Physics - Astronomy

	CORE KNOWLEDGE			
	PHYSICS	CHEMISTRY	BIOLOGY	
9A	EXCELLING			9A
9B	Explain why the speed of a planet changes as it moves around its orbit. Use data to derive the formula relating the force of gravity to masses and the distance between them.			9B
8A				8A
8B				8B
7A				7A
7B				7B
6A	SECURING			6A
6B	Obtain information from secondary sources to investigate the relationships in astronomical data.			6B
5A	Use a model to explain the changes in the seasons. Use a model to explain the pattern of light and dark at the poles.			5A
5B	Use a model to explain why the height of the Sun at noon and hours of daylight vary with latitude.			5B
4A	Use a model to explain why we have partial and total solar eclipses. Analyse the rotations and axes of other planets to predict annual changes.			4A
4B	Compare different theories for the origin of the Moon. Explain the effect of the tilt of the Earth's axis on the energy received from the Sun. Describe how gravity affects bodies in space. Describe how mass and distance affect the strength of gravity. Use gravitational field strength to calculate weights. Describe some ways in which astronomers can detect planets orbiting stars other than the Sun.			4B
3A	DEVELOPING			3A
3B	Describe differences in the seasons in terms of day length and the height of the Sun. Describe some ways of investigating the planets.			3B
2A	Explain how we see the Moon.			2A
2B	Explain the changes in day length and height of the sun in terms of the tilt of the Earth's axis. Use a model to explain why we see phases of the Moon.			2B
1A	Compare the geocentric and heliocentric models of the Solar System.			1A
1B	Describe the Milky Way. Explain that stars in a constellation only appear to be close to each other. Compare the relative sizes and distances of objects in space. Describe how gravitational effects were used to estimate the mass of the Earth. Describe the different shapes of galaxies and relate the view of the sky to a planet’s position in a galaxy. Describe the variables that affect an object's gravitational potential energy. Explain how technological developments have increased our knowledge of the Solar System. Explain why the heliocentric model is our current model of the Solar System. Explain why the weight of an object changes if taken to the Moon, but not its mass. Recall that planets and natural satellites are kept in orbit by gravity. State the meaning of: light year.			1B
P8	PRE-GCSE			P4
P7	Describe how the Earth, Moon and planets move. Describe the positions of the Earth and planets in the Solar System.			P3
P6	Recall the direction in which gravity acts. Recall the variables that affect the strength of gravity.			P2

P5	State the meaning of gravitational field and gravitational field strength State the meaning of: Sun, star, galaxy, Universe, constellation.	P1

Physics – Electricity and magnetism

	CORE KNOWLEDGE			
	PHYSICS	CHEMISTRY	BIOLOGY	
9A	EXCELLING			9A
9B	Explain how the motor effect is used in unfamiliar devices. Evaluate energy saving appliances or modifications.			9B
8A				8A
8B				8B
7A				7A
7B				7B
6A	SECURING			6A
6B	Analyse a given parallel circuit and say which components will be on or off with different combinations of switches closed.			6B
5A	Describe how a voltmeter is used. Describe how current and voltage behave in series and parallel circuits.			5A
5B	Describe how voltage and energy are linked. Describe how voltage varies in a parallel circuit.			5B
4A	Explain why a voltmeter is connected in parallel. Explain why the current increases when the voltage of the supply is increased.			4A
4B	Recall the differences between how current behaves in series and parallel circuits and describe and predict what the current is like at different points in a series circuit and parallel circuit. Describe how voltage is divided between the components in a series circuit. Evaluate a physical model for electric circuits on how well it explains data or observations. Use a model to explain the idea of voltage. Use their knowledge of switches and parallel circuits to devise circuits for specified purposes. Describe an electromagnet and the shape of its magnetic field. Describe how a wire carrying a current must be oriented in a magnetic field to produce a force. Describe how the strength of an electromagnet can be changed. Describe the shape of the magnetic field around a wire carrying a current. Explain how changing the size or direction of the current affects the magnetic field. Explain how electromagnets are used in relays Explain how electromagnets are used in simple applications. Use Fleming's left hand rule and the right hand grip rule. Describe the domain model and use it to explain various phenomena connected with magnets. Use ideas about the Earth's magnetic field to explain variation, dip and deviation. Describe how the resistance of a filament lamp changes with voltage. Explain how a variable resistor works. Plan an investigation into how the resistance of a wire changes with length or thickness. Explain why the resistance of a filament lamp increases with increasing voltage. Interpret a voltage–current graph for resistors of different values. Interpret a current-potential difference graph .... Use the formula relating voltage, current and resistance. Explain how the transfer of electrons results in the two materials gaining equal and opposite charges. Explain why a conducting object conductorcannot be given a charge of static electricity.			4B

	Recall and explain how a charge can be induced in an uncharged object and use this idea to explain familiar electrostatic phenomena. Use ideas about attraction and repulsion to explain electrostatic phenomena involving repulsion between like charges. Explain why power companies use the kWh as a measure of energy. Use data to consider cost efficiency by calculating payback times. Use the formula relating power, current and voltage.	
3A	DEVELOPING	3A
3B	Describe how changing the number or type of components in a circuit affects the current. Explain how switches and broken bulbs affect a circuit.	3B
2A	Explain how switches work to turn a circuit on or off.	2A
2B	Model circuits using simple circuit diagrams. Recall that current is not used up.	2B
1A	State what is meant by series circuit, parallel circuit.	1A
1B	State what is meant by: current. Use a model to describe how an electrical circuit works. Use the idea of a complete circuit to test whether different materials conduct electricity. Apply their knowledge of voltage, current and electrical safety to novel situations. Construct a circuit from instructions provided in the form of a circuit diagram. Describe a current as a flow of electrons. Describe and explain how adding more bulbs affects the brightness of bulbs in a circuit. Describe what the current is like at different points in a series circuit. Explain how switches can be used to control different parts of a parallel circuit. Explain why the lights in a house are wired in parallel. Recall how electrical cells work. Recall how the current changes when the voltage of the supply changes. State the units for voltage. Explain how a compass can be used together with maps for navigation. Describe the Earth's magnetic field and explain why a magnetic compass needle points north. Explain how a plotting compass can be used to show the shape and direction of a magnetic field. Describe the job that fuses do. Explain some safety precautions to be followed when using electricity. Identify electrical hazards in a scenario. Identify errors in the wiring of a plug. Recall how the different wires are connected in a plug. Explain how a fuse works. Describe how the resistance of a wire varies with its length and thickness. Describe the relationship between resistance and current. State what is meant by resistance and name its units. State what is meant by: voltage, resistance. Describe the effect of an electric field on electrically charged objects. Describe the kinds of materials that can and cannot be given a charge of static electricity. Recall how objects can be given a charge of static electricity, and describe some of its effects. Recall the two types of charges and their effects on each other. State what is meant by electric field, and recall the shape and direction of the electric field around a charged object. Describe the relationship between watts and joules/second. Explain how a domestic ring main is a form of parallel circuit. Explain why electricity is more convenient than other sources of energy, and classify some of its uses. Recall some advantages of low-energy appliances. Recall that electricity and mains gas are charged for on the basis of the energy transferred.	1B
P8	PRE-GCSE Identify common circuit components and their symbols.	P8

P7	Describe the effects of breaking or removing bulbs in a circuit.	P7
P6	Describe why a cell is needed in a circuit. Measure current and state its unit.	P6
P5	Recall materials that are conductors and insulators.	P5
P4	State the meaning of: conductor, insulator, complete circuit, ammeter, current. Describe the Earth's magnetic field and its effect on compass needles.	P4
P3	Describe the effect of the Earth's magnetic field on compass needles.	P3
P2	Describe the shape of the magnetic field between two bar magnets in different arrangements. Explain how to arrange two magnets so that they attract or repel each other.	P2
P1	Recall the direction of a magnet's magnetic field. Recall the shape and direction of a magnet's magnetic field, and its effect on magnetic materials and other magnets. State what is meant by a magnetic field and recall the shape of the field of a bar magnet. Recall some dangers of electricity. Recall some safety precautions to be followed when using electricity.	P1

Physics – Energy

	CORE KNOWLEDGE			
	PHYSICS	CHEMISTRY	BIOLOGY	
9A	EXCELLING			9A
9B	Explain some ways in which energy is transferred wastefully by mechanical processes. Recall and use the formula for calculating energy efficiency.			9B
8A	Compare conduction, convection, radiation and evaporation as methods of heat energy transfer.			8A
8B	Evaluate different ways of keeping something warm.			8B
7A	Recall and use the equation for gravitational potential energy.			7A
7B	Recall and use the equation for kinetic energy. Evaluate ways of increasing or decreasing energy transfer by conduction, convection, radiation and evaporation. Use data to evaluate methods of reducing carbon emissions. Describe how the average kinetic energy of the particles in a gas relates to its kelvin temperature.			7B
6A	SECURING			6A
6B	Define what efficiency means. Describe whether one machine is more efficient than another.			6B
5A	Explain how certain gases cause the greenhouse effect. Explain how the levels of greenhouse gases in the atmosphere can be prevented from increasing further.			5A
5B	State the meaning of efficiency and recall some advantages of efficient appliances.			5B
4A	State the meaning of: efficiency, climate change. Calculate energy efficiencies.			4A
4B	Explain how efficiency can be increased. [H] Explain some ways of reducing unwanted energy transfers in mechanical processes. Explain whether a machine is more efficient than another. Explain why the efficiency can never be greater than 100%. Use Sankey diagrams to compare appliances or processes. Describe energy transfer chains for given situations. Describe how different factors affect the gravitational potential energy stored in an object. Describe how different factors affect the kinetic energy stored in an object. Describe how energy is transferred in conduction, convection and radiation. Describe the effects of the thickness and thermal conductivity of the walls of a building on its rate of cooling. Explain, using examples, that energy is conserved. Identify useful and wasted energies. Interpret diagrams that represent energy transfers. Apply ideas about energy stores and transfers to complex situations. Apply the idea of different colours being good or poor emitters or absorbers. Apply the idea of thermal mass to homes. Compare conduction in thermal conductors and thermal insulators. Compare the effects of different rates of conduction in different materials Describe ways of reducing unwanted energy transfers using thermal insulation. Describe what happens to wasted energy in energy transfers. Explain how different ways of reducing energy transfer by heating work. Explain the causes and effects of wind chill.			4B

	Explain the process(es) in which energy is transferred by heating in a given situation. Represent energy transfers using diagrams. Use the formula relating power, energy and time (in W, J and s) Use the particle model of matter to explain energy transfers by conduction and convection. Compare the temperature rise of water when some fuels are burnt. Compare the temperature rise of water when some fuels are burnt. Describe advantages and disadvantages of different energy resources. Describe advantages and disadvantages of different renewable, energy resources. Explain how the Sun is the ultimate source of the energy used in renewable resources. Explain how the use of non-renewable energy resources is changing. Explain how the use of renewable energy resources is changing. Compare the advantages and disadvantages of non-renewable energy resources. Explain why we cannot use only renewable energy resources. Describe the factors that affect the rate of transfer of energy by heating. Describe the factors that determine the temperature of an object. Use the particle model of matter to explain energy transfer by evaporation from a surface.	
3A	DEVELOPING	3A
3B	Match Sankey diagrams to simple situations. Recall some effects of climate change.	3B
2A	Calculate the energy requirements for a particular person or activity.	2A
2B	Define the meaning of thermal conductivity. Describe the factors that affect an object's kinetic energy and gravitational potential energy.	2B
1A	Describe the ways in which energy can be transferred by heating.	1A
1B	Describe what power means, and the relationship between watts and joules/second. Explain the differing energy needs of people of different ages and activity levels. Explain why particular materials are used for given purposes. Explain why particular materials are used for given purposes. Give examples of energy being moved between different stores. Identify situations in which an energy transfer is taking place. Identify situations in which energy is stored. Identify the process(es) in which energy is transferred by heating in a given situation. Recall examples of common thermal conductors and insulators. Recall that heat can be transferred by conduction, radiation and convection. Recall the different ways in which energy can be stored. Recall the different ways in which energy can be transferred. Recall the law of conservation of energy. Recall ways of reducing energy transfer by conduction, convection and evaporation. List the non-renewable energy resources in use today. List the renewable energy resources in use today. Recall some substances that are used as sources of energy. Recall what power stations are used for. Describe the advantages and disadvantages of non-renewable energy resources. Describe the factors that make up a good fuel. Describe the source of energy for different renewable resources. Describe the ways in which the different energy resources are used. Describe what happens in a fuel cell. Explain the source of the energy in fuels. Recall examples of renewable and non-renewable fuels and their sources. State the meaning of: biomass/biofuel, fuel, renewable, non-renewable. State the meaning of: hydroelectricity, geothermal, solar energy, wind energy, tidal power. Suggest ways in which our use of fossil fuels/non-renewable fuels can be reduced. Convert between the kelvin and Celsius scales. Explain how internal energy and temperature are different. Identify the direction in which energy will be transferred in given circumstances. Recall that energy will be transferred by heating between materials at different temperatures.	1B

	Recall the effect of evaporation on the temperature of the remaining liquid, and recall ways of reducing energy transfers by evaporation.	
P8 - P1	PRE-GCSE Describe the factors that affect body mass. Recall the factors that affect the amount of energy needed in a person's diet. Recall some units for measuring temperature.	P8 - P1

Physics – Forces and motion

	CORE KNOWLEDGE			
	PHYSICS	CHEMISTRY	BIOLOGY	
9A	EXCELLING			9A
9B	Use scale drawings to find the resultant of forces in two dimensions. Calculate uniform accelerations from the gradients of velocity-time graphs.			9B
8A	Determine speed from the gradient of a distance-time graph.			8A
8B	Estimate the magnitudes of some everyday accelerations.			8B
7A	Give some examples of objects moving in circular paths and the type of centripetal force involved. [H]			7A
7B	Use the formula relating acceleration, velocity and distance. Use the formula relating acceleration, velocity and time. Use the formula relating force, mass and acceleration. Work out the direction of relative motion for objects not moving along the same line. Change the subject of the formula relating force, mass and acceleration. Determine the distance travelled from the area under a velocity-time graph. Calculate the resultant of forces. Describe how objects affect each other when they collide. [H] Distinguish between action–reaction pairs and balanced forces. Identify action–reaction pairs in familiar situations. Calculate the force needed to produce a change in momentum in a given time. Calculate the force needed to produce a change in momentum in a given time. Describe examples of momentum in collisions. Calculate the momentum of moving objects. Use knowledge of changes in momentum to estimate the forces involved in road collisions. [H] Use the idea of conservation of momentum to calculate velocities of objects after collisions. Use the idea that a force can be represented by two orthogonal forces. Explain how gears work using ideas about moments. Use the formula relating moment, force and perpendicular distance.			7B
6A	SECURING			6A
6B	Describe changes of speed shown on a distance-time graph. Describe what an acceleration is.			6B
5A	Explain how the distance travelled and the time taken affects the speed. Explain what relative speed means.			5A
5B	Explain why the maximum speed on a journey is usually greater than the mean speed. Interpret distance/time graphs (including recognising what the steepness of the line tells you).			5B
4A	List the factors that affect the acceleration of an object. Recall the acceleration in free fall.			4A
4B	Recall the formula relating acceleration, velocity and distance. Recall the formula relating acceleration, velocity and time. Recall the formula that relates the factors affecting acceleration Calculate speeds from the gradient of a distance–time graph. Calculate the relative speed between two objects moving along the same line. Describe circular motion at constant speed as a changing velocity and hence as an acceleration. [H]			4B

	Describe how speed can be measured in a school laboratory. Describe the force needed to keep an object moving in a circular path. [H] Explain what inertial mass means. [H] Interpret velocity-time graphs qualitatively. Recall and use equations relating distance, speed and time. Represent journeys on distance/time graphs. Represent journeys on velocity-time graphs. Define a resultant force. Describe the effect of a non-zero resultant force on moving and stationary objects. Explain the effects of balanced and unbalanced forces in a range of situations. Explain the effects of balanced and unbalanced forces in simple situations. Explain whether forces on an object are balanced or unbalanced. Explain why a vehicle needs a force from the engine to keep moving at a constant speed. Explain why vehicles or other moving objects have a top speed. Compare the way in which force meters and balances that compare masses work. Describe what Newton's Third Law says. Explain the difference between scalar and vector quantities. Explain the effects of balanced and unbalanced forces in unfamiliar situations. Recall the meaning of equilibrium situation. Use arrows to represent the direction and magnitude of forces. Describe the dangers caused by large decelerations. Describe the factors that affect the momentum of an object. [H] Explain the meaning of a 'large deceleration.' Explain why large decelerations cause dangers. Recall some typical forces involved in road collisions. [H] Explain applications of pressure in different situations. Use the formula relating force, pressure and area. Explain why a vehicle needs a force from the engine to keep moving at a constant speed. Draw lines of best fit on scatter graphs. Use and interpret the equation linking drag, density, speed and frontal area. Explain how levers are used in common devices. Identify the pivot, load and effort in Class 1 levers. Identify the pivot, load and effort in Class 2 and Class 3 levers. Explain why the actual mechanical advantage may not be the same as the theoretical value. Use ideas about conservation of energy when explaining how simple machines work. Use the formula relating work, force and distance moved. Work out the mechanical advantage of simple machines. Students analyse new situations involving springs. Describe how different factors affect stopping distances. Describe the factors that affect a driver's reaction time, including drugs and distractions. Describe how gears affect the force needed to move an object and the speed of movement. Describe the factors that affect the size of a moment. Recall that an object will balance if the moments are equal and opposite. State what is meant by a moment of a force and recall its units. Use the equation relating weight, mass and gravitational field strength. Define the terms: acceleration, force, momentum, energy. Describe the difference between displacement and distance. Describe the difference between velocity and speed. Explain the difference between a vector and a scalar quantity.	
3A	DEVELOPING	3A
3B	Describe the meaning of speed and mean speed. Recall typical speeds for walking, running, cycling and travelling by car.	3B
2A	Explain how a force has caused certain effects on an object.	2A
2B	Describe the effect of balanced forces on moving and stationary objects. Explain the effects of balanced forces in simple situations.	2B
1A		1A

1B	Identify the forces acting on moving and stationary objects, and the directions in which they act. State what is meant by: balanced forces, unbalanced forces. Describe how the pressure depends on force and area. Describe the effects of high or low pressure in simple situations. Recall some common units for measuring pressures. Recall that 1 Pa = 1 N/m2. State what is meant by: pressure. Describe how drag changes with speed. Describe how drag changes with speed. Describe how friction forces affect movement. Describe some ways in which friction can be changed. Describe the causes of air and water resistance. Describe the ways in which the size of drag forces can be changed. Identify simple situations in which friction is helpful or not helpful. Recall some effects of frictional forces. Explain some ways in which friction can be changed. Suggest how and why friction has been reduced or increased in unfamiliar situations. Describe how a ramp or a simple pulley system can reduce the force needed to lift an object. Describe how a simple lever can magnify force or distance. Describe the factors that affect the total work done. Describe the relationship between work done and energy transferred. Recall that if the force needed is decreased the distance it moves is increased. Describe how the extension of a spring depends on the force applied. Explain what is meant by elastic limit, limit of proportionality Describe how human reaction times are measured. Describe the link between stopping distance, thinking distance and braking distance. Recall the factors that affect stopping distances Recall typical human reaction times. Describe how to use a force meter and a newton meter. Describe how weight is measured. Describe the difference between mass and weight. Describe the difference between mass and weight. Identify situations and places where different forces are likely to be found. List the factors that determine the weight of an object. Name different forces, such as weight, friction, upthrust, drag. Recall the equation for calculating weight. State what is meant by: mass, weight. Describe how the weight of an object is affected by gravitational field strength. Explain the difference between mass and weight.	1B
P8	PRE-GCSE	P8
P7	Recall the effects of forces on an object. Recall the different types of resistive forces and describe how they affect movement.	P7
P6	State what is meant by friction.	P6
P5	Describe what a force is. Recall the direction in which gravity acts.	P5
P4	Recall the names of simple forces.	P4
P3	Recall the unit for measuring forces. State what is meant by: contact force, non-contact force.	P3
P2	State what is meant by: friction, air resistance, water resistance.	P2
P1	Classify forces as contact and non-contact. State what is meant by extension, compress, stretch, elastic, plastic.	P1

Physics – Light and sound

	CORE KNOWLEDGE			
	PHYSICS	CHEMISTRY	BIOLOGY	
9A	EXCELLING			9A
9B	Compare quantitatively how the intensity of sound waves and waves on water decrease with increasing distance from the source.			9B
8A	Describe some differences in the ways that different parts of the electromagnetic spectrum are refracted and reflected.			8A
8B	Use the equation relating wave speed, distance and time.			8B
7A	Use the equation relating wave speed, frequency and wavelength.			7A
7B	Evaluate the use of a slinky as a model for sound waves.			7B
6A	SECURING			6A
6B	Describe how radio waves are produced and detected by electrical circuits. Describe some uses of gamma radiation.			6B
5A	Describe some uses of microwaves. Describe some uses of radio waves.			5A
5B	Describe some uses of ultraviolet radiation. Describe some uses of X-rays.			5B
4A	Describe the differences between longitudinal and transverse waves. Describe the harmful effects of microwave and infrared radiation.			4A
4B	Describe the harmful effects of ultraviolet radiation, X-rays and gamma rays. Describes some uses of infrared. Model transverse and longitudinal waves. Recall the equation relating wave speed, distance and time. Recall the equation relating wave speed, frequency and wavelength Compare longitudinal and transverse waves. Describe an effect caused by the different velocities of electromagnetic waves in different substances. Describe how long wavelength electromagnetic waves are affected by different substances. [H] Describe how short wavelength electromagnetic waves are affected by different substances. [H] Describe how the potential danger of electromagnetic radiation depends on its frequency. Describe how to measure the velocity of waves on the surface of water. Describe some differences in the ways that different parts of the electromagnetic spectrum are absorbed and transmitted. Explain how a change in wave speed can cause a change in direction. [H] Explain the effects caused by long wavelength electromagnetic waves travelling at different velocities in different substances. [H] Explain the effects caused by short wavelength electromagnetic waves travelling at different velocities in different substances. [H] Recall that absorption of radiation can cause changes in atoms and their nuclei.			4B

	Recall the nature of radiation produced by changes in atoms and their nuclei. Describe some examples of the absorption of energy transferred by light leading to chemical or electrical effects (in the retina or in a camera sensor). Describe the causes and effects of long-sight and short-sight. Describe the way our eyes detect different colours. Identify which parts of the eye cause refraction of light and describe how light is focused on the retina. Describe similarities and differences between cameras and eyes. Explain how different types of lens are used to correct long-sight and short-sight. Describe the characteristics of the image formed by a plane mirror and use ray diagrams to explain its formation. Describe the effects of concave lenses on parallel beams of light. Describe the effects of convex lenses on parallel beams of light. Draw ray diagrams to describe the refraction of light as it passes into and out of different media. Explain some effects of the refraction of light (explanations in terms of changing speeds are not expected). Explain why refraction occurs. Use a model to explain the effect of various factors on shadow size. Use a ray diagram to explain how shadows are formed and to explain image formation in pinhole cameras. Use ray diagrams to explain image formation in pinhole cameras Use ray diagrams to explain some of the features of images in periscopes. Use ray diagrams to model and explain the effect of hole size on the image formed by a pinhole camera. Use the ray model of light to explain how a periscope works. Use the ray model of light to explain how we see things that are not sources of light. Relate the power of a lens to its shape. Calculate depth or distance from time and velocity of ultrasound. Calculate the speed of sound from data about echoes. Discuss the ethical aspects of animal experiments. The progress descriptor on the right is completely out of place here - both the prerequisite and booster are biology and nothing to do with physics. I can't see why this is here. Describe how to measure the velocity of sound in air. Explain why sounds are fainter further from the source in terms of the waves spreading out. Explain why the intensity of sound decreases with increasing distance from a source in terms of the energy dissipating. Explain why the intensity of sound waves decreases with increasing distance from a source in terms of the waves spreading out. Describe how secondary colours or white light can be made from primary colours of light. Explain how filters can be used to make coloured light. Explain why coloured objects appear coloured. Explain how paints of different colours can be made by colour subtraction. Explain why objects look different in light of different colours.	
3A	DEVELOPING	3A
3B	Give examples of transverse and longitudinal waves.	3B
2A	Describe how the direction of a wave changes when it goes from one material to another. Describe how the waves in the electromagnetic spectrum are grouped.	2A
2B	Describe the common features of electromagnetic waves.	2B
1A	Describe the transfer of energy by electromagnetic waves. Describe waves using the terms frequency, wavelength, period and velocity.	1A
1B	Recall examples of electromagnetic waves. Recall that waves transfer energy and information but do not transfer matter. Recall the groups of waves in the electromagnetic sprectrum in order. Recall what sort of waves sound waves and waves on water are. State the meaning of superposition, and give examples.	1B

	State the meaning of: transverse wave, longitudinal wave. Use the terms frequency, amplitude, speed to describe waves. Identify the parts of a camera and state their functions. Describe the range of electromagnetic waves that our eyes can detect Identify the parts of the eye (including rods and cones) and state their functions. Describe the difference between even reflection and scattering, and recall the law of reflection. State the meaning of convex mirror, concave mirror. State the meaning of: diffuse, specular, incident ray, reflected ray. State the meaning of: reflect, scatter, transmit, absorb, reflection, angle of incidence, angle of reflection, normal, plane mirror. Describe some uses of lenses Describe some uses of total internal reflection such as in optical fibres and in binoculars. Describe what refraction is. Recall that light, sound travels at different speeds in different materials. Represent the path of light as straight lines with arrows on diagrams and describe how you can demonstrate that light travels in straight lines. State the meaning of focal length, focus, and principal axis. State the meaning of transverse wave and recall that light waves are transverse waves. State the meaning of: refraction, angle of refraction, refracted ray, convex lens, converging lens State the meaning of: total internal reflection, critical angle. Use ray diagrams to explain the law of reflection, and to describe the differences in light reflected from smooth and from rough surfaces. Use the ray model of light to explain how we see things that are not sources of light and to explain how shadows are formed. Compare how sounds travel through different materials. Describe how fast sound is transmitted by solids, liquids, gases. Describe how to make different sources of sound louder or quieter, or make sounds of different pitches Describe some uses of ultrasound. Describe the functions of the parts of the ear. Name the parts of the ear. Recall that different animals have different hearing ranges. Relate the size of a source of sound to the pitch of the sound it produces. Relate the volume/intensity of a sound to the size of the vibrations producing it. State the meaning of pitch, volume, intensity, frequency, amplitude. State the meaning of: ultrasound, infrasound. Apply knowledge of sound to new contexts and situations. Describe how microphones convert sound into electrical signals. Evaluate different materials used for soundproofing/ sound insulation. Explain how animals can detect the direction from which a sound is coming. Explain how human hearing can be damaged by sound. Explain how sonar and echolocation work. Use a model incorporating the idea of vibrations to explain how sound travels through different materials. Use a model incorporating the idea of vibrations to explain how sound travels through different materials. Use quantitative data to compare the speed of sound in solids, liquids, gases Describe how to split light into different colours using a prism and correctly use the terms: spectrum, dispersion. Recall that filters can be used to make coloured light. Recall that the appearance of an object depends on the colour of light shining on it. Recall the colours of the visible spectrum, in order.	
P8	PRE-GCSE Recall the primary colours for light.	P8

P7	Describe some uses of plane mirrors. Recall that light travels in straight lines and can pass through empty space. Recall that sound does not travel as quickly as light, and needs a medium through which to travel but light does not. State the meaning of: opaque, translucent, transparent, reflect, scatter, transmit, absorb. Describe how a sound changes as you get further from the source. Recall that human hearing can be damaged by loud sounds. Recall that sound travels through different materials by vibrations, and needs a medium. Recall that sounds are made by vibrations. Recall that sounds can be detected by sound meters and microphones. Recall the units for loudness. State the meaning of: absorb, transmit, reflect.	P7
P6		P6
P5		P5
P4		P4
P3		P3
P2		P2
P1		P1

Physics – Particle theory of matter

	CORE KNOWLEDGE			
	PHYSICS	CHEMISTRY	BIOLOGY	
9A	EXCELLING Explain what happens to particles and temperature during changes of state, in terms of energy and forces. Compare densities of materials and link them to the mass of the particles and how closely they pack together.			9A
9B				9B
8A				8A
8B				8B
7A				7A
7B				7B
6A	SECURING Describe the effect of physical weathering on rocks and explain it in terms of expansion and contraction. Describe the ways in which the volume and density changes during the water-ice transition are different to other materials. Explain why ice is less dense than water. Use the idea of latent heats when discussing changes of state. Describe how the volumes and densities of substances change at different temperatures. Explain how density depends on mass and volume. Identify some consequences of changing the temperature of objects or substances, such as structures expanding or contracting. Use the particle model of matter/particle theory to explain density changes at different temperatures. Explain that the upthrust depends on the weight of fluid displaced. Use ideas about density changes to explain how a hot air balloon flies/how the depth of a submarine is controlled. Use ideas about displacement to explain phenomena connected with floating and sinking. Work out if something will float. Use the particle model of matter to describe the causes of pressure in fluids. Apply ideas about pressure to barometers and altimeters. Explain some effects caused by air or water pressure using ideas about forces. Explain why pressure in a fluid increases with depth. Use the equation relating pressure to the depth and density of a liquid. Use the particle model of matter to explain atmospheric pressure in different situations. Identify a solid, liquid or gas from the arrangement of particles. Use quantitative information on expansion and contraction.			6A
6B				6B
5A				5A
5B				5B
4A				4A
4B				4B

	Use the particle model of matter to explain expansion and contraction at different temperatures. Use the particle model of matter to explain the properties of solids, liquids and gases, and how their movement changes with temperature. Use the particle model of matter to explain why gas pressure changes with temperature, number of particles and volume.	
3A	DEVELOPING	3A
3B	Explain how chemical changes are different to physical changes, and recall some examples of each type.	3B
2A	Recall that a change of state of a pure substance takes place at a constant temperature.	2A
2B	Recall that ice is less dense than water. State what is meant by density, and recall its units and the factors that affect it.	2B
1A	Explain why an object floats.	1A
1B	Recall the factors that affect the amount of upthrust on an object. Describe how pressure in a fluid increases with depth. Recall that pressure in a fluid changes with depth. State what is meant by gas pressure and recall some of its effects. Describe the three states of matter in terms of shape, volume and compressibility. Draw the arrangement of particles in a solid, liquid and gas. Recognise that all matter consists of particles. State what is meant by diffusion, contraction, expansion.	1B
P8	PRE-GCSE	P8
P7	State what is meant by upthrust.	P7
P6		P6
P5		P5
P4		P4
P3		P3
P2		P2
P1		P1