PERSONALISED LEARNING CHECKLISTS

GCSE Science Trilogy CHEMISTRY: PERSONALISED LEARNING CHECKLIST				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Atomic Structure and the Periodic Table				
Atoms, elements and compounds				
Mixtures				
The development of the model of the atom				
Relative electrical charges of subatomic particles				
Size and mass of atoms				
Relative atomic mass				
Electronic structure				
The periodic table and its development				
Metals and non-metals				
Group 0				
Group 1				
Group 7				
I am most confident with the following topic/topics:				
I have struggled most with the following topic/topics:				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Bonding, Structure and the Properties of Matter				
Ionic bonding				
Properties of ionic compounds				
Covalent bonding				
Properties of small molecules				
Polymers				
Properties of giant covalent structures				

Structure and bonding of carbon (Diamond, graphite, graphene and fullerenes)				
Metallic bonding				
Properties of metals and alloys				
Metals as conductors				
The three states of matter and state symbols				
HT – Limitations of particle theory				
I am most confident with the following topic/topics:				
I have struggled most with the following topic/topics:				

	Red	Amber	Green	Revised Tick ☑
Area of Study: Quantitative Chemistry				
The law of conservation of mass				
Mass changes when a reactant is a product or gas				
Balancing symbol equations				
Relative formula mass (M_r)				
Chemical measurements				
HT: Moles				
HT: Calculating masses from balanced equations				
HT: Using moles to balance equations				
HT: Limiting reactants				
Concentrations of solutions in g/dm^3 **HT: the link between mass of solute and volume of solution**				
I am most confident with the following topic/topics:				
I have struggled most with the following topic/topics:				

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	Red	Amber	Green	Revised Tick ☑
Area of Study: Chemical Changes				
Metal oxides				
The reactivity series				
Extracting metals using reduction				
HT: Oxidation and reduction equations				
Naming salts				
Reactions of acids and metals to form salts **HT: Redox reactions**				
Neutralisation of acids to form salts				
The pH scale and neutralisation				
Methods of forming soluble salts				
HT: Strong and weak acids				
Electrolysis of molten ionic compounds				
Using electrolysis to extract aluminium				
Electrolysis of ionic compound solutions (eg. Sodium chloride solution)				
HT: Use half equations to represent what happens to electrons at the electrodes				
I am most confident with the following topic/topics: ***I have struggled most with the following topic/topics:***				

	Red	Amber	Green	Revised Tick ☑
Area of Study: Energy				
Energy transfer during exothermic reactions to include combustion, oxidation and neutralisation reactions				
Everyday uses of such exothermic reactions				

Energy transfer during endothermic reactions to include thermal decompositions and reaction of a weak acid with sodium hydrogencarbonate				
Everyday uses of endothermic reactions				
Distinguish between exo and endo reactions using temperature measurements				
Reaction energy profiles to include showing how activation energy term is used for both exothermic and endothermic reactions				
The Energy changes of reactions using the energy required to break bonds compared to the energy formed to make bonds (HT)				
Actual calculations of the overall energy transfer from given bond energies values(HT)				
I am most confident with the following topic/topics: ***I have struggled most with the following topic/topics:***				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Rate and Extent of Chemical Change				
Calculating rates of reactions				
Activation energy and how reactions happen				
Factors affecting rates of reactions: • Temperature • Concentration/pressure • Surface area • Catalyst				
Collision theory for factors affecting rate: • Temperature • Concentration/pressure • Surface area • Catalyst				
Catalysts and reaction profiles				
Reversible reactions				
Energy changes and reversible reactions				

Equilibrium				
HT: The effect of changing concentration on equilibrium				
HT: The effect of changing temperature on equilibrium				
HT: The effect of changing pressure on equilibrium				
I am most confident with the following topic/topics: ***I have struggled most with the following topic/topics:***				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Organic Chemistry				
The alkanes mixture that crude oil is made up of				
How to these alkanes generally and specifically				
The fractional distillation method details used to separate these Alkanes from crude oil				
An awareness of some of the uses of the many products processed from these fractions and the vast array of products they contribute to making in our everyday lives.				
What the physical properties of Hydrocarbons are, how this can vary (trends) and why				
Details about the process of oxidation (complete combustion) of hydrocarbon fuels				
Able to write balanced symbol equations for the above from given starting formula of alkane				
Able to describe in general terms both catalytic and steam 'cracking' processes to obtain new alkanes and alkenes				
Alkenes double bonds reaction with Bromine water as test for level of unsaturation				
Give examples of the usefulness of cracking in addressing the supply and demand issues of such necessary products as polymers and fuels				
Structure, formula as ways of representing and identifying alkenes with names of the first 4.				
Correct use of terms such as homologous series, unsaturated/saturated, general formula				

Describe how alkenes can react with oxygen, hydrogen, water and group 7 Halogens to give rise to many varied products. (+ conditions)				
Be able to draw fully displayed structural formulae of first 4 Alkenes				
How to represent the first 4 alcohols in formula and structure. Recall uses of them				
Describe how alcohols react with sodium, in air, added to water and with an oxidising agent				
Conditions for the fermentation process to make alcohols from sugar solution				
How to represent the first 4 Carboxylic acids in formula and structure. Recall uses of them				
Describe what happens when Carboxylic acids react with carbonates, dissolve in water, react with alcohols				
Explain why carboxylic acids are referred to as weak acids (HT)				
Able to name first 4 Carboxylic acids				
Know and recognise the ester ethyl ethanoate				
Recognise and draw diagrams to represent the process called addition polymerisation to form polymers from any given alkene monomer				
I am most confident with the following topic/topics: ***I have struggled most with the following topic/topics:***				
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Area of Study: Chemical Analysis				
Using melting and boiling point data, identify pure substances and mixtures				
Define the meaning of the term formulation.				
Identify formulations given the appropriate information.				
Explain how paper chromatography separates mixtures				
Suggest how chromatographic methods can be used for distinguishing pure substances from impure substances.				

Interpret chromatograms and determine Rf values from chromatograms.				
Describe how to test for hydrogen gas.				
Describe how to test for oxygen gas.				
Describe how to test for carbon dioxide gas.				
Describe how to test for chlorine.				

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	Red	Amber	Green	Revised Tick ☑
Area of Study: Chemistry of the Atmosphere				
State the proportions of the gases in the Earth's atmosphere.				
Describe theories of the Earth's early atmosphere.				
Describe theories of how the Earth's early atmosphere became what it is today.				
Interpret evidence and evaluate theories about the Earth's early atmosphere.				
Describe how oxygen in the current atmosphere was produced.				
State the photosynthesis equation.				
Describe the main changes in the atmosphere over time and some of the likely causes of these changes.				
Describe and explain the formation of deposits of limestone, coal, crude oil and natural gas.				
Describe the greenhouse effect in terms of the interaction of short and long wavelength radiation with matter.				
Recall human activities that increase the amounts of carbon dioxide and methane.				
Describe four potential effects of global climate change.				
Discuss the scale, risk and environmental implications of global climate change.				
Describe actions to reduce emissions of carbon dioxide and methane and give reasons why these may be limited.				

Describe how carbon monoxide, carbon particles (soot), sulphur dioxide and oxides of nitrogen are produced by burning fuels.				
Describe and explain the problems caused by increased amounts of the pollutants above.				
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Area of Study: Using Resources				
State reasons for using the Earth's resources.				
Give examples of natural products that are supplemented or replaced by agricultural and synthetic products.				
Distinguish between finite and renewable resources given appropriate information.				
Distinguish between potable water and pure water.				
Describe the differences in treatment of ground water and salty water.				
Give reasons for the steps used to produce potable water.				
Describe the process of sewage treatment and comment on the relative ease of obtaining potable water.				
HT: give reasons for alternative methods of extracting copper.				
HT: describe and evaluate the process of phytomining.				
HT: describe and evaluate the process of bioleaching.				
Compare life cycle assessments of shopping bags made from plastic and paper.				
Evaluate ways of reducing the use of limited resources.				
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	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Energy – Changes in Energy				
Students should be able to calculate the amount of energy associated with a moving object, a stretched spring and an object raised above ground level.				
The kinetic energy of a moving object can be calculated using the equation: $E_K = \frac{1}{2}mv^2$				
The amount of elastic potential energy stored in a stretched spring can be calculated using the equation: $E_e = \frac{1}{2}ke^2$				
The amount of gravitational potential energy gained by an object raised above ground level can be calculated using the equation: E=mgh				
Gravitational field strength, g, in newtons per kilogram, N/kg (In any calculation the value of the gravitational field strength (g) will be given.) height, h, in metres, m				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Energy – Energy changes in system				
The amount of energy stored in or released from a system as its temperature changes can be calculated using the equation: $\Delta E = m c \Delta \theta$				
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.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Energy –Power				
Power is defined as the rate at which energy is transferred or the rate at which work is done. $P = E/t$ $P = W/t$				
An energy transfer of 1 joule per second is equal to a power of 1 watt.				

Students should be able to give examples that illustrate the definition of power eg comparing two electric motors that both lift the same weight through the same height but one does it faster than the other.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Energy –Conservation and dissipation of energy				
Energy can be transferred usefully, stored or dissipated, but cannot be created or destroyed.				
Students should be able to describe with examples where there are energy transfers in a closed system, that there is no net change to the total energy.				
Students should be able to describe, with examples, how in all system changes energy is dissipated, so that it is stored in less useful ways. This energy is often described as being 'wasted'.				
Students should be able to explain ways of reducing unwanted energy transfers, for example through lubrication and the use of thermal insulation.				
The higher the thermal conductivity of a material the higher the rate of energy transfer by conduction across the material.				
Students should be able to describe how the rate of cooling of a building is affected by the thickness and thermal conductivity of its walls.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Energy –Efficiency				
The energy efficiency for any energy transfer can be calculated using the equation: $efficiency = \frac{useful...energy...output...transfer}{Total...input...energy...transfer}$				
Efficiency may also be calculated using the equation: $efficiency = \frac{useful...power...output}{Total...power...input}$				
Students should be able to describe ways to increase the efficiency of an intended energy transfer.				
The main energy resources available for use on Earth include: fossil fuels (coal, oil and gas), nuclear fuel, bio-fuel, wind, hydroelectricity, geothermal, the tides, the Sun and water waves.				
A renewable energy resource is one that is being (or can be) replenished as it is used.				

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The uses of energy resources include: transport, electricity generation and heating.				
describe the main energy sources available				
distinguish between energy resources that are renewable and energy resources that are non-renewable				
compare ways that different energy resources are used, the uses to include transport, electricity generation and heating				
understand why some energy resources are more reliable than others				
describe the environmental impact arising from the use of different energy resources				
explain patterns and trends in the use of energy resources.				
consider the environmental issues that may arise from the use of different energy resources				
show that science has the ability to identify environmental issues arising from the use of energy resources but not always the power to deal with the issues because of political, social, ethical or economic considerations.				
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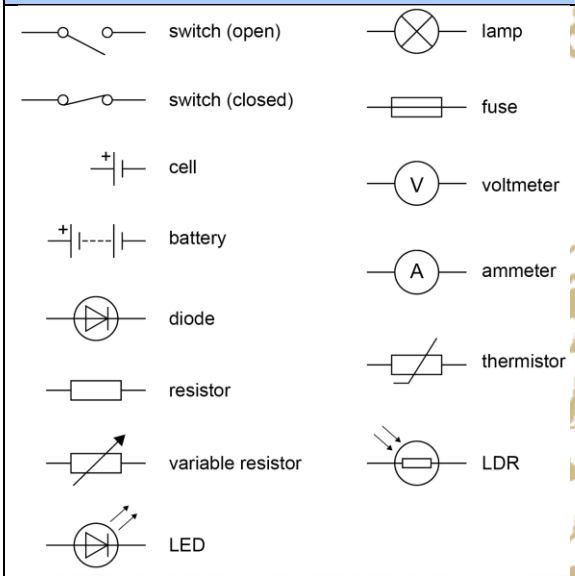
	Red	Amber	Green	Revised Tick ☑
Area of Study: Electricity – Standard circuit diagram symbols				
				
Students should be able to draw and interpret circuit diagrams.				
	Red	**Amber**	**Green**	**Revised Tick ☑**
Area of Study: Electricity – Electrical charge and current				
For electrical charge to flow through a closed circuit the circuit must include a source of potential difference.				
Electric current is a flow of electrical charge. The size of the electric current is the rate of flow of electrical charge. Charge flow, current and time are linked by the equation: Q = It				
A current has the same value at any point in a single closed loop.				
	Red	**Amber**	**Green**	**Revised Tick ☑**
Area of Study: Electricity – Current, resistance and potential difference				
The current (I) through a component depends on both the resistance (R) of the component and the potential difference (V) across the component. The greater the resistance of the component the smaller the current for a given potential difference (pd) across the component.				
Questions will be set using the term potential difference. Students will gain credit for the correct use of either potential difference or voltage.				
Current, potential difference or resistance can be calculated using the equation: V = IR				

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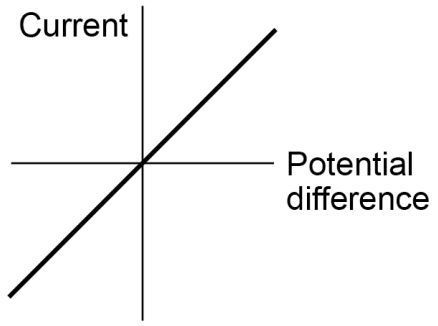
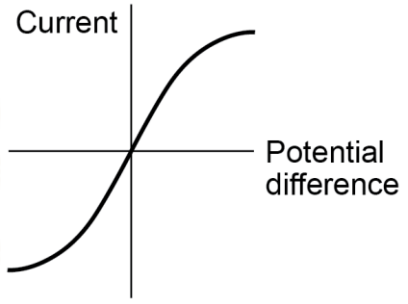
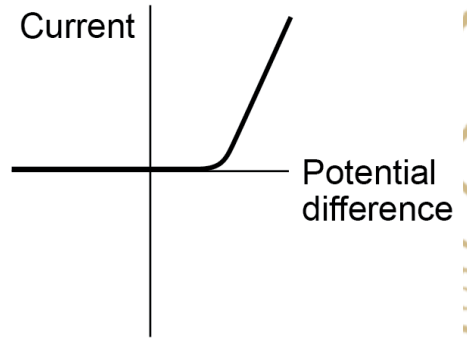
Area of Study: Electricity – Resistors				
Students should be able to explain that, for some resistors, the value of R remains constant but that in others it can change as the current changes.				
The current through an ohmic conductor (at a constant temperature) is directly proportional to the potential difference across the resistor. This means that the resistance remains constant as the current changes.				
				
The resistance of components such as lamps, diodes, thermistors and LDRs is not constant; it changes with the current through the component				
The resistance of a filament lamp increases as the temperature of the filament increases. 				
The current through a diode flows in one direction only. The diode has a very high resistance in the reverse direction. 				

The resistance of a thermistor decreases as the temperature increases.				
The applications of thermistors in circuits eg a thermostat is required.				
The resistance of an LDR decreases as light intensity increases.				
The application of LDRs in circuits eg switching lights on when it gets dark is required.				
explain the design and use of a circuit to measure the resistance of a component by measuring the current through, and potential difference across, the component				
draw an appropriate circuit diagram using correct circuit symbols.				
Students should be able to use graphs to explore whether circuit elements are linear or non-linear and relate the curves produced to their function and properties.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Electricity – Series and parallel circuits				
There are two ways of joining electrical components, in series and in parallel. Some circuits include both series and parallel parts.				
For components connected in series: • there is the same current through each component • the total potential difference of the power supply is shared between the components • the total resistance of two components is the sum of the resistance of each component. $R_T = R_1 + R_2$				
For components connected in parallel: • the potential difference across each component is the same • the total current through the whole circuit is the sum of the currents through the separate components • the total resistance of two resistors is less than the resistance of the smallest individual resistor.				
use circuit diagrams to construct and check series and parallel circuits that include a variety of common circuit components				
describe the difference between series and parallel circuits				
explain qualitatively why adding resistors in series increases the total resistance whilst adding resistors in parallel decreases the total resistance				
explain the design and use of dc series circuits for measurement and testing purposes				

calculate the currents, potential differences and resistances in dc series circuits				
solve problems for circuits which include resistors in series using the concept of equivalent resistance.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Electricity – Direct and alternating potential difference				
Mains electricity is an ac supply. In the United Kingdom the domestic electricity supply has a frequency of 50 Hz and is about 230 V.				
Students should be able to explain the difference between direct and alternating potential difference				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Electricity – Mains electricity				
Most electrical appliances are connected to the mains using three core cable.				
The insulation covering each wire is colour coded for easy identification: live wire – brown neutral wire – blue earth wire – green and yellow stripes.				
The live wire carries the alternating potential difference from the supply. The neutral wire completes the circuit. The earth wire is a safety wire to stop the appliance becoming live.				
The potential difference between the live wire and earth (0 V) is about 230 V. The neutral wire is at, or close to, earth potential (0 V). The earth wire is at 0 V, it only carries a current if there is a fault.				
• that a live wire may be dangerous even when a switch in the mains circuit is open • the dangers of providing any connection between the live wire and earth.				

I am most confident with the following topic/topics:

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	Red	Amber	Green	Revised Tick ☑
Area of Study: The Particle Model – Density of Materials				
The density of a material is defined by the equation: $\rho = \frac{m}{V}$				
The particle model can be used to explain • the different states of matter • differences in density.				
Students should be able to recognise/draw simple diagrams to model the difference between solids, liquids and gases.				
Students should be able to explain the differences in density between the different states of matter in terms of the arrangement of atoms or molecules.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: The Particle Model – Changes of State				
Students should be able to describe how, when substances change state (melt, freeze, boil, evaporate, condense or sublimate), mass is conserved.				
Changes of state are physical changes which differ from chemical changes because the material recovers its original properties if the change is reversed.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: The Particle Model – Internal Energy				
Energy is stored inside a system by the particles (atoms and molecules) that make up the system. This is called internal energy.				
Internal energy is the total kinetic energy and potential energy of all the particles (atoms and molecules) that make up a system.				
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.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: The Particle Model – Temperature changes in a system and specific heat capacity				
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.				
The following equation applies:				

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$\Delta E = m c \Delta \theta$				
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.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: The Particle Model – Changes of heat and specific latent heat				
The energy needed for a substance to change state is called latent heat. When a change of state occurs, the energy supplied changes the energy stored (internal energy) but not the temperature.				
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.				
energy for a change of state = mass × specific latent heat $E = mL$				
Specific latent heat of fusion – change of state from solid to liquid				
Specific latent heat of vaporisation – change of state from liquid to vapour				
Students should be able to interpret heating and cooling graphs that include changes of state.				
Students should be able to distinguish between specific heat capacity and specific latent heat.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: The Particle Model – Particle Motion in Gases				
The molecules of a gas are in constant random motion. The temperature of the gas is related to the average kinetic energy of the molecules.				
Changing the temperature of a gas, held at constant volume, changes the pressure exerted by the gas.				
explain how the motion of the molecules in a gas is related to both its temperature and its pressure				
explain qualitatively the relation between the temperature of a gas and its pressure at constant volume.				
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	Red	Amber	Green	Revised Tick ☑
Area of Study: Atomic Structure – The structure of an atom				
Atoms are very small, having a radius of about 1×10^{-10} metres				
The basic structure of an atom is a positively charged nucleus composed of both protons and neutrons surrounded by negatively charged electrons.				
The radius of a nucleus is less than 1/10000 of the radius of an atom. Most of the mass of an atom is concentrated in the nucleus.				
The electrons are arranged at different distances from the nucleus (different energy levels). The electron arrangements may change with the absorption of electromagnetic radiation (move further from the nucleus; a higher energy level) or by the emission of electromagnetic radiation (move closer to the nucleus; a lower energy level).				
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Area of Study: Atomic Structure – Mass number, atomic numbers and isotopes				
In an atom the number of electrons is equal to the number of protons in the nucleus. Atoms have no overall electrical charge.				
The All atoms of a particular element have the same number of protons. number of protons in an atom of an element is called its atomic number.				
The total number of protons and neutrons in an atom is called its mass number.				
Atoms can be represented as shown in this example: (Mass number) 23 (Atomic number) 11 Na				
Atoms of the same element can have different numbers of neutrons; these atoms are called isotopes of that element.				
Atoms turn into positive ions if they lose one or more outer electron(s).				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Atomic Structure – The development of the model of the atom (common content with chemistry)				
Before the discovery of the electron, atoms were thought to be tiny spheres that could not be divided.				

The discovery of the electron led to the plum pudding model of the atom. The plum pudding model suggested that the atom is a ball of positive charge with negative electrons embedded in it.				
The results from the alpha particle scattering experiment led to the conclusion that the mass of an atom was concentrated at the centre (nucleus) and that the nucleus was charged. This nuclear model replaced the plum pudding model.				
Niels Bohr adapted the nuclear model by suggesting that electrons orbit the nucleus at specific distances. The theoretical calculations of Bohr agreed with experimental observations.				
Later experiments led to the idea that the positive charge of any nucleus could be subdivided into a whole number of smaller particles, each particle having the same amount of positive charge. The name proton was given to these particles.				
The experimental work of James Chadwick provided the evidence to show the existence of neutrons within the nucleus. This was about 20 years after the nucleus became an accepted scientific idea.				
Students should be able to describe: • why the new evidence from the scattering experiment led to a change in the atomic model • the difference between the plum pudding model of the atom and the nuclear model of the atom.				
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Area of Study: Atomic Structure – Radioactive decay and nuclear radiation				
Some atomic nuclei are unstable. The nucleus gives out radiation as it changes to become more stable. This is a random process called radioactive decay.				
Activity is the rate at which a source of unstable nuclei decays.				
Activity is measured in becquerel (Bq).				
Count-rate is the number of decays recorded each second by a detector (eg Geiger-Muller tube).				
The nuclear radiation emitted may be: • an alpha particle (α) – this consists of two neutrons and two protons, it is the same as a helium nucleus, • a beta particle (β) – a high speed electron ejected from the nucleus as a neutron turns into a proton, • a gamma ray (γ) – electromagnetic radiation from the nucleus, • a neutron (n).				

Know how penetrating the types of radiation are for materials, range in air and ionising power.				
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Area of Study: Atomic Structure – Nuclear equations				
Nuclear equations are used to represent radioactive decay.				
In a nuclear equation an alpha particle may be represented by the symbol: $^{4}_{2}He$ and a beta particle by the symbol: $^{0}_{-1}e$				
The emission of the different types of nuclear radiation may cause a change in the mass and /or the charge of the nucleus. For example: $^{219}_{86}\text{radon} \longrightarrow {}^{215}_{84}\text{polonium} + {}^{4}_{2}He$ So alpha decay causes both the mass and charge of the nucleus to decrease.				
$^{14}_{6}\text{carbon} \longrightarrow {}^{14}_{7}\text{nitrogen} + {}^{0}_{-1}e$ So beta decay does not cause the mass of the nucleus to change but does cause the charge of the nucleus to increase.				
Students should be able to use the names and symbols of common nuclei and particles to write balanced equations that show single alpha (α) and beta (β) decay. This is limited to balancing the atomic numbers and mass numbers.				
The emission of a gamma ray does not cause the mass or the charge of the nucleus to change.				
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Area of Study: Atomic Structure – Half-lives and random nature of radioactive decay				
Radioactive decay is random.				
The half-life of a radioactive isotope is the time it takes for the number of nuclei of the isotope in a sample to halve, or the time it takes for the count rate (or activity) from a sample containing the isotope to fall to half its initial level.				
Students should be able to explain the concept of half-life and how it is related to the random nature of radioactive decay.				
Students should be able to determine the half-life of a radioactive isotope from given information.				
(HT only) Students should be able to calculate the net decline, expressed as a ratio, in a radioactive emission after a given number of half-lives.				

	Red	Amber	Green	Revised Tick ☑
Area of Study: Atomic Structure – Radioactive Contamination				
Radioactive contamination is the unwanted presence of materials containing radioactive atoms on other materials. The hazard from contamination is due to the decay of the contaminating atoms. The type of radiation emitted affects the level of hazard.				
Irradiation is the process of exposing an object to nuclear radiation. The irradiated object does not become radioactive.				
Students should be able to compare the hazards associated with contamination and irradiation.				
Suitable precautions must be taken to protect against any hazard that the radioactive source used in the process of irradiation may present.				
Students should understand that it is important for the findings of studies into the effects of radiation on humans to be published and shared with other scientists so that the findings can be checked by peer review.				
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Area of Study: Forces – scalar and vector quantities				
Scalar quantities have magnitude only. Vector quantities have magnitude and an associated direction.				
A vector quantity may be represented by an arrow. The length of the arrow represents the magnitude, and the direction of the arrow the direction of the vector quantity.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Forces – Contact and non-contact forces				
A force is a push or pull that acts on an object due to the interaction with another object. All forces between objects are either: • contact forces – the objects are physically touching				

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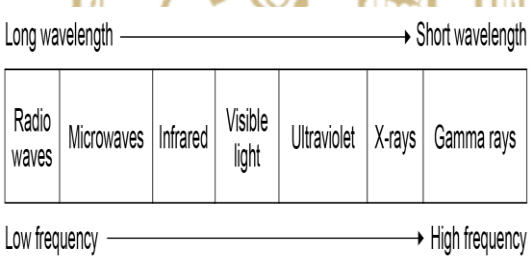
• non-contact forces – the objects are physically separated.				
Examples of contact forces include friction, air resistance, tension and normal contact force.				
Examples of non-contact forces are gravitational force, electrostatic force and magnetic force.				
Force is a vector quantity.				
Students should be able to describe the interaction between pairs of objects which produce a force on each object. The forces to be represented as vectors.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Forces – Gravity				
Weight is the force acting on an object due to gravity. The force of gravity close to the Earth is due to the gravitational field around the Earth.				
The weight of an object depends on the gravitational field strength at the point where the object is.				
The weight of an object can be calculated using the equation: weight = mass × gravitational field strength				
The weight of an object may be considered to act at a single point referred to as the object's 'centre of mass'.				
The weight of an object and the mass of an object are directly proportional.				
Weight is measured using a calibrated spring-balance (a Newton meter).				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Forces – Resultant Forces				
A number of forces acting on an object may be replaced by a single force that has the same effect as all the original forces acting together. This single force is called the resultant force. Students should be able to calculate the resultant of two forces that act in a straight line.				
describe examples of the forces acting on an isolated object or system				
use free body diagrams to describe qualitatively examples where several forces lead to a resultant force on an object, including balanced forces when the resultant force is zero.				
A single force can be resolved into two components acting at right angles to each other. The two component forces together have the same effect as the single force.				

Students should be able to use vector diagrams to illustrate resolution of forces, equilibrium situations and determine the resultant of two forces, to include both magnitude and direction (scale drawings only).				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Forces – Work Done and Energy Transfer				
When a force causes an object to move through a distance work is done on the object. So a force does work on an object when the force causes a displacement of the object.				
The work done by a force on an object can be calculated using the equation: work done = force × distance moved along the line of action				
One joule of work is done when a force of one newton causes a displacement of one metre. 1 joule = 1 newton-metre				
Students should be able to describe the energy transfer involved when work is done.				
Students should be able to convert between newton-metres and joules.				
Work done against the frictional forces acting on an object causes a rise in the temperature of the object.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Forces – Forces and Elasticity				
Students should be able to: • give examples of the forces involved in stretching, bending or compressing an object • explain why, to change the shape of an object (by stretching, bending or compressing), more than one force has to be applied – this is limited to stationary objects only • describe the difference between elastic deformation and inelastic deformation caused by stretching forces.				
The extension of an elastic object, such as a spring, is directly proportional to the force applied, provided that the limit of proportionality is not exceeded.				
force = spring constant × extension				
A force that stretches (or compresses) a spring does work and elastic potential energy is stored in the spring. Provided the spring is not inelastically deformed, the work done on the spring and the elastic potential energy stored are equal.				
Students should be able to: • describe the difference between a linear and non-linear relationship between force and extension				

• calculate a spring constant in linear cases				
interpret data from an investigation of the relationship between force and extension				
calculate work done in stretching (or compressing) a spring (up to the limit of proportionality) using the equation: $E_E = \frac{1}{2} k e^2$				
Students should be able to calculate relevant values of stored energy and energy transfers.				
I am most confident with the following topic/topics: ***I have struggled most with the following topic/topics:***				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Waves – Transverse and longitudinal waves				
Waves may be either transverse or longitudinal.				
The ripples on a water surface are an example of a transverse wave.				
Longitudinal waves show areas of compression and rarefaction.				
Sound waves travelling through air are longitudinal.				
Students should be able to describe the difference between longitudinal and transverse waves.				
Students should be able to describe evidence that, for both ripples **on a water surface and sound waves in air, it is the wave and not** **the water or air itself that travels.**				

	Red	Amber	Green	Revised Tick ☑
Area of Study: Waves – Properties of waves				
Students should be able to describe wave motion in terms of their amplitude, wavelength, frequency and period.				
The amplitude of a wave is the maximum displacement of a point on a wave away from its undisturbed position.				
The wavelength of a wave is the distance from a point on one wave to the equivalent point on the adjacent wave.				
The frequency of a wave is the number of waves passing a point each second.				
Tf = 1				
The wave speed is the speed at which the energy is transferred (or the wave moves) through the medium.				
All waves obey the wave equation: **wave speed = frequency × wavelength** **$v = f\lambda$**				
identify amplitude and wavelength from given diagrams				
describe a method to measure the speed of sound waves in air				
describe a method to measure the speed of ripples on a water surface.				
Students should be able to show how changes in velocity, frequency and wavelength, in transmission of sound waves from one medium to another, are inter-related.				

	Red	Amber	Green	Revised Tick ☑
Area of Study: Waves – Types of electromagnetic waves				
Electromagnetic waves are transverse waves that transfer energy from the source of the waves to an absorber.				
Electromagnetic waves form a continuous spectrum and all types of electromagnetic wave travel at the same velocity through a vacuum (space) or air.				
The waves that form the electromagnetic spectrum are grouped in terms of their wavelength and their frequency. Going from long to short wavelength (or from low to high frequency) the groups are: radio, microwave, infrared, visible light (red to violet), ultraviolet, Xrays and gamma rays.				
				
Our eyes only detect visible light and so detect a limited range of electromagnetic waves.				
Students should be able to give examples that illustrate the transfer of energy by electromagnetic waves.				

	Red	Amber	Green	Revised Tick ☑
Area of Study: Waves – Properties of electromagnetic waves 1				
(HT only) Different substances may absorb, transmit, refract or reflect electromagnetic waves in ways that vary with wavelength.				
(HT only) Some effects, for example refraction, are due to the difference in velocity of the waves in different substances.				
Students should be able to construct ray diagrams to illustrate the refraction of a wave at the boundary between two different media.				
(HT only) Students should be able to use wave front diagrams to explain refraction in terms of the change of speed that happens when a wave travels from one medium to a different medium.				
	Red	Amber	Green	Revised Tick ☑
Area of Study: Waves – Properties of electromagnetic waves 2				
(HT only) Radio waves can be produced by oscillations in electrical circuits.				
(HT only) When radio waves are absorbed they may create an alternating current with the same frequency as the radio wave itself, so radio waves can themselves induce oscillations in an electrical circuit.				
Changes in atoms and the nuclei of atoms can result in electromagnetic waves being generated or absorbed over a wide frequency range. Gamma rays originate from changes in the nucleus of an atom.				
Ultraviolet waves, X-rays and gamma rays can have hazardous effects on human body tissue. The effects depend on the type of				

radiation and the size of the dose. Radiation dose (in sieverts) is a measure of the risk of harm resulting from an exposure of the body to the radiation.				
Ultraviolet waves can cause skin to age prematurely and increase the risk of skin cancer. X-rays and gamma rays are ionising radiation that can cause the mutation of genes and cancer.				
	Red	Amber	Green	Revised Tick ☑
Area of Study: Waves – Uses and applications of electromagnetic waves				
Electromagnetic waves have many practical applications. For example: • radio waves – television and radio • microwaves – satellite communications, cooking food • infrared – electrical heaters, cooking food, infrared cameras • visible light – fibre optic communications • ultraviolet – energy efficient lamps, sun tanning • X-rays and gamma rays – medical imaging and treatments.				
(HT only) Students should be able to give brief explanations why each type of electromagnetic wave is suitable for the practical application.				
	Red	Amber	Green	Revised Tick ☑
Area of Study: Waves – Emissions and absorption of infrared radiation				
All bodies (objects), no matter what temperature, emit and absorb infrared radiation. The hotter the body, the more infrared radiation it radiates in a given time.				
A perfect black body is an object that absorbs all of the radiation incident on it. A black body does not reflect or transmit any radiation. Since a good absorber is also a good emitter, a perfect black body would be the best possible emitter.				

• that all bodies (objects) emit radiation • that the intensity and wavelength distribution of any emission depends on the temperature of the body.				
(HT only) A body at constant temperature is absorbing radiation at the same rate as it is emitting radiation. The temperature of a body increases when the body absorbs radiation faster than it emits radiation.				
(HT only) The temperature of the Earth depends on many factors including: the rates of absorption and emission of radiation, reflection of radiation into space.				
(HT only) Students should be able to explain how the temperature of a body is related to the balance between incoming radiation absorbed and radiation emitted, using everyday examples to illustrate this balance, and the example of the factors which determine the temperature of the Earth.				
(HT only) Students should be able to use information, or draw/ interpret diagrams to show how radiation affects the temperature of the Earth's surface and atmosphere.				
I am most confident with the following topic/topics: *I have struggled most with the following topic/topics:*				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Electromagnetism – Poles of a magnet				
The poles of a magnet are the places where the magnetic forces are strongest. When two magnets are brought close together they exert a force on each other. Two like poles repel each other. Two unlike poles attract each other. Attraction and				

repulsion between two magnetic poles are examples of non-contact force.				
A permanent magnet produces its own magnetic field. An induced magnet is a material that becomes a magnet when it is placed in a magnetic field. Induced magnetism always causes a force of attraction. When removed from the magnetic field an induced magnet loses most/all of its magnetism quickly.				
• the attraction and repulsion between unlike and like poles for permanent magnets **• the difference between permanent and induced magnets.**				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Electromagnetism – Magnetic Fields				
The region around a magnet where a force acts on another magnet or on a magnetic material (iron, steel, cobalt and nickel) is called the magnetic field.				
The force between a magnet and a magnetic material is always one of attraction.				
The strength of the magnetic field depends on the distance from the magnet. The field is strongest at the poles of the magnet.				
The direction of the magnetic field at any point is given by the direction of the force that would act on another north pole placed at that point. The direction of a magnetic field line is from the north (seeking) pole of a magnet to the south(seeking) pole of the magnet.				
A magnetic compass contains a small bar magnet. The Earth has a magnetic field. The compass needle points in the direction of the Earth's magnetic field.				
• describe how to plot the magnetic field pattern of a magnet using a compass **• draw the magnetic field pattern of a bar magnet showing how strength and direction change from one point to another**				

• explain how the behaviour of a magnetic compass is related to evidence that the core of the Earth must be magnetic.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Electromagnetism – Electromagnetism				
When a current flows through a conducting wire a magnetic field is produced around the wire. The strength of the magnetic field depends on the current through the wire and the distance from the wire.				
Shaping a wire to form a solenoid increases the strength of the magnetic field created by a current through the wire. The magnetic field inside a solenoid is strong and uniform.				
The magnetic field around a solenoid has a similar shape to that of a bar magnet. Adding an iron core increases the strength of the magnetic field of a solenoid. An electromagnet is a solenoid with an iron core.				
• describe how the magnetic effect of a current can be demonstrated • draw the magnetic field pattern for a straight wire carrying a current and for a solenoid (showing the direction of the field) • explain how a solenoid arrangement can increase the magnetic effect of the current.				
(Physics only) Students should be able to interpret diagrams of electromagnetic devices in order to explain how they work.				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Electromagnetism – Fleming's left hand rule (HT only)				
When a conductor carrying a current is placed in a magnetic field the magnet producing the field and the conductor exert a force on each other. This is called the motor effect.				
Students should be able to show that Fleming's left-hand rule represents the relative orientation of the force, the current in the conductor and the magnetic field.				
Students should be able to recall the factors that affect the size of the force on the conductor.				
For a conductor at right angles to a magnetic field and carrying a current: F = BIL				

	Red	Amber	Green	Revised Tick ☑
Area of Study: Electromagnetism – Electric Motors (HT only)				
A coil of wire carrying a current in a magnetic field tends to rotate. This is the basis of an electric motor.				
Students should be able to explain how the force on a conductor in a magnetic field causes the rotation of the coil in an electric motor.				
	Red	**Amber**	**Green**	**Revised Tick ☑**
Area of Study: Electromagnetism – Loudspeakers (physics only) (HT only)				
Loudspeakers and headphones use the motor effect to convert variations in current in electrical circuits to the pressure variations in sound waves.				
Students should be able to explain how a moving-coil loudspeaker and headphones work.				
	Red	**Amber**	**Green**	**Revised Tick ☑**
Area of Study: Electromagnetism – Uses of the generator effect (HT only)				
The generator effect is used in an alternator to generate ac and in a dynamo to generate dc.				
explain how the generator effect is used in an alternator to generate ac and in a dynamo to generate dc				
draw/interpret graphs of potential difference generated in the coil against time.				
4.7.3.3 Microphones (HT only)				
Microphones use the generator effect to convert the pressure variations in sound waves into variations in current in electrical circuits.				
Students should be able to explain how a moving-coil microphone works.				

I am most confident with the following topic/topics:

I have struggled most with the following topic/topics:

PERSONALISED LEARNING CHECKLISTS

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GCSE Science Trilogy BIOLOGY: PERSONALISED LEARNING CHECKLIST				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Cell Biology				
Plant/animal cells and their organelles/structure				
Bacterial cells and their organelles/structure				
Differences between prokaryotes and eukaryotes				
Cells may be specialised to carry out a particular function: • sperm cells, nerve cells and muscle cells in animals • root hair cells, xylem and phloem cells in plants.				
Cell differentiation in plant and animal cells				
Understand how microscopy techniques have developed over time				
Explain how electron microscopy has increased understanding of sub-cellular structures.				
Carry out calculations involving magnification, real size and image size using the formula: magnification = size of image / size of real object				
Required practical activity 1: using a light microscope				
Describe how bacteria multiply by simple cell division (binary fission)				
Required practical activity 2: investigate the effect of antiseptics or antibiotics on bacterial growth				
The contents of the nucleus including chromosomes and genes				
How cells divide by the process of mitosis				
Describe the stages of the cell cycle				
Describe the function of stem cells in embryos, in adult animals and in the meristems in plants				
Evaluate the uses and implications of stem cell treatment				
Explain the process of therapeutic cloning				
Define diffusion				
Describe which factors affect the rate of diffusion				

Calculate and compare surface area to volume ratios.				
Explain how different multicellular organisms have adapted exchange surfaces				
Define osmosis				
Required practical activity 3: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue				
Define active transport and describe it happening with mineral uptake in root hair cells and uptake of sugar molecules in the gut of humans				
I am most confident with the following topic/topics: ***I have struggled most with the following topic/topics:***				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Organisation				
Define the term tissue and give examples.				
Define and give examples of organs.				
Define and give examples of organ system.				
Label and describe the functions of the digestive system.				
Describe how enzymes catalyse specific and be able to use the 'lock and key theory' as a simplified model to explain it.				
How enzymes are affected by temp and pH changes.				
Be able to carry out rate calculations.				
Be able to recall the sites of production and the action of amylase, proteases and lipases.				
How the adaptations of the small intestine allow digested food molecules to be absorbed into the bloodstream.				
Describe how the products of digestion are used.				
Describe and explain the action of bile in digestion.				
Know the structure and functioning of the human heart and its associated blood vessels.				

Know the structure of the lungs, including how lungs are adapted for gaseous exchange.				
Explain how the pacemaker controls its heart rate and how Artificial pacemakers are used to correct irregularities.				
Explain how the structure of arteries, veins and capillaries relates to their functions.				
Know the functions of each of the blood components, plasma, red blood cells, white blood cells and platelets.				
Recognise different types of blood cells in a photograph or diagram, and how they are adapted to their functions.				
Evaluate the advantages and disadvantages of treating cardiovascular diseases by drugs (statins), mechanical devices (valves, stents, artificial heart) or transplant.				
Describe the consequences of faulty valves and replacement biological or mechanical valves.				
Define the term 'Health'.				
Define and give examples of 'communicable diseases' and 'non-communicable', as major causes of ill health.				
Describe how diet, stress and life situations may have an effect on both physical and mental health.				
Explain how different types of disease may interact.				
Be able to translate disease incidence information between graphical and numerical forms, construct and interpret frequency tables and diagrams, bar charts and histograms.				
Understand the principles of sampling as applied to scientific data, including epidemiological data.				
Discuss the human and financial cost of non communicable diseases to an individual, a local community, a nation or globally.				
Explain the effect of lifestyle factors including diet, alcohol and smoking on the incidence of non-communicable diseases at local, national and global levels.				
Be able to use a scatter diagram to identify a correlation between two variables in terms of risk factors.				
describe how cancer results as a change in cell growth and division.				

Describe the differences between benign and malignant tumours,				
Explain how lifestyle and genetic risk factors can increase the likelihood for various types of cancer.				
Required practical activity 4: use qualitative reagents to test for a range of carbohydrates, lipids and proteins				
Required practical activity 5: investigate the effect of pH on the rate of reaction of amylase enzyme.				
I am most confident with the following topic/topics: ***I have struggled most with the following topic/topics:***				
	Red	**Amber**	**Green**	**Revised** Tick ☑
Area of Study: Infection and Response				
How diseases are spread and how this spread can be reduced				
How we can culture bacteria				
The definition of 'pathogen' and how they make us ill				
Examples of viral, bacterial and fungal diseases – how they spread and how they are treated				
Malaria as an example of a protist disease, including the malarial protist life cycle, symptoms and treatment				
1st line (non-specific) defence systems of the human body and how they work				
The role of white blood cells in the immune system				
Vaccinations and how they prevent disease				
The use of antibiotics and how antibiotic resistance arises. The discovery of penicillin by Fleming				
The use of painkillers and the origins of aspirin				
Traditionally drugs were extracted from plants and micro-organisms eg. Digitalis, aspirin and penicillin				

The stages of drug testing and what is being tested at each point				
The meaning of the key terms 'placebo' and 'double blind trial'				
Monoclonal antibodies and how they are produced				
Uses of monoclonal antibodies				
Advantages and disadvantages of monoclonal antibodies				
The general symptoms of plant disease and how they can be diagnosed				
Examples of plant disease, and their symptoms/effects on plants (Tobacco mosaic virus, Rose black spot and aphids)				
The damage caused to plants by ion deficiencies				
Plant defence responses (physical responses, chemical responses and mechanical adaptations)				

I am most confident with the following topic/topics:

I have struggled most with the following topic/topics:

	Red	Amber	Green	Revised Tick ☑
Area of Study: Bioenergetics				
Photosynthesis is represented by the equation: $\text{carbon dioxide} + \text{water} \xrightarrow{\text{light}} \text{glucose} + \text{oxygen}$				
I recognise, and can name these symbols: CO_2, H_2O, O_2 and $C_6H_{12}O_6$.				
I can describe photosynthesis as an endothermic reaction in which energy is transferred from the environment to the chloroplasts by light.				
I can explain the effects of temperature, light intensity, carbon dioxide concentration, and the amount of chlorophyll on the rate of photosynthesis.				
I can • measure and calculate rates of photosynthesis				

• extract and interpret graphs of photosynthesis rate involving one limiting factor • plot and draw appropriate graphs selecting appropriate scale for axes • translate information between graphical and numeric form.				
Higher Tier only: These factors interact and any one of them may be the factor that limits photosynthesis.				
Higher Tier only: I can explain graphs of photosynthesis rate involving two or three factors and decide which is the limiting factor.				
Higher Tier only: I understand and can use inverse proportion – the inverse square law and light intensity in the context of photosynthesis.				
Higher Tier only: Limiting factors are important in the economics of enhancing the conditions in greenhouses to gain the maximum rate of photosynthesis while still maintaining profit.				
Required Practical 6: I have investigated the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed.				
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.				
To produce proteins, plants also use nitrate ions that are absorbed from the soil.				
I can describe cellular respiration as an exothermic reaction which is continuously occurring in living cells.				

The energy transferred from respiration supplies all the energy needed for living processes.				
Respiration in cells can take place aerobically (using oxygen) or anaerobically (without oxygen), to transfer energy.				
I can compare the processes of aerobic and anaerobic respiration with regard to the need for oxygen, the differing products and the relative amounts of energy transferred.				
Organisms need energy for: • chemical reactions to build larger molecules • movement • keeping warm.				
Aerobic respiration is represented by the equation: glucose + oxygen → carbon dioxide + water				
I can recognise and name these symbols: $C_6H_{12}O_6$, O_2, CO_2 and H_2O.				
Anaerobic respiration in muscles is represented by the equation: glucose → lactic acid				
As the oxidation of glucose is incomplete in anaerobic respiration much less energy is transferred than in aerobic respiration.				
Anaerobic respiration in plant and yeast cells is represented by the equation: glucose → ethanol + carbon dioxide				
Anaerobic respiration in yeast cells is called fermentation and has economic importance in the manufacture of bread and alcoholic drinks.				
During exercise the human body reacts to the increased demand for energy. The 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.				
Higher Tier only: Blood flowing through the muscles transports the lactic acid to the liver where it is converted back into glucose. Oxygen debt is the amount of extra oxygen the body needs after exercise to react with the accumulated lactic acid and remove it from the cells.				
Students should be able to explain the importance of sugars, amino acids, fatty acids and glycerol in the synthesis and breakdown of carbohydrates, proteins and lipids.				
Metabolism is the sum of all the reactions in a cell or the body.				
The energy transferred by respiration in cells is used by the organism for the continual enzyme controlled processes of metabolism that synthesise new molecules.				
Metabolism includes: • conversion of glucose to starch, glycogen and cellulose • the formation of lipid molecules from a molecule of glycerol and three molecules of 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.				
I am most confident with the following topic/topics: ***I have struggled most with the following topic/topics:***				

PERSONALISED LEARNING CHECKLISTS

	Red	Amber	Green	Revised Tick ☑
Area of Study: Homeostasis and response				
I am able to explain that homeostasis is the regulation of the internal conditions of a cell or organism to maintain optimum conditions for function in response to internal and external changes.				
Homeostasis maintains optimal conditions for enzyme action and all cell functions.				
In the human body, these include control of: • blood glucose concentration • body temperature • water levels.				
These automatic control systems may involve nervous responses or chemical responses.				
All control systems include: • cells called receptors, which detect stimuli (changes in the environment) • coordination centres (such as the brain, spinal cord and pancreas) that receive and process information from receptors • effectors, muscles or glands, which bring about responses which restore optimum levels.				
I can explain how the structure of the nervous system is adapted to its functions.				
The nervous system enables humans to react to their surroundings and to coordinate their behaviour.				
Information from receptors passes along cells (neurones) as electrical impulses to the central nervous system (CNS). The CNS is the brain and spinal cord. The CNS coordinates the response of effectors which may be muscles contracting or glands secreting hormones.				
stimulus → receptor → coordinator → effector → response				
I can explain how the various structures in a reflex arc – including the sensory neurone, synapse, relay neurone and motor neurone				

– relate to their function. I understand why reflex actions are important.				
Reflex actions are automatic and rapid; they do not involve the conscious part of the brain.				
I can extract and interpret data from graphs, charts and tables, about the functioning of the nervous system.				
I can translate information about reaction times between numerical and graphical forms.				
I have completed required practical 7: To plan and carry out an investigation into the effect of a factor on human reaction time.				
Higher Tier only: I am able to explain how these mechanisms lower or raise body temperature in a given context.				
I am able to describe the principles of hormonal coordination and control by the human endocrine system.				
The endocrine system is composed of glands which secrete chemicals called hormones directly into the bloodstream. The blood carries the hormone to a target organ where it produces an effect. Compared to the nervous system the effects are slower but act for longer.				
The pituitary gland in the brain is a 'master gland' which secretes several hormones into the blood in response to body conditions. These hormones in turn act on other glands to stimulate other hormones to be released to bring about effects.				
Students should be able to identify the position of the following on a diagram of the human body: • pituitary gland • pancreas • thyroid • adrenal gland • ovary • testes.				

Blood glucose concentration is monitored and controlled by the pancreas.				
If the blood glucose concentration is too high, the pancreas produces the hormone insulin that causes glucose to move from the blood into the cells. In liver and muscle cells excess glucose is converted to glycogen for storage.				
I am able to explain how insulin controls blood glucose (sugar) levels in the body.				
Type 1 diabetes is a disorder in which the pancreas fails to produce sufficient insulin. It is characterised by uncontrolled high blood glucose levels and is normally treated with insulin injections.				
In Type 2 diabetes the body cells no longer respond to insulin produced by the pancreas. A carbohydrate controlled diet and an exercise regime are common treatments. Obesity is a risk factor for Type 2 diabetes.				
I am able to compare Type 1 and Type 2 diabetes and explain how they can be treated.				
I am able to extract information and interpret data from graphs that show the effect of insulin in blood glucose levels in both people with diabetes and people without diabetes.				
Higher Tier only: If the blood glucose concentration is too low, the pancreas produces the hormone glucagon that causes glycogen to be converted into glucose and released into the blood.				
Higher Tier only: I am able to explain how glucagon interacts with insulin in a negative feedback cycle to control blood glucose (sugar) levels in the body.				
I am able to explain the effect on cells of osmotic changes in body fluids.				
Water leaves the body via the lungs during exhalation. Water, ions and urea are lost from the skin in sweat.				
There is no control over water, ion or urea loss by the lungs or skin.				

Excess water, ions and urea are removed via the kidneys in the urine.				
If body cells lose or gain too much water by osmosis they do not function efficiently.				
Higher Tier only: The digestion of proteins from the diet results in excess amino acids which need to be excreted safely. In the liver these amino acids are deaminated to form ammonia. Ammonia is toxic and so it is immediately converted to urea for safe excretion.				
Students should be able to describe the function of kidneys in maintaining the water balance of the body.				
The kidneys produce urine by filtration of the blood and selective reabsorption of useful substances such as glucose, some ions and water.				
(Knowledge of other parts of the urinary system, the structure of the kidney and the structure of a nephron is not required).				
I am able to translate tables and bar charts of glucose, ions and urea before and after filtration.				
Higher Tier only: Students should be able to describe the effect of ADH on the permeability of the kidney tubules.				
Higher Tier only: The water level in the body is controlled by the hormone ADH which acts on the kidney tubules. ADH is released by the pituitary gland when the blood is too concentrated and it causes more water to be reabsorbed back into the blood from the kidney tubules. This is controlled by negative feedback.				
People who suffer from kidney failure may be treated by organ transplant or by using kidney dialysis. I understand the basic principles of dialysis.				
Students should be able to describe the roles of hormones in human reproduction, including the menstrual cycle.				
During puberty reproductive hormones cause secondary sex characteristics to develop.				

Oestrogen is the main female reproductive hormone produced in the ovary. At puberty eggs begin to mature and one is released approximately every 28 days. This is called ovulation.				
Testosterone is the main male reproductive hormone produced by the testes and it stimulates sperm production.				
Several hormones are involved in the menstrual cycle of a woman. • Follicle stimulating hormone (FSH) causes maturation of an egg in the ovary. • Luteinising hormone (LH) stimulates the release of the egg. • Oestrogen and progesterone are involved in maintaining the uterus lining.				
Higher Tier only: I am able to explain the interactions of FSH, oestrogen, LH and progesterone, in the control of the menstrual cycle.				
Higher Tier only: Students should be able to extract and interpret data from graphs showing hormone levels during the menstrual cycle.				
I can evaluate the different hormonal and non-hormonal methods of contraception.				
Fertility can be controlled by a variety of hormonal and non-hormonal methods of contraception. These include: • oral contraceptives that contain hormones to inhibit FSH production so that no eggs mature • injection, implant or skin patch of slow release progesterone to inhibit the maturation and release of eggs for a number of months or years • barrier methods such as condoms and diaphragms which prevent the sperm reaching an egg • intrauterine devices which prevent the implantation of an embryo or release a hormone • spermicidal agents which kill or disable sperm • abstaining from intercourse when an egg may be in the oviduct				

• surgical methods of male and female sterilisation.				
Students should be able to explain the use of hormones in modern reproductive technologies to treat infertility. This includes giving FSH and LH in a 'fertility drug' to a woman. She may then become pregnant in the normal way.				
In Vitro Fertilisation (IVF) treatment. • IVF involves giving a mother FSH and LH to stimulate the maturation of several eggs. • The eggs are collected from the mother and fertilised by sperm from the father in the laboratory. • The fertilised eggs develop into embryos. • At the stage when they are tiny balls of cells, one or two embryos are inserted into the mother's uterus (womb).				
Although fertility treatment gives a woman the chance to have a baby of her own: • it is very emotionally and physically stressful • the success rates are not high • it can lead to multiple births which are a risk to both the babies and the mother.				
Higher Tier only: Students should be able to explain the roles of thyroxine and adrenaline in the body.				
Higher Tier only: Adrenaline is produced by the adrenal glands in times of fear or stress. It increases the heart rate and boosts the delivery of oxygen and glucose to the brain and muscles, preparing the body for 'flight or fight'.				
Higher Tier only: Thyroxine from the thyroid gland stimulates the basal metabolic rate. It plays an important role in growth and development.				
Higher Tier only: Thyroxine levels are controlled by negative feedback.				

PERSONALISED LEARNING CHECKLISTS

I am most confident with the following topic/topics:

I have struggled most with the following topic/topics:

	Red	Amber	Green	Revised Tick ☑
Area of Study: Inheritance, Variation and Evolution				
I understand that meiosis leads to non-identical cells being formed while mitosis leads to identical cells being formed.				
Sexual reproduction involves the joining (fusion) of male and female gametes: • sperm and egg cells in animals • pollen and egg cells in flowering plants.				
In sexual reproduction there is mixing of genetic information which leads to variety in the offspring. The formation of gametes involves meiosis.				
Asexual reproduction involves only one parent and no fusion of gametes. There is no mixing of genetic information. This leads to genetically identical offspring (clones). Only mitosis is involved.				
I am able to explain how meiosis halves the number of chromosomes in gametes and fertilisation restores the full number of chromosomes.				
Cells in reproductive organs divide by meiosis to form gametes. When a cell divides to form gametes: • copies of the genetic information are made • the cell divides twice to form four gametes, each with a single set of chromosomes • all gametes are genetically different from each other.				
Gametes join at fertilisation to restore the normal number of chromosomes. The new cell divides by mitosis. The number of cells increases. As the embryo develops cells differentiate.				
(Knowledge of the stages of meiosis is not required.)				

I can describe the structure of DNA and define genome.				
The genetic material in the nucleus of a cell is composed of a chemical called DNA. DNA is a polymer made up of two strands forming a double helix. The DNA is contained in structures called chromosomes.				
A gene is a small section of DNA on a chromosome. Each gene codes for a particular sequence of amino acids, to make a specific protein.				
The genome of an organism is the entire genetic material of that organism. The whole human genome has now been studied and this will have great importance for medicine in the future.				
I am able to discuss the importance of understanding the human genome. This is limited to the: • search for genes linked to different types of disease • understanding and treatment of inherited disorders • use in tracing human migration patterns from the past.				
I am able to explain the terms: • gamete • chromosome • gene • allele • dominant • recessive • homozygous • heterozygous • genotype • phenotype.				
Some characteristics are controlled by a single gene, such as: fur colour in mice; and red-green colour blindness in humans. Each gene may have different forms called alleles.				
The alleles present, or genotype, operate at a molecular level to develop characteristics that can be expressed as a phenotype.				

A dominant allele is always expressed, even if only one copy is present. A recessive allele is only expressed if two copies are present (therefore no dominant allele present).				
If the two alleles present are the same the organism is homozygous for that trait, but if the alleles are different they are heterozygous.				
Most characteristics are a result of multiple genes interacting, rather than a single gene.				
I understand the concept of probability in predicting the results of a single gene cross, but can recall that most phenotype features are the result of multiple genes rather than single gene inheritance.				
I am able to use direct proportion and simple ratios to express the outcome of a genetic cross.				
Students should be able to complete a Punnett square diagram and extract and interpret information from genetic crosses and family trees.				
(HT only) Students should be able to construct a genetic cross by Punnett square diagram and use it to make predictions using the theory of probability.				
Some disorders are inherited. These disorders are caused by the inheritance of certain alleles. • Polydactyly (having extra fingers or toes) is caused by a dominant allele. • Cystic fibrosis (a disorder of cell membranes) is caused by a recessive allele.				
I can make informed judgements about the economic, social and ethical issues concerning embryo screening, given appropriate information.				
Ordinary human body cells contain 23 pairs of chromosomes.				
22 pairs control characteristics only, but one of the pairs carries the genes that determine sex. • In females the sex chromosomes are the same (XX). • In males the chromosomes are different (XY).				

I am able to carry out a genetic cross to show sex inheritance.				
I understand and can use direct proportion and simple ratios in genetic crosses.				
I am able to describe simply how the genome and its interaction with the environment influence the development of the phenotype of an organism.				
Differences in the characteristics of individuals in a population is called variation and may be due to differences in: • the genes they have inherited (genetic causes) • the conditions in which they have developed (environmental causes) • a combination of genes and the environment.				
I am able to: • state that there is usually extensive genetic variation within a population of a species • recall that all variants arise from mutations and that: most have no effect on the phenotype; some influence phenotype; very few determine phenotype.				
Mutations occur continuously. Very rarely a mutation will lead to a new phenotype. If the new phenotype is suited to an environmental change it can lead to a relatively rapid change in the species.				
I am able to describe evolution as a change in the inherited characteristics of a population over time through a process of natural selection which may result in the formation of a new species.				
The theory of evolution by natural selection states that all species of living things have evolved from simple life forms that first developed more than three billion years ago.				
Students should be able to explain how evolution occurs through natural selection of variants that give rise to phenotypes best suited to their environment.				
If two populations of one species become so different in phenotype that they can no longer interbreed to produce fertile offspring they have formed two new species.				

I am able to explain the impact of selective breeding of food plants and domesticated animals.				
Selective breeding (artificial selection) is the process by which humans breed plants and animals for particular genetic characteristics. Humans have been doing this for thousands of years since they first bred food crops from wild plants and domesticated animals.				
Selective breeding involves choosing parents with the desired characteristic from a mixed population. They are bred together. From the offspring those with the desired characteristic are bred together. This continues over many generations until all the offspring show the desired characteristic.				
The characteristic can be chosen for usefulness or appearance: • Disease resistance in food crops. • Animals which produce more meat or milk. • Domestic dogs with a gentle nature. • Large or unusual flowers.				
Selective breeding can lead to 'inbreeding' where some breeds are particularly prone to disease or inherited defects.				
I am able to describe genetic engineering as a process which involves modifying the genome of an organism by introducing a gene from another organism to give a desired characteristic.				
Plant crops have been genetically engineered to be resistant to diseases or to produce bigger better fruits.				
Bacterial cells have been genetically engineered to produce useful substances such as human insulin to treat diabetes.				
Students should be able to explain the potential benefits and risks of genetic engineering in agriculture and in medicine and that some people have objections.				
In genetic engineering, genes from the chromosomes of humans and other organisms can be 'cut out' and transferred to cells of other organisms.				
Crops that have had their genes modified in this way are called genetically modified (GM) crops. GM crops include ones that are resistant to insect attack or to herbicides. GM crops generally show increased yields.				

Concerns about GM crops include the effect on populations of wild flowers and insects. Some people feel the effects of eating GM crops on human health have not been fully explored.				
Modern medical research is exploring the possibility of genetic modification to overcome some inherited disorders.				
Higher Tier only: I am able to describe the main steps in the process of genetic engineering.				
Higher Tier only: In genetic engineering: • enzymes are used to isolate the required gene; this gene is inserted into a vector, usually a bacterial plasmid or a virus • the vector is used to insert the gene into the required cells • genes are transferred to the cells of animals, plants or microorganisms at an early stage in their development so that they develop with desired characteristics.				
The theory of evolution by natural selection was only gradually accepted because: • the theory challenged the idea that God made all the animals and plants that live on Earth • there was insufficient evidence at the time the theory was published to convince many scientists • the mechanism of inheritance and variation was not known until 50 years after the theory was published.				
Students should be able to describe the evidence for evolution including fossils and antibiotic resistance in bacteria.				
The theory of evolution by natural selection is now widely accepted.				
Evidence for Darwin's theory is now available as it has been shown that characteristics are passed on to offspring in genes. There is further evidence in the fossil record and the knowledge of how resistance to antibiotics evolves in bacteria.				

Fossils are the 'remains' of organisms from millions of years ago, which are found in rocks.				
Fossils may be formed: • from parts of organisms that have not decayed because one or more of the conditions needed for decay are absent • when parts of the organism are replaced by minerals as they decay • as preserved traces of organisms, such as footprints, burrows and rootlet traces.				
Many early forms of life were soft-bodied, which means that they have left few traces behind. What traces there were have been mainly destroyed by geological activity. This is why scientists cannot be certain about how life began on Earth.				
We can learn from fossils how much or how little different organisms have changed as life developed on Earth.				
I am able to extract and interpret information from charts, graphs and tables such as evolutionary trees.				
Extinctions occur when there are no remaining individuals of a species still alive.				
Students should be able to describe factors which may contribute to the extinction of a species.				
Bacteria can evolve rapidly because they reproduce at a fast rate.				
Mutations of bacterial pathogens produce new strains. Some strains might be resistant to antibiotics, and so are not killed. They survive and reproduce, so the population of the resistant strain rises. The resistant strain will then spread because people are not immune to it and there is no effective treatment.				
MRSA is resistant to antibiotics.				
To reduce the rate of development of antibiotic resistant strains: • doctors should not prescribe antibiotics inappropriately, such as treating non-serious or viral infections • patients should complete their course of antibiotics so all bacteria are killed and none survive to mutate and form resistant strains • the agricultural use of antibiotics should be restricted.				

The development of new antibiotics is costly and slow. It is unlikely to keep up with the emergence of new resistant strains.				
Traditionally living things have been classified into groups depending on their structure and characteristics in a system developed by Carl Linnaeus.				
Linnaeus classified living things into kingdom, phylum, class, order, family, genus and species. Organisms are named by the binomial system of genus and species.				
Students should be able to use information given to show understanding of the Linnaean system.				
Students should be able to describe the impact of developments in biology on classification systems.				
As evidence of internal structures became more developed due to improvements in microscopes, and the understanding of biochemical processes progressed, new models of classification were proposed.				
Due to evidence available from chemical analysis there is now a 'three domain system' developed by Carl Woese. In this system organisms are divided into: • archaea (primitive bacteria usually living in extreme environments) • bacteria (true bacteria) • eukaryota (which includes protists, fungi, plants and animals).				
Evolutionary trees are a method used by scientists to show how they believe organisms are related. They use current classification data for living organisms and fossil data for extinct organisms.				

I am most confident with the following topic/topics:

I have struggled most with the following topic/topics:

PERSONALISED LEARNING CHECKLISTS

	Red	Amber	Green	Revised Tick ☑
Area of Study: Ecology				
I can recall what an ecosystem is				
I can describe which resources animals and plants compete for, and why they do this				
I can explain the terms 'interdependence' and 'stable community'				
I can name some abiotic and biotic factors that affect communities				
I can describe structural, behavioural and functional adaptations of organisms				
I know the definition of an 'extremophile' and can give an example.				
I can represent the feeding relationships within a community using a food chain and describe these relationships				
I can explain how and why ecologists use quadrats and transects				
I have done Required practical 7: measure the population size of a common species in a habitat. Use sampling to investigate the effect of one factor on distribution				
I can describe the processes involved in the water cycle				
I can describe the processes involved in the carbon cycle				
I can describe what biodiversity is, why it is important, and how human activities affect it				
I can describe the impact of human population growth and increased living standards on resource use and waste production				
I can explain how pollution can occur, and the impacts of pollution				
I can describe how humans reduce the amount of land available for other animals and plants				
I can explain the consequences of peat bog destruction				
I can describe what deforestation is and why it has occurred in tropical areas				
I can explain the consequences of deforestation				

I can describe how the composition of the atmosphere is changing, and the impact of this on global warming				
Describe some biological consequences of global warming				
I can describe both positive and negative human interactions in an ecosystem and explain their impact on biodiversity				
I can describe programmes that aim to reduce the negative effects of humans on ecosystems and biodiversity				

I am most confident with the following topic/topics:

I have struggled most with the following topic/topics: