Higher National Unit specification

General information

Unit title: Physics for Life Sciences (SCQF level 7)

Unit code: H93F 34

Superclass: RC

Publication date: May 2015

Source: Scottish Qualifications Authority

Version: 02

Unit purpose

This Unit is designed to enable learners to understand key aspects of physics. Learners will also develop practical skills in techniques relevant to physics. The Unit is suitable for learners studying at HNC level, and will provide the necessary underpinning knowledge and skills to enable progression to further study of physics at HND level or to seek employment in science based industries.

Outcomes

On successful completion of the Unit the learner will be able to:

1 Describe and explain principles of waves and interference.
2 Describe and explain medical applications using lasers, electromagnetic spectrum and magnetic fields.
3 Describe heat transfer, fluid mechanics, and equilibrium and elasticity.
4 Perform a practical experiment related to physics.

Credit points and level

1 Higher National Unit credit at SCQF level 7: (8 SCQF credit points at SCQF level 7)

Recommended entry to the Unit

Entry is at the discretion of the centre, however it is recommended that learners should have completed the HN Unit H8XP 33 *Mathematics for Science 1* or equivalent, or have experience of Physics and Mathematics at Higher level.

Higher National Unit specification: General information (cont)

Unit title: Physics for Life Sciences (SCQF level 7)

Core Skills

Achievement of this Unit gives automatic certification of the following Core Skills component:

Complete Core Skill	None
Core Skill component	Critical Thinking at SCQF level 6 Using Number at SCQF level 6

There are also opportunities to develop aspects of Core Skills which are highlighted in the Support Notes of this Unit specification.

Context for delivery

If this Unit is delivered as part of a Group Award, it is recommended that it should be taught and assessed within the subject area of the Group Award to which it contributes.

The Assessment Support Pack (ASP) for this Unit provides assessment and marking guidelines that exemplify the national standard for achievement. It is a valid, reliable and practicable assessment. Centres wishing to develop their own assessments should refer to the ASP to ensure a comparable standard. A list of existing ASPs is available to download from SQA's website **www.sqa.org.uk/sqa/46233.2769.html**.

Equality and inclusion

This Unit specification has been designed to ensure that there are no unnecessary barriers to learning or assessment. The individual needs of learners should be taken into account when planning learning experiences, selecting assessment methods or considering alternative evidence.

Further advice can be found on our website **www.sqa.org.uk/assessmentarrangements**.

Higher National Unit specification: Statement of standards

Unit title: Physics for Life Sciences (SCQF level 7)

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Where evidence for Outcomes is assessed on a sample basis, the whole of the content listed in the Knowledge and/or Skills section must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed and different items should be sampled on each assessment occasion.

Outcome 1

Describe and explain principles of waves and interference.

Knowledge and/or Skills

- Wave phenomena: superposition, wave fronts, Doppler effect
- Interference: amplitude
- Diffraction and X-ray diffraction
- Polarisation: birefringence, Brewster's law

Outcome 2

Describe and explain medical applications using lasers, electromagnetic spectrum and magnetic fields.

Knowledge and/or Skills

- Lasers generation
- Laser types: ruby laser, helium–neon laser
- Lasers and medical applications
- Electromagnetic spectrum and medical applications
- Magnetic fields and medical applications

Outcome 3

Describe heat transfer, fluid mechanics, and equilibrium and elasticity.

Knowledge and/or Skills

- Heat transfer: conduction, convection and radiation
- Fluid mechanics
- Equilibrium and elasticity

Higher National Unit specification: Statement of standards

Unit title: Physics for Life Sciences (SCQF level 7)

Outcome 4

Perform a practical experiment related to physics.

Knowledge and/or Skills

- Physics experiments
- Working safely, within current health and safety regulations
- Consistent and accurate results
- Recording observations and results
- Evaluation skills
- Result analysis and conclusions

Higher National Unit specification: Statement of standards (cont)

Unit title: Physics for Life Sciences (SCQF level 7)

Evidence Requirements for this Unit

Written and/or oral recorded evidence for Outcomes 1−3 should be assessed using a holistic closed-book assessment under supervised conditions. Outcomes may also be assessed individually. The assessment will use a sampling approach to the Knowledge and/or Skills as detailed below. It is recommended that the assessment — whether holistically or individually — be completed within 90 minutes. Learners can only have access to the *SQA Databook for HN Physics* or any suitable replacement when sitting the assessment.

Written and/or oral recorded evidence for Outcome 4 should be assessed by production of a full laboratory report, or by completion of an appropriate pro forma. An assessor's observation checklist could be used to record performance evidence of the practical experiment.

Outcome 1

The assessment will sample 3 of the 4 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- Describe the effect of superposition, wave fronts and the Doppler effect.
- Describe the difference between constructive and destructive interference, using this information to perform calculations of the angle of diffraction; describe interference by reflection and refraction on different materials including partially reflecting surfaces; perform calculations to determine the refractive index and/or the critical angle.
- Explain diffraction of light through a double slit; perform calculations to determine the wavelength of light or the angle of diffraction; apply the Bragg equation to determine the spacing between planes in a crystal structure.
- Explain polarisation; explain polarising filters and polarisation by reflection; perform calculations to determine the angle of reflection; explain the meaning of birefringence; apply Brewster's law to calculate the polarising angle.

Higher National Unit specification: Statement of standards (cont)

Unit title: Physics for Life Sciences (SCQF level 7)

Outcome 2

The assessment will sample 3 of the 5 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- Explain the generation of laser light, absorption and emission spectra; apply the Maxwell–Boltzmann distribution and the Boltzmann's constant to calculate the number of atoms in an excited state.
- Describe the production of light in a ruby laser or a helium–neon laser.
- Describe the use of laser light in a medical application and the associated health and safety requirements for its use.
- Determine the correct part of the electromagnetic spectrum in a medical application; perform calculations to determine the dosage, radiation factor and half-life of a radioactive source or age of a specimen; describe the appropriate health and safety requirements for use of laser light or radiation.
- Description of the use of magnetic fields in a medical application.

Outcome 3

The assessment will sample 2 of the 3 Knowledge and/or Skills items. Learners will not have prior knowledge of which items are being assessed. Those items which are not sampled must be covered in the alternative (re-sit) assessment.

Where an item is sampled, a learner's response will be judged satisfactory where the evidence shows that the learner can:

- Describe conduction, convection and radiation in heat transfer and determine the type of heat transfer taking place; apply the Stefan–Boltzmann law and the Stefan–Boltzmann constant to calculate the rate of heat gain or loss of a material.
- Perform calculations to determine the density and/or pressure of a fluid; explain Archimedes' principle; perform calculations to determine the surface tension; determine if a fluid flow is laminar or turbulent flow.
- Resolve the force vectors to show equilibrium; solve problems involving stress, strain or Young's modulus; determine from a stress strain graph if a material is in elastic or plastic deformation.

Higher National Unit specification: Statement of standards (cont)

Unit title: Physics for Life Sciences (SCQF level 7)

Outcome 4

Learners will perform one practical experiment, the content of which will be related to Outcomes 1−3. A learner's response will be judged satisfactory where the evidence shows that the learner can achieve all of the following:

- Follow instructions to perform an experiment related to physics.
- Work in a safe manner regarding current health and safety regulations.
- Achieve consistent and accurate results.
- Record experimental observations and results clearly and accurately.
- Evaluate validity of results in terms of sources of and values of experimental errors.
- Analyse results correctly and state valid conclusions.

An assessor observation checklist will be used to record the learner's performance of the practical work in line with given instructions and health and safety requirements.

Learners may report results either by production of a full laboratory report, or by completion of an appropriate pro forma. Where a pro forma approach is deployed, the pro forma will not present information or assistance to the learners on how to correctly perform calculations, analyse experimental results or experimental errors. Learners will be expected to perform such activities independently on the basis of the experimental data.

Where a learner does not perform an assessed practical experiment to the required standard, they will be given the chance to either reattempt the same practical experiment, or to undertake a different practical experiment of similar complexity. Where a laboratory report or pro forma does not meet required standard, then the learner will be given a single opportunity to re-draft. If the required standard is still not attained, then an alternative practical experiment will be set.

Higher National Unit Support Notes

Unit title: Physics for Life Sciences (SCQF level 7)

Unit Support Notes are offered as guidance and are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

This Unit is intended as part of the framework for HNC/HND Applied Sciences, HNC Applied Biological Sciences and HND Applied Chemical Sciences but may be suitable for inclusion in other HN Science awards. It is designed to introduce learners to the theoretical and practical aspects of physics.

Outcome 1 — Describe and explain principles of waves and interference

- The principle of linear superposition and how the combining of two or more waves will produce either constructive or destructive interference. White light is a superposition of waves with wavelengths extending throughout the visible spectrum. Wave fronts and the concept of wave propagation, interference of light from a single source through a double slit giving fringe patterns. Calculations of angle of diffraction and wavelength of light. The Doppler effect; waves approaching a moving listener have a speed of propagation relative to the listener. The Doppler frequency shift for light.
- In a region of waves from a coherent source, superposition occurs giving reinforcement of the wave. At other points the waves cancel each other out. The resulting effect is called an interference pattern or a system of fringes. The constructive and destructive interference causes changes in amplitude. The effect of the change in amplitude causes effects like the change in pitch in music. Interference by reflection and refraction shows how light behaves with different materials and different angles. These types of interference should be looked at through a range of materials including materials with partly reflecting and partly transmitting surfaces.
- The way light defracts can be investigated by looking at single and double slit experiments. With the results the wavelength of the light and the diffractions angle can be calculated. X-ray diffraction can be investigated by looking at crystal structures, the Bragg equation can be used to find the spacing between the planes in the structure and the angle required to determine interference maxima.

  Bragg equation $2d \sin\theta = n\lambda$

- Polarisation occurs with all transverse waves. When a wave is only displaced in one direction it is linearly polarised. Polarising filters allow waves displaced in a certain direction to pass through. Polarisation by reflection and the calculation of the polarising angle. Brewster's law. Materials which exhibit birefringence have different refractive indexes for different directions of polarisation, eg calcite which has a refractive index of 1.658 in one direction and 1.486 in the perpendicular direction.

Higher National Unit Support Notes (cont)

Unit title: Physics for Life Sciences (SCQF level 7)

Outcome 2 — Describe and explain medical applications using lasers, electromagnetic spectrum and magnetic fields

- A description of the laser light beam when produced being highly coherent and monochromatic light as a result of emission of many atoms. Looking at atoms in the excited state returning to the ground state and producing a photon. Stimulated emission when an incident photon encounters an excited atom, forcing the atom to emit another photon with the same frequency, same direction, same phase and the same polarisation as the incident photon. Use of the Maxwell–Boltzmann distribution and Boltzmann's constant to calculate the number of atoms in various excited states.
- The ruby laser uses a synthetic crystal of aluminium oxide containing a small amount of chromium as the laser material. The helium–neon laser uses a mixture of helium and neon and works continuously producing a less divergent beam than the ruby laser.
- Lasers are used in many different medical applications: ophthalmology and dermatology. The health and safety for the use of lasers is set out by the Medicines and Healthcare Products Regulatory Agency (MHRA).
- Electromagnetic spectrum medical applications; radiotherapy, PET tomography, X-rays. Health and safety for radioactivity, dosage, radiation factors, half-life and carbon dating.
- Magnetic fields looking at magnetic field lines and flux, the motion of charged particles in a magnetic field and their application in medicine eg MRI, NMR, bacteria alignment and biomagnetism.

Outcome 3 — Describe heat transfer, fluid mechanics, and equilibrium and elasticity

- Conduction is the transfer of heat energy through a solid material eg copper. Convection currents occur when a fluid is heated and expands and so becomes less dense. Radiation depends on electromagnetic waves such as visible light, infrared and ultra violet. The object radiates the energy in the form of electromagnetic radiation. The heat current being calculated using the Stefan–Boltzmann law and the Stefan–Boltzmann constant.

$$\text{Stefan - Boltzmann law}: \quad \mathrm{E} = \sigma \mathrm{T}^4$$

$$\sigma \text{ is the Stefan - Boltzmann constant} = \frac{2\pi^5 K^4}{15 C^2 h^3} = 5.7\,x10^{-8}\, Js^{-1} m^{-2} K^{-4}$$

- Explain that a fluid is either a liquid or gas. Density of a fluid, defined as its mass per unit volume. Pressure in a fluid; when a fluid is at rest it exerts a force perpendicular to any surface in contact with it, such as a container wall or the surface of a body immersed in it. Archimedes' principle; when a body is completely or partially immersed in a fluid, the fluid exerts an upward force on the body equal to the weight of the fluid displaced by the body. Calculations including the density, pressure and Archimedes' principle. Surface tension, various effects suggest that the surface of a liquid behaves like a stretched elastic skin. Calculations using the equation $\gamma = F / d$. Capillarity when the surface tension causes a liquid with an angle of contact less than 90^o to rise up a capillary tube. Viscosity of a liquid is a kind of internal fiction which affects the way fluids flow.

- Explain the difference between laminar or turbulent flow and use Poiseuille's formula to calculate the volume of fluid passing per second.

$$V = \frac{\pi \rho r^4}{8 \eta l}$$

Resolve the forces applied to a material. The general conditions for equilibrium: if the material has a number of coplanar forces applied and are in equilibrium it will stay at rest or continue to move at constant velocity. Look at the nature of a material by calculating the stress, $\sigma = \frac{\text{force}}{\text{area}}$, a stress which causes an increase in length puts the material in tension known as tensile stress. Calculate the strain on the material is given by $\varepsilon = \frac{\text{extension}}{\text{original length}}$. Explain plastic and elastic deformation of a material and identify the type of deformation from a stress strain graph. Calculate Young's modulus, $\mathrm{E} = \frac{\text{tensile stress}}{\text{tensile strain}} = \frac{Fl}{Ae}$.

Outcome 4 — Perform a practical experiment related to physics

Guidance on suitable practical experiments for assessment purposes is given elsewhere in this document. However, it is envisaged that learners will also participate in a range of other practical experiments which will both develop their laboratory skills and support the theory covered in Outcomes 1−3.

In carrying out such activities, learners should follow Good Laboratory Practice (GLP) and carry out or be familiar with the risk and Control of Substances Hazardous to Health (COSHH) assessments on all procedures undertaken. Opportunities should be taken to develop awareness of the sources of experimental error and of the accuracy of measurements, with quantification of errors where possible.

Guidance on approaches to delivery of this Unit

There is no particular order in which Outcomes 1−3 would be best delivered. It is envisaged that laboratory work and demonstrations will feature across the delivery of each of the Outcomes, and that the assessed practical experiment will be undertaken in a similar timeframe to the underpinning theory.

It is envisaged that delivery of Outcome 1 could commence with coverage of the basic description of waves before covering aspects of wave phenomena, in particular superposition, wave fronts and the Doppler effect. Delivery could then focus on the effect of interference of a light from a single source through a double slit, and calculations of the wavelength and the angle of diffraction. The effects of interference both constructive and destructive on a wave could be covered using appropriate examples, ie the increase in amplitude of the sound wave changes the pitch of the music. Interference by reflection and refraction, and calculation of the refractive index in different materials should include materials with partly reflecting and partly transmitting surfaces. Diffraction could be investigated by looking at single and double slit experiments and X-ray diffraction by looking at crystal structures.

The Bragg equation should be used to calculate the spacing between planes in the structure. The basics of linear polarisation should be covered followed by the polarisation filters, polarisation by reflection and the calculation of the polarising angle and Brewster's law.

Outcome 2 will cover the generation of laser light, with absorption and emission spectra being introduced to learners. The Maxwell-Boltzmann distribution and the Boltzmann's constant could be used to calculate the number of atoms in an excited state. The difference between a ruby laser and a helium-neon laser and their uses could then be discussed. The use of lasers in medical applications could then be covered (ophthalmology and dermatology), along with the appropriate health and safety requirements for the use of lasers as set out by the Medicines and Healthcare Products Regulatory Agency (MHRA). Delivery could then focus on the basics of the electromagnetic spectrum followed by the different parts of the spectrum used in medical applications; radiotherapy, PET tomography, X-rays. Learners should be made aware of the appropriate health and safety requirements for radioactivity, dosage, radiation factors, half-life and carbon dating. Delivery should also cover a description of magnetic fields including looking at magnetic field lines and flux. The effect of a magnetic field on the motion of charged particles and how this is used in medicine should be covered, eg MRI, NMR, bacteria alignment and biomagnetism.

Outcome 3 will cover heat transfer, conduction, convection and radiation with learners performing calculations using the Stefan–Boltzmann law and the Stefan–Boltzmann constant. Fluid mechanics should cover the density of fluids, pressure in a fluid and Archimedes' principle. Delivery should cover surface tension, capillarity and a look at viscosity and its effects on fluid flow with learners performing calculations using Poiseuille's formula. Delivery should also include the conditions for equilibrium and the calculation of stress, strain and Young's modulus.

It is envisaged that Outcome 4 will be delivered alongside the theoretical based Outcomes 1−3. A range of practical experiments could be utilised to both support understanding of the underlying theory and to prepare learners for undertaking the assessed practical experiments. Aspects suitable for experimental investigation might include the Doppler effect, dividing the amplitude of laser light or measuring the viscosity of glycerol.

Guidance on approaches to assessment of this Unit

Evidence can be generated using different types of assessment. The following are suggestions only. There may be other methods that would be more suitable to learners.

Outcomes 1−3 could be assessed by a single holistic closed-book assessment with an appropriate cut-off score that covers the minimum sampling requirements as detailed in the Evidence Requirements. Outcomes may also be assessed individually. Assessment should be carried out in supervised conditions, and it is recommended that the assessment — whether holistically or individually — be completed within 90 minutes. Learners can only have access to the *SQA Databook for HN Physics* or any suitable replacement when sitting the assessment.

Higher National Unit Support Notes (cont)

Unit title: Physics for Life Sciences (SCQF level 7)

Where evidence of Outcomes 1−3 is assessed by sampling, the whole of the content listed in the Knowledge and/or Skills must be taught and available for assessment. Learners should not know in advance the items on which they will be assessed, and different items should be sampled on each assessment occasion. Any items not sampled in the first assessment, must be included in the alternative (re-sit) assessment.

In Outcome 4 learners are required to undertake one assessed practical experiment, the content of which will be related to Outcomes 1−3. Examples of suitable experiments are given below. This list is however not prescriptive, and other practical experiments of similar complexity may be used by the centre.

Suitable practical experiments for Outcome 1 are:

- Doppler effect
- Snell's law, refraction of light through a glass block
- Optical polarisation and Brewster's angle
- Wavelength of light
- Measuring the refractive index of air using a Michelson interferometer
- Dividing the amplitude of laser light
- Interference by dividing the amplitude using a thin air wedge

Suitable practical experiments for Outcome 2 are:

- Measuring viscosity of water using a capillary tube and Poiseuille's equation
- Measuring the viscosity of glycerol
- Measuring Young's modulus

The assessed practical experiment will usually be performed individually. However, there may be some experiments that are suitable to be undertaken in pairs or small groups. If this is the case then the assessor should ensure that all participants are actively involved and are able to adequately demonstrate the required skills.

An exemplar instrument of assessment with marking guidelines has been produced to indicate the national standard of achievement at SCQF level 7.

Centres are reminded that prior verification of centre-devised assessments would help to ensure that the national standard is being met. Where learners experience a range of assessment methods, this helps them to develop different skills that should be transferable to work or further and higher education.

Opportunities for e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or social software. Centres which wish to use e-assessment must ensure that the national standard is applied to all learner evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. The most up-to-date guidance on the use of e-assessment to support SQA's qualifications is available at **www.sqa.org.uk/e-assessment**.

Higher National Unit Support Notes (cont)

Unit title: Physics for Life Sciences (SCQF level 7)

Opportunities for developing Core and other essential skills

The delivery and assessment of this Unit will provide learners with the opportunity to develop the Core Skills of *Numeracy* and *Problem Solving* at SCQF level 6, and *Information and Communication Technology (ICT)* at SCQF level 4.

***Numeracy* — Using Number at SCQF level 6**

Learners will be required to decide on the steps and operations to solve complex problems, carrying out sustained and complex calculations, eg performing calculations related to wavelength of light, calculation of the refractive index and Young's modulus.

***Problem Solving* — Reviewing and Evaluating at SCQF level 6**

Following the assessed practical experiment learners will be required to review and evaluate the effectiveness of the exercise with a thorough interpretation of random and systematic sources of error. Learners will be required to reach sound conclusions on the basis of the data collected and the inherent errors.

***Information and Communication Technology (ICT)* — Providing/Creating Information at SCQF level 4**

Learners will make effective and appropriate use of ICT packages to produce a laboratory report or a pro forma in an appropriate format. Packages used will likely include word processing and spreadsheets.

Sustainability

Sustainability can be embedded in delivery of the Unit in a variety of ways. For example, by encouraging minimum usage, and possibly recycling during practical experiments.

This Unit has the Critical Thinking components of Problem Solving and Using Number components of Numeracy embedded in it. This means that when candidates achieve the Unit, their Core Skills profile will also be updated to show they have achieved Critical Thinking at SCQF level 6 and Using Number at SCQF level 6.

History of changes to Unit

Version	Description of change	Date
02	Core Skills Components Critical Thinking and Using Number at SCQF level 6 embedded.	28/07/2015

General information for learners

Unit title: Physics for Life Sciences (SCQF level 7)

This section will help you decide whether this is the Unit for you by explaining what the Unit is about, what you should know or be able to do before you start, what you will need to do during the Unit and opportunities for further learning and employment.

This is a 1 credit Unit at SCQF level 7, which you are likely to be studying as part of the first year of an HNC/HND science programme. Before progressing to this Unit it would be beneficial to have completed the HN Unit H8XP 33 *Mathematics for Science 1*, where you will have learned the appropriate mathematical skills. There will be a strong emphasis on the importance of experimental data in understanding the principles of physics, and on the applications of physical knowledge in practical situations.

On completion of the Unit you should be able to:

1 Describe and explain principles of wave and interference.
2 Describe and explain medical applications using lasers, electromagnetic spectrum and magnetic fields.
3 Describe heat transfer, fluid mechanics, and equilibrium and elasticity.
4 Perform a practical experiment related to physics.

Outcome 1

In this Outcome you will cover aspects of wave phenomena, in particular superposition, wave fronts and the Doppler effect. You will learn about the effect of interference, diffraction and polarisation on light. You will also learn why we see a rainbow and why some surfaces appear to change colour when you look at them at a different angle.

Outcome 2

In this Outcome you will learn about the different types of lasers. You will learn how lasers generate light and how they are used in medical applications. You will also cover different parts of the electromagnetic spectrum and magnetic fields in medical applications.

Outcome 3

In this Outcome you will cover the three mechanisms of heat transfer: conduction, convection and radiation. You will learn about heat engines and refrigerators, where heat energy is transferred partly into or from work or mechanical energy.

You will learn about fluid mechanics, the properties of a fluid and about how they flow. You will also look at how fluids are affected by different types of forces and how water is transported in biological systems.

You will also learn about equilibrium and elasticity and the different types of stress and strain which can be applied to a material. You will cover elastic polymers and how they are affected by temperature and elastic and plastic deformation.

General information for learners (cont)

Unit title: Physics for Life Sciences (SCQF level 7)

Outcome 4

In this Outcome you will undertake a practical experiment, based on the content of Outcomes 1−3.

During this practical work, you will also be expected to develop good laboratory practices as well as improve your skills of manipulation, observation and measurement. You will be encouraged to develop safe working practices and to strive constantly to improve the accuracy and reliability of your results. The reporting and analysis of experimental data is an important aspect of the practical sessions.

Assessment

For Outcomes 1−3 assessment may be conducted on an Outcome by Outcome basis or by one single assessment. Assessment will be conducted under closed-book conditions.

Outcome 4 will be assessed after you have learned the necessary practical skills, and will take the form of one practical experiment, for which you will report your results either in a full laboratory report, or by completion of a pro forma report.

Core Skills

You will have opportunities to develop the Core Skills of *Numeracy* and *Problem Solving* at SCQF level 6, and *Information and Communication Technology (ICT)* at SCQF level 4.