

Curriculum Implementation Mapping – BTEC Level 3 National Extended Certificate Applied Science

The applied science sector

The applied science sector is diverse and wide-ranging, including, for example, biomedical, forensic, physical and chemical sciences. There are approx. 5.8 million people employed in applied science occupations in the UK. This equates to approximately 20% of the workforce. The applied science sector has a crucial role to play in delivering economic growth in the UK and allowing companies to compete in a rapidly enlarging global market.

Who is this qualification for?

This is an Applied General qualification for post-16 students wanting to continue their education through applied learning and who aim to progress to higher education, and ultimately to employment, possibly in the applied science sector. The qualification is equivalent in size to one A level. Students wishing to take this qualification will have completed a level 2 programme of learning with GCSE or vocational qualifications.

What does the qualification cover?

The content of this qualification has been developed in consultation with academics to ensure that it supports progression to higher education. In addition, employers and professional bodies have been involved and consulted, in order to confirm that the content is also appropriate and consistent with current practice for students planning to enter employment directly in the applied science sector.

There are three mandatory units:

1. Principles and Application of Science (Year 12 – Examined unit)
 - This unit will be assessed through a written exam worth 90 marks, which is set and marked by Pearson. There are three papers, each worth 30 marks:
 - Paper 1 – Biology
 - Paper 2 – Chemistry
 - Paper 3 – Physics
 - The assessment availability is January and May/June each year
2. Practical Scientific Procedures and Techniques (Year 12 – Assignment based unit)
 - Learning aim A: Undertake titration and colorimetry to determine the concentration of solutions
 - Learning aim B: Undertake calorimetry to study cooling curves
 - Learning aim C: Undertake chromatographic techniques to identify components in mixtures
 - Learning aim D: Review personal development of scientific skills for laboratory work
3. Science Investigation Skills (Year 13 – Examined unit)
 - This assessment takes place in two parts:
 - Part A: Supervised practical assessment session where students obtain investigation results for Part B
 - Part B: One hour and 30 minute exam during which learners will plan, record, process, analyse and evaluate scientific findings, using primary and secondary information/data.

There is a choice of option units for the fourth unit (Year 13 – Assignment based unit). The option units cover content areas such as:

- Physiology of human body systems
- Biological molecules and metabolic pathways
- Applications of inorganic chemistry
- Electrical circuits and their application

Subject: BTec Applied Science

Year group: 12

Topic	Unit 1: Principles and Applications of Science			Unit 2: Practical Scientific Procedures and Techniques
	Biology - Structure and functions of cells and tissues	Chemistry - Periodicity and properties of elements	Physics - Waves in communication	
Prior Knowledge	From KS4 <ul style="list-style-type: none"> • SB1 Key Concepts in Biology • SB2 Cells and Control • SB5 Health Disease and the Development of Medicines 	From KS4 <ul style="list-style-type: none"> • SC3-7 Atomic Structure, Periodic table, Types of Bonding & Structure • SC9 Calculations involving masses 	From KS4 <ul style="list-style-type: none"> • CP4 Waves • CP5 Light and EM Spectrum 	From KS4 <ul style="list-style-type: none"> • Working scientifically skills • SC1/2 States of matter & Separation Techniques • SC8 Acids and Alkalis
Knowledge	<p>B1 Cell structure and function</p> <ul style="list-style-type: none"> • Understand the structure and function of organelles in cells • Use of light microscopes. • Understand the similarities and differences between plant and animal cell • Distinguish between gram-positive and gram-negative <p>B2 Cell specialisation</p> <ul style="list-style-type: none"> • Understand cell specialisation <p>B3 Tissue structure and function</p> <ul style="list-style-type: none"> • Understand the structure and function of epithelial tissue, endothelial tissue, muscular tissue, nervous tissue 	<p>A1 Structure and bonding in applications in science</p> <ul style="list-style-type: none"> • Understand the electronic structure of atoms • Understand ionic, covalent and metallic bonding • Understand intermolecular forces • Calculations involving masses <p>A2 Production and uses of substances in relation to properties</p> <ul style="list-style-type: none"> • Understand key physical properties of elements and periodicity • Understand the chemical properties of elements, redox reactions, neutralisation reactions and displacement reactions 	<p>C1 Working with waves</p> <ul style="list-style-type: none"> • Understand wave features and the difference between transverse and longitudinal • Discuss the application of diffraction gratings • Be able to use the wave equation ($v f = \lambda$) <p>C2 Waves in communication</p> <ul style="list-style-type: none"> • Understand the principles and applications of fibre optics <p>C3 Use of electromagnetic waves in communication</p> <ul style="list-style-type: none"> • Understand the speed, energy and frequency of EMS waves and their applications • Be able to use the inverse square law in relation to the intensity of a wave 	<p>Learning aim A: Undertake titration and colorimetry to determine the concentration of solutions</p> <p>A1 Laboratory equipment and its calibration A2 Preparation and standardisation of solutions using titration A3 Colorimetry</p> <p>Learning aim B: Undertake calorimetry to study cooling curves</p> <p>B1 Thermometers B2 Cooling curves</p> <p>Learning aim C: Undertake chromatographic techniques to identify components in mixtures</p> <p>C1 Chromatographic techniques C2 Application of chromatography C3 Interpretation of a chromatogram</p> <p>Learning aim D: Review personal development of scientific skills for laboratory work</p> <p>D1 Personal responsibility D2 Interpersonal skills D3 Professional practice</p>
Math Skills	<ul style="list-style-type: none"> • Calculate magnification and size of cells and organelles from drawings or images 	<ul style="list-style-type: none"> • moles, molar masses and molarities, mass, volume of solution, concentration, reacting quantities & percentage yields 	<ul style="list-style-type: none"> • Use of wave equation • Calculation of speed, critical angle, refractive index, wave intensity 	<ul style="list-style-type: none"> • plots of pH versus volume and $\Delta pH/\Delta \text{volume}$ versus volume • Calculation of concentrations & use of Beer-Lambert law • Calibration curves and graph tangents • Interpretation of cooling curves • Calculation of Rf values
Assessment Pattern	1 x interim tests (30 marks) 1 x mock (90 marks)			Assignment A Assignment B Assignment C Assignment D

Topic	Unit 3: Science Investigation Skills			Unit 8: Physiology of Human Body Systems
Prior Knowledge	From KS4: <ul style="list-style-type: none"> Working Scientifically SB1 Key Concepts in Biology SB6 Plant Structures and their functions SC20 Fuels SP9 Electricity From KS5: Unit 2: Practical Scientific Procedures and Techniques 			SB2 Cells and Control SB5 Health Disease and the Development of Medicines SB8 Exchange and Transport in Animals
Knowledge	A Planning a scientific investigation A1 Developing a hypothesis for an investigation A2 Selection of appropriate equipment, techniques and standard procedures A3 Health and safety associated with the investigation A4 Variables in the investigation A5 Method for data collection and analysis B Data collection, processing and analysis/interpretation B1 Collection of quantitative/qualitative data B2 Processing data	C Drawing conclusions and evaluation C1 Interpretation/analysis of data C2 Evaluation D Enzymes in action D1 Protein structure D2 Enzymes as biological catalysts in chemical reactions D3 Factors that can affect enzyme activity E Diffusion of molecules E1 Factors affecting the rate of diffusion E2 Arrangement and movement of molecules	F Plants and their environment F1 Factors that can affect plant growth and/or distribution F2 Sampling techniques F3 Sampling sizes G Energy content of fuels G1 Fuels G2 Hazards associated with fuels G3 Units of energy H Electrical circuits H1 Use of electrical symbols to design circuits H2 Equations H3 Energy usage	Learning aim A: Understand the impact of disorders of the musculoskeletal system and their associated corrective treatments A1 Structure of the musculoskeletal system A2 Function of the musculoskeletal system A3 Health matters and treatments related to the musculoskeletal system Learning aim B: Understand the impact of disorders on the physiology of the lymphatic system and the associated corrective treatments B1 Structure of the lymphatic system B2 Function of the lymphatic system B3 Health matters and treatments related to the lymphatic system Learning aim C: Explore the physiology of the digestive system and the use of corrective treatments for dietary-related diseases C1 Structure of the digestive system C2 Function of the digestive system C3 Health matters and treatments related to the digestive system
Math Skills	<ul style="list-style-type: none"> Be able to collect data accurately/reliably and to appropriate levels of precision. Be able to display data in a clear and logical format using correct headings with units Be able to identify anomalous data and take appropriate action. Be able to calculate mean and standard deviation, use error bars, use of t-test, chi-squared and correlation analysis, use and transposition of formulae, conversion of units, use of standard form and percentage error of measuring equipment. Be able to identify trends/patterns in data. Be able to compare primary and secondary data. Calculate heat energy released from a fuel in kJ mol⁻¹, power and work done 			
Assessment Pattern	3 x interim tests (40 marks) 1 x mock (70 marks)			Assignment A Assignment B Assignment C