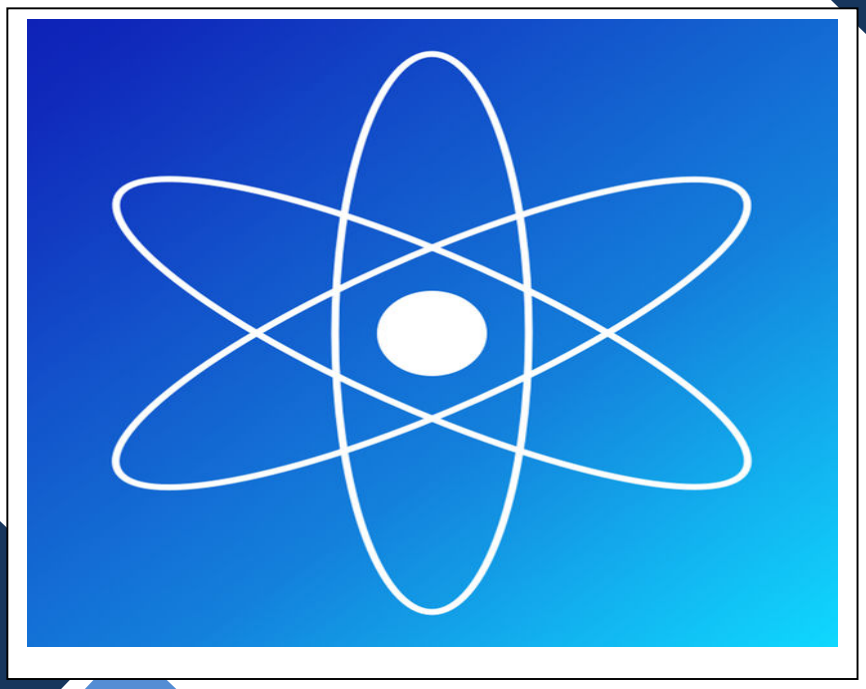
THE BECKET SCHOOL
A CATHOLIC VOLUNTARY ACADEMY

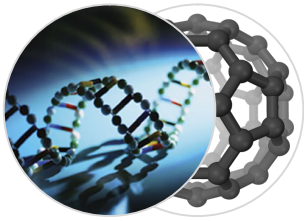
LABORARE ORARE

PERSONAL LEARNER CHECKLIST KS4

GCSE Physics (Combined)



Parent Curriculum Information: Combined Science



Subject: Combined (Trilogy) Science **Year Group:** 11

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

What syllabus is being taught?	AQA Combined Science, Trilogy
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 a Combined Science pathway will sit two GCSEs in Science which are a combination of Biology, Chemistry and Physics content • Both 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 15 minutes and is worth 70 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; and Magnetism and electromagnetism
What can my son or daughter do for revision at home? What materials are provided or available online?	- Use a CGP Combined 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			
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: $\text{Power} = \frac{\text{energy transferred}}{\text{time}}$			
Recall and use the equation: $\text{Power} = \frac{\text{work done}}{\text{time}}$			

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			

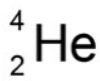
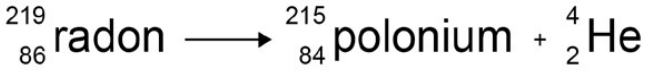
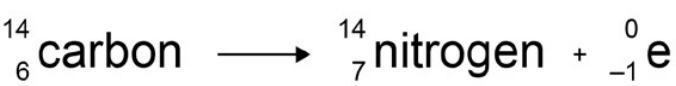
Can you…?			√
P4.2.3 – Domestic uses and safety			
Know mains electricity is an a.c.supply – 50 Hz and about 230V			
Be able to explain the difference between direct and alternating potential difference			
Know most electrical appliances are connected to the mains using 3-core cable			
Know that brown 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^{2}R)**			
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			

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			

Review P4.4 Atomic Structure

Can you…?			
P4.4.1 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: 			
In a nuclear equation a beta particle may be represented by the symbol: 			
Understand how to complete nuclear equations for alpha decay such as:  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:  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			

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** **($v^2 - u^2 = 2as$)**			
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)			

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 = 1 / 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			
P4.6.1.5 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			
Understand ultrasound waves have a frequency higher than the upper limit of human hearing			
Understand ultrasound waves are partially reflected when they meet a boundary between two different media			
Explain how ultrasound waves are used for both medical and industrial imaging			
Understand the difference between P waves and S waves			
Explain how P and S waves can be used to determine the structure of the Earth			
Describe how high frequency sound waves is used to detect objects in deep water and measure deep water			

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 only)			
Know that Fleming's Left Hand Rule represents the relative directions of the current, the force and the magnetic field (HT only)			
Be able to use the equation: **force = magnetic flux density x current x length (HT only)**			
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 only)			