BTEC Unit 1: Principles & Applications of Science I

	Curriculum Checkpoints: What do students know and what can they do?			***Possible resources***	Further guidance
Summative Comment	**Developing (P)**	**Securing (M)**	**Mastering (D)**		
Unit 1	Learners are able to recall, select and apply scientific knowledge and understanding to vocational and realistic situations. They are able to use scientific terminology and concepts in given situations. Learners are able to use given information and apply appropriate mathematical and technical skills in context. Learners are able to interpret and analyse information in order to make valid judgements.	Learners are able to use relevant scientific knowledge and understanding from different areas to demonstrate a good understanding of how these apply to vocational and realistic situations. They are able to use scientific terminology and concepts, communicating consistently in given situations. They are able to select relevant information and apply appropriate mathematical and technical skills to solve problems in context. Learners are able to interpret and analyse information in order to make valid judgements that are supported by evidence.	Learners are able to integrate relevant scientific knowledge and understanding from different areas to demonstrate a deeper understanding of how these apply to vocational and realistic situations. They are able to use scientific terminology and concepts, communicating consistently and effectively in given situations. They are able to select relevant information and apply appropriate mathematical and technical skills to justify decisions or solve problems in context. Learners are able to interpret and analyse information in order to make valid judgements that are supported by evidence, with awareness of limitations.	A level textbooks and websites will have similar/same content	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/Applied-Science/2016/specification-and-sample-assessments/BTEC-L3-Nat-ExtDip-in-Applied-Science-Spec.pdf
Chemistry	Can recall the structure of atoms. Is able to define and draw ionic and covalent bonding and list the factors affecting bonding. Can recall metallic bonding and intermolecular forces. Is able to produce balanced equations and define RAM, atomic number, RMM, moles, molar mass and molarities. Can understand the use of mass, volume and concentration and attempts to carry out calculations regarding reacting quantities and percentage yields. Can identify features of the periodic table and identify the physical and chemcial properties of elements in groups and periods.	Can describe the structure of atoms using electronic orbitals, Aufbau principle and Bohr theory. Is able to describe ionic bonding with the use of scientific drawing to describe how atoms become ions. Is able to describe covalent bonding using scientific dot-cross diagrams for single and multiple bonds. Be able to describe how different factors affect bonding. Can describe metallic bonding using delocalised elecrons and different types of intermolecular forces - Van der Waals, dipole-dipole and hydrogen bonding. Is able to produce balanced equations and describe RAM, atomic number, calculate RMM, moles, molar mass and molarities. Can understand the use of mass, volume and concentration and can carry out calculations regarding reacting quantities and percentage yields. Can describe features of the periodic table explaining the groups and periods in relation to electron structure of elements. Describe the physical and chemcial properties of elements in groups and periods.	Can understand the structure of atoms using electronic orbitals, Aufbau principle and Bohr theory. Is able to understand ionic bonding with the use of scientific drawing to describe how electrostatic attraction occurs when atoms become ions and the electron configuration of these ions. Can understand the effects of ionic radius and charge on ionic bonding. Is able to understand covalent bonding using scientific dot-cross diagrams to show the shared electrons for single and multiple bonds. Be able to describe relationship between bond length and strength affect in covalent bonding and relate covalent bonding to tetrahedral basis of organic chemistry. Can understand metallic bonding using delocalised elecrons and different types of intermolecular forces - Van der Waals, dipole-dipole and hydrogen bonding. Is able to understand balanced equations, RAM, atomic number, calculate RMM, moles, molar mass and molarities. Can understand the use of mass, volume and concentration and can carry out calculations regarding reacting quantities and percentage yields. Can understand theorganisation of the periodic table explaining the groups and periods in relation ton features of the elements such as electron structure. Understand the physical and chemcial properties of elements in groups and periods.		
Biology	Can state cell theory. Is able to identify the ultrastructure of prokaryotic and eukaryotic cells recognising them from electronmicrographs and use of a light microscope and being able to compare plant and animal cells. Able to describe the tests used to distinguish between the different types of bacteria. Can calculate magnification and size of cells from drawings or images. Is able to desribe how cells are specialised for a particular function. Be able to link structure and function of both epithelial and endothelial tissue, muscle tissue and nervous tissue.	Can describe cell theory understanding the role of cells in living organisms. Can describe the ultrastructure and function of prokaryotic and eukaryotic organelles recognising them from electronmicrographs and use of a light microscope. Is able to describe similarities and differences between plant and animal cell structure and function. Able to describe gram-positive and gram-negative tests and explain how they work to distinguish between the different types of bacteria. Can calculate magnification and size of cells from drawings or images. Is able to desribe how cells are specialised for a particular function referring to structure. Be able to link structure and function of both epithelial (squamos and columnar cells in the lungs) and endothelial tissue (blood vessels and how these are affected by disease), muscle tissue (skeletal and comparing fast and slow twitch) and nervous tissue to include comparison of myelinated and non-myelinated tissue, how a nerve impulse is generated and how a synapse works. Should be able to conside impact of nervous impulse imbalances and possible treatments.	Knows the importance of as a unifying concept of cell theory, understanding the role of cells in living organisms. Can understand the ultrastructure and function of prokaryotic and eukaryotic organelles recognising them from electronmicrographs and use of a light microscope. Is able to understand the similarities and differences between plant and animal cell structure and function. Able to describe gram-positive and gram-negative tests and explain how they work to distinguish between the different types of bacteria and why each type reacts differently to some antibiotics. Can calculate magnification and size of cells from drawings or images. Is able to understand how cells are specialised for a particular function referring to structure including palisade mesophyll cells, sperm cells, egg cells, root hair cells and white/red blood cells. Be able to understand structure and function of both epithelial (squamos cells and how these are affected in COPD & columnar cells in the lungs to protect from pathogens) and endothelial tissue (blood vessels and how these are affected by atherosclerosis), muscle tissue (skeletal and comparing fast and slow twitch) and nervous tissue to include comparison of myelinated and non-myelinated tissue, how a nerve impulse is generated and how a synapse works. Should be able to consider impact of nervous impulse imbalances and possible treatments.		
Physics	Can draw and label a wave diagram, being able to define the key terms. State the names of the different types of waves. Is able to define displacement, coherence path difference, phase difference and superposition. Is able to state the industrial applications of diffraction gratings. Can use the wave equation v=fλ and describe what stationary waves resonance is. Can use the equation to calculate speed of a wave. Can state how waves are used in communication, e.g fibre optics and how these are important in different industries. Able to describe features of EM waves and how the EM spectrum is arranged and the uses of EM waves in communication. Can use the inverse square law to calculate the intensity of a wave.	Can describe features common to all waves, being able to define the key terms and label a wave diagram. State the differences between the different types of waves - transverse and longitudinal. Is able to describe concepts of displacement, coherence path difference, phase difference and superposition as applied to diffraction gratings. Is able to describe the industrial applications of diffraction gratings in emission spectra and identifying gases. Can use the wave equation v=fλ and describe the concept and application of stationary waves resonance and musical instruments. Can use the equation to calculate speed of a wave. Can state how waves are used in communication, e.g. fibre optics and how these are important in different industries such as medicine and communication. Able to describe the principles of fibre optics including refeactive index, TIR and calculation of critical angles. Able to describe features of EM waves in a vacuum and how the EM spectrum is arranged using frequency and the uses of EM waves in communication (satellites, mobile phones, bluetooth, IR and Wi-Fi). Can use the inverse square law to calculate the intensity of a wave.	Can understand features common to all waves, being able to define the key terms and label a wave diagram. Understand the differences between the different types of waves - transverse and longitudinal. Is able to understand concepts of displacement, coherence path difference, phase difference and superposition as applied to diffraction gratings. Is able to understand the industrial applications of diffraction gratings in emission spectra and identifying gases. Can use the wave equation v=fλ and understand the concept and application of stationary waves resonance and musical instruments. Can use the equation to calculate speed of a wave. Can state how waves are used in communication, e.g. fibre optics and how these are important in different industries such as medicine (endoscopes) and communication (analogue, digital, analogue-to-digital conversiona nd broadband). Able to describe the principles of fibre optics including refeactive index, TIR and calculation of critical angles. Able to describe and understand features of EM waves in a vacuum and understand how the EM spectrum is arranged using frequency and the uses of EM waves in communication (satellites, mobile phones, bluetooth, IR and Wi-Fi). Can use the inverse square law to calculate the intensity of a wave.		

BTEC Unit 2: Practical Scientific Procedures and Techniques

	Curriculum Checkpoints: What do students know and what can they do?			***Possible resources***	Further guidance
Summative Comment	**Developing (P)**	**Securing (M)**	**Mastering (D)**		
Learning Aim A: Undertake titration and colorimetry to determine the concentration of solutions	A.P1 Can correctly prepare and standardise solutions for titration and colorimetry. A.P2 Can investigate the concentration of unknown solutions, using procedures and techniques in titration and colorimetry.	A.M1 Can demonstrate skillful application of procedures and techniques in titration and colorimetry to accurately determine the concentration of solutions.	A.D1 Can evaluate the accuracy of procedures and techniques used in titration and colorimetry in relation to outcomes and suggest improvements.	http://www.chemteam.info/Thermochem/Determine-Specific-Heat.html http://www.virtlab.com/main.aspx http://www.chem.illinois.edu/CLCTutorials/104/Calorimetry/SeeIt.html https://www.youtube.com/watch?v=NZuU8BGj3uY https://www.youtube.com/watch?v=EAgbknIDKNo http://www.rsc.org/ http://education.seattlepi.com/titration-different-colorimetry-4356.html	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/Applied-Science/2016/specification-and-sample-assessments/BTEC-L3-Nat-ExtDip-in-Applied-Science-Spec.pdf and Pearson Applied Science Student book 1
Learning Aim B: Undertake calorimetry to study cooling curves	B.P3 Can correctly obtain data using different equipment to construct cooling curves. B.P4 Can correctly determine the rate of cooling of substances using cooling curves.	B.M2 Can analyse the rate of cooling of substances from your data using cooling curves to draw valid conclusions.	B.D2 Can evaluate the accuracy of practical work in calorimetry in relation to the analysis of the cooling curve.	http://www.chemteam.info/Thermochem/Determine-Specific-Heat.html http://www.virtlab.com/main.aspx http://www.chem.illinois.edu/CLCTutorials/104/Calorimetry/SeeIt.html https://www.youtube.com/watch?v=NZuU8BGj3uY https://www.youtube.com/watch?v=EAgbknIDKNo http://www.rsc.org/	
Learning Aim C: Undertake chromatographic techniques to identify compponents in mixtures	C.P5 Can correctly use chromatographic techniques to produce chromatograms. C.P6 Is able to explain the use of chromatographic techniques to separate mixtures.	C.M3 Is able to analyse own chromatograms and relate the factors that affect the separation of mixtures to the quality of results obtained.	C.D3 Can evaluate the chromatographic techniques used in relation to outcomes and suggest improvements.	http://www.virtlab.com/ http://www.chemguide.co.uk/analysis/chromatography/thinlayer.html#top http://filestore.aqa.org.uk/resources/chemistry/AQA-7405-TN-CHROMATOGRAPHY.PDF http://www.xtremepapers.com/revision/a-level/chemistry/analysis/chromatography/thinlayer.php http://www.bbc.co.uk/education/guides/ztkdd::2p/revision https://www.youtube.com/watch?v=YkkU2lv4ftY https://www.youtube.com/watch?v=SnbXQTTHGs4 https://www.youtube.com/watch?v=6Z-SpXUeKr0	
Learning Aim D: Review personal development of scientific skills for laboratory work	D.P7 Can summarise key personal competencies developed in relation to scientific skills undertaken.	D.M4 Is able to analyse skills developed and suggest improvements to own practice.	D.D4 Can evaluate scientific skills developed in terms of potential for future progression.	http://www.virtlab.com/ http://www.chemguide.co.uk/analysis/chromatography/thinlayer.html#top https://www.youtube.com/watch?v=VRWRmlEHr3A (lab safety) https://www.youtube.com/watch?v=9DkB82xLvNE (SOP titration) https://www.youtube.com/watch?v=-mD2hstt7DI (COSHH)	

BTEC Unit 5: Principles & Applications of Science II

	Curriculum Checkpoints: What do students know and what can they do?			***Possible resources***	Further guidance
Summative Comment	**Developing (P)**	**Securing (M)**	**Mastering (D)**		
Unit 5- General Descriptors	Learners will be able to recall, select and apply scientific knowledge and understanding to vocational and realistic situations. They will be able to use scientific terminology and concepts in given situations, and use given information and apply appropriate mathematical and technical skills in context. Learners will be able to interpret and analyse information in order to make valid judgements.	Learners will be able to integrate relevant scientific knowledge and understanding from different areas to demonstrate a good understanding of how these apply to vocational situations. They will be able to use scientific terminology and concepts in given situations, and use given information and apply appropriate mathematical and technical skills in context. Learners will be able utilise these skills and begin to problem solve. Learners will attempt to make judgments on new situations, fully supported by evidence.	Learners will be able to integrate relevant scientific knowledge and understanding from different areas to demonstrate a deeper understanding of how these apply to vocational and realistic situations. They will be able to use scientific terminology and concepts, communicating consistently and effectively in given situations. They will be able to select relevant information and apply appropriate mathematical and technical skills to justify decisions or solve problems in context. Learners will be able to interpret and analyse information in order to make valid judgements that are supported by evidence, with awareness of limitations.	A level textbooks and websites would be useful here	https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/Applied-Science/2016/specification-and-sample-assessments/BTEC-L3-Nat-ExtDip-in-Applied-Science-Spec.pdf
Chemistry	Learners must be able to: Understand the chemical properties of substances, including: amphoteric character of alumina; the basic character of metal oxides and hydroxides; ease of electrolysis. Learners must be able to explain the uses of: Ca(OH)2 in acidic effluent treatment; transition metals, transition metal oxides and transition metal complexes as catalysts– vanadium (V) oxide as catalyst in the contact process, iron as a catalyst in the Haber process and alumina in refractories. Learners must be able to explain the purification, extraction and manufacture of: alumina from bauxite: titanium from its ore; aluminium from alumina, Hall–Héroult; electrolysis of brine to produce sodium hydroxide, hydrogen and chlorine, diaphragm cell and membrane cell. Learners must be able to explain how to relate the properties of substances to their production and uses, including a comparison of production methods in relation to properties and choice of a substance for use in relation to its properties. Learners must be able to explain exothermic and endothermic reactions and processes and reaction profiles.	Learners must be able to explain the following: Straight-chain, branched and cyclic alkanes and alkenes, including isomer; the general formulae of alkanes and alkenes; International Union of Pure and Applied Chemistry (IUPAC) nomenclature; structure representations, full (displayed) structural formulae showing all the bonds; shortened structural formulae; 3D representations using wedge/dashed line diagrams, skeletal formulae. Learners must be able to state the Kelvin scale of temperature; the definition of enthalpy change, ΔH = ΔU + pΔV, also called 'change in heat content' and the standard conditions: of 1 × 105 Pa (100 kPa) 298 per mole (mol-1). Learners must be able to explain enthalpy change under standard conditions, ΔH and state nthe units of standard enthalpy change kJ mol-1.	Learners must be able to explain the following: symmetric and asymmetric alkenes; sigma and pi-bonding in alkanes and alkenes; hybridisation; bond angles, lengths and strengths in alkanes, alkenes, benzene; increase in boiling point with chain length and intermolecular forces of attraction; mechanisms of hydrocarbon reactions; free radical substitution in alkanes; electrophilic addition of water, halogens, hydrogen halides and sulfuric acid in alkenes; stability of carbocations; reactions of commercial importance; use of free radical polymerisation of alkenes and hydration of ethene; cracking of hydrocarbons; combustion of alkanes. Learners must be able to state the definitions of a range of standard enthalpy changes related to reactions including combustion, formation, hydration and be able to interpret the size and sign of values including literature values. Learners must be able to explain the measurement of enthalpy changes using the specific heat capacity of water, enthalpy change in water in contact with a reaction and heat Q = mcΔt Learners must be able to Calculate enthalpy changes from supplied data.		
Biology	Learners must be able to explain the structure and function of the heart, to include: atria, ventricles, septum, valves – semi-lunar, (tricuspid, bicuspid) vena cava, pulmonary vein, pulmonary artery, aorta, myogenic muscle, sinoatrial node (SAN), atrioventricular node (AVN), Purkinje fibres, bundle of His. Learners must be able to calculate cardiac output and explain the characteristic features of blood vessels and pressure changes, to include: arteries – elastic, small lumen, thick muscle, high pressure; veins – large lumen, valves, thin walled, low pressure; capillaries – link arteries and veins, one cell thick, site of diffusion; blood transfusion and the ABO rhesus system.• Understand the cardiac cycle, to include: atrial systole, ventricular systole, cardiac diastole, role of major blood vessels – vena cava, pulmonary vein, pulmonary artery, aorta and coronary artery, opening and closing of the heart valves. Learners must be able to explain the use of electrocardiograms (ECG), to include: significance of PQRST points on an ECG trace, identification of arrhythmias – tachycardia, bradycardia, ventricular fibrillation, sinus arrhythmia, flat line. Learners should be able to explain how genetics, age, gender, diet, high blood pressure, smoking, inactivity affect risk of CVD. Learners should be able to explain all types of transport in cells to include diffusion, facilitated diffusion, active transport and osmosis.	Learners must be able to explain the structure of the human lung and overall ventilation system, to include: trachea, bronchi, bronchioles, alveoli, capillary network, intercostal muscles, diaphragm, role of pleural membranes. Learners must be able to explain the mechanics of ventilation of the lungs, to include:inspiration and expiration, action of intercostal muscles, action of the diaphragm, changes in the volume of thorax, changes in air pressure and movement, the use of a ventilator to assist breathing. Learners must understand the principles that relate to efficient gas exchange in the human lung: proximity of alveoli to capillary network; one-cell-thick capillaries, alveolar large surface area, moisture, diffusion gradients, provision of oxygen for respiration and removal of carbon dioxide for efficient, production of adenosine triphosphate (ATP) during cellular respiration. Learners must be able to explain the importance of spirometer readings of lung volumes, to include: tidal volume, inspiratory reserve volume, residual volume, expiratory reserve volume, vital capacity, total lung capacity. Learners must understand the importance of the methods used to measure lung function for respiratory conditions, to include: peak expiratory flow, forced vital capacity.Learners must understand the effects of exercise on the following using data from spirometer traces, to include: tidal volume, breathing rate, respiratory minute ventilation, oxygen consumption.	Learners must be able to explain the roles of the kidney in: excretion, osmoregulation and describe the function of the urinary system, to include: ureter, bladder, renal artery and vein. Learners must be able to describe the structure and function of a kidney nephron, to include: glomerulus and its role in ultrafiltration, Bowman's capsule, proximal convoluted tubule and its role in selective reabsorption of glucose, distal convoluted tubule, collecting duct, loop of Henle, osmoregulation and the role of anti-diuretic hormone (ADH), electrolyte balance, blood pressure and the role of the renin-angiotensin-aldosterone mechanism. Learners must be able to explain how the kidney is involved in water, electrolyte and acid base balances. Learners must understand how to treat kidney disease, to include: dialysis and transplantation		
Physics	Learners must be able to use the following quantities and units: power, watt (W), kilowatt (kW), megawatt (MW), gigawatt (GW); convert °C to K, pressure (Pascals (Pa), Newton per metre squared (Nm−2)). Learners must know the following definitions: work done as energy transferred; work done as force × distance moved in direction of force (ΔW = F × Δs); work done by a gas as pressure × change in volume of gas (ΔW = p × ΔV); Learners must be able to calculate efficiency using the relationships: efficiency = useful energy output / total energy input - including heat engines. Learners must understand the changes of state of substances used in domestic and industrial processes: transfer of energy producing temperature change or changes of state, thermal capacity, thermal equilibrium; specific heat capacity from (ΔQ = mcΔT); specific latent heat from (ΔQ = ΔmL), fusion, vapourisation, condensation.	Learner must understand the following concepts:law of conservation of energy, ideal gas equation pV = NkT, internal energy (U), first law of thermodynamics (Q = ΔU + W), isothermal and adiabatic processes, idealised engine cycles, second law of thermodynamics, heat engines, refrigerators and heat pumps, maximum theoretical coefficient of performance (COP). Learners must understand the following concepts: law of conservation of energy; ideal gas equation pV = NkT; internal energy (U), first law of thermodynamics (Q = ΔU + W; isothermal and adiabatic processes; idealised engine cycles; second law of thermodynamics; heat engines, refrigerators and heat pumps; maximum theoretical coefficient of performance (COP). Learners must understand the following concepts and apply them in domestic and industrial applications: elasticity, stress-strain curves, elastic limit, strength, yield point, plastic deformation, creep, fatigue, ductility, brittleness, malleability, elastic hysteresis. Learners must be able to use the following quantities and units: density kgm−3, tensile/compressive stress (Newton per metre squared (Nm−2)), tensile/compressive strain (no units), Young's modulus (Newton per metre squared (Nm−2)).	Learners must be able to use the following quantities and units: density kgm−3, tensile/compressive stress (Newton per metre squared (Nm−2)) tensile/compressive strain (no units); Young's modulus (Newton per metre squared (Nm−2)). Learners must know the formulae for: density, stress strain, Young's Modulus and Hooke's Law. Learners must understand the following concepts and apply them in industrial and domestic situations: fluid flow patterns, streamline and turbulent flow, viscosity, viscous drag, mass of fluid flow per second for all points along a pipe or stream tube is constant, non-Newtonian fluid flow, rate of fluid flow and pressure, Bernoulli's principle.		

BTEC Unit 7: Contemporary Issues in Science

	Curriculum Checkpoints: What do students know and what can they do?			***Possible resources***	Further guidance
Summative Comment	**Developing (P)**	**Securing (M)**	**Mastering (D)**		
Unit 7	Learners will demonstrate a sound understanding of contemporary scientific issues. They will be able to interpret, analyse and evaluate scientific information and select relevant evidence to support judgements made. They will show application of understanding by identifying relevant ethical, social, economic and environmental implications of the scientific issue, and the influence from different organisations. Learners will be able to demonstrate sound knowledge and understanding of what makes scientific information reliable to make comments on the validity of articles. They will identify potential areas for further development/research. Learners will apply their knowledge and understanding to select and organise relevant information to form an article using correct scientific terminology.	Learners will demonstrate a good understanding of contemporary scientific issues in the arguments they make and justify their conclusions. They will be able to reach some judgements on the scientific issue, which are formed through an analytical approach to the source material. Learners will make links in articles, showing application of understanding to ethical, social, economic and environmental implications. Learners will present judgements about the validity of articles demonstrating their knowledge and understanding of what makes scientific information reliable. They will make recommendations on potential areas for further development/research. Learners will be able to apply their knowledge of the issue and the intended audience to formulate an article that uses appropriate style and terminology.	Learners will demonstrate a thorough understanding of contemporary scientific issues in the arguments they articulate and justify their conclusions. They will be able to reach valid judgements on the scientific issue, which are formed through a critical approach to the interpretation, analysis and evaluation of the source material. Learners will make links within and across articles, showing application of understanding to ethical, social, economic and environmental implications. Learners will present reasoned judgements about the validity of articles demonstrating thei knowledge and understanding of what makes scientific information reliable. They will make reasoned recommendations on potential areas for further development/research. Learners will be able to apply their knowledge and understanding of the issue and the intended audience to formulate an article that uses appropriate style, tone and scientific terminology.	Range of articles used	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/Applied-Science/2016/specification-and-sample-assessments/BTEC-L3-Nat-ExtDip-in-Applied-Science-Spec.pdf
A Contemporary scientific issues **A1 Understand the scientific issues in terms of ethical/social/economic/environmental impact** **A2 Understand the influence of different organisations/individuals on scientific issues**	Demonstrates adequate knowledge and understanding of the scientific issues by identifying and selecting relevant implications from all three articles. Attempts to draw links to ethical/social/ economic/ environmental implications. The discussion shows some structure and coherence.	Demonstrates good knowledge and understanding of the scientific issues by identifying and selecting relevant implications from all three articles. Draws some links to and between ethical/social/ economic/ environmental implications. The discussion shows a structure which is mostly clear, coherent and logical.	Demonstrates comprehensive knowledge and understanding of the scientific issues by identifying and selecting relevant implications from all three articles. Draws a wide range of links to and between ethical/social/ economic/ environmental implications. The discussion shows a well-developed structure which is clear, coherent and logical.	Range of articles used	
B Interpretation, analysis and evaluation of scientific information **B1 Interpretation and analysis of scientific information** **B2 Evaluation of scientific information**	Demonstrates adequate knowledge and understanding of how key organisations/ individuals can influence the scientific issue by identifying different types of organisations/individuals. A basic explanation of how the organisation/individual may have an influence is given but with general statements made and limited linkages to the articles. The validity of article 3 is discussed vagually or is partially supported by a consideration of: - how the article has interpreted and analysed the scientific information to support the conclusions/ judgments being made - the validity and reliability of data - references to other sources of information. The discussion shows no/some structure and coherence	Demonstrates good knowledge and understanding of how key organisations/individuals can influence the scientific issue by identifying different types of organisations/individuals (including any references/ acknowledgments in footnotes) from all three articles. An explanation of how these organisations/individuals may influence the issue is given which is occasionally supported through linkage and application to the articles. The validity of article 3 is discussed which is mostly supported by a consideration of: - how the article has interpreted and analysed the scientific information to support the conclusions/ judgments being made - the validity and reliability of data - references to other sources of information. The discussion shows a structure which is mostly clear, coherent and logical.	Demonstrates comprehensive knowledge and understanding of how key organisations/ individuals can influence the scientific issue by identifying and selecting different types of organisations/individuals (including any references/ acknowledgments in footnotes) from all three articles. An explanation of how these organisations/individuals may influence the issue is given which is supported throughout with linkage and application to the articles. The validity of article 3 is discussed and is consistently supported throughout the consideration of: - how the article has interpreted and analysed the scientific information to support the conclusions/ judgments being made - the validity and reliability of data - references to other sources of information. The discussion shows a well-developed structure which is clear, coherent and logical.	Range of articles used	
C2 Understand the presentation of science reporting and its relationship with the reporting medium and target audience	Areas for further development and/or research of the scientific issue are identified but these are usually vague descriptions with limited analysis/evaluation of the articles to support the statements being made. Summarises the main points and evidence including any supporting and conflicting statements from the three articles. Shows an awareness of audience/purpose and there is some structure and coherence.	A description for further areas of development and/or research of the scientific issue is given. • Provides occasional evidence from the analysis/evaluation of the articles and attempts to synthesise and integrate relevant knowledge. Summarises and attempts to synthesise the main points and evidence including any supporting and conflicting statements from the three articles. Selects material to suit audience and purpose, with appropriate use of tone, style and scientific terminology. The article shows a structure which is mostly clear, coherent and logical.	A description for further areas of development and/or research of the scientific issue is given. • Consistently provides evidence from the analysis/evaluation of the articles and demonstrates throughout the skills of synthesising and integrating relevant knowledge. Summarises and synthesises the main points and evidence including any supporting and conflicting statements consistently from the three articles. Consistently selects and organises material for particular effect, with effective use of tone, style and scientific terminology. The article shows a well-developed structure which is clear, coherent and logical.	Range of articles used	

BTEC Unit 11: Genetics and Genetic Engineering

	Curriculum Checkpoints: What do students know and what can they do?			***Possible resources***	Further guidance
Summative Comment	**Developing (P)**	**Securing (M)**	**Mastering (D)**		
Learning Aim A: Understand the structure and function of nucleic acids in order to describe gene expression and the process of protein synthesis	A.P1 Can explain the structure and function of DNA and various nucleic acids.	A.M1 Can discuss the functional role of nucleic acids in DNA in the stages of protein synthesis.	A.D1 Can assess the impact of error in the stages of protein synthesis	https://www.youtube.com/watch?v=gG7uCskUOrA http://www.nature.com/scitable/topicpage/discovery-of-dna-structure-and-function-watson-397 http://www.scienceprofonline.com/genetics/ribonucleic-acid-rna-structure-and-function.html http://www.livescience.com/37247-dna.html https://www.ncbi.nlm.nih.gov/books/NBK26821/ https://www.thebalance.com/what-is-sirna-and-how-is-it-used-375598 https://highered.mheducation.com/sites/9834092339/student_view0/chapter15/protein_synthesis.html https://ghr.nlm.nih.gov/primer/mutationsanddisorders/possiblemutations	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/Applied-Science/2016/specification-and-sample-assessments/BTEC-L3-Nat-ExtDip-in-Applied-Science-Spec.pdf and Pearson Applied Science Student book 1
Learning Aim B: Explore how the process of cell division in eukaryotic cells contributes to genetic variation	B.P2 Is able to prepare microscopic slides to observe and draw the stages of mitosis and meiosis. B.P3 Can explain the structure and function of human chromosomes.	B.M2 Can demonstrate skilful preparation of microscopic slides to observe and draw the stages of mitosis and meiosis. B.M3 Can discuss the behaviour of the chromosomes during the cell cycle stages of mitosis and meiosis.	B.D2 Can evaluate how the behaviour of the chromosomes leads to variation.	http://www.nuffieldfoundation.org/practical-biology/preparing-anther-squash http://vlab.amrita.edu/?sub=3&brch=188&sim=1102&cnt=2 http://www.cellsalive.com/mitosis.htm http://biology.about.com/od/meiosis/ss/meiosisstep.htm http://www.microscopy-uk.org.uk/mag/indexmag.html?http://www.microscopy-uk.org.uk/mag/artdec06/yl-squash.html	
Learning Aim C: Explore the principles of inheritance and their application in predicting genetic traits	CP4. Can carry out investigations to collect and record data for mono and dihybridnphenotypic ratios chromatograms. C.P5 Is able to explain genetic crosses between non-affected, affected and carriers of genetic conditions.	C.M4 Is able to analyse data to explain the correlation between observed pattern of monohybrid and dihybrid inheritance. C.M5 Can apply Mendel's laws of inheritance to the results of genetic crosses.	C.D3 Can make valid predictions on patterns of monohybrid and dihybrid inheritance and variation using principles of inheritance.	http://sciencecourseware.org/vcise/drosophila/drosophila.php?guestaccess=1 http://www2.le.ac.uk/departments/genetics/vgec/schoolscolleges/topics/inheritancepatterns http://www.science.oregonstate.edu/genbio/otherresources/punnett%20squares.htm http://www.nature.com/scitable/definition/principle-of-independent-assortment-302 http://www.shmoop.com/genetics/chi-squared-test.html http://www.ygyh.org/cf/inherited.htm https://www.dnalc.org/view/15940-What-is-color-blindness-.html https://www.learner.org/interactives/dna/genetics6.html	
Learning Aim D: Explore basic DNA techniques and the use of genetic engineering technologies.	D.P6 Is able to extract, separate and amplify DNA. D.P7 Explain the use of genetic engineering technologies in industry and medicine.	D.M6 Can analyse the uses of genetic engineering technologies in industry and medicine.	D.D4 Can evaluate possible future uses of genetic engineering technologies.	http://learn.genetics.utah.edu/content/labs/ https://www.foe.co.uk/sites/default/files/downloads/gm_crops_food.pdf https://ghr.nlm.nih.gov/primer/therapy/procedures http://www.nhs.uk/news/2012/01January/Pages/embyonic-stem-cell-trial-macular-degeneration.aspx	

BTEC Unit 14: Applications of Organic Chemistry

	Curriculum Checkpoints: What do students know and what can they do?			***Possible resources***	Further guidance
Summative Comment	**Developing (P)**	**Securing (M)**	**Mastering (D)**		
Learning Aim A: Understand the structures, reactions and properties of functional group compounds	**A.P1** Can explain the reactions of a range of carbonyl and non-carbonyl functional group compounds.	**A.M1** Can construct mechanisms for non-carbonyl and carbonyl compounds. **A.M2** Can plan a multi-step synthesis of carbonyl and non-carbonyl organic molecules in order to produce many organic substances, taking more than one reaction step.	**A.D1** Can analyse the types of reaction mechanisms undergone bynon-carbonyl and carbonyl compounds.	www.chemguide.co.uk http://scienceaid.co.uk/chemistry/organic/index.html http://rod.beavon.org.uk http://www.chemhelper.com/mechanisms.html Edexcel A Level Science – A2 Chemistry Students Book ISBN 9781408206058 Edexcel A Level Science – AS Chemistry Students Book ISBN 978140589635	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/Applied-Science/2016/specification-and-sample-assessments/BTEC-L3-Nat-ExtDip-in-Applied-Science-Spec.pdf and Pearson Applied Science Student book 1
Learning Aim B: Understand the reactions and properties of aromatic compounds	**B.P2** Can explain the structure of benzene using sigma and pi bonding, providing evidence for the structure. **B.P3** Can explain the chemical properties of industrially important benzene and monosubstituted benzene compounds.	**B.M3** Can compare the mechanisms for addition and substitution reactions of benzene.	**B.D2** Can analyse the effects of different monosubstituents on the benzene ring to predict further substitution position(s) of a reaction species on the benzene ring.	www.chemguide.co.uk http://scienceaid.co.uk/chemistry/organic/index.html http://rod.beavon.org.uk http://www.chemhelper.com/mechanisms.html Edexcel A Level Science – A2 Chemistry Students Book ISBN 9781408206058 Edexcel A Level Science – AS Chemistry Students Book ISBN 9781405896351	
Learning Aim C: Understand the types, structures, reactions, uses and properties of isomers	**C.P4** Can explain the different types of structural isomerism and stereoisomerism.	**C.M4** Can compare the different types of isomers and their industrial importance.	**C.D3** Can analyse the chemical/therapeutic importance of isomerism.	www.chemguide.co.uk http://scienceaid.co.uk/chemistry/organic/index.html http://rod.beavon.org.uk http://www.chemhelper.com/mechanisms.html www.creative-chemistry.org.uk/molecules/optical.htm www.rsc.org/learn-chemistry/resources/chemistry-in-your-cupboard/nurofen/3 www3.fed.cuhk.edu.hk/chemistry/files/chiraldrug.pdf Edexcel A Level Science – A2 Chemistry Students Book ISBN 9781408206058 Edexcel A Level Science – AS Chemistry Students Book ISBN 9781405896351	
Learning Aim D: Investigate organic chemistry reactions in order to gain skills in preparative organic chemistry	**D.P5** Can carry out practical examinations of organic chemical reactions safely and in order to produce the predicted products. **D.P6** Can explain the chemical reactions carried out in terms of the functional groups and reaction conditions involved.	**D.M5** Can assess the importance of the conditions chosen for the reactions carried out practically.	**D.D4** Evaluate the results obtained and the importance of the reaction conditions chosen for the reactions carried out practically.	http://science.cleapss.org.uk/Resources/HazCards/ http://www.cleapss.org.uk/secondary/secondary-science/secondary-science-student-safety-sheets http://www.rsc.org/learn-chemistry/resource/res00001777/the-hydration-of-alkenes http://rod.beavon.org.uk/organic_preps.htm http://www.rsc.org/learn-chemistry/resource/res00000058/paracetamol http://filestore.aqa.org.uk/subjects/AQA-2420-W-TRB-PSA07.PDF	

BTEC Unit 21: Medical Physics Applications

	Curriculum Checkpoints: What do students know and what can they do?			***Possible resources***	Further guidance
Summative Comment	**Developing (P)**	**Securing (M)**	**Mastering (D)**		
Learning Aim A: Explore the principles, production, uses and benefits of non-ionising instrumentation techniques in medical applications	**A.P1** Can explain how the principles and production of non-ionising radiation technologies are used in medical applications. **A.P2** Can explain why non-ionising radiation technologes are used for diagnosis and treatment of the human body.	**A.M1** Can compare the principles, production and uses of different non-ionising radiation techniques in medical applications.	**A/B.D1** Can justify the choice of non-ionising and ionising radiation techniques in medical applications.	http://www.guysandstthomas.nhs.uk/our-services/radiology/types/specialties.aspx http://www.fda.gov/Radiation-EmittingProducts/RadiationEmittingProductsandProcedures/MedicalImaging/ucm115357.htm https://www.gov.uk/government/collections/medical-radiation-uses-dose-measurements-and-safety-advice http://www.hse.gov.uk/radiation/nonionising/ https://www.rcr.ac.uk/policy-public-and-media/public-and-patients/educational-resources/proton-beam-therapy-pbt http://www.sor.org/about-radiography/patient-information/overview-radiotherapy http://www.cancerresearchuk.org/about-cancer/causes-of-cancer/cancer-controversies/x-rays-body-scans-and-radiation	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/Applied-Science/2016/specification-and-sample-assessments/BTEC-L3-Nat-ExtDip-in-Applied-Science-Spec.pdf and Pearson Applied Science Student book 1
Learning Aim B: Explore the principles, production, uses and benefits of ionising instrumentation techniques in medical applications	**B.P3** Can explain how the principles and production of ionising radiation technologies are used in medical applications. **B.P4** Can explain why ionising radiation technologies are used for diagnosis and treatment of the human body.	**B.M2** Can compare the principles, production and uses of different ionising radiation techniques in medical applications.	**A/B.D1** Can justify the choice of non-ionising and ionising radiation techniques in medical applications.	(As above)	
Learning Aim C: Understand health and safety, associated risks, side effects and limitations of ionising and non-ionising instrumentation techniques in medical applications	**C.P5** Can explain the health and safety risks, side effects and limitations of non-ionising and ionising radiation technologies. **C.P6** Can explain how hospitals can employ health and safety measures, when using instrumentation, for the protection of operators and patients.	**C.M3** Can compare the health and safety risks, side effects and limitations of non-ionising and ionising radiation technologies in medical applications to maximise the protection of operators and patients.	**C.D2** Can discuss the consequences of poor health and safety when using non-ionising and ionising radiation technologies and the prevention and safety measures employed.	http://www.hse.gov.uk/radiation/ https://www.gov.uk/government/collections/medical-radiation-uses-dose-measurements-and-safety-advice http://www.cancer.net/navigating-cancer-care/how-cancer-treated/radiation-therapy/side-effects-radiation-therapy http://www.hsa.ie/eng/Your_Industry/Healthcare_Sector/Occupational_Hazards_in_Hospital_Departments/Department_Hazards/Radiology/ http://www.radiologyinfo.org/en/info.cfm?pg=safety-xray http://www.hse.gov.uk/pubns/priced/hsg281.pdf	