Grid system is an efficient way to transfer energy.
	HT: select and use the equation: potential difference across primary coil x current in primary coil = potential difference across secondary coil x current in secondary coil.
MEL.7	Describe the production of static electricity, and sparking, by rubbing surfaces
	Describe evidence that charged objects exert forces of attraction or repulsion on one another when not in contact.
	Explain how the transfer of electrons between objects can explain the phenomena of static electricity.
MEL.8	Identify that a charged object creates an electric field around itself.
	Draw the electric field pattern for an isolated charged sphere.
	Recall that the force gets stronger as the distance between the objects decreases.
	Explain how the concept of an electric field helps to explain the non-contact force between charged objects as well as other electrostatic phenomena such as sparking.

In Depth Content – Energy and Particle Model of Matter (Introductions)

Covered in year 9 Introduction to Energy 9EN	
9EN.1	Identify the 8 Energy stores
	Describe what happens when the amount of energy in a store is increased
9EN.2	Identify the 4 ways energy is transferred between stores
	Describe all the energy transfers that occur in simple scenarios
9EN.3	Define Efficiency
	Calculate Efficiency of a transfer using either Energy or Power
	Describe how Insulation increases efficiency
	Describe how Lubrication increases efficiency
9EN.4	Describe the difference between a renewable and non-renewable resources.
	Identify the main renewable and non-renewable energy resources
	Compare how different energy resources are used
	Explain why some resources are more reliable than others
	Describe the environmental impact of different energy resources

Covered in year 9 Introduction to Particle Model of Matter 9MA	
9MA.1	Draw a diagram to show the particles in a Solid.
	Draw a diagram to show the particles in a Liquid.
	Draw a diagram to show the particles in a Gas.
	Explain why Solids, Liquids and Gases have certain properties because of their particle arrangements.
9MA.2	Identify the state changes when a substance Melts, Evaporates, Sublimes, Deposits, Condenses and Freezes.
	Describe what happens to the particles when a substance Melts, Evaporates, Sublimes, Deposits, Condenses and Freezes.
	Identify changes of state on a Heating and Cooling Curve.
9MA.3	Describe how gases exert pressure.
	Identify factors that affect gas pressure.
	Explain how temperature affects gas pressure.
9MA.4	Identify that Mass has symbol m and is measured in kilograms (kg).
	Identify that Volume has symbol V and is measured in metres cubed (m^3).
	Identify that Density has symbol ρ (rho) and is measured in kilograms per metre cubed (kg/m^3).
	Define density.
	Calculate Density, Volume and Mass using the equation $\rho = m \div V$.
9MA.5	Describe a method to calculate the density of a regularly shaped object.
	Describe a method to calculate the density of an irregularly shaped object.
	Describe a method to calculate the density of a fluid.
	Identify risks, hazards and control for the methods mentioned above.
9MA.6	Identify the features of a good method

In Depth Content – Energy and Particle Model of Matter (2)

Energy and Particle Model of Matter ENM	
ENM.1	Recall that energy stored by an object because of its position within a gravitational field is gravitational potential energy.
	Identify that gravitational potential energy has the symbol E_p and is measured in joules (J)
	Identify that gravitational field strength has the symbol g and is measured in in newtons per kilogram (N/kg)
	Calculate gravitational potential energy, mass, gravitational field strength and height using the equation $E_p = mgh$.
ENM.2	Recall that energy stored by a moving object is kinetic energy.
	Identify that kinetic energy has the symbol Ek and is measured in joules (J)
	Identify that speed has the symbol v and is measured in metres per second (m/s)
	Calculate kinetic energy, mass and speed using the equation $E_k = ½mv^2$
ENM.3	Recall that energy is stored inside a system by the particles (atoms and molecules) that make up the system. This is called internal energy.
	Describe how internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system.
	Explain how heating changes the energy stored within the system by increasing the energy of the particles that make up the system. This either raises the temperature of the system or produces a change of state.
ENM. 4&5	Describe how if the temperature of the system increases, the increase in temperature depends on the mass of the substance heated, the type of material and the energy input to the system.
	Recall that the specific heat capacity of a substance is the amount of energy required to raise the temperature of one kilogram of the substance by one degree Celsius.
	Identify that specific heat capacity has symbol c and is measured in joules per kilogram per degree Celsius (J/kg°C)
	Identify that change in thermal energy has the symbol ΔE and is measured in joules (J)
	Identify that change in temperature has symbol Δθ and is measured in degrees Celsius (°C)
	Calculate change in thermal energy, mass, specific heat capacity and change in temperature using the equation $\Delta E = mc\Delta\theta$
	Carry out an investigation to determine the specific heat capacity of one or more materials. Required practical.
ENM.6	Recall that the energy needed for a substance to change state is called latent heat.
	Recall that when a change of state occurs, the energy supplied changes the energy stored (internal energy) but not the temperature.
	Recall that the specific latent heat of a substance is the amount of energy required to change the state of one kilogram of the substance with no change in temperature.
	Recall specific latent heat of fusion – change of state from solid to liquid
	Recall specific latent heat of vaporisation – change of state from liquid to vapour
	Identify that specific latent heat has symbol L and is measured in joules per kilogram (J/kg)
	Calculate energy to change state, mass and latent heat using the equation E = mL

ENM.7	**Recall that energy is stored in a stretched spring as elastic potential energy.**
	Identify that elastic potential energy has the symbol E_e and is measured in joules (J)
	Identify that extension has the symbol e and is measured in metres (m)
	Identify that spring constant has symbol k and is measured in newtons per metre, N/m
	Calculate elastic potential energy, spring constant and extension using the equation $E_e=½ke^2$
ENM.8	Recall that power is defined as the rate at which energy is transferred or the rate at which work is done.
	Identify that power has symbol P and is measured in watts (W).
	Recall that an energy transfer of 1 joule per second is equal to a power of 1 watt.
	Identify that work done has symbol W and is measured in joules (J).
	Calculate power, energy transferred and time using the equation E=P÷t
	Calculate power, work done and time using the equation E=W÷t
ENM.9	Explain ways of reducing unwanted energy transfers, for example through lubrication and the use of thermal insulation.
	Describe how the higher the thermal conductivity of a material the higher the rate of energy transfer by conduction across the material.
	Describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls.
	Investigate the effectiveness of different materials as thermal insulators. Required practical.
ENM.10	Investigate the factors that may affect the thermal insulation properties of a material. Required practical.

In Depth Content – Atomic Structure and Radiation

Learning Journey – Atomic Structure - ATM	
ATM.1	Describe Rutherford's Gold Leaf Experiment
	Describe the Plum Pudding Model of the Atom
	Describe Rutherford's Nuclear Model of the Atom
	Describe Bohr's Model of the Atom
	Describe Chadwick's Model of the Atom
	Explain how evidence from Rutherford's experiment led him to develop his model
ATM.2	Describe the basic structure of an atom
	Describe the properties of Protons, Neutrons and Electrons
	Define Isotope
	Explain how ions are formed
ATM.3	Describe how atoms emit electromagnetic radiation
ATM.4 **ATM.5**	Recall that Activity, A, is measured in Becquerels (Bq) Define Half-Life Calculate Half-Life using a graph
ATM.6	Describe the properties of Alpha radiation
	Describe the properties of Beta radiation
	Describe the properties of gamma radiation
	Explain the uses of each type of radiation based on its properties
ATM.7	Represent alpha and beta particles using symbols
	Write balanced equations showing alpha decay and beta decay
ATM.8	Explain the difference between Irradiation and Contamination
	Explain the risks of Irradiation and Contamination
ATM.9 (triple only)	Describe the uses of nuclear radiation in medicine
	Evaluate the types of sources used in different types of medical procedure
	Evaluate the risks of using nuclear radiation in medicine
ATM.10 (triple only)	State the sources of background radiation
	Describe factors that affect the level of background dose
ATM.11 (triple only)	Describe the process of Nuclear Fission
	Describe how a Chain Reaction occurs
	Interpret diagrams representing Nuclear Fission and Chain reactions
	Describe the process of fusion and how it converts mass into energy