



Belonging • Experiences • Aspirations • Teamwork • Honesty

# Beath High School

## S4>S5 and S5>S6 Learner Pathways

### Science Faculty

# 2020-21





## Introduction

S4 and S5 pupils are now considering their Learner Pathway as they move towards their S5/S6 at Beath High School. From the full range of courses on offer, pupils are required to choose five different subjects to study during third year. In addition, current S4 and S5 pupils will continue with their current NPA course as they move into S5 and S6 in 2020-21.

To ensure that learners have as much information and guidance as possible, and in addition to all of the general advice given in Personal and Social Education classes, we provide pupils with an individual interview with their Guidance teacher.

A significant amount of work has been done to review our curriculum offer to deliver our curriculum rationale:

***The Beath curriculum is designed to encourage the learning and development of all of our young people. Our curriculum allows learners to achieve their true potential through flexible pathways to success. Personalisation ensures that the needs of all learners are met. Our young people gain a portfolio of qualifications, experiences and skills from our curriculum. We utilise partnership working and we focus on improving attainment and achievement. Our learners are supported into a robust and sustained positive destination.***

If you have any further questions, please do not hesitate to make contact with the school.





## SCIENCE FACULTY

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**Entry Level:**

Pupils will ideally have a National 5 qualification in another Science and have a desire to add Biology to their qualifications.

Progression from National 4 Biology in S4 is only recommended for those pupils who have shown that they have the work ethic to make the step up to National 5.

This should first be discussed with the Principal Teacher of Science.

**Course Structure and Content:**

Biology affects everyone and aims to find solutions to many of the world's problems. Biology, the study of living organisms, plays a crucial role in our everyday existence, and is an increasingly important subject in the modern world. Advances in technologies have made this varied subject more exciting and relevant than ever.

**Cell Biology**

The key areas covered in National 4/5 within the Cell Biology Unit are: cell structure; transport across membranes; producing new cells; DNA and its role in the production of proteins: proteins and enzymes; genetic engineering and respiration.

**Multicellular Organisms**

In this unit we focus on the whole organisms starting with cells, tissues and organs: stem cells and meristems. Then move onto control and communication: reproduction, variation and inheritance: the need for transport in both plants and animals.

**Life on Earth**

In this unit we focus on biodiversity and the distribution of life: energy in ecosystems, photosynthesis: sampling techniques and measurement of abiotic and biotic factors. The unit is completed with a study of adaptation, natural selection and the evolution of species and human impact on the environment.

**Assessment:**

Assessments will take place at the end of each topic to monitor progression and to aid in presentation at the appropriate level.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement at National 5 level will involve a course work task worth 20% of the overall grade as well as a final written exam.

Achievement at National 4 level will involve passing all internally assessed elements. These are a written assessment for each unit as well as two course work tasks: a write up of a practical task and an Added Value Unit.



**Entry Level:**

Pupils will ideally have a National 5 qualification in another Science and have a desire to add Chemistry to their qualifications.

Progression from National 4 Chemistry in S4 is only recommended for those pupils who have shown that they have the work ethic to make the step up to National 5. This should first be discussed with the Principal Teacher of Science.

**Course Structure and Content:****1. Chemical Changes and Structure**

Through practical experience, learners will, investigate average rates of reaction and the chemistry of neutralisation reactions. Focusing on these reactions, learners will work towards the concept of balanced chemical equations. Learners will explore the mole concept, formulae and reaction quantities. The connection between bonding and chemical properties of materials is investigated.

**2. Nature's Chemistry**

The Earth has a rich supply of natural resources which are used by all of us. In this Unit, learners will investigate the physical and chemical properties of cycloalkanes, branched chain alkanes and alkenes, and straight chain alcohols and carboxylic acids. They will explore their chemical reactions and their uses in everyday consumer products.

**3. Chemistry in Society**

Consists of chemistry of metals and their bonding, reactions and uses. The connection between bonding in plastics, their physical properties and their uses is investigated. Learners will investigate the chemical reactions and processes used to manufacture fertilisers. They will research the use and effect of different types of nuclear of radiation. Learners will investigate chemical analysis techniques used for monitoring the environment.

**Assessment:**

Assessments will take place at the end of each topic to monitor progression and to aid in presentation at the appropriate level.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement at National 5 level will involve a course work task worth 20% of the overall grade as well as a final written exam.

Achievement at National 4 level will involve passing all internally assessed elements. These are a written assessment for each unit as well as two course work tasks: a write up of a practical task and an Added Value Unit.



**Entry Level:**

Pupils will ideally have a National 5 qualification in Mathematics and at least one other Science and will have a desire to add Physics to their qualifications.

Progression from National 4 Physics in S4 is only recommended for those pupils who have achieved National 5 Mathematics and have shown that they have the work ethic to make the step up to National 5. This should first be discussed with the Principal Teacher of Science.

**Course Structure and Content:****Electricity and Energy**

This Unit covers the key areas energy transfer, heat and gas laws. Learners will research issues, apply scientific skills and communicate their finds, which will develop skills of scientific literacy.

**Waves and Radiation**

In this Unit we will study wave characteristics and nuclear radiation. This work is carried out using a variety of approaches, including investigation and problem solving.

**Dynamics and Space**

In this Unit we cover kinematics, forces and space. Learners will research various key issues within this topic, apply scientific skills and communicate their finds, which will develop skills of scientific literacy.

**Assessment:**

Assessments will take place at the end of each topic to monitor progression and to aid in presentation at the appropriate level.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement at National 5 level will involve a course work task worth 20% of the overall grade as well as a final written exam.

Achievement at National 4 level will involve passing all internally assessed elements. These are a written assessment for each unit as well as two course work tasks: a write up of a practical task and an Added Value Unit.



**Entry Level:**

Pupils should have a National 5 qualification in Physics and, preferably, Mathematics. This course ideally suited to pupils who would like to broaden their qualifications at a National 5 level.

Those who have achieved National 4 Physics should discuss their potential participation with the Principal Teacher of Science.

**Course Structure and Content:**

**Engineering Contexts and Challenges**

Understanding of engineering concepts by investigating engineered objects, engineering problems and their solutions. This will include environmental impacts and sustainable development.

**Electronics and Control**

Understanding control systems using Yenka software and physical systems; investigating analogue, digital and programmable systems.

**Mechanisms and Structures**

Understanding of hydraulic and pneumatic systems and structures.

**Assessment:**

Assessments will take place internally for the design, construction and testing of circuits. This assessment will contribute to the overall grade in conjunction with a final SQA exam.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.



**Entry Level:**

Pupils will ideally have a National 4 qualification in Biology or another Science and have a desire to work in the health industry.

This course is ideally suited to those pupils who have achieved National 4 in a Science but National 5 Biology is not an appropriate next step.

**Course Structure and Content:**

The health sector includes the National Health Service (NHS) (primary and secondary care), Independent Healthcare, Complementary Therapies, the Life Sciences and Retail Pharmaceutical Industries and the Community and Voluntary Sector.

The health sector is seen as a growth industry across Scotland offering a wide range of employment opportunities at a variety of levels. The National Health Service (NHS) is a major employer in Scotland and currently employs over 160,000 people. The demands placed upon the NHS are increasing, through changes in demographics combined with an ageing workforce.

Scotland has one of the largest life sciences industries in Europe, with a worldwide reputation particularly in research and development and manufacturing. The growing life sciences industry currently employs over 30,000 people in a wide variety of job roles.

The National 5 Health Sector Course has been designed to provide learners with opportunities to develop generic employability skills in the context of the health sector. The course may assist progression into further and higher education and training/employment.

The course consists of five units:

- Working in the Health Sector
- Life Sciences Industry and the Health Sector
- Improving Health and Well-being
- Physiology of the Cardiovascular System
- Working in Non Clinical Roles

**Assessment:**

There is no exam for the Health Sector course, all assessments are marked in school.

To achieve the award of National 5 Health Sector: Skills for Work, learners must achieve all the required units outlined above. They will be assessed pass/fail within the school.





**Subject: Practical Electronics National 5 ONLY**

**Entry Level:**

Pupils should have a National 5 qualification in Physics and, preferably, Mathematics. This course ideally suited to pupils who would like to broaden their qualifications at a National 5 level.

Those who have achieved National 4 Physics should discuss their potential participation with the Principal Teacher of Science.

**Course Structure and Content:**

**Circuit Design**

Analysis of electronic problems; design solutions to these problems.

**Circuit Simulation**

Using Yenka software to assist in design, construction and testing of circuits and electronic systems.

**Circuit Construction**

Soldering skills will be developed in assembling of electronic systems, using permanent and non-permanent methods; testing of the functionality of systems.

**Assessment:**

Assessments will take place internally for the design, construction and testing of circuits. This assessment will contribute to the overall grade in conjunction with a final SQA exam.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.



**Entry Level:**

Pupils must have National 5 Biology with a grade A-C.

Progression from National 5 Biology with a grade D is only recommended for those pupils who have shown that they have the work ethic to make the step up to Higher. This should first be discussed with the Principal Teacher of Science.

**Course Structure and Content:**

Biology affects everyone and aims to find solutions to many of the world's problems. Biology, the study of living organisms, plays a crucial role in our everyday existence, and is an increasingly important subject in the modern world. Advances in technologies have made this varied subject more exciting and relevant than ever.

**1) Human Cells**

In this Unit, learners will develop knowledge and understanding through studying stem cells, differentiation in somatic and germline cells, and the research and therapeutic value of stem cells and cancer cells. The Unit covers the key areas of division and differentiation in human cells; structure and replication of DNA; gene expression; genes and proteins in health and disease; human genomics; metabolic pathways; cellular respiration; energy systems in muscle cells.

**2) Physiology and Health**

In this Unit, learners will develop knowledge and understanding by focusing on the key areas of the structure and function of reproductive organs and gametes and their role in fertilisation; hormonal control of reproduction; the biology of controlling fertility; ante and postnatal screening; the structure and function of arteries, capillaries and veins.

**3) Neurobiology and Immunology**

In this Unit, learners will develop knowledge and understanding through the key areas of divisions of the nervous system and parts of the brain; memory; the cells of the nervous system and neurotransmitters at synapses; non-specific and specific defences against pathogens; immunisations and clinical trials of vaccines and drugs.

**Assessment:**

Assessments will take place at the end of each topic to monitor progression and to aid in presentation at the appropriate level.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement at Higher level will involve a course work task worth 20% of the overall grade as well as a final written exam.



**Entry Level:**

Pupils must have National 5 Chemistry with a grade A-C.

Progression from National 5 Chemistry with a grade D is only recommended for those pupils who have achieved National 5 in Mathematics (A-C) or at least one other Science (A-C) and have shown that they have the work ethic to make the step up to Higher. This should first be discussed with the Principal Teacher of Science.

**Course Structure and Content:****Chemical Changes and Structure**

This Unit covers the knowledge and understanding of controlling reaction rates and periodic trends. Learners will investigate collision theory and the use of catalysts in reactions. Learners will explore the concept of electronegativity and intra-molecular and intermolecular forces. The connection between bonding and a material's physical properties is investigated.

**Researching Chemistry**

This Unit covers the key skills necessary to undertake research in chemistry. Learners will develop the key skills associated with collecting and synthesising information from a number of different sources. Equipped with the knowledge of common chemistry apparatus and techniques, they will plan and undertake a practical investigation related to a topical issue.

**Nature's Chemistry**

This Unit covers the knowledge and understanding of organic chemistry within the context of the chemistry of food and the chemistry of everyday consumer products, soaps, detergents fragrances and skincare. Key functional groups and types of organic reaction are covered.

**Chemistry in Society**

This Unit covers the knowledge and understanding of the principles of physical chemistry which allow a chemical process to be taken from the researcher's bench through to industrial production. Learners will calculate quantities of reagents and products, percentage yield and the atom economy of processes. They will develop skills to manipulate dynamic equilibria and predict enthalpy changes. Learners will oxidising and reducing agents and their use in analytical chemistry through the context of titrations.

**Assessment:**

Assessments will take place at the end of each topic to monitor progression and to aid in presentation at the appropriate level.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement at Higher level will involve a course work task worth 20% of the overall grade as well as a final written exam.



**Entry Level:**

Pupils must have National 5 Physics with a grade A-C.

Progression from National 5 Physics with a grade D is not recommended but may be possible for those pupils who have achieved National 5 in Mathematics (A-C) and at least one other Science (A-C) and have shown that they have the work ethic to make the step up to Higher. This should first be discussed with the Principal Teacher of Science.

**Course Structure and Content:**

Physics: Our dynamic universe

The Unit covers the key areas of kinematics, dynamics and space time. Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Physics: Waves and Particles

The Unit covers the key areas of particles and waves. Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Physics: Electricity

The Unit covers the key areas of electricity, and electrical storage and transfer. They will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Researching Physics

The Unit offers opportunities for collaborative and for independent learning. Learners will develop knowledge and skills associated with standard laboratory apparatus and in the recording and processing of results.

**Assessment:**

Assessments will take place at the end of each topic to monitor progression and to aid in presentation at the appropriate level.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement at Higher level will involve a course work task worth 20% of the overall grade as well as a final written exam.



**Entry Level:**

Pupils must have Higher Human Biology with a grade A-C.

Progression from Higher Human Biology with a grade D is only recommended for those pupils who have achieved a Higher in at least one other Science (A-C) and have shown that they have the work ethic to make the step up to Advanced Higher. This should first be discussed with the Principal Teacher of Science.

**Course Structure and Content:****Biology: Cells and Proteins**

This Unit builds on understanding of the genome from Higher Human Biology. Learners will develop knowledge and understanding of proteomics, protein structure, binding and conformational change; membrane proteins; detecting and amplifying a stimulus; communication within multi cellular organism and protein control of cell division. The study of protein is primarily a laboratory-based activity, so the Unit includes important laboratory techniques for biologists.

**Biology: Organisms and Evolution**

This Unit builds on understanding of selection in the context of evolution and immune response from Higher Human Biology. Learners will develop knowledge and understanding of evolution; variation and sexual reproduction; sex and behaviour and parasitism. It covers the role of sexual reproduction and parasitism in the evolution of organisms. Biological variation is a central concept in this Unit and is best observed in the natural environment.

**Biology: Investigative Biology** This Unit builds on understanding of the scientific method from Higher Human Biology. Learners will develop knowledge and understanding of the principles and practice of investigative biology and its communication. The Unit covers scientific principles and processes, experimentation and critical evaluation of biological research.

**Assessment:**

Assessments will take place at the end of each topic to monitor progression and to aid in presentation at the appropriate level.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement at Advanced Higher level will involve a course work task worth 20% of the overall grade as well as a final written exam.



**Entry Level:**

Pupils must have Higher Chemistry with a grade A-C.

Progression from Higher Chemistry with a grade D is only recommended for those pupils who have achieved a Higher in Mathematics (A-C) or at least one other Science (A-C) and have shown that they have the work ethic to make the step up to Advanced Higher. This should first be discussed with the Principal Teacher of Science.

**Course Structure and Content:**

Advanced Higher is studied in three units:

**1. Inorganic and Physical Chemistry**

Learners will discover how electromagnetic radiation is used in atomic spectroscopy to identify elements. They will extend an understanding of the concept of atomic structure by considering atomic orbitals and electronic configuration related to the periodic table. Learners will predict the shape of molecules. Learners will gain an understanding of the physical and chemical properties of transition metals and their compounds. Learners will investigate the quantitative component of chemical equilibria. They will develop their understanding of the factors which influence the feasibility of chemical reactions. Learners will progress their understanding of reaction kinetics by exploring the order and mechanisms of chemical reaction.

**2. Organic Chemistry and Instrumental Analysis**

Learners will research the structure of organic compounds, including aromatics and amines, and draw on this to explain the physical and chemical properties of the compounds. They will consider the key organic reaction types and mechanisms, and link these to the synthesis of organic chemicals. Learners will discover the origin of colour in organic compounds and how elemental analysis and spectroscopic techniques are used to verify chemical structure. They will study the use of medicines in conjunction with the interactions of the drugs.

**3. Researching Chemistry**

In this Unit, learners will develop key investigative skills. The Unit offers opportunities for independent learning set within the context of experimental physics. Learners will identify, research, plan and carry out a Chemistry investigation of their choice.

**Assessment:**

Assessments will take place at the end of each topic to monitor progression and to aid in presentation at the appropriate level.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement at Advanced Higher level will involve a course work task worth 20% of the overall grade as well as a final written exam.



**Entry Level:**

Pupils must have Higher 5 Physics with a grade A-C.

Progression from Higher Physics with a grade D is not recommended but may be possible for those pupils who have achieved a Higher in Mathematics (A-C) and at least one other Science (A-C) and have shown that they have the work ethic to make the step up to Advanced Higher. This should first be discussed with the Principal Teacher of Science.

**Course Structure and Content:**

Pupils will study Advanced Higher Physics over these four topics:

**1) Rotational Motion and Astrophysics**

This Unit provides opportunities to develop and apply concepts and principles in a wide variety of situations involving angular motion. An astronomical perspective is developed through a study of gravitation, leading to work on general relativity and stellar physics.

**2) Quanta and Waves**

This Unit provides opportunities to develop and apply concepts and principles in a wide variety of situations involving quantum theory and waves. The Unit introduces non-classical physics and considers the origin and composition of cosmic radiation. Simple harmonic motion is introduced and work on wave theory is developed.

**3) Electromagnetism**

This Unit provides opportunities to develop and apply concepts and principles in a wide variety of situations involving electromagnetism. The Unit develops knowledge and understanding of electric and magnetic fields and capacitors and inductors used in d.c. and a.c. circuits.

**4) Investigative Physics**

In this unit learners will develop key investigative skills. The Unit offers opportunities for independent learning set within the context of experimental physics. Learners will identify, research, plan and carry out a physics investigation of their choice.

**Assessment:**

Assessments will take place at the end of each topic to monitor progression and to aid in presentation at the appropriate level.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement at Advanced Higher level will involve a course work task worth 20% of the overall grade as well as a final written exam.



**Entry Level:**

This course is ideally suited to those pupils who have achieved National 4 in a Science but National 5 is not an appropriate next step.

The content of this NPA is at level 4 and so would not be suitable for those pupils who have achieved National 5 (A-C) or Higher level in Science. It may be suitable to pupils who have achieved National 5 Grade D in Sciences.

**Course Structure and Content:**

The NPA in Science and Health at SCQF level 4 develops knowledge and understanding of science in relation to human health and provides an entry level point for people who wish to pursue a career in science, technology, engineering or maths. This is seen to be of particular importance given the existing and projected shortfall in suitably qualified individuals in these areas.

The NPA in Science and Health at SCQF level 4 allows learners to:

- Develop knowledge and understanding of biology, chemistry, and physics develop skills in good laboratory practice.
- Develop an understanding of health and safety practices.
- Develop an awareness of the Skill for Life of Health and Wellbeing.
- Prepare candidates for progression to qualifications at SCQF level 5 in areas related to human health.

This course is made up of four units in Biology, Chemistry and Physics which focusses on elements of health across all three science subjects. Ideal for pupils who are keen to pursue a career in health related industries.

**Skills Developed**

- Provide structured awards that will recognise existing skills and competences relating to science
- Provide a range of development opportunities in core and essential skills, specifically to:
  - Communications
  - ICT
  - Numeracy
  - Working with Others
  - Problem solving
  - Employability skills
- Develop a range of key skills that are aligned to industry standard.

**Assessment:**

Assessments will take place at the end of each topic.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement involves passing an assessment of all of the individual units and the completion of a formal experimental report.





**Entry Level:**

This course is ideally suited to those pupils who have achieved National 4 in a Science but for whom National 5 is not an appropriate next step.

The content of this NPA is at level 4 (National 4) and so would **not** be suitable for those pupils who have already achieved National 5 (A-C) or Higher level in a Science subject. It may be suitable to pupils who have achieved National 5 Grade D in a Science subject(s).

**Course Structure and Content:**

The NPA in Science and Technology at SCQF level 4 develops knowledge and understanding of science in relation to applications in everyday life and provides an entry level point for people who wish to pursue a career in science, technology, engineering and maths sector. This is particularly important given the existing and projected shortfall in suitably qualified individuals in these areas.

This NPA allows learners to:

- Develop knowledge and understanding of biology, chemistry, and physics.
- Apply knowledge to understand developments in new technology.
- Develop skills in good laboratory practice.
- Develop an understanding of science health and safety practices.
- Develop an awareness of the Essential Skill of Sustainable Development.
- Progress to qualifications at SCQF level 5 in science and in engineering.

This course will appeal to pupils interested in adding to their knowledge of Physics, Chemistry and Biological. Pupils will study four units looking at; telecommunications and electronics in Physics, Chemistry in Society in Chemistry and Biotechnology in Biology. Real world applications and developments in these areas will form the main subjects of study. The course is ideal for pupils who may be working towards or considering a job/apprenticeship in the biotech, telecoms or electronics industries.

**Skills Developed**

- Provide structured awards that will recognise existing skills and competences relating to science
- Provide a range of development opportunities in core and essential skills, specifically to:
  - Communications
  - ICT
  - Numeracy
  - Working with Others
  - Problem solving
  - Employability skills
  - Develop a range of key skills that are aligned to industry stand



**Assessment:**

Assessments will take place at the end of each topic.

Continual assessment of knowledge and understanding will take place as part of learning and teaching.

Achievement involves passing an assessment of all of the individual units and the completion of a formal experimental report.

