SQA Advanced Unit specification

General information for centres

Unit title: Physics Principles: Heat and Thermodynamics (SCQF level 7)

Unit code: HV0N 47

Superclass:	RC
Publication date:	November 2017
Source:	Scottish Qualifications Authority
Version:	01

Unit purpose

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

Outcomes

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

1 Explain and apply aspects related to heat and the thermal expansion of materials.
2 Explain heat transfer between systems and materials.
3 Apply aspects of the First Law of Thermodynamics and its consequences.
4 Explain and apply aspects related to the kinetic theory of gases.
5 Perform practical experiments related to heat and thermodynamics.

Credit points and level

1 SQA 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 experience of Physics and Mathematics at Higher level.

Core Skills

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

Complete Core Skill	None
Core Skill component	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**.

SQA Advanced Unit specification: Statement of standards

Unit title: Physics Principles: Heat and Thermodynamics (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

Explain and apply aspects related to heat and the thermal expansion of materials.

Knowledge and/or Skills

- Empirical temperature scales: Celsius and Kelvin
- Thermometric properties
- Thermal equilibrium and the Zeroth Law of Thermodynamics
- Young's modulus
- Thermal expansion and strain

Outcome 2

Explain heat transfer between systems and materials.

Knowledge and/or Skills

- Heat transfer by conduction
- Fourier's Law
- Heat transfer by convection
- Heat transfer by radiation
- Stefan-Boltzmann Law
- Heat loss

Outcome 3

Apply aspects of the First Law of Thermodynamics and its consequences.

Knowledge and/or Skills

- State function
- Ideal Gas Law
- Work of expansion and contraction
- First Law of Thermodynamics

Outcome 4

Explain and apply aspects related to the kinetic theory of gases.

Knowledge and/or Skills

- Theoretical assumptions
- Relationship between pressure, temperature and kinetic energy
- Equipartition of energy theorem
- Translational kinetic energy and rotational kinetic energy of molecules
- Root mean square of velocity of molecules
- Momentum of molecules

Outcome 5

Perform practical experiments related to heat and thermodynamics.

Knowledge and/or Skills

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

Evidence Requirements for this Unit

Written and/or oral recorded evidence for Outcomes 1−4 should be assessed using a holistic closed-book assessment under supervised conditions. The assessment will use a sampling approach to the Knowledge and/or Skills as detailed below. It is recommended that the assessment 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 5 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 practical experiments.

Outcome 1

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:

- Differentiate between empirical temperature scales.
- State three thermometric properties from length, density, electrical resistance, volume, colour; describe a temperature measuring device based on one thermometric property.
- Use the Zeroth Law of Thermodynamics in the case of three systems to explain thermal equilibrium.
- Perform calculations to determine Young’s moduli of materials.
- Perform calculations to determine expansion coefficients from thermal induced strain and temperature.

Outcome 2

The assessment will sample 4 of the 6 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 process of heat transfer by conduction.
- Use Fourier's Law to determine related values.
- Explain the process of heat transfer by convection.
- Explain the process of heat transfer by radiation.
- Use the Stefan-Boltzmann Law to calculate values related to blackbody thermal radiation.
- Explain one way of reducing heat loss from conduction, convection and radiation.

Outcome 3

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:

- Explain what is meant by a state function, giving at least one example.
- Derive the Ideal Gas Law from Boyle's, Charles's, Amonton's and Avogadro's laws.
- Perform calculations to determine the work for expansion and contraction in the following thermodynamic processes: isothermal, isobaric and adiabatic conditions.
- Apply the First Law of Thermodynamics to determine internal energy changes.

Outcome 4

The assessment will sample 4 of the 6 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 at least three assumptions behind the kinetic theory of gases.
- Describe quantitatively the relationship between pressure, temperature and kinetic energy of an ideal gas.
- Explain the equipartition of energy theorem.
- Perform calculations to determine the total transitional and rotational energy of molecules.
- Perform calculations to determine the root mean square velocities of molecules.
- Perform calculations to determine the root mean square momentum of molecules.

Outcome 5

Learners will perform a minimum of two practical experiments, the content of which will be related to Outcomes 1−4. 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 experiments related to heat and thermodynamics.
- 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 experiments 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 the 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.

SQA Advanced Unit Support Notes

Unit title: Physics Principles: Heat and Thermodynamics (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 part of the framework for the SQA Advanced Certificate/Diploma in Applied Sciences but may be suitable for inclusion in other SQA Advanced science awards. It is designed to develop theoretical and practical aspects of the physics principles of heat and thermodynamics, and also to introduce learners to mechanics.

Outcome 1 — Explain and apply aspects related to heat and the thermal expansion of materials

Define temperature scale using thermometric properties. Compute linear relationships between two fixed points on a graph. Examine Celsius and Kelvin scales for similarities, common and correct usage.

Examine thermometric properties abstractly and as seen in thermometers (constant volume gas thermometer, resistance thermometer, thermocouple, disappearing filament thermometer).

Introduce notion of arbitrary thermodynamic systems of some temperature. Equilibrium of heat follows in an analogous fashion to equilibrium of forces; unbalanced thermodynamic systems will either experience an increase or decrease in heat until they are each at the same value of temperature. Introduce the Zeroth Law of Thermodynamics to explain the action of three systems attaining equilibrium.

Beginning with the case of a stretched wire, define tensile stress and extensional strain, leading to Young's modulus as the ratio of stress and strain, with the same units as that for pressure (Pascal, Nm^{-2}). Calculations may involve determining the Young's moduli for a variety of materials or its related terms such as cross sectional areas.

Define the relationship between changing lengths of a material and its change in temperature, leading to thermal strain. Calculate expansion coefficients, applying to given materials of known values. Give examples of thermal expansion and its applications, as well as means of reducing net expansion or minimising its effects.

Outcome 2 — Explain heat transfer between systems and materials

Propagation of heat arising from transfer of energy between neighbouring molecules. Conduction in isomorphic single systems (for example, a bar of metal) and across the junctions of two different systems.

Expression of heat transfer as energy transferred per unit time across a unit area leading to notation of heat flux and as a result of a negative temperature gradient. Thermal conductivity is the constant which equates heat flux and temperature gradient, yielding Fourier's Law.

Perform calculations to determine terms contained within Fourier's Law for given values of a system of heat conduction.

Heat transfer by convection, mediated by a fluid (liquid or gas). Relate density and temperature of medium to follow with notion of convection cycles. Diagrams can include direction of cycle and be annotated with relevant mathematical relationships to denote specific actions.

Heat transfer by radiation, mediated by an electromagnetic wave. Overview of relationship between wave frequency or length and heat, ie most commonly observed bodies emit Infra-Red radiation, 'red hot' bodies glow with a visible light emission, etc. Cases of heat transfer via radiation, ie electromagnetic wave propagation through vacuum allows the sun's heating effect on the earth. Images from thermal imaging cameras can be used to help visualise heat and its effects on surroundings.

Explanation of blackbody radiators; ideal physical entities producing a continuous spectrum of electromagnetic energy with some peak value. Brief comparison of classical to modern blackbody models, the latter justifying a peak frequency instead of the classical infinitely increasing curve. Introduce the Stefan-Boltzmann Law which gives the total energy per unit time per unit surface area radiated by a blackbody. This can be explained as the area beneath the curve on a graph of blackbody emission versus frequency.

Revising methods of heat loss, examine the mechanisms which mediate each of the heat transfer types encountered and highlight ways to remove or impede them. Examine cases such as the Thermos flask, domestic insulation.

Outcome 3 — Apply aspects of the First Law of Thermodynamics and its consequences

Define what is meant by a state function, giving examples (energy, enthalpy, entropy).

Close examination of Boyle's, Charles's and Amonton's laws using substitution to combine, producing the combined gas law. Introduction of Avogadro's Law to yield Ideal Gas Law.

Define what is meant by isobaric, isothermal and adiabatic conditions. From the Ideal Gas Law, assume constant pressure for an isobaric process and constant temperature for an isothermal process. For the case of the adiabatic process, define the adiabatic index (γ) as the ratio of specific heats for constant pressure and volume. Applying the Ideal Gas Law, compute work done assuming a constant pressure and volume, incorporating the adiabatic index.

Mathematical definition of the First Law of Thermodynamics in terms of the work done onto or by a system and the resultant gain or loss of heat. Emphasis should be placed on the IUPAC convention which defines the work as being done onto the system (and not work being done by the system - although this classical convention should be covered to avoid confusion). Description of what this means in practice via examination of energy conservation for a given system, eg Joule's experiment where a paddle does work onto a volume of water, thus raising its temperature. Perform related calculations using given values for a system, eg determining the work required to pressurise a gas inside a piston by an amount, raise the temperature of a liquid inside a kettle, the heating of the earth by the sun.

Outcome 4 — Explain and apply aspects related to the kinetic theory of gases

Explain ideal systems and motivation to approximate complex systems through assumption of ideal behaviour. Give assumptions made and how they correspond to the kinetic theory of gases.

Relate kinetic theory to Ideal Gas Law.

Examine translational forces within the kinetic model of gas, noting the partitioning of energy. Formally define the equipartition of energy theorem.

Definition of what is meant by ‘translational’ and ‘rotational’ motion and relate to classic conventions of mechanics. Incorporate concept of degrees of motion, applying to ideal kinetic theory gas.

Overview of the concept of root mean square, give motivation for statistical terms like ‘expectation’ and ‘root mean square’ to stochastic systems of large, randomly distributed populations. Examine statistical distribution models (referring back to the distribution of emissions from blackbody radiation as a possible example). Evaluate velocity equation from energy and substitute with thermodynamic terms. Calculate the root mean square of the velocity.

Following from velocity, redefine momentum in mechanical and thermodynamic terms. Apply a similar treatment to yield the root mean square momentum.

Outcome 5 — Perform practical experiments related to heat and thermodynamics

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 1−4.

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

Outcomes 1−4 would be best delivered in order. It is envisaged that laboratory work and demonstrations will feature across the delivery of each of the Outcomes, and that the assessed practical experiments for Outcome 5 will be undertaken in a similar timeframe to the underpinning theory. It is envisaged that the Unit will be delivered predominantly through lecturing such that the theory may be delivered while also setting an appropriate pace for the class. There is potential for practical and hands-on elements which may also take place on an ad-hoc basis through the usual lecture setting, ie quick demonstrations of apparatus. As Outcome 5 is to be delivered alongside Outcomes 1−4, classes for laboratory work shall replace lecture classes when appropriate.

It is envisaged that Outcome 1 could commence with an introduction to the measurement of heat via temperature scales and the three main units of temperature measurement before moving on to the classifications of thermometric properties and the intuitive notion of thermal equilibrium. These topics shall form the basis of the knowledge to be covered in other areas of the Unit. Outcome 1 will end with the mechanical effects of heat on materials, and Young’s modulus of elasticity will be formally introduced. There is also the potential to demonstrate Young's modulus as a practical experiment, which can be done quickly by stretching copper wire against a suitable scale. This could be done during a lecture setting where the class may participate by plotting their own graphs or by making predictions as the demonstration is performed.

Outcome 2 is intended to focus on heat transfer by examining the cases before thermal equilibrium has been reached. Cases may involve both arbitrary systems and examples of materials in an applied setting. Fourier's Law should be used to quantify heat conduction while the mathematics of convection can be defined and revisited in Outcome 3 when dealing with the Ideal Gas Law. Heat transfer by radiation will open up aspects of modern physics which can be detailed in a limited fashion to show the limitations of classical theory and also to furnish learners for potential further study in the field. The aspects related to heat loss prevention will utilise the learner's problem solving abilities and give appreciation to the many existing methods currently employed.

Outcome 3 will expand upon and refine the theoretical aspects of thermodynamics by introducing new terminology and concepts via state functions and thermodynamic processes. The elements included in the derivation of the Ideal Gas Law should bear some familiarity to learners and will formalise the existing knowledge into a general theorem.

Outcome 4 introduces the kinetic theory of gas, focussing on its definition as a theoretical model and related aspects throughout the Unit. Animated computer simulations of a gas, based on kinetic theory, could be displayed during lectures and also made available to learners during tutorial or self-study periods. The simulation could be part of a website, proprietary software on a local computer or programming code. Ideally, the learner should be able to control the parameters of the simulation, ie adjusting volume of container, moles of gas, pressure.

It is envisaged that Outcome 5 will be delivered alongside the theoretical based Outcomes 1−4. 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. If required, a tutorial session could be organised for analysing and presenting data, ie using spreadsheet software, producing graphs and writing laboratory reports.

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 1−4 could be assessed by a single holistic closed-book assessment with an appropriate cut-off score that covers the sampling requirements as detailed in the Evidence Requirements. Assessment should be carried out in supervised conditions, and it is recommended that the assessment 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.

Where evidence of Outcomes 1−4 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 5 learners are required to undertake two assessed practical experiments, the content of which will be related to Outcomes 1−4. Examples of suitable experiments are given below. However, this list is not prescriptive, and other practical experiments of similar complexity may be used by the centre.

Suitable practical experiments for Outcome 5 are:

- Measurement of Young's modulus (bending of cantilevers, beams or via dynamic approaches; measuring vibration, etc).
- Measuring temperature via thermometric properties (ie optical pyrometry).
- Measuring heat conduction through various materials (ie steel, copper, Styrofoam, air) using Fourier's Law.
- Measuring thermal expansion of metals.
- Measuring heat capacities of various materials.
- Investigations into adiabatic gas law; measuring adiabatic index for various gases.
- Measurement of saturated vapour pressures.
- Measurement of radiative power from a lightbulb, utilising the Stefan-Boltzmann Law.
- Measurement of work done by a heat engine.
- Measurement of work done by fuel cells (or similar constructs).
- Comparison of efficiencies between heat engines and fuel cells.

Assessed practical experiments 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**.

Opportunities for developing Core and other essential skills

This Unit has the *Using Number* component of *Numeracy* embedded in it. This means that when learners achieve the Unit, their Core Skills profile will also be updated to show they have achieved *Using Number* at SCQF level 6.

The delivery and assessment of this Unit will also provide learners with the opportunity to develop the Core Skills of *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 thermal radiation.

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

Following assessed practical experiments 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 laboratory reports or pro formas in an appropriate format. Packages used will likely include word processing and spreadsheets.

History of changes to Unit

Version	Description of change	Date

SQA acknowledges the valuable contribution that Scotland's colleges have made to the development of SQA Advanced Qualifications.

FURTHER INFORMATION: Call SQA's Customer Contact Centre on 44 (0) 141 500 5030 or 0345 279 1000. Alternatively, complete our Centre Feedback Form.

General information for learners

Unit title: Physics Principles: Heat and Thermodynamics (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 SQA Advanced Diploma science programme. Before progressing to this Unit it would be beneficial to have experience of Higher Physics and Higher Mathematics.

On successful completion of the Unit you should be able to:

1 Explain and apply aspects related to heat and the thermal expansion of materials.
2 Explain heat transfer between systems and materials.
3 Apply aspects of the First Law of Thermodynamics and its consequences.
4 Explain and apply aspects related to the kinetic theory of gases.
5 Perform practical experiments related to heat and thermodynamics.

Outcome 1

In this Outcome you will be introduced to the notions of temperature representation and measurement, from which follows the aspects of thermometric properties. You will define the Zeroth Law of Thermodynamics, examining the act of thermal equilibrium in the process. You will also be given a formal introduction to Young's modulus, where you will learn how to quantify the elastic nature of a material by its reactance to mechanical stress before applying the concept to thermal stresses in materials.

Outcome 2

In this Outcome you will examine heat transfer between arbitrary thermodynamic systems and different materials. You will study conduction, convection and radiation, while learning of their respective theories and how to apply them in a mathematical context. You will also learn how to appreciate and determine ways to reduce heat loss by applying your understanding of heat transfer to applied settings.

Outcome 3

In this Outcome you will learn new concepts from the perspective of the First Law of Thermodynamics. You will be introduced to state functions and thermodynamic processes but you will also revisit familiar theories with a rigorous approach by deriving the Ideal Gas Law. You will formulate the actions of work in a thermodynamic setting, examining the aspects of expansion and contraction and thermal changes.

Outcome 4

In this Outcome you will study the kinetic theory of gases by examining the individual building blocks which make up this classical model of physics. You will be required to make certain assumptions on the nature of gas but in doing so, gain an appreciation of why this is common practice. You will learn about the mathematics which relate pressure, temperature and energy before arriving at the interesting result given by the equipartion theory of energy. You will also learn how to model the behaviour of gas molecules after classical mechanics and the statistical tools needed to evaluate the properties of a randomised and arbitrarily large model of gas.

Outcome 5

In this Outcome you will undertake practical experiments, based on the content of Outcomes 1−4.

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 also 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 1−4 you will take a closed-book, end of Unit assessment.

Outcome 5 will be assessed after you have learned the necessary practical skills, and will take the form of two practical experiments, for which you will report your results either in full laboratory reports, or by completion of pro forma reports.

Core Skills

This Unit has the Core Skill of Using Number at SCQF level 6 embedded in it. You will also have opportunities to develop the Core Skills of *Problem Solving* at SCQF level 6, and *Information and Communication Technology (ICT)* at SCQF level 4.