Course Support Notes

National 3 Physics Course Support Notes

Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Contents

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the National 3 Physics Course. They are intended for teachers and lecturers who are delivering the Course and its Units. They should be read in conjunction with the *Course Specification* and the *Unit Specifications* for the Units in the Course.

General guidance on the Course

Aims

As stated in the *Course Specification*, the aims of the Course are to enable learners to:

- develop basic knowledge and understanding of physics
- develop an understanding of the role of physics in scientific issues and relevant applications of physics in society and the environment
- develop scientific inquiry and investigative skills
- develop scientific analytical thinking skills in a physics context
- develop the use of technology, equipment and materials, safely, in practical scientific activities
- develop problem solving skills in a physics context
- use scientific literacy in everyday contexts
- establish the foundation for more advanced learning in physics

Progression into this Course

Entry to this Course is at the discretion of the centre. However, learners would normally be expected to have attained the skills and knowledge required by one or more of the following or by equivalent qualifications and/or experience:

- National 2 Science in the Environment Course or relevant component Units

Experiences and Outcomes

National Courses have been designed to draw on and build on the curriculum experiences and outcomes as appropriate. Qualifications developed for the senior phase of secondary education are benchmarked against SCQF levels. SCQF level 4 and the curriculum level 4 are broadly equivalent in terms of level of demand although qualifications at SCQF level 4 will be more specific to allow for more specialist study of subjects.

Learners who have completed relevant Curriculum for Excellence experiences and Outcomes will find these an appropriate basis for doing the Course.

In this Course, learners would benefit from having experience of the following:

Organisers	Lines of development	
Planet Earth	Energy Sources and Sustainability	SCN 04
	Space	SCN 06
Forces, electricity & waves	Forces	SCN 07,08
	Electricity	SCN 09,10
	Vibrations and Waves	SCN 11
Topical Science	Topical Science	SCN 20

More detail is contained in the Physics Progression Framework.
This shows the development of the key areas throughout the suite of Courses.

Progression from this Course

This Course or its components may provide progression for the learner to:

- National 4 in Physics
- National 3 or 4 in another science subject
- Skills for Work Courses (SCQF levels 3 or 4)
- National Certificate Group Awards
- National Progression Awards (SCQF levels 3 or 4)
- employment and/or training

Hierarchies

Hierarchy is the term used to describe Courses and Units which form a structured sequence involving two or more SCQF levels.

It is important that any content in a Course and/or Unit at one particular SCQF level is not repeated if a learner progresses to the next level of the hierarchy. The skills and knowledge should be able to be applied to new content and contexts to enrich the learning experience. This is for centres to manage.

- Physics Courses from Access 3 to Advanced Higher are hierarchical.
- Courses from Access 3 to National 5 have Units with the same structure and titles.

Approaches to learning and teaching

The purpose of this section is to provide you with advice and guidance on learning and teaching for National 3 Physics.

Teaching should involve an appropriate range of approaches to develop knowledge and understanding and skills for learning, life and work. This can be integrated into a related sequence of activities, centred on an idea, theme or application of Physics, based on appropriate contexts, and need not be restricted to the Unit structure. Learning should be experiential, active, challenging and enjoyable, and include appropriate practical experiments/activities and could be learner-led. The use of a variety of active learning approaches is encouraged, including peer teaching and assessment, individual and group presentations, role-playing and game-based learning, with learner- generated questions.

When developing your Physics Course there should be opportunities for learners to take responsibility for their learning. Learning and teaching should build on learners' prior knowledge, skills and experiences. The Units and the key areas identified within them may be approached in any appropriate sequence, at the centre's discretion. The distribution of time between the various Units is a matter for professional judgement and is entirely at the discretion the centre. Each Unit is likely to require an approximately equal time allocation, although this may depend on the learners' prior learning in the different key areas.

Learning and teaching, within a class, can be organised, in a flexible way, to allow a range of learners' needs to be met, including learners achieving at different levels. The hierarchical nature of the new Physics qualifications provides improved continuity between the levels. Centres can, therefore, organise learning and teaching strategies in ways appropriate for their learners.

Within a class, there may be learners capable of achieving at a higher level in some aspects of the Course. Where possible, they should be given the opportunity to do so. There may also be learners who are struggling to achieve in all aspects of the Course, and may only achieve at the lower level in some areas.

Teachers/lecturers need to consider the *Course Specifications*, *Unit Specifications* and *Course Assessment Specifications* to identify the differences between Course levels. It may also be useful to refer to the Physics Progression Framework.

When delivering this Course to a group of learners, with some working towards different levels, it may be useful for teachers to identify activities covering common concepts and skills for all learners, and additional activities required for some learners. In some aspects of the Course, the difference between levels is defined in terms of a higher level of skill.

An investigatory approach is encouraged in Physics, with learners actively involved in developing their skills, knowledge and understanding by investigating a range of relevant Physics applications and issues. A holistic approach should be adopted to encourage simultaneous development of learners' conceptual understanding and skills.

Where appropriate, investigative work/experiments, in Physics, should allow learners the opportunity to select activities and/or carry out extended study. Investigative and experimental work is part of the scientific method of working and can fulfil a number of educational purposes.

All learning and teaching should offer opportunities for learners to work collaboratively. Practical activities and investigative work can offer opportunities for group work, which should be encouraged. Group work approaches can be used within Units and across Courses where it is helpful to simulate real life situations, share tasks and promote team working skills. However, there must be clear evidence for each learner to show that the learner has met the required assessment standards for the Unit or Course.

Laboratory work should include the use of technology and equipment that reflects current scientific use in Physics.

Learners would be expected to contribute their own time in addition to programmed learning time.

Effective partnership working can enhance the science experience. Where possible, locally relevant contexts should be studied, with visits where this is possible. Guest speakers from eg industry, further and higher education could be used to bring the world of physics into the classroom.

Information and Communication Technology (ICT) can make a significant contribution to practical work in Physics, in addition to the use of computers as a learning tool. Computer interfacing equipment can detect and record small changes in variables allowing experimental results to be recorded over short periods of time completing experiments in class time. Results can also be displayed in real-time helping to improve understanding. Data logging equipment and video cameras can be set up to record data and make observations over periods of time longer than a class lesson which can then be subsequently downloaded and viewed for analysis.

Assessment should be integral to and improve learning and teaching. The approach should involve learners and provide supportive feedback. Self- and peer-assessment techniques should be encouraged, wherever appropriate. Assessment information should be used to set learning targets and next steps.

Learning about Scotland and Scottish culture will enrich the learners' learning experience and help them to develop the skills for learning, life and work they will need to prepare them for taking their place in a diverse, inclusive and participative Scotland and beyond. Where there are opportunities to contextualise approaches to learning and teaching to Scottish contexts, teachers and lecturers should consider this.

Suggestions for possible contexts and activities to support and enrich learning and teaching are detailed in the table below. The **Key areas** are from the *Unit Specifications*. **Suggested learning activities** are not mandatory. This offers examples of suggested activities, from which you could select a range. It is not expected that all will be covered. The contexts for key areas are open to personalisation and choice, so centres are likely to devise their own learning activities. **Exemplification of key areas** is not mandatory. It provides an outline of the level of demand and detail of the key areas.

Electricity and Energy		
Key areas	**Suggested learning activities**	**Exemplification of key areas**
Energy Sources Identify different energy sources Classify renewable and non-renewable sources Describe advantages and disadvantages to society/ environment of different energy sources	Renewable and non-renewable energy sources (including responsible use) Benefits and problems associated with each type Advantages and disadvantages of 'green' transport such as hybrid vehicles, biofuels, and hydrogen fuel cells etc 'Best' location for harnessing different types of renewable energy Current study/research/testing of new ways to harness renewable energy Environmental issues associated with renewable energy Energy supply and demand	Reserves of sources of energy — oil, coal, gas Renewables — wind, wave, solar Nuclear
Electricity Production of Electricity Domestic Electricity and Safety Electrical Circuits	Production of electricity from a simple cell — ie fruit, potatoes, soft drinks. Compare voltages produced Generation of electricity by moving magnets near coils and vice versa Investigation into photocell production of voltage Electricity bills/costs	

	Efficiency of electrical appliances (A–G ratings) Comparison of efficiency tables for household electrical appliance Electrical safety — double insulation, wiring a plug, human conductivity Government standards and consumer advice Cost of electricity calculations in terms of appliance power rating, tariff, time Ways of reducing electricity consumption Various electrical circuits used in the home Use of simple circuits to solve practical problems, eg stair lighting, continuity tester, car lighting Qualitative investigation of Ohm's law	

Energy Transfer Conduction of heat Convection of heat Radiation of heat	Concepts of transfer of heat energy by conduction, convection, radiation using 'animation' and/or modelling Examples of convection — gulf stream, weather systems, gliders, sea breezes Factors affecting the rate of heat transfer from hot to cold objects Insulating properties of different materials Use of 'model houses' to investigate the factors affecting the rate of heat transfer from inside to outside, and relate to efficiency Best methods for reducing rate of heat transfer in a variety of situations, for example heat loss from a house, animal survival Best methods for increasing rate of heat transfer in a variety of situations for example car radiators, computer cooling systems Eco-friendly house, eg 'Sun City' homes in Dundee, the Glasgow House	

Waves and Radiation		
Key areas	**Suggested learning activities**	**Exemplification of key areas**
Wave properties	Water wave energy, surfing Observation of bobbing float in water waves Video analysis of water waves Ripple tanks Swinging sand bag leaking sand over moving paper to show wave motion	
Light Light travels in straight lines Reflection of light Convex and concave lenses	Laser levelling devices Three cards with a hole in each and a torch to show that light only travels in straight lines Use of shadow to draw a silhouette portrait Law of reflection investigation Road safety and reflections Construction of homemade ray box using bright LED Use of a ray box, reflectors and glass blocks to write letters using light rays Laser on disco ball Transmission of light message using mirrors Reflection from a parabolic reflector	

	Construction of a solar furnace Use of convex parabolic mirrors: security, at blind corners, on buses Ray box experiments using convex and concave lenses Spectacle lenses (and contact lenses) and correction of eyesight conditions (no ray diagrams). Model eye experiments Optical fibres and total internal reflection Construction of a communication system using optical fibres, eg radio Coin 'appearing' in a mug by filling with water, bending pencil, apparent depth in tanks/pools etc. For a wider audience use a video camera at set angle while pouring slowly	
Colour	Visible spectrum with a prism to show light dispersing Mixing coloured lights to give the perception of white light/ combinations used in screens. Relation to display screens Shine coloured light or different white light sources on to pure coloured reflectors or clothing to see how their appearance changes. Importance of checking clothing in daylight Construction of CD spectrometer and examination of different light sources White light sources, eg different lamps incandescent, energy saving, discharge tubes, sunlight (safety precautions with sunlight)	

	Colour blindness	
Optical instruments	Construction of periscopes. Uses of periscopes Pinhole camera Comparison of eye to simple camera Use of convex lenses to construct a telescope and microscope. Comparison of results with commercial optical instruments Commercial, medical and industrial uses of optical instruments	
Electromagnetic radiation	Talk by local radiographer or dental nurse on X-rays X-ray photos, gamma camera slides Applications of IR: thermograms, thermometers, cameras, remote controls (range) Safety issues with X-rays and gamma Detection of infrared from remote control on camera phone Use of web-cam or digital camera in near dark situations Ultraviolet sensitive dyes and beads Security markers and 'invisible ink' messages UV safety: sunbeds, sun creams, sun Detection of radio waves of different wavebands in	Gamma rays X-rays Ultraviolet Visible light Infrared Microwaves TV and radio

	different rooms in a building or behind metal obstacles Range and variety of TV/radio stations Range of walkie-talkie radios Applications of microwaves and safety issues Transmission and reflection of microwaves	
Sound	Measurement of speed of sound (clap-echo) Sound in solids — tin can phone Straws cut to different lengths (with reed cut) to produce different notes when blown Test tube rack instrument to play simple tune Use of small pieces of wood and rulers to compare frequencies Sounds through different materials Microphone connected to oscilloscope or sound capture system on PC to compare whistled notes with tuning fork notes Frequency of musical notes, octaves etc Range of hearing Introduction to ultrasound — dog whistle Sounds from different animals — frequency and loudness Frequency measurement using frequency meter or mobile	

	phone application Medical uses of ultrasound Construction of a model ear using tambourine for eardrum and drumsticks for ossicles (small bones) etc Comparison of sound level eg car stereos, cinema and home hi-fis, MP3 players, road works, lorries, bell Investigation of damage to hearing from excessive sound levels — decibel meter, industrial health and safety limits, ear protection	

Dynamics and Space		
Key areas	**Suggested learning activities**	**Exemplification of key areas**
Forces Forces can change the shape, speed and direction of an object Link between force and energy Applications of forces	Use of light gate and slope of different angles to measure speed of trolley Use of magnets and iron filings to investigate magnetic field patterns then investigate magnetic forces and movement Galileo's falling objects experiment: two objects of equal size but different mass (eg two tennis balls where one is injected full of water) are dropped Examples of friction, eg shoe soles, tyres, bicycle brakes, tarmac Motion on slopes covered in different materials Useful and problematic frictional forces Construction of parachutes of different areas dropped with	Push/pull Friction and air resistance Magnetic forces Gravity

	the same payload — time the difference Effect of an object's shape on its motion by plasticine moulding and dropping into a measuring cylinder of water Investigation of the falling time of different shapes (cone, flattened circle etc) Demonstration of heat produced due to friction by rubbing sheets of sand paper together Relationship between the depth of craters and the force of gravity acting on mass Dropping balls of different masses on to plasticine Exploration of gravity on other planets (using software) Construction of simple rockets: film canister and fizzy vitamin-C tablets/IOP air rocket/water rockets etc History of the space race and predictions of how far humans will travel in the next 10 years and 100 years	
Solar System Our Planet Earth Sun and Moon Our Solar System	Use of information on the weather outside (temperature/cloud cover/humidity/precipitation etc) to film a 30 second weather report Tornado in a bottle Cloud in a bottle and exploration of the effect of pollution (smoke) Rain gauge to find the average rainfall over a week Thunder and lightning: burst an inflated brown paper bag and	Earth ♦ Weather ♦ Earthquakes ♦ Volcanoes ♦ Rocks ♦ Climate ♦ Global warming

	use Van de Graaf to create static electricity Model of the Earth showing the layers in different colours Model tectonic plates shifting and causing earthquakes using two moving pieces of card covered with sand Model volcano Growth of cress at different temperatures to see how global warming effects vegetation growth Investigation of different types of rock and the rock cycle Growth of crystals of salt/sugar at different temperatures Construction of simple sundial using a template from the web or a larger model with a stick and some chalk. Historical sundials Earth rotating on its axis: using torch and a globe to model night and day Earth orbiting the sun to explain a year Seasons occurring as a result of the Earth's tilt Explanation of a day and a year using two people (with one holding a lamp) in spinning office chairs to model the Earth rotating as it orbits the Sun Lunar month: use of a globe and a white ball to model the moon rotating around the Earth Demonstration of a lunar eclipse using a torch, a globe and a white ball (Moon) Investigation 'Where does the water go at low tide?' and	Sun and Moon ♦ Measuring time ♦ Periods of time ♦ Seasons ♦ Lunar month ♦ Moon's orbit ♦ Tides

	relation to gravity and the Moon Model of the Solar System using different sized balls to represent the relative sizes of objects Pocket solar system diagram from 1 m strip of paper with relative sizes and distances marked Comets, meteors and meteorites Description of ‘Journey through the Solar System’ starting at the Sun Explanation of the Moon reflecting sunlight	

Developing skills for learning, skills for life and skills for work

Learners are expected to develop broad generic skills as an integral part of their learning experience. The *Course Specification* lists the skills for learning, skills for life and skills for work that learners should develop through this Course. These are based on SQA's *Skills Framework: Skills for Learning, Skills for Life and Skills for Work* and must be built into the Course where there are appropriate opportunities. The level of these skills will be appropriate to the level of the Course.

For this Course, it is expected that the following skills for learning, skills for life and skills for work will be significantly developed:

Numeracy
This is the ability to use numbers in order to solve problems by counting, doing calculations, measuring, and understanding graphs and charts. This is also the ability to understand the results. Learners will have opportunities to extract, process and interpret information presented in numerous formats including tabular and graphical. Practical work will provide opportunities to develop time and measurement skills.

2.1 Number processes
Number processes means solving problems arising in everyday life through carrying out calculations, when dealing with data and results from experiments/investigations and everyday class work, making informed decisions based on the results of these calculations and understanding these results.

2.2 Money, time and measurement
This means using and understanding time and measurement to solve problems and handle data in a variety of physics contexts, including practical and investigative.

2.3 Information handling
Information handling means being able to interpret physics data in tables, charts and other graphical displays to draw sensible conclusions throughout the Course. It involves interpreting the data and considering its reliability in making reasoned deductions and informed decisions. It also involves an awareness and understanding of the chance of events happening.

Thinking skills
This is the ability to develop the cognitive skills of remembering and identifying, understanding and applying. The Unit will allow learners to develop skills of applying, analysing and evaluating. Learners can analyse and evaluate practical work and data by reviewing the process, identifying issues and forming valid conclusions. They can demonstrate understanding and application of key areas and explain and interpret information and data.

5.2 Understanding
This is the ability to demonstrate the meaning of items of physics information, to explain the order of events in a sequence, and to interpret in a different Physics setting or context.

5.3 Applying
This is the ability to use existing information to solve physics problems in different contexts, and to plan, organise and complete a task such as an investigation.

In addition, learners will also have opportunities to develop literacy skills, working with others, creativity and citizenship.

Literacy
Learners develop the literacy skills to effectively communicate physics key areas and describe, clearly, physics issues in written media. Learners will have opportunities to communicate knowledge and understanding of Physics, with an emphasis on applications and environmental, ethical and/or social impacts. Learners will have opportunities to develop listening and reading skills when gathering and processing information.

Working with others
Learning activities provide many opportunities, in all areas of the Course, for learners to work with others. Practical activities and investigations, in particular, offer opportunities for group work, which is an important aspect of science and should be encouraged.

Creativity
Through learning in Physics, learners can demonstrate their creativity. In particular, when planning and designing experiments/investigations, learners have the opportunity to be innovative in their approach and do/make/say/write something new.

Citizenship
Learners will develop citizenship skills, when considering the applications of Physics on our lives, as well as environmental and ethical implications.

Approaches to assessment

Assessment should cover the mandatory skills, knowledge and understanding of the Course. Assessment should be integral to and improve learning and teaching. The approach should involve learners and provide supportive feedback. Self and peer assessment techniques should be used, where appropriate.

See the *Unit Support Notes* for guidance on approaches to assessment of the Units of the Course.

Combining assessment across Units

If an integrated approach to Course delivery is chosen then there may be opportunities for combining assessment across Units. If this approach is used, then it is necessary to be able to track evidence for individual Outcomes and Assessment Standards.

Transfer of evidence

Evidence for the achievement of Outcome 1 and Assessment Standards 2.2, 2.3 and 2.4 for one Unit can be used as evidence of the achievement of Outcome 1 and Assessment Standards 2.2, 2.3 and 2.4 in the other Units of this Course.

Exemplification of standards

Outcome 1, Candidate 1
Assessment Standards can be achieved using one or more pieces of evidence covering work done on different occasions.

Assessors should record evidence of achievement of Outcomes and Assessment Standards. The table below shows one way of recording evidence. This table is not mandatory.

Assessment Standard	**Evidence required**	**Evidence produced**
1.1 Following procedures safely	Procedures have been followed safely	✓
1.2 Making and recording observations/measurements correctly	Observations/measurements taken are correct	✓
1.3 Presenting results in an appropriate format	Results have been presented in an appropriate format	Table
1.4 Drawing valid conclusions	What the experiment shows, with reference to the aim	✓
1.5 Evaluating experimental procedures	The suggestion given will improve the experiment	✓

This candidate passes all five Assessment Standards for Outcome 1.

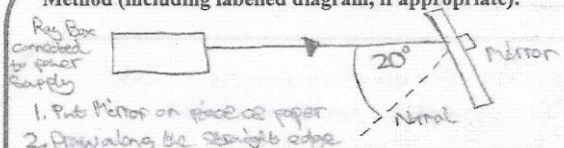
Comment
Assessment Standard 1.3 — Units should be in column headings but still accepted at N3 as they are included with the readings.

Candidate 1

Reflection of Light

Aim: To investigate the relationship between the angle of incidence and the angle of reflection for a plane mirror.

Method (including labelled diagram, if appropriate):



1. Put Mirror on piece of paper
2. Draw along the straight edge of the mirror.
3. Take the Mirror away and draw a dotted line at right angles to the mirror line. (Normal)
4. Draw in lines at 20°, 40°, 60°, 80° from the normal.
5. Shine the light along each line and draw a line over the reflected ray each time.
6. Measure the angle of reflection, for each reflected ray, with a protractor.

Results:

Angle of Incidence	Angle of reflection
20°	22°
40°	42°
60°	65°
80°	80°

Conclusions: The angle of incidence and the angle of reflection are near enough the same.

Evaluations: Use a perspex protector and use something to make the mirror stay on the line.

Outcome 2, Candidate 2
Assessment Standards can be achieved using one or more pieces of evidence covering work done on different occasions.

Assessors should record evidence of achievement of Outcomes and Assessment Standards. The tables below show one way of recording evidence. These tables are not mandatory.

Individual evidence for Assessment Standard 2.2

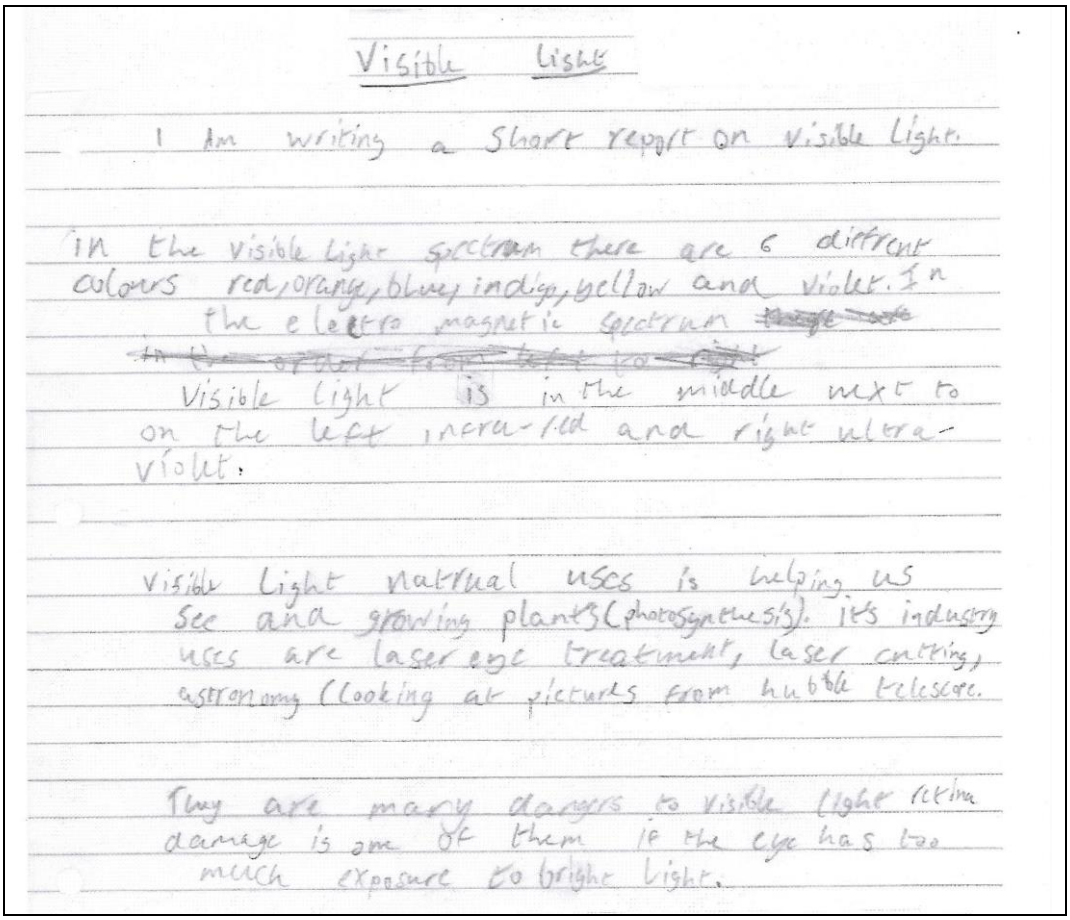
Assessment Standard	**Evidence required**	**Evidence produced**
2.2 Describing a given application	Appropriate physics knowledge is used to describe the given application	Incorrect physics knowledge

Individual evidence for Assessment Standard 2.3

Assessment Standard	**Evidence required**	**Evidence produced**
2.3 Describing a given physics issue in terms of its effect on the environment/society	Appropriate physics knowledge is used to describe its effect	Correct use of physics knowledge

This candidate passes Assessment Standard 2.3 but fails Assessment Standard 2.2.

Candidate 2



Visible Light

I Am writing a Short report on visible Light.

In the visible Light spectrum there are 6 diffrent colours red, orange, bluey indigo, yellow and violet. In the electro magnetic spectrum ~~[illegible]~~ Visible light is in the middle next to on the left infra-red and right ultra-violet.

Visible Light natrual uses is helping us See and growing plants (photosynthesis). Its industry uses are laser eye treatment, laser cutting, astronomy (looking at pictures from hubble telescope.

They are many dangers to visible Light retina damage is one of them if the eye has too much exposure to brighe light.

Outcome 2, Candidate 3

Assessment Standards can be achieved using one or more pieces of evidence covering work done on different occasions.

Assessors should record evidence of achievement of Outcomes and Assessment Standards. The tables below show one way of recording evidence. These tables are not mandatory.

Individual evidence for Assessment Standard 2.2

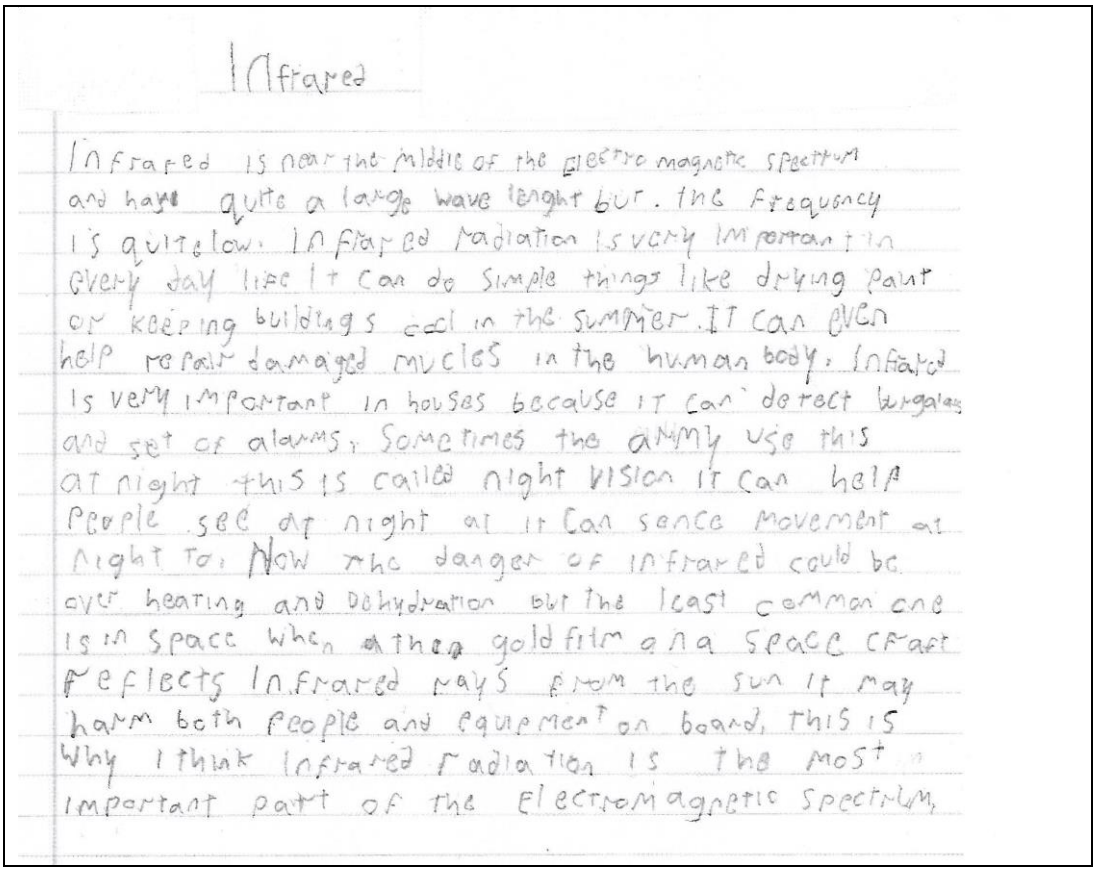
Assessment Standard	**Evidence required**	**Evidence produced**
2.2 Describing a given application	Appropriate physics knowledge is used to describe the given application	Correct use of physics knowledge.

Individual evidence for Assessment Standard 2.3

Assessment Standard	**Evidence required**	**Evidence produced**
2.3 Describing a given physics issue in terms of its effect on the environment/ society	Appropriate physics knowledge is used to describe its effect	Correct use of physics knowledge.

This candidate passes Assessment Standards 2.2 and 2.3.

Candidate 3



Infrared

Infrared is near the middle of the electro magnetic spectrum and have quite a large wave lenght but. the frequency is quite low. Infrared radiation is very important in every day life it can do simple things like drying paint or keeping buildings cool in the summer. It can even help repair damaged mucles in the human body. Infared is very important in houses because it can detect burgalers and set of alarms. Sometimes the army use this at night this is called night vision it can help people see at night as it can sence movement at night too. Now the danger of infrared could be over heating and Dehydration but the least commen one is in space when a thin gold film on a space craft reflects Infrared rays from the sun it may harm both people and equipment on board. this is why I think Infrared radiation is the most important part of the Electromagnetic Spectrum.

Equality and inclusion

The following should be taken into consideration:

Situation	Reasonable Adjustment
Carrying out practical activities	Use could be made of practical helpers for learners with: ♦ physical disabilities, especially manual dexterity, when carrying out practical activities ♦ visual impairment who have difficulty distinguishing colour changes or other visual information
Reading, writing and presenting text, symbolic representation, tables, graphs and diagrams	Use could be made of ICT, enlarged text, alternative paper and/or print colour and/or practical helpers for learners with visual impairment, specific learning difficulties and physical disabilities
Process information using calculations	Use could be made of practical helpers for learners with specific cognitive difficulties (eg dyscalculia)
Draw a valid conclusion, giving explanations and making generalisation/predictions	Use could be made of practical helpers for learners with specific cognitive difficulties or autism

As far as possible, reasonable adjustments should be made for the Assignment, where necessary. This includes the use of 'practical helpers', readers, scribes, adapted equipment or assistive technologies.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Course Support Notes* is designed to sit alongside these duties but is specific to the delivery and assessment of the Course.

It is important that centres are aware of and understand SQA's assessment arrangements for disabled learners, and those with additional support needs, when making requests for adjustments to published assessment arrangements. Centres will find more guidance on this in the series of publications on Assessment Arrangements on SQA's website: www.sqa.org.uk/sqa/14977.html

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications are available on SQA's website at: www.sqa.org.uk/sqa//14977.html
- *Building the Curriculum 3: A framework for learning and teaching*
- *Course Specifications*
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- Principles and practice papers for curriculum areas
- *SCQF Handbook: User Guide* (published 2009) and SCQF level descriptors (to be reviewed during 2011 to 2012): www.sqa.org.uk/sqa/4595.html
- *SQA Skills Framework: Skills for Learning, Skills for Life and Skills for Work*
- *Skills for Learning, Skills for Life and Skills for Work: Using the Curriculum Tool*

Administrative information

Published: June 2013 (version 1.1)

History of changes to Course Support Notes

Course details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials added.	Qualifications Development Manager	June 2013

Unit Support Notes

Unit Support Notes — Physics: Electricity and Energy (National 3)

Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the Physics: Electricity and Energy (National 3) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the *Unit Specification*
- the *Course Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

In this Unit, learners will develop skills of scientific inquiry, investigation and knowledge and understanding of electricity and energy.

Learners will apply these skills when considering the applications of electricity and energy on our lives, as well as the implications on society/ the environment. This can be done by using a variety of approaches, including investigation and problem solving.

The Unit covers the key areas of:

- energy sources
- electricity
- energy transfer

Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Progression into this Unit

Entry to this Unit is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

- National 2 Science in the Environment Course or relevant component Units

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 3 Physics *Course Support Notes*.

If this Unit is being delivered on a freestanding basis, teachers and lecturers are welcome to select the skills, knowledge, understanding and contexts that are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- other qualifications in Physics or related areas
- further study, employment and/or training

Approaches to learning and teaching

Approaches to learning and teaching and suggested learning activities are given in the *Course Support Notes*.

Developing skills for learning, skills for life and skills for work

Information about developing skills for learning, skills for life and skills for work in this Unit, is given in the relevant *Course Support Notes*.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice on approaches to assessment for the Unit. There will be other documents produced for centres to provide exemplification of assessments and guidance on how to write them.

Approaches to the assessment of Units when they form part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. Where Units are delivered on a stand-alone basis, teachers/lecturers will have more flexibility to develop approaches to delivering and assessing the Units which are not related to Course assessment.

Assessments must be valid, reliable and fit for purpose for the subject and level, and should fit in with learning and teaching approaches.

Unit assessment should support learning and teaching and where possible enable personalisation and choice for learners in assessment methods and processes. Teachers and lecturers should select the assessment methods they believe are most appropriate, taking into account the needs of their learners and the requirements of the Unit.

There is no mandatory order for delivery of the Outcomes. These should be overtaken throughout the Unit and are an integral part of learning and teaching

The table below gives guidance and advice on possible approaches to assessment and gathering evidence.

Strategies for Gathering Evidence
There may be opportunities, both planned and naturally occurring, in the day-to-day learning and teaching of the Unit, to observe learners providing evidence. This evidence may satisfy completely or partially an Outcome or Outcomes. Additional evidence may be required to supplement this evidence. Assessment might cover all or parts of both Outcomes. A holistic approach can enrich the assessment process for the learner and the assessor by bringing together different Outcomes and/or Assessment Standards. If a holistic approach is used, then it is necessary to be able to track individual Assessment Standard evidence. Strategies for gathering evidence and ensuring that the learners' work is their own could include: ♦ personal interviews during which the teacher or lecturer can ask additional questions about completed work ♦ an oral presentation on their work ♦ writing reports in supervised conditions ♦ checklists to record the authenticity ♦ supplementary sources of evidence, such as witness testimony, film or audio clips Evidence can be gathered from classwork, experiments, investigations and/or research carried out in this Unit. It can be obtained using one or more of the strategies outlined above or by alternative methods, which could include a test of knowledge, understanding and skills.

Equality and inclusion

The *Course Support Notes* provide full information on equality and inclusion.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in this document is designed to sit alongside these duties but is specific to the delivery and assessment of the Unit.

Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and where the alternative approach to assessment will, in fact, generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

- Assessment Arrangements (for disabled candidates and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
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- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

Published: June 2013 (version 1.1)

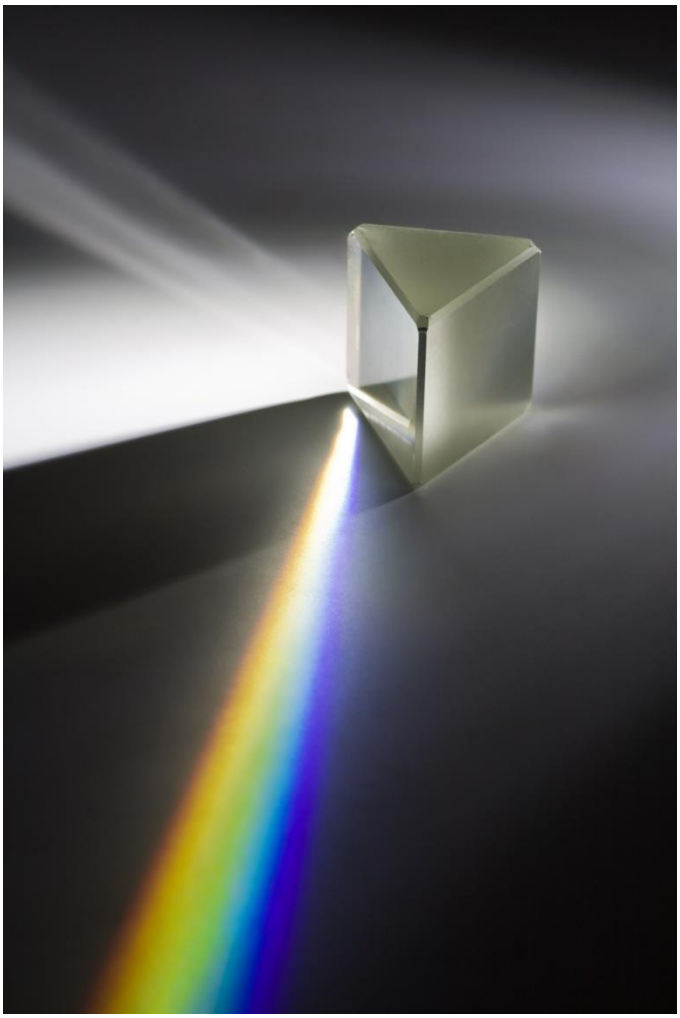
Superclass: RC

History of changes to Unit Support Notes

Course details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials added.	Qualifications Development Manager	June 2013

Unit Support Notes

Unit Support Notes — Physics: Waves and Radiation (National 3)



Please refer to the note of changes at the end of this document for details of changes from previous version (where applicable).

Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the Physics: Waves and Radiation (National 3) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the *Unit Specification*
- the *Course Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

In this Unit, learners will develop skills of scientific inquiry, investigation and knowledge and understanding of waves and radiation.

Learners will apply these skills when considering the applications of waves and radiation on our lives, as well as the implications on society/ the environment. This can be done by using a variety of approaches, including investigation and problem solving.

The Unit covers the key areas of:

- wave properties
- light
- colour
- optical instruments
- electromagnetic radiation
- sound

Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Progression into this Unit

Entry to this Unit is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

- National 2 Science in the Environment Course or relevant component Units

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 3 Physics *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers are free to select the skills, knowledge, understanding and contexts which are most appropriate for delivery in their centres.

Progression from this Unit

This Unit may provide progression to:

- other qualifications in Physics or related areas
- further study, employment and/or training

Approaches to learning and teaching

Approaches to learning and teaching and suggested learning activities are given in the *Course Support Notes*.

Developing skills for learning, skills for life and skills for work

Information about developing skills for learning, skills for life and skills for work in this Unit, is given in the relevant *Course Support Notes*.

Approaches to assessment and gathering evidence

The purpose of this section is to give advice on approaches to assessment for the Unit. There will be other documents produced for centres to provide exemplification of assessments and guidance on how to write them.

Approaches to the assessment of Units when they form part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. Where Units are delivered on a stand-alone basis, teachers/lecturers will have more flexibility to develop approaches to delivering and assessing the Units which are not related to Course assessment.

Assessments must be valid, reliable and fit for purpose for the subject and level, and should fit in with learning and teaching approaches.

Unit assessment should support learning and teaching and where possible enable personalisation and choice for learners in assessment methods and processes. Teachers and lecturers should select the assessment methods they believe are most appropriate, taking into account the needs of their learners and the requirements of the Unit.

There is no mandatory order for delivery of the Outcomes. These should be overtaken throughout the Unit and are an integral part of learning and teaching .

The table below gives guidance and advice on possible approaches to assessment and gathering evidence.

Strategies for Gathering Evidence

There may be opportunities, both planned and naturally occurring, in the day-to-day learning and teaching of the Unit, to observe learners providing evidence. This evidence may satisfy completely or partially an Outcome or Outcomes. Additional evidence may be required to supplement this evidence.

Assessment might cover all or parts of both Outcomes. A holistic approach can enrich the assessment process for the learner and the assessor by bringing together different Outcomes and/or Assessment Standards. If a holistic approach is used, then it is necessary to be able to track individual Assessment Standard evidence.

Strategies for gathering evidence and ensuring that the learners' work is their own could include:

- personal interviews during which the teacher or lecturer can ask additional questions about completed work
- an oral presentation on their work
- writing reports in supervised conditions
- checklists to record the authenticity
- supplementary sources of evidence, such as witness testimony, film or audio clips

Evidence can be gathered from classwork, experiments, investigations and/or research carried out in this Unit. It can be obtained using one or more of the strategies outlined above or by alternative methods, which could include a test of knowledge, understanding and skills.

Equality and inclusion

The *Course Support Notes* provide full information on equality and inclusion.

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Alternative approaches to Unit assessment to take account of the specific needs of learners can be used. However, the centre must be satisfied that the integrity of the assessment is maintained and where the alternative approach to assessment will, in fact, generate the necessary evidence of achievement.

Appendix 1: Reference documents

The following reference documents will provide useful information and background.

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Administrative information

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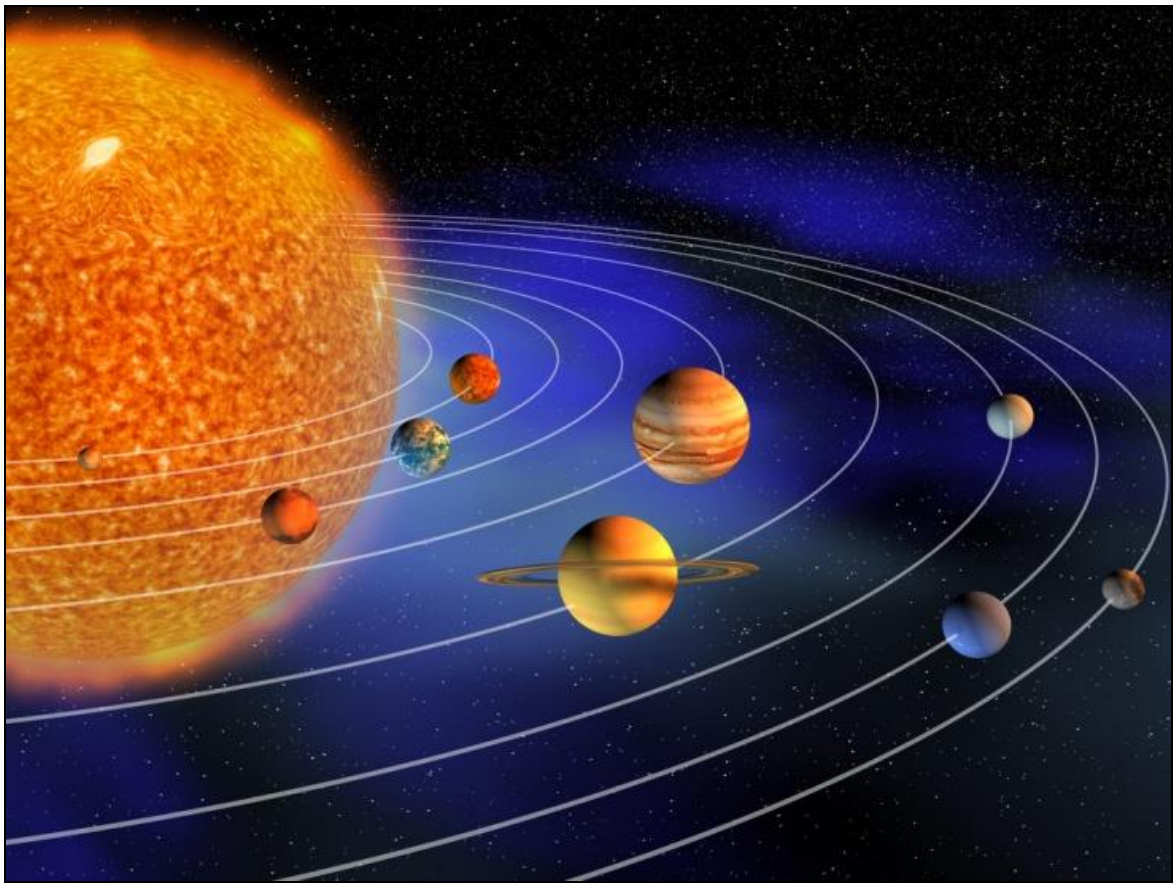
Superclass: RC

History of changes to Unit Support Notes

Course details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials added.	Qualifications Development Manager	June 2013

Unit Support Notes

Unit Support Notes — Physics: Dynamics and Space (National 3)



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Introduction

These support notes are not mandatory. They provide advice and guidance on approaches to delivering and assessing the Physics: Dynamics and Space (National 3) Unit. They are intended for teachers and lecturers who are delivering this Unit. They should be read in conjunction with:

- the *Unit Specification*
- the *Course Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

In this Unit, learners will develop skills of scientific inquiry, investigation and knowledge and understanding of dynamics and space.

Learners will apply these skills when considering the applications of dynamics and space on our lives, as well as the implications on society/ the environment. This can be done by using a variety of approaches, including investigation and problem solving.

The Unit covers the key areas of:

- forces
- solar system

Learners will research issues, apply scientific skills and communicate information related to their findings, which will develop skills of scientific literacy.

Progression into this Unit

Entry to this Unit is at the discretion of the centre. However, learners would normally be expected to have attained the skills, knowledge and understanding required by the following or equivalent qualifications and/or experience:

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Skills, knowledge and understanding covered in this Unit

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