



Sir John Cass Red Coat School Programme of Study – Key Stage 5
Subject: Applied Science - BTEC Level 3 – Nationals in Applied Science Subsidiary

Year 12	Year 13
<p>Topics Covered/ Areas of Focus:</p> <p>Unit 1 [R/502/5536]: Fundamentals of Science The aim of this unit is to enable learners to develop the practical techniques necessary to pursue a career as a laboratory technician. Learners will investigate the quantities necessary in chemical reactions, the structure and functions of cells, the calorific value of different fuels and develop skills in communicating scientific information.</p> <p>Unit 2 [H/502/5539]: Working in the Science Industry The aim of this unit is to enable learners to gain the knowledge and skills that an employee in the science industry needs to be an effective, efficient and safe member of a team. Learners will know communication practices, how laboratories are designed, how information is stored in laboratory information management (LIMS) and how to work safely in a scientific workplace.</p> <p>Unit 4 [M/502/5544]: Scientific Practical Techniques The aim of this unit is to enable learners to use a range of practical techniques used in science such as the analysis of substances, the separation of substances and the use of instruments/sensors. The variety of techniques in the content allows the unit to be tailored to reflect the focus of different areas of study, e.g. forensic science, biology, chemistry, physics, electronics and environmental science. (MRI) and radiotherapy.</p>	<p>Topics Covered/ Areas of Focus:</p> <p>Unit 11 [F/502/5550]: Physiology of Human Body Systems The aim of this unit is to enable learners to investigate some of the organ systems of the human body and how they work together. Learners will have an opportunity to use appropriate tests to investigate the cardiovascular, respiratory, digestive and lymphatic systems and the organisation of cells and tissues.</p> <p>Unit 12 [J/502/5551]: Physiology of Human Regulation and Reproduction The aim of this unit is to enable learners to understand of the physiology of human regulation and reproduction. Learners will cover the regulation of body fluids, how the nervous system functions, homeostasis and the human reproductive system.</p> <p>Unit 20 [F/502/5564]: Medical Physics Techniques The aim of this unit is to enable learners to develop, through a practical vocational skills approach, an understanding of the important fundamental physics concepts behind medical physics techniques such as x-rays, ultrasounds, diagnostic imaging and magnetic resonance imaging (MRI) and radiotherapy.</p>
<p>Skills Development & Expected Progress:</p> <ul style="list-style-type: none"> • Gives learners the opportunity to acquire technical and employability skills, knowledge and understanding which are transferable and will enable individuals to meet changing circumstances, whether these arise from a shift in their own status or employment, or general changes in applied science practice, provision or environment • Gives science employees opportunities to achieve a nationally recognised level 3 vocationally-specific qualification • Gives full-time learners the opportunity to enter employment in the science sector or to progress to vocational qualifications such as the Edexcel BTEC Higher Nationals 	

in Applied Biology, Applied Chemistry or health-related or other science-related qualifications

- Increases understanding of the role of the science technician or assistant practitioner, their relationship with the scientific community and their responsibilities towards the community and the environment

Gives learners the opportunity to develop a range of skills and techniques, personal skills and attributes essential for successful performance in working life.

Assessment:

Unit 1: Fundamentals of Science

This unit is assessed by means of a written coursework consisting of the following assignments:

Assignment 1 – Volumetric Analysis Made Easy (P1, P2, M1, D1)

Assignment 2 – Training for Work (P3, P4, P5, M2, D2)

Assignment 3 – Energy for All (P6, P7, M3, D3)

Assignment 4 – Communicating Scientific Information (P8, P9, M4, D4)

Unit 2: Working in the Science Industry

This unit is assessed by means of a written coursework consisting of the following assignments:

Assignment 1 – Work in the Science Industry (P1, P2, M1, M2, D1)

Assignment 2 – Designing a Laboratory (P3, M3, D2)

Assignment 3 – Data Storage (P4, M4, D3)

Assignment 4 – Legislation in the Laboratory (P5, M5, D4)

Unit 4: Scientific Practical Techniques

This unit is assessed by means of a written coursework consisting of the following assignments:

Assignment 1 – Quantitative Analysis (P1, M1, D1) Stage 1

Assignment 1 – Qualitative Analysis (P1, M1, D1) Stage 2

Assignment 2 – Separating and Estimating Purity (P2, P3, M2, D2)

Assignment 3 – Selecting and Using Instruments/Sensors to Test Materials (P4, M3, D3)

Grading Criteria:

All units are internally and some externally assessed in the BTEC qualifications in this specification. All assessment for the BTEC qualifications in this course is criterion

Assessment:

Unit 11: Physiology of Human Body Systems

This unit is assessed by means of a written coursework consisting of the following assignments

Assignment 1: Levels of Organisation of the Human Body (P1, P2, M1, D1)

Assignment 2: Physiology of the Cardiovascular System (P3, M2, D2)

Assignment 3: Physiology of the Respiratory System (P4, M3, D2)

Assignment 4: Nutritional Content of Foodstuffs (P5, P6, M4, D2)

Assignment 5: The Lymphatic System (P7, M5, D3)

Unit 12: Physiology of Human Regulation and Reproduction

This unit is assessed by means of a written coursework consisting of the following assignments

Assignment 1 – Re-absorption in the Kidney and Associated Abnormalities (P1, M1)

Assignment 2 – Maintenance of Bodily Fluids under Different Conditions (P2, D1)

Assignment 3 – The Role of the Nervous System and Reflex Arcs in the Body (P3, M2)

Assignment 4 – The Structure and Function of the Endocrine System in the Body (P4, M3, D2)

Assignment 5 – Homeostatic Mechanisms and Malfunctions Leading to Disorders (P5, M4, D3)

Assignment 6 – Primary and Secondary Sex Organs (P6)

Assignment 7 – The Role of the Reproductive System in Fertility and Menstruation (P7, M5, D4)

Unit 20: Medical Physics Techniques

This unit is assessed by means of a written coursework consisting of the following assignments

Assignment 1: Practical Investigations of Radioactivity (P1, P2, M1, D1)

Assignment 2: Raising Awareness of the Uses of Radiopharmaceuticals With a

referenced, based on the achievement of specified learning outcomes. Each unit within the qualification has specified assessment and grading criteria, which are to be used for grading purposes. A summative unit grade can be awarded at pass, merit or distinction:

- To achieve a 'pass' a learner must have satisfied **all** the pass assessment criteria
- To achieve a 'merit' a learner must additionally have satisfied **all** the merit grading criteria
- To achieve a 'distinction' a learner must additionally have satisfied **all** the distinction grading criteria. Learners who complete the unit but who do not meet all the pass criteria are graded 'unclassified'.

Gamma Camera in Medical Diagnosis (P3, P4, M2, D2)

Assignment 3: An Introduction to How an MRI Scanner Works (P5, M3, D3)

Assignment 4: Risks and Benefits of Using Radiation With Patients (P6, M4, D4)

Grading Criteria:

All units are internally and some externally assessed in the BTEC qualifications in this specification. All assessment for the BTEC qualifications in this course is criterion referenced, based on the achievement of specified learning outcomes. Each unit within the qualification has specified assessment and grading criteria, which are to be used for grading purposes. A summative unit grade can be awarded at pass, merit or distinction:

- To achieve a 'pass' a learner must have satisfied **all** the pass assessment criteria
- To achieve a 'merit' a learner must additionally have satisfied **all** the merit grading criteria
- To achieve a 'distinction' a learner must additionally have satisfied **all** the distinction grading criteria. Learners who complete the unit but who do not meet all the pass criteria are graded 'unclassified'.

Literacy:

The Level 3 Applied science course facilitates to develop strong literacy cognition within students. The Applied science specification emphasises the development of chemical literacy skills, biological literacy, which are assessed throughout the course. Detailed and extended responses to the assignment criteria are assessed components. Pupils develop the ability of using and processing written information by reviewing scientific literature to help understand and develop scientific knowledge. Students will develop the ability to write legibly, with accurate use of spelling, grammar and punctuation, in order to make the meaning clear and explain scientific processes. They will also learn how to select and use a form and style of writing appropriate to purpose and to complex subject matter (reviews, reports and essays)

Numeracy:

The Applied Science covers all aspects of Biology Chemistry and Physics; numeracy is greatly embedded within each subject. Scientific experimentation will require learners to draw on their numeracy skills to help collect and analyse data and draw conclusions accordingly. 10% of the course covers mathematical skills, these include:

- Handling data (finding arithmetic means, identify uncertainties in measurements and use appropriate number of significant figures)
- Use ratios, fractions and percentages
- Be able to carry out serial dilution

- Carry out quantitative and qualitative analytical techniques
- Be able to identify the size of magnified organisms
- Substitute numerical values into algebraic equations using appropriate units for physical quantities
- Translate information between graphical, numerical and algebraic forms
- Plot two variables from experimental or other data
- Use data to draw conclusion and make predictions

ICT:

The ICT resources used by teachers enable them to provide a fully **differentiated and inspiring material** that allow students of all ability levels to reach their potential. Learners will be required to write up their work based on the specified learning outcomes. Learners are required to carry out literature research to help their understanding of assignments and complete reviews; PowerPoint's or essays to demonstrate their level on understanding. Sources of information will need to be cited demonstrating that research has taken place, supporting planning and conclusions. Learners will have access to world wide web where they will have access to a bank or recourses in the forms of Reviews, diagrams, images, videos, articles and published scientific paper. Learners are expected to carry out 5 hours per week of independent study and research and we are expanding our ICT provision to fully incorporate it into the school VLE/Firefly which can be accessed at home

Life in Modern Britain:

The course contributes in many aspects to the understanding of life in modern Britain

- **Criminal and Civil Law** – themes – abiding the laws that protect workers in industry (safe working practises and safety laws), understanding the consequences of breaching contracts. Identify procedures for storing sensitive information and laws protecting these systems.
- **Institutions and services** - themes – discussion of local government policy with regards to issues such as health, medical treatments, safety and environmental issues.
- **Democracy and democratic values** – themes - development of socio-political policy to problems such as use of radioactive material
- **Individual liberty** - themes – promotes dialogue and debate in issues such as stem cell research and genetic manipulation, the use of unions in the workplace and equal opportunity
- **Respect and tolerance of multi-faith society** – themes - Unit 20: Astronomy when considering how science and religion have influenced beliefs on how the universe originated (Unit 11 and Unit 18), how employers have adapted to help provide safe working environments based on respect and tolerance.
- **Safeguarding and resilience to propaganda** – learners will be monitored within schools and lessons will be delivers on safe E-learning, critically analysing the misuse of science in history such as nuclear radiation.

SMSC:

This qualifications contribute to an understanding of:

- **Spiritual issues** – for example in *Unit 44: Astronomy* when considering how science and religion have influenced beliefs on how the universe originated (*Unit 11 and Unit*

18)

- **Moral and ethical issues** – for example in *Unit 5: Perceptions of Science* looking at the ethics of scientific development and in *Unit 18: Genetics and Genetic Engineering* when considering how the technology relates to societies' morals and ethics (*Unit 2, unit 3, unit 11, unit 12 and unit 20*)
- **Social and cultural issues** – for example in *Unit 29: Physiological Investigations* when communicating with patients about various physiological conditions (*Unit 2, unit 3 and unit 18*)
- **Citizenship issues** - Equal opportunities issues are implicit throughout the BTEC qualifications in this specification (*unit 2*)
- **Environmental issues** - Learners undertaking the BTEC qualifications in this specification will have the opportunity to develop their understanding of environmental issues, for example in *Unit 2* when researching the maintenance of environmental balance and safe practices (*Unit 1, unit 2, unit 4, and unit 18*)
- **Health and safety considerations** - The BTEC qualifications in this specification are practically based and health and safety issues are encountered throughout the units. The European dimensions of legislation when working in science is specifically addressed in *Unit 2: Working in the Science Industry* and *Unit 10: Using Science in the Workplace*. (*Unit 1, unit 2, unit 4, unit 11, unit 18 and unit 20*)

Equal opportunities issues - are implicit throughout the BTEC qualifications in this program of study (*unit 2*)

Meeting the needs of individual students & Additional Support:

Opportunities are available to develop personal, learning and thinking skills (PLTS) within sector-related context. Further opportunities for learners to demonstrate these skills may arise as learners' progress throughout their learning.

- **Independent enquirers** - Young people process and evaluate information in their investigations, planning what to do and how to go about it. They take informed and well-reasoned decisions, recognising that others have different beliefs and attitudes.
- **Creative thinkers** - Young people think creatively by generating and exploring ideas, making original connections. They try different ways to tackle a problem, working with others to find imaginative solutions and outcomes that are of value.
- **Reflective learners** - Young people evaluate their strengths and limitations, setting themselves realistic goals with criteria for success. They monitor their own performance and progress, inviting feedback from others and making changes to further their learning.
- **Team workers** - Young people work confidently with others, adapting to different contexts and taking responsibility for their own part. They listen to and take account of different views. They form collaborative relationships, resolving issues to reach agreed outcomes.
- **Self-managers** - Young people organise themselves, showing personal responsibility, initiative, creativity and enterprise with a commitment to learning and self-improvement. They actively embrace change, responding positively to new priorities, coping with challenges and looking for opportunities.
- **Effective participators** - Young people actively engage with issues that affect them and those around them. They play a full part in the life of their school, college, workplace or wider community by taking responsible action to bring improvements for others as well as themselves.

To help learners identifying **areas for learner progression**, including stretch and challenge, teachers will

- Explaining clearly **how BTEC assessment works** and what learners need to do to achieve a Pass, Merit or Distinction.
- **Setting “dry run” or “mock” tasks** and scenarios to help learners understand what level they have reached and prepare for assessment.

- **Feedback on how to improve** knowledge, skills, understanding, behaviour, approach, grammar etc.

Learners will be provided with 5 hours of teaching time per-week and after school session are also provided for extra support. Learners that have difficulty grasping concepts will also be provided with one-to-one support with an academic mentor that can future help develop understanding.

Extra-Curricular Activities & Club:

Learners studying for the qualification bring with them a wealth of experience that are utilised to maximum effect by. The use of assessment evidence drawn from learners' work environments are encouraged. We aim to enhance the vocational nature of the qualification by:

- Liaising with employers to ensure a course relevant to learners' specific needs
- Accessing and using non-confidential data and documents from learners' workplaces
- Linking with company-based/workplace training programmes
- Making full use of the variety of experience of work and life that learners bring to the programme.
- Learner are also encouraged to attended university lectures on topics of interest and related to their assignment
- Learners are also encouraged to carry out work experience in industry and attend open days and career fairs.

Independent Study/ Homework:

Learners are expected to undertake a minimum of 5 hours of independent study of Applied science. In addition to this they are expected to read around the subject in advance of the lesson. Learners will be provided with the brief sheet and knowledge from taught lessons, where they have to complete the evidence required for the assessment. Homework will be given at the end of every lesson and these are linked with the assessment criteria. Details of the learning outcomes are in the student Study Guides with references to their textbooks. Learners are expected to make accurate notes and complete assignments regularly. Learners who are struggling with the course content are expected to approach teachers and/or academic tutor in this subject for extra support. Learners are expected to have the correct stationary and a calculator for every lesson.

Resources for Learning Support and VLE:

- Foale S, Hocking S, Llewellyn R, Musa I, Patrick E, Rhodes P and Sorensen J – BTEC Level 3 in Applied Science Student Book (Pearson, 2010) ISBN 9781846906800 Adams S and Allday J – Advanced Physics (Oxford University Press, 2000) ISBN 9780199146802 Ciccotti F and Kelly D – Physics AS (Collins Educational, 2000) ISBN 9780003277555
- Fullick A and Fullick P – Chemistry: Evaluation Pack (Heinemann Educational Secondary Division, 2000) ISBN 9780435570965 Fullick A – Heinemann Advanced Science: Biology (Heinemann Educational Secondary Division, 2000) ISBN 9780435570958
- Fullick P – Heinemann Advanced Science: Physics (Heinemann Educational Secondary Division, 2000) ISBN 9780435570972 Thompson A, Lainchbury A and Stephens J – Advanced Practical Chemistry, 2nd Edition

Useful websites

- www.akzonobel.com Akzonobel (formally the ICI Company)
- www.bbc.co.uk/learning BBC learning
- www.cellsalive.com CELLS alive
- www.nln.ac.uk National Learning Network resources
- www.rsc.org The Royal Society of Chemistry

Careers Information:

The course give learners the knowledge, understanding and skills that they need to prepare for employment. The qualifications provide career development opportunities for those already in work, and progression opportunities to higher education, degree and professional development programmes within the same or related areas of study, within universities and other institutions.

Units within the qualification cover areas of laboratory science, forensic science, medical science, environmental science and biological, chemical and physical science to provide a route to employment in the science industry or within organisations that use science or degrees in these fields. These can include roles such as:

- Working as a quality control technician/analyst, where the employee works in a production plant laboratory carrying out analytical tests using modern instrumentation, ICT and data interpretation
- Working in a hospital as a medical physics technician supporting the use of X-ray and other imaging/ scanning equipment
- Working in a research laboratory in the development of new drugs. Managing projects that include setting up apparatus, measuring and handling chemical substances, following procedures, carrying out observations and measurements, separating and analysing products
- Working in the chemical industry, involved with testing materials
- Working with the forensic science service or using their analytical skills in the chemistry industry
- Working in chemical companies developing fertilisers and other plant feeds
- Working for a scientific magazine or journal, editing and proofreading articles on issues such as applications and implications of new scientific discoveries and developments
- Working in a biotechnology laboratory carrying out fermentation and purification processes.