THE BECKET SCHOOL
A CATHOLIC VOLUNTARY ACADEMY

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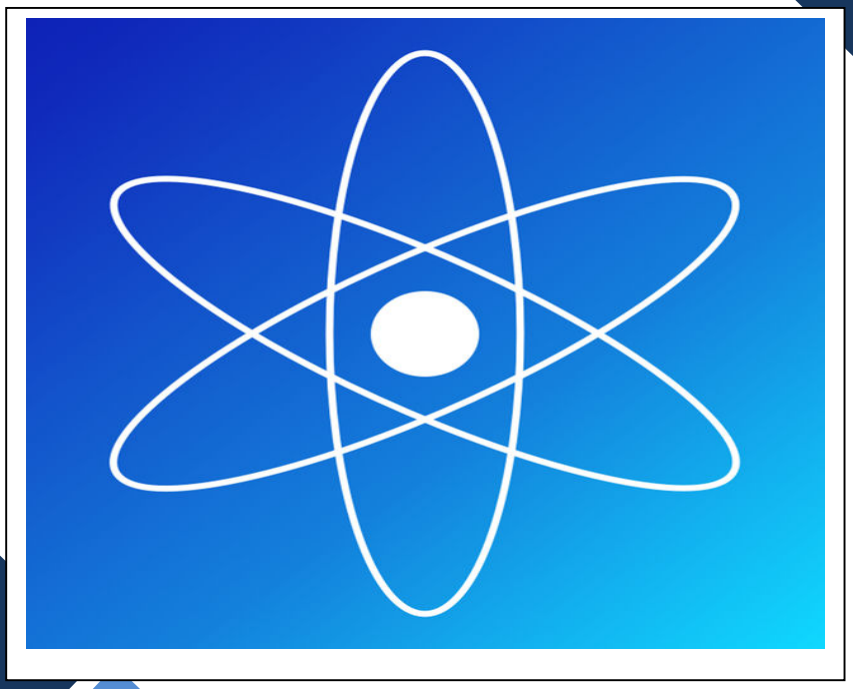
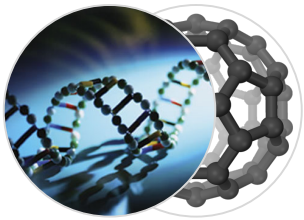
PERSONAL LEARNER CHECKLIST KS4

GCSE Physics (Separate)



Parent Curriculum Information: Science



Subject: Separate (Triple) Science **Year Group:** 11

Subject Leader: Mr Bradley **Email address:** g.bradley@becketonline.co.uk

What specification (syllabus) is being taught?	AQA Biology AQA Chemistry AQA Physics
What are the key topics and themes? When will they be taught? How will my son or daughter be assessed? When do these assessments take place?	• Learners following the Separate Science pathway will sit three GCSEs, one each in Biology, Chemistry and Physics • Each of these GCSEs offer the potential to sit Higher (grade 9 to 4) or Foundation (grade 5 to 1) papers • There are six examinations in the summer of Year 11: two for Biology, two for Chemistry and two for Physics. Each exam will last 1 hour and 45 minutes and is worth 100 marks. The "Required Practicals" taught during lesson time will also be assessed on the exams **Biology Paper 1** - Cell Biology; Organisation; Infection and response; and Bioenergetics **Biology Paper 2** - Homeostasis and response; Inheritance, variation and evolution; and Ecology **Chemistry Paper 1** - Atomic structure and the periodic table; Bonding, structure, and the properties of matter; Quantitative chemistry; Chemical changes; and Energy changes **Chemistry Paper 2** - The rate and extent of chemical change; Organic chemistry; Chemical analysis; Chemistry of the atmosphere; and Using resources **Physics Paper 1** - Energy; Electricity; Particle model of matter; and Atomic structure **Physics Paper 2** - Forces; Waves; Magnetism and electromagnetism; and Space Physics
What can my son or daughter do for revision at home? What materials are provided or available online?	- Use a CGP Physics Science revision guide that they can purchase from the school - Make use of their classwork booklets - Make use of Seneca, through the following link: www.senecalearning.com - Make use of Quizlet, through the following link: www.quizlet.com - Access BBC Bitesize, through the following link: www.bbc.co.uk/education/subjects/zrkw2hv - Attempt past papers by following this procedure: www.aqa.org.uk/exams-administration/exams-guidance/find-past-papers-and-mark-schemes -Access Physics and Maths tutor, through the following link: https://www.physicsandmathstutor.com/ This contains revision materials for ALL sciences not just physics

Review P4.1.1 Energy

Can you…?			
P4.1.1 Energy changes in a system and the ways energy is stored before and after a change			
Define what a system is			
Recall all energy stores			
Describe all energy changes for common systems			
Understand the difference between conduction, convection and radiation			
Describe with examples system changes that involve 'wasted' energy			
Understand what thermal conductivity of materials is			
Draw and use a Sankey diagram			
Recall and describe Required Practical 2 – Thermal Insulation (Physics only)			
P4.1.1.2 Efficiency			
Calculate efficiency and percentage efficiency of energy systems			
Describe ways to increase the efficiency of an energy transfer (HT only)			
P4.1.3 Nation and global energy resources			
Recall the energy resources available for use in Earth			
Understand the difference between renewable and non-renewable energy resources			
Recall uses of energy resources			
Compare energy resources, knowing advantages and disadvantages for each			
Recall reliability of energy resources			
Describe the environmental impact of each energy resource			
Explain patterns and trends in the use of energy resources			
P4.1.1.2 Changes in energy			
Recall and use the equation: **Kinetic energy = ½ x mass x (velocity)^2**			
Use the equation: **Elastic potential energy = ½ x spring constant x (extension)^2**			
Recall and use the equation: **Gravitational potential energy = mass x gravitational field strength x height**			
Recall and use the equation: **Work done = force x distance moved**			
P4.1.1.4 Power			
Recall and use the equation: **Power = energy transferred / time**			
Recall and use the equation: **Power = work done / time**			

Review 4.2 Electricity

Can you…?			
P4.2.1 - Current, Potential Difference and Resistance			
Know the standard circuit symbols			
Be able to draw and interpret circuit diagrams			
Know that a complete circuit and a source of potential difference are needed for electrical charge to flow			
Know that a current is a flow of charge			
Know and be able to use the formula: **charge = current x time**			
Know that the current is the same at any point in a closed loop			
Recognise that the current through a component depends both on its resistance and the potential difference across it			
Know and be able to use the formula: **potential difference = current x resistance**			
Required Practical 3: Factors affecting the resistance of circuits Resistance of different lengths of wire and resistors in series and parallel			
Explain that for some resistors the value of resistance stays constant but that in others it can change as current changes			
Know that the resistance of an Ohmic conductor is directly proportional to the potential difference across it. This means that the resistance remains constant			
Understand that the resistance of a filament lamp increases as the current increases because it heats up			
Know that a diode only allows current to flow through it in one direction			
Know that the resistance of a thermistor decreases as temperature increases			
Know that the resistance of an LDR decreases as light intensity increases			
Be able to draw a circuit to measure the resistance of a component by measuring the current through it and the potential difference across it			
Required Practical 4: Measuring I-V characteristics Plot current v potential difference graphs for a resistor, a lamp and a diode			
P4.2.2 - Series and Parallel Circuits			
Know that components can be connected in series or in parallel			
Understand that, in series, the current is the same through each component			
Understand that, in series, the potential difference of the power supply is shared between the components			
Know that the total resistance of components in series is: $R_{total} = R_1 + R_2$			
Understand that, in parallel, the potential difference across each component is the same			
Understand that, in parallel, the current from the power supply is split up through the different components			
Recognise that the resistance of two resistors connected in parallel is less than the resistance of the smallest individual resistor			
Be able to describe the difference between series and parallel circuits			
P4.2.3 – Domestic uses and safety			
Know mains electricity is an a.c.supply – 50 Hz and about 230V			
Be able to explain the difference between direct and alternating potential difference			
Know most electrical appliances are connected to the mains using 3-core cable			
Know that brown is live, blue is neutral, yellow/green is earth			
Know that the live wire carries the alternating pd from the supply			
Know that the neutral wire completes the circuit			
Know that the earth wire is a safety wire to stop the appliance becoming live			
Know that the earth wire only carries a current if there is a fault			

P4.2.4 – Energy transfers			
Know that power transfer in a circuit is related to the potential difference and the current **Power = potential difference x current (P = V I)**			
Know that power can also be calculated using: **Power = (current)^2 x resistance ($P = I^2R$)**			
Know the correct units for each of the quantities			
Know that everyday electrical appliances cause energy transfers			
Recognise that the amount of energy an appliance transfers depends on how long it is switched on for and the power of the appliance			
Be able to describe the energy transfers in electrical appliances			
Recognise that work is done when charge flows in a circuit			
Know that the amount of energy transferred by electrical work can be calculated using the equation**:** **energy transferred = power x time (E = P t)**			
Know that energy can also be calculated using: **energy transferred = charge x potential difference (E = Q V)**			
Be able to explain how the power in a circuit device is related to the potential difference across it, the current through it and the energy transferred in a given time.			
Be able to describe, with examples, the relationship between the power ratings for domestic appliances and the changes in stored energy when they are in use.			
Know that the National Grid is a system of cables and transformers linking power stations to consumers			
Know that step-up transformers increase the voltage and step-down transformers decrease the voltage			
Be able to explain why the National Grid system is an efficient way to transfer energy			
P4.2.5 – Static Electricity (Physics only)			
Know that insulating materials can become charges due to friction when rubbed against each other			
Understand that insulators become charges due to the transfer of electrons			
Be able to explain that the material that gains electrons becomes negatively charged			
Be able to explain that the material that loses electrons becomes positively charged			
Understand that objects with the same charge repel			
Understand that objects with opposite charge attract			
Know that a charged object creates an electric field around itself and that this fiend is strongest closer to the object			
Know that another charged object placed in the field experiences a force			
Be able to draw the electric field around an isolated charged sphere			

Review 4.3 Particle Model of Matter

Can you…?			
P4.3.1 – Changes of state and the particle model			
Know that density is defined by the equation: **density = mass / volume**			
Be able to draw diagrams to model the differences between solids, liquids and gases			
Be able to explain differences in density between the different states of matter in terms of the arrangement of atoms or molecules			
Required Practical 5: Measuring density Measuring density of regular shaped objects, irregular shaped objects and liquids			
P4.3.2 – Internal Energy and Energy transfers			
Be able to describe changes of state and physical and chemical changes			
Understand that internal energy is the total kinetic energy and potential energy of the particles that make up a system			
Know that heating increases the internal energy of a system and that this either raises the temperature of the system or produces a change of state			
Know that, if the temperature of a system increases, this increase in temperature depends on the energy supplied, the mass of the substance and the material it is made from			
Be able to use the equation: **change in thermal energy = mass x specific heat capacity x temperature change**			
Know that the specific heat capacity is the energy needed to heat up 1 kg of a substance by 1 ^{o}C			
Know that the energy needed for a substance to change state is called latent heat			
Know that specific latent heat is the energy needed to change the state of 1 kg of a substance			
Be able to use the equation: **energy for a change of state = mass x specific latent heat**			
Be able to interpret heating and cooling graphs			
P4.3.3 – Particle Model and Pressure			
Know that particles in a gas are in constant random motion and the kinetic energy of molecules is related to temperature			
Recognise that, if volume doesn't change, increasing temperature of a gas increases its pressure			
Physics only			
Understand that pressure in gases is caused by particles colliding with the walls of the container			
Be able to explain how a change in volume can lead to a change in pressure			
Be able to apply the equation: **pressure x volume = constant**			
Higher Tier Physics only			
Know that work is the transfer of energy by a force			
Know that doing work on a gas increases its internal energy			
Be able to explain why doing work on a gas can increase its temperature			

Review P4.4 Atomic Structure

Can you…?			
P4.1.1 The structure of an atom			
Recall the basic structure of an atom			
Recall the name of each particle in an atom, their charge and mass			
Understand that most of the mass of an atom is in the nucleus			
Recall the radius of an atom is very small (1×10^{-10} meters)			
Recall electron arrangements in shells at different distances to the nucleus			
Recall the number of protons is equal to the number of electrons in the nucleus, therefore atoms have no overall charge			
Define the mass number			
Define the atomic number			
Understand and use the following notation: $^{23}_{11}Na$			
Define an isotope			
Relate difference between isotopes to differences in their identities, charges and masses			
P4.4.1.3 The development of the model of the atom			
Explain new experimental evidence may lead to a scientific model being changed or replaced			
Recall the history and development of the structure of the atom			
Describe the scattering experiment and how it lead to change in the the atomic model			
Describe the difference between the plum pudding model and nuclear model of the atom			
P4.4.3.1 Background radiation			
Understand what background radiation is and where it comes from, both man-made and natural sources			
Understand that background radiation may be affected by location or occupation			
Radiation dose is measured in Sieverts (Sv)			
1000 millisieverts (mSv) = I Sievert (Sv)			

P4.2.2.1 Radioactive decay and nuclear radiation			
Define radioactive decay is and know that it is random			
Define activity and know the unit is the Becquerel (Bq)			
Know the count rate is the number of decays recorded each second by a detector			
Recall what can be emitted by nuclear radiation (α, β, γ, n)			
Recall what makes up an alpha (α) particle			
Recall what makes up a beta (β) particle			
Recall what makes up a gamma (γ) ray			
Describe the properties of α, β and γ including penetration of materials, range in air and ionising power			
Apply knowledge of α, β and γ to evaluate which is the best source to use in different situations			
P4.4.2.2 Nuclear equations			
In a nuclear equation an alpha particle may be represented by the symbol: $${}^{4}_{2}\mathrm{He}$$			
In a nuclear equation a beta particle may be represented by the symbol: $${}^{0}_{-1}\mathrm{e}$$			
Understand how to complete nuclear equations for alpha decay such as: $${}^{219}_{86}\mathrm{radon} \longrightarrow {}^{215}_{84}\mathrm{polonium} + {}^{4}_{2}\mathrm{He}$$ by balancing the mass numbers and/or atomic numbers on either side of the arrow			
Understand how to complete nuclear equations for beta decay such as: $${}^{14}_{6}\mathrm{carbon} \longrightarrow {}^{14}_{7}\mathrm{nitrogen} + {}^{0}_{-1}\mathrm{e}$$ by balancing the mass numbers and/or atomic numbers on either side of the arrow			
Know the emission of a gamma ray does not affect the element in any way			
P4.4.2.3 Half-lives and the random nature of decay			
Understand what half-life of an radioactive isotope is			
Explain what a half-life is and how it is related to the random nature of decay			
Determine the half-life of a radioactive isotope from given information			
Calculate amount of radioactive source left after a given number of half-lives and give this answer as a ratio (HT only)			

P4.4.3.3 Uses of nuclear radiation			
Describe and evaluate the uses of radiations in exploration of internal organise and the control and destruction of unwanted tissue			
When given data and consequences, evaluate the perceived risks of using nuclear radiation			
P4.4.2.4 Radioactive contamination			
Define irradiation and contamination and know the hazard form each			
Explain how the type of radiation emitted effects the level of hazard			
Compare hazards associated with contamination and irradiation			
Know suitable precautions that must be taken to protect against any hazard using radioactive sources may produce			
Understand the importance of studies that report the effects of radiation on humans			
Understand the importance of publishing scientific papers and peer review of these papers			
P4.4.4.1 Nuclear fission			
Understand nuclear fission (Physics only)			
Know spontaneous fission is rare, the unstable nucleus must first absorb an atom (Physics only)			
Describe each stage of fission (Physics only)			
Know all the fission products have kinetic energy (Physics only)			
Understand how a chain reaction is produced (Physics only)			
Explain how a chain reaction can be controlled and what happens when a chain reaction is not controlled (Physics only)			
Draw/interpret diagrams representing nuclear fission and how chain reaction might occur (Physics only)			
P4.4.4.2 Nuclear fusion			
Explain what nuclear fusion is (Physics only)			
Understand that in the process of fusion some mass may be converted into the energy of radiation (Physics only)			

Review 4.5 Forces parts 1,2,3

Can you…?			
P4.5.1 – Forces and their interactions			
Know that scalar quantities have magnitude only			
Know that vector quantities have both magnitude and direction			
Recognise that a vector quantity can be represented by an arrow giving the length and direction			
Know that a force is a push or a pull that acts on an object and that they can be either contact forces or non-contact forces			
Be able to give examples of contact and non-contact forces and know that force is a vector quantity			
Know that weight is the force acting on an object due to gravity			
Know that the weight of an object depends on the gravitational field strength at that point			
Know that the weight of an object can be calculated using the equation: **weight = mass x gravitational field strength** **W = m g**			
Know that gravitational field strength, g, is measured in newtons			
Know that the weight of an object is directly proportional to the mass of the object			
Know that weight is measured using a newton-meter			
Know that the resultant force acting on an object is the single force that has the same effect as all the other forces together			
Be able to calculate the resultant of two forces acting in the same line			
Be able to describe the forces acting on an object (HT)			
Be able to use free body force diagrams (HT)			
Know that 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 (HT)			
Be able to use vector diagrams to illustrate resolution of forces (HT)			
P4.5.2 – Work done and energy transfer			
Know that work is done when a force causes an object to move			
Know that the work done by a force can be calculated using the equation: **work done = force x distance moved** **W = F s**			
Know that work done is measured in joules			
Understand that one joule of work is done when a force of one newton causes a displacement of one metre			
Be able to describe the energy transfer involved when work is done			
Know that work done against frictional forces acting on the object causes a rise in the temperature of the object			
P4.5.3 – Forces and elasticity			
Be able to give examples of the forces involved in stretching, bending or compressing an object			
Be able to explain why, to change the shape of an object, more than one force has to be applied			
Be able to explain the difference between elastic deformation and inelastic deformation caused by stretching forces			
Know that the extension of an elastic object, such as a spring, is directly proportional to the force applied			
Know that **force = spring constant x extension** **F = k e**			
Know that a force that stretches (or compresses) a spring does work and elastic potential energy is stored in the spring			
Be able to describe the difference between a linear and non-linear relationships between force and extension			
Be able to calculate spring constants from straight line graphs			
Be able to calculate work done stretching an object using the equation: **elastic potential energy = 0.5 x spring constant x (extension)^2** **Ee = ½ k e^2**			
Required Practical 6: Investigate the relationship between force and extension for a spring Calculating spring constant from a graph			

P4.5.6 – Forces and motion			
Know that distance is how far an object moves and is a scalar quantity			
Know that displacement is a vector and is how far an object moves in a certain direction			
Know that speed is a scalar quantity			
Know typical speeds including walking (1.5 m/s), running (3 m/s), cycling (6 m/s)			
Know the speed of sound in air is 330 m/s			
Be able to calculate the distance moved by an object at constant speed using the equation: **distance travelled = speed x time** **s = v t**			
Be able to calculate average speed for non-uniform motion			
Know that velocity is a vector quantity and is the speed in a certain direction			
Be able to explain that motion in a circle involves constant speed but changing velocity because direction is changing (HT)			
Know that the distance travelled by an object can be represented by a distance-time graph			
Know that the speed can be calculated from the gradient of a distance-time graph			
Know that, if the object is accelerating the speed can be calculated from a tangent to the distance-time graph (HT)			
Know that acceleration of an object can be calculated using the equation: **acceleration = change in velocity / time taken** **a = Δv / t**			
Know that an object that slows down is decelerating			
Know that the acceleration of an object can be calculated from the gradient of a velocity-time graph			
Know that the distance travelled by an object can be calculated from the area under a velocity-time graph (HT)			
Be able to draw and interpret velocity-time graphs			
Be able to use the following equation for an object with uniform acceleration: **(final velocity)^2 - (initial velocity)^2 = 2 x acceleration x distance** **($v^2 - u^2 = 2as$)**			
Be able to draw and interpret velocity-time graphs for objects that reach terminal velocity and interpret the changing motion in terms of the forces acting			
Know that an object falling through a fluid initially accelerates due to the force of gravity. Eventually the resultant force will be zero and the object will move at terminal velocity			
Understand Newton's 1st Law			
Know that, if the resultant force acting on an object is zero then the object will not change its motion			
Know that the tendency of objects to continue in their state of rest or uniform motion is called inertia (HT)			
Understand Newton's 2nd Law			
Know that the acceleration of an object is proportional to the resultant force and inversely proportional to the mass of the object **force = mass x acceleration** **F = m a**			
Required Practical 7 – Investigate the effect of varying the force on the acceleration of an object of constant mass, and the effect of varying the mass of an object on the acceleration produced by a constant force. Using light gates.			
Understand Newton's 3rd Law			
Know that, when two objects interact, the forces they exert on each other are equal and opposite			
Know that the stopping distance of a vehicle is equal to the thinking distance added to the braking distance			
Know that human reaction times vary between 0.2s and 0.9s			
Recognise that reaction time can be affected by tiredness, drugs, alcohol and distractions			
Be able to describe a method to measure reaction time			
Know that braking distance can be affected by road conditions, weather conditions, and the condition of the vehicle			
Know that when a force is applied to the brakes of a vehicle work is done by the friction force between the brakes and the wheel, kinetic energy is reduced and the temperature of the brakes increases			

Know that, the greater the speed, the greater the braking force required			
P4.5.7 - Momentum			
Momentum is defined by the equation: **momentum = mass x velocity** **p = m v (HT)**			
Know that momentum is measured in kilogram metres per second kgm/s (HT)			
Know that, in a closed system, the total momentum before an event is equal to the total momentum after the event – Conservation of momentum (HT)			
Be able to complete calculations involving an event, such as the collision of two objects (HT)			
Recognise that, when a force acts on an object that is moving, or able to move, a change in momentum occurs (HT)			
Understand that the equations F = m a and a = (v – u)/t combine to give the equation: $F = \frac{m \Delta v}{\Delta t}$ where m Δv = change in momentum (HT)			
Be able to explain safety features such as: air bags, seat belts, crash mats, cycle helmets and cushioned surfaces for playgrounds with reference to the rate of change of momentum (HT)			
Be able to apply the equations relating force, mass, velocity and acceleration to explain how the changes are inter-related (HT)			

Review 4.5 – Forces part 4

Can you…?			
P4.5.4 – Moments, levers and gears			
Recognise that a force, of a system of forces, may cause an object to rotate			
Know that the turning effect of a force is called the moment of the force			
Know and be able to use the equation: **moment = force x distance**			
Recognise that the direction in the perpendicular distance from the pivot			
Understand that, if an object is balanced, the clockwise moment is equal to the anticlockwise moment about the pivot			
Know that a simple lever and a simple gear system can be used to transmit the rotational effects of forces			
Be able to explain how levers and gears transmit the rotational effects of forces			
P4.5.5 – Pressure and pressure differences in fluids			
Know that fluids and liquids and gases			
Know that pressure in fluids causes a force normal (at right angles) to any surface			
Know and be able to use the equation: **pressure = force / area**			
Know that the pressure in a fluid depends on the depth			
Be able to use the equation: **pressure = height of column x density of liquid x gravitational field strength (HT)**			
Be able to calculate the difference in pressure at different depths (HT)			
Understand that up thrust is caused by the pressure at the bottom surface of an object being higher than at the top surface (HT)			
Be able to describe the factors that influence floating and sinking (HT)			
Recognise that the atmosphere is a thin layer that gets less dense as altitude increases			
Be able to explain why atmospheric pressure decreases with an increase in height			

Review P4.6.1 Waves

Can you…?			
P4.6.1.1 Transverse and longitudinal waves			
Describe transverse and longitudinal waves			
Recall which type of wave travels through solids and which through liquids			
Describe the difference between transverse and longitudinal waves			
Explain that when a wave travels through a material it is not the material that moves but the wave			
P4.6.1.2 Properties of waves			
Describe wave motion in terms of amplitude, wavelength, frequency and period			
Define the term amplitude and be able to label it on a diagram			
Define the term wavelength and be able to label it on a diagram			
Define the term frequency			
Recall and use the equation: **Period = $\frac{1}{\text{frequency}}$**			
Recall the wave speed is the speed at which the energy is transferred through the medium			
Recall and use the equation: **Wave speed = frequency x wavelength**			
Describe a method to measure air speed			
Describe a method to measure wave speed			
Show how changes in velocity, frequency and wavelength are inter-related in the transmission of sound waves from one medium to another (HT only)			
Describe Required Practical 8 – The ripple tank			
P4.6.1.3 Reflection of waves			
Understand that waves can be reflected at the boundary between two different materials (Physics only)			
Understand that waves can be absorbed or transmitted at the boundary between two different materials (Physics only)			
Construct ray diagrams to illustrate the reflection of a wave at a surface (Physics only)			
Describe the effects of reflection, transmission and absorption of waves at material interfaces (Physics only)			
Describe Required Practical 9 – reflection and refraction of light by different substances (Physics only)			
P4.6.1.4 Sound waves			
Recall that sound waves can travel through solids (Physics only) (HT)			
Understand that sound waves cause vibrations in the ear drum and other parts of the ear which causes the sensation of sound (Physics only) (HT)			
Understand the conversion of sounds waves to vibrations of solids works over limited frequency range, this restricts the limits of human hearing (Physics only) (HT)			
Recall the range of human hearing is from 20 Hz to 20kHz (Physics only) (HT)			
P4.6.1.5 Waves for detection and exploration			
Explain how the differences in velocity, absorption and reflection between different types of waves in solids and liquids can be used for detection and exploration of structures that cannot be seen by eye (HT)			
Understand ultrasound waves have a frequency higher than the upper limit of human hearing (HT)			
Understand ultrasound waves are partially reflected when they meet a boundary between two different media (HT)			
Explain how ultrasound waves are used for both medical and industrial imaging (HT)			
Understand the difference between P waves and S waves (HT)			
Explain how P and S waves can be used to determine the structure of the Earth (HT)			
Describe how high frequency sound waves is used to detect objects in deep water and measure deep water (HT)			

Review P4.6.2 Electromagnetic Spectrum

Can you…?			
P4.6.2.1 Types of electromagnetic spectrum			
Recall that electromagnetic waves are transverse and transfer energy from source to absorber			
Electromagnetic waves form a continuous spectrum and travel at the same velocity through a vacuum or air			
Recall the spectrum and know which has the longest wavelength, highest frequency and most energy			
Recall which waves are ionising			
P4.6.2.2 Properties of electromagnetic waves 1			
Understand substances may absorb, transmit, refract and reflect electromagnetic waves in ways that vary with wavelength (HT only)			
Understand why refraction happens (HT only)			
Construct ray diagrams to illustrate the refraction if a wave at a boundary between two different media			
Use wave front diagrams to explain refraction (HT only)			
Describe and explain Required Practical 10 Leslie Cubes - absorption and radiation			
P4.6.2.3 Properties of electromagnetic waves 2			
Recall radio waves can be produced by oscillations in electrical circuits (HT only)			
Describe and explain using radio waves as carrier waves (HT only)			
Understand where gamma rays come from			
Understand the hazardous effect of UV, x-rays and gamma rays on humans			
Recall the unit of radiation dose			
P4.6.2.4 Uses and applications of electromagnetic waves			
Know practical applications for each wave type in the electromagnetic spectrum			
Explain why each type of electromagnetic wave is suitable for the practical application (HT only)			

Review 4.7 – Magnetism and Electromagnetism

Can you…?			
P4.7.1 – Permanent and induced magnetism, magnetic forces and fields			
Know that the poles of a magnet are where the magnetic forces are strongest			
Be able to describe the attraction and repulsion between like and unlike poles			
Be able to describe the differences between permanent and induced magnets			
Know that the magnetic materials are iron, steel, nickel and cobalt			
Know that the region around a magnet where a force acts on another magnet or magnetic material is called a magnetic field			
Recognise that the direction of a magnetic field is the direction of the force on a north pole			
Know how to plot the shape of a magnetic field using a compass			
Know that a compass contains a small magnet that moves in the Earth's magnetic field			
P4.7.2 – The motor effect			
Know that when a current is passed through a conducting wire a magnetic field is produced around the wire			
Understand that the strength of this field depends on the current and on the distance from the wire			
Recognise that the strength of the magnetic field can be increased by coiling the wire into a solenoid and that the shape of this field is similar to that of a bar magnet			
Know that adding an iron core increases the strength of the field			
Understand that a current carrying conductor placed in a magnetic field experiences a force. This is called to motor effect (HT)			
Know that Fleming's Left Hand Rule represents the relative directions of the current, the force and the magnetic field (HT)			
Be able to use the equation: **force = magnetic flux density x current x length** (HT)			
Know that a coil of wire carrying a current in a magnetic field tends to rotate and this is the basis of an electric motor (HT)			
Know that loudspeakers and headphones use the motor effect to change a varying current in an electrical circuit into pressure variations in sound waves (HT)			
Be able to explain how a moving-coil loudspeaker and headphones work (HT)			
P4.7.3 – Induced potential, transformers and the National Grid			
Know that moving a conductor relative to a magnetic field induces a potential difference between the ends of the conductor (HT)			
Know that a change on the magnetic field around a conductor induces a potential difference between the ends of the conductor (HT)			
Recognise that the induced current generates a magnetic field that opposes the change that caused it (HT)			
Recall the factors that affect the size and direction of the induced current (HT)			
Explain how the generator effect is used to generate a.c. in an alternator and d.c. in a dynamo (HT)			
Be able to draw and interpret graphs of p.d. generated in the coil against time (HT)			
Be able to explain how a moving-coil microphone works (HT)			
Recall that a transformer consists of a primary and a secondary coil wound on an iron core (HT)			
Understand that iron is used as it is easily magnetised (HT)			
Be able to apply the equation: $\frac{V_p}{V_s} = \frac{N_p}{N_s}$ (HT)			
Know the difference between step-up and step-down transformers (HT)			
Understand that, if transformers were 100% efficient then output power would equal input power (HT)			
Be able to apply the equation: $V_s \times I_s = V_p \times I_p$ (HT)			
Be able to use knowledge of transformers to explain why electrical power is transmitted at high potential differences (HT)			

Review 4.8 - Space

Can you…?			
P4.8.1 – Solar system, stability of orbital motions, satellites			
Know the different objects that make up our solar system			
Know that our solar system is part of the Milky Way galaxy			
Know that the Sun was formed from a cloud of dust and gas (nebula) pulled together by gravitational attraction			
Recognise that, as the dust and gas gets pulled together it heats up until nuclear fusion takes place			
Understand that fusion lead to an equilibrium between gravitational collapse and expansion due to fusion energy			
Know that stars go through a life cycle determined by the size of the star			
Know the different stages in the life cycle of the Sun and of a much more massive star			
Recognise that fusion reactions produce all naturally occurring elements and that heavier elements than iron are produced in supernovae			
Be able to explain how fusion leads to the production of new elements			
Understand that gravity provides the force that allows planets and satellites to maintain circular orbits			
Be able to describe differences between planets, their moons and artificial satellites			
Recognise that, for circular orbits, the force of gravity leads to changing velocity but constant speed			
Understand that, for a stable orbit, the radius must change if the speed changes			
P4.6.2 – Lenses			
Know that lenses form images by refracting light			
Know that, in a convex lens, parallel rays of light are brought to a focus at the principle focus – the focal length			
Be able to use ray diagrams to show the formation of images by convex and concave lenses			
Recognise that the image produced by a convex lens can be either real or virtual but images produced by concave lenses are always virtual			
Understand that magnification is how much bigger the image is than the object			
Be able to apply the equation: **magnification = image height / object height**			
P4.6.3 – Black body radiation			
Understand that all bodies, no matter what temperature, emit and absorb infra-red radiation. The hotter it is, the more it radiates in a given time			
Know that a perfect black-body is an object that absorbs all the radiation that hits it. It does not reflect or transmit any radiation			
Understand that a body at constant temperature absorbs radiation at the same rate as it emits radiation			
Understand that the temperature of the Earth depends on many factors including: the rates of emission and absorption of radiation and reflection of radiation into space			
P4.8.2 – Red-shift			
Recognise that there is an observed increase in the wavelength of light from most distant galaxies showing that they are moving away from us			
Know that the further away a galaxy is the faster it is moving away from us and the bigger the observed increase in wavelength. The red-shift is bigger			
Understand that this provides evidence that space is expanding and supports the Big Bang theory			
Know that, since 1988, observations of supernovae suggest that distant galaxies are receding even faster			