Course Support Notes

National 5 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 5 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*, the *Course Assessment 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 and apply knowledge and understanding of physics
- develop an understanding of the role of physics in scientific issues and relevant applications of physics, including the impact these could make 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 planning skills
- develop problem solving skills in a physics context
- use and understand scientific literacy, in everyday contexts, to communicate ideas and issues and to make scientifically informed choices
- develop the knowledge and skills for more advanced learning in physics
- develop skills of independent working

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 4 Physics

There may also be progression from National 4 Biology, National 4 Chemistry, National 4 Environmental Science and National 4 Science Courses.

Experiences and outcomes

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 and 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. The Physics Progression framework shows the development of the key areas throughout the suite of Courses.

Skills, knowledge and understanding covered in the Course

Note: teachers and lecturers should refer to the *Course Assessment Specification* for mandatory information about the skills, knowledge and understanding to be covered in this Course.

Progression from this Course

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

- Higher Physics
- National 5 Course in another science subject
- Skills for Work Courses (SCQF levels 5 or 6)
- National Certificate Group Awards
- National Progression Awards (SCQF levels 5 or 6)
- 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 National 3 to Advanced Higher are hierarchical.
- Courses from National 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. It is essential that you are familiar with the mandatory information within the National 5 Physics Course Assessment Specification.

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 and 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 , further and higher education could be used to bring the world of physics into the classroom.

Information and Communications 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 learning activities, to support and enrich learning and teaching, are detailed in the table below.

The **Mandatory Course key areas** are from the *Course Assessment Specification*. **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 **Mandatory Course key areas** are open to personalisation and choice, so centres may also devise their own learning activities. **Exemplification of key areas** is also not mandatory. It provides an outline of the level of demand and detail of the key areas.

Electricity and Energy		
Mandatory Course key areas	**Suggested learning activities**	**Exemplification of key areas**
Conservation of energy Principle of 'conservation of energy' applied to examples where energy is transferred between stores. Identify and explain 'loss' of energy where energy is transferred. Calculations of potential and kinetic energy. Calculations involving conservation of energy.	Investigate energy transfers and losses in the generation of electricity, motion down a hill, etc. using model car 'stunt sets'. Research other energy transfers in everyday objects such as solar panels. Discuss and explain why processes are not 100% efficient in terms of useful energy.	$E_p = mgh$ $E_k = \frac{1}{2}mv^2$
Electrical charge carriers and electric fields Definition of electric charge. Electrical current as the electrical charge transferred per unit time. Use an appropriate relationship to carry out calculations involving charge, current and time. Difference between alternating and direct current.	Investigate the interaction of charged objects, for example, metallised polystyrene spheres attracted and repelled, Van de Graaff generator discharged through micro ammeter. Discuss and research the uses of electrostatics, for example: laser printers, paint spraying, cling film, forensic science, removal of dust, electrostatic precipitators, electrostatic separators.	$Q = It$

	Research the definition of current and its historical context. Use an oscilloscope/data logging software to compare alternating and direct sources.	
Potential difference (voltage) Effect of electric field on a charged particle. The potential difference (voltage) of the supply is a measure of the energy given to the charge carriers in a circuit.	Demonstration of electric fields using Teltron tubes, olive oil and seeds with high tension supply, Van de Graaff generator, parallel plates and suspended pith ball. Use of computer simulations to investigate the behaviour of charges in an electric field. Carry out practical investigations to measure potential differences across components in series circuits. Describe the energy transfers and show that although there is a transfer of energy in the circuit the law of conservation of energy still applies.	
Ohm's law Use of a V-I graph to determine resistance. Use of an appropriate relationship to calculate potential difference (voltage), current and resistance. The relationship between temperature and resistance of a conductor.	Carry out a range of practical investigations to determine the relationship between potential difference, current and resistance using simple ohmic components. Carry out practical investigations with non-ohmic conductors, eg *V/I* for a ray-box lamp.	$V = IR$

Practical electrical and electronic circuits Measurement of current, voltage and resistance, using appropriate meters in complex circuits. The function and application of standard electrical and electronic components including cell, battery, lamp, switch, resistor, variable resistor, voltmeter, ammeter, LED, motor, microphone, loudspeaker, photovoltaic cell, fuse, diode, capacitor, thermistor, LDR, relay, transistor. Current and voltage relationships in a parallel circuit. Use of appropriate relationships to calculate the total resistance of resistors in series and in parallel circuits, and circuits with a combination of series and parallel resistors.	Carry out experiments to confirm the relationships for current and voltage in series and parallel circuits. Construct and investigate a range of series, parallel and combination circuits using ammeters and voltmeters. Investigate the function of the named components in practical circuits. Transistor- symbol and function (as a switch) Research and discuss the benefits of a ring circuit over a standard parallel circuit. Investigate the effect of combining resistors in series and in parallel.	$R_T = R_1 + R_2 + ...$ $\frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + ...$
Electrical power Use of an appropriate relationship to determine energy, power and time. Use of an appropriate relationship to determine the power, voltage, current and resistance in electrical circuits.	Measure and compare the power of various electrical devices. Investigate the relationship between power and fuses for household appliances. Investigate power loss using model power transmission lines. Carry out a survey into household/educational establishment energy consumption.	$P = \frac{E}{t}$ $P = IV$ $P = I^2R$ $P = \frac{V^2}{R}$

Specific heat capacity The same mass of different materials requires different quantities of heat to raise the temperature of unit mass by one degree celsius. The temperature of a substance is a measure of the mean kinetic energy of its particles. Explain the connection between temperature and heat energy. Use an appropriate relationship to carry out calculations involving mass, heat energy, temperature change and specific heat capacity. Conservation of energy to determine heat transfer.	Investigation of heating different masses of water to predict which would reach boiling point first and to explain the reasons for this prediction. Carry out experiments to compare the heat energy stored in different materials of the same mass when heated to the same temperature. Research clothing used for specialist jobs — fire fighter, NASA, outside environmental wear, etc. Explain why some foods seem much warmer on the tongue than others when cooked, eg tomatoes in a cheese and tomato toastie. Design a heating system for example heat pump, solar-heat traps, ground-storage systems, etc. Design a central-heating boiler to be as ‘efficient’ as possible and to explain how they plan to reduce heat energy dissipation through the walls of the boiler.	$E_h = cm\Delta T$

Gas laws and the kinetic model Pressure is the force per unit area exerted on a surface. Describe how the kinetic model accounts for the pressure of a gas. Use an appropriate relationship to calculate pressure, force and area. Explanation of the pressure-volume, pressure-temperature and volume-temperature laws qualitatively in terms of a kinetic model. Use of an appropriate relationship to calculate the volume, pressure and temperature of a fixed mass of gas. The relationship between kelvin, degrees celsius and absolute zero of temperature.	Kinetic theory of gases. Investigation into the relationship between pressure and force using gas syringe and masses. Study of Brownian motion in a smoke cell or microspheres. Kinetic theory models — physical or virtual. Practical investigations into the relationships in the three gas laws. Research the role of Lord Kelvin and the determination of the absolute scale of temperature. Research and discuss the limitations of the behaviour of real gases.	$p = F/A$ $p_1V_1 = p_2V_2$ $\frac{p_1}{T_1} = \frac{p_2}{T_2}$ $\frac{V_1}{T_1} = \frac{V_2}{T_2}$ $\frac{p_1V_1}{T_1} = \frac{p_2V_2}{T_2}$ 0 K = –273 °C

Waves and Radiation		
Mandatory Course key areas	**Suggested learning activities**	**Exemplification of key areas**
Wave parameters and behaviours Energy can be transferred as waves. Determination of frequency, period, wavelength, amplitude and wave speed for longitudinal and transverse waves. Use of the relationships between wave speed, frequency, period, wavelength, distance and time. Diffraction and practical limitations. Comparison of long wave and short-wave diffraction.	Identify, measure and calculate frequency, wavelength and speed for sound waves or water waves, eg using data loggers, or echo methods. 'Slinkies' can be used to discuss transverse and longitudinal waves. Investigate diffraction around objects and through gaps.	$v = \frac{d}{t}$ $v = f\lambda$ $T = \frac{1}{f}$
Electromagnetic spectrum Relative frequency and wavelength of bands of the electromagnetic spectrum with reference to typical sources, detectors and applications. Qualitative relationship between the frequency and energy associated with a form of radiation. All radiations in the electromagnetic spectrum travel at the speed of light.	Explore, discuss and compare applications of e-m spectrum beyond the visible. Discuss and compare limitations for applications of e-m waves in relation to frequency.	

Light Refraction of light including identification of the normal, angle of incidence and angle of refraction. Description of refraction in terms of change of wave speed.	A change in a wave speed results in a change in wavelength and can result in change of direction of a wave. This property of waves can be exploited in a range of applications and effects, eg apparent depth of water, lenses, medical and industrial applications.	
Nuclear radiation The nature of alpha, beta and gamma radiation: relative effect of ionisation, absorption, shielding. Background radiation sources. Absorbed dose, equivalent dose and comparison of equivalent dose due to a variety of natural and artificial sources. Applications of nuclear radiation. Activity in becquerels. Half-life and use of graphical or numerical data to determine the half-life. A qualitative description of fission and fusion, emphasising the importance of these processes in the generation of energy.	Research the extraction of naturally occurring radioactive materials. Determination of background radiation. Research into society's reliance on radioactivity for a range of medical and industrial applications, including energy sources. Discussion/debate about the risks and benefits of radioactivity in society. Discussion/debate about the biological effects of radiation. Research the importance of half-life in medical and industrial applications. Research into current applications and developments of fission and fusion reactions to generate energy.	$A = \frac{N}{t}$ $D = \frac{E}{m}$ $H = Dw_r$

Dynamics and Space		
Mandatory Course key areas	**Suggested learning activities**	**Exemplification of key areas**
Velocity and displacement — vectors and scalars Vector and scalar quantities: force, speed, velocity, distance, displacement, acceleration, mass, time and energy. Calculation of the resultant of two vector quantities in one dimension or at right angles. Determination of displacement and/or distance using scale diagram or calculation. Use of appropriate relationships to calculate velocity in one dimension	Orienteering course in school grounds — calculation of displacement and average velocity. Discuss and compare the difference between vector and scalar quantities. Measured distance and displacement; measured average and instantaneous velocity. For example, sports, cars, flight, space. Analyse motion vectors using scale diagrams and/or trigonometry.	$\bar{v} = \frac{s}{t}$ $v = \frac{s}{t}$
Velocity–time graphs Velocity–time graphs for objects from recorded or experimental data. Interpretation of velocity–time graph to describe the motion of an object. Displacement from a velocity–time graph.	Plotting of graph from data sets — manually or use of software. Capture and analyse data using appropriate software, eg trolleys running down slopes. Observation of *v*-*t* graph of bouncing ball using motion sensor.	*s* = area under *v*-*t* graph

Acceleration Acceleration of a vehicle between two points using appropriate relationships with initial and final velocity and time for change. Acceleration from a velocity–time graph.	Determination of acceleration using two light gates and timer recording times for instantaneous speeds and time between. Use of data software, or otherwise, to analyse gradient.	$a = \frac{v - u}{t}$
Newton's laws Applications of Newton's laws and balanced forces to explain constant velocity, making reference to frictional forces. Calculations involving the relationship between unbalanced force, mass and acceleration for situations where more than one force is acting. Calculations involving the relationship between work done, unbalanced force and distance/displacement. Calculations involving the relationship between weight, mass and gravitational field strength including on different planets. Newton's second law including its application to space travel, including rocket launch and landing. Newton's third law and its application to explain motion resulting from a 'reaction' force. Use of Newton's laws to explain free-fall and terminal velocity.	Identify forces in vehicles travelling with constant velocity, car, helicopter, boat. Frictionless movement — air hockey puck, linear air-track, model hovercraft. Practical examples of balanced forces — eg gliding, floating in water, tug of war, etc. Practical investigation of Newton's second law using air track or other suitable means. Simulations and/or water rocket experiments, lunar landing simulations. Dropping flat and crushed sheet of paper — leading on to parachutes investigation. Glycerine filled measuring cylinders and ball bearings to demonstrate balanced forces (terminal velocity).	$F = ma$ $E_w = Fd$ $W = mg$

	Car safety and seat belts/airbags related to Newton's laws.	
Projectile motion Explanation of projectile motion. Calculations of projectile motion from a horizontal launch using appropriate relationships and graphs. Explanation of satellite orbits in terms of projectile motion.	'String of pearls' experiment (using a strobe light to see the separation of projectile motion). 'Monkey and hunter' experiment. Video analysis of projectile motion (tracker or similar). Investigate and calculate 'drop time' and 'time of flight'. Newton's 'thought' experiment.	Area under v_h-t graphs for horizontal range and area under v_V-t graphs for vertical height. $v_h = \frac{s}{t}$ (constant horizontal velocity) $v_V = u + at$ (constant vertical acceleration)
Space exploration Evidence to support current understanding of the universe from telescopes and space exploration. Impact of space exploration on our understanding of planet Earth, including use of satellites. The potential benefits of space exploration including associated technologies and the impact on everyday life. Risks and benefits associated with space exploration, including challenges of re-entry to a planet's atmosphere.	Discuss space exploration (emphasising the idea that this is a continually developing area) using suitable simulations and/or DVDs. Videos of re-entry — Joe Kittinger. The need for thermal protection systems to protect spacecraft on re-entry, including qualitative and quantitative specific heat capacity. Design and make a model heat shield for re-entry.	$E_h = cm\Delta T$ $E_h = ml$ $E_p = mgh$ $E_k = \frac{1}{2}mv^2$ $E_w = Fd$

Cosmology Use of the term ‘light year’ and conversion between light years and metres. Observable universe — description, origin and age of universe. The use of different parts of the electromagnetic spectrum in obtaining information about astronomical objects. Identification of continuous and line spectra. Use of spectral data for known elements, to identify the elements present in stars.	Construct a simple spectroscope from a CD disk and examine common light sources. Use a spectroscope to look at a range of light sources, eg sodium lamp and other gas discharge lamps. Research recent advances in astronomy and in our knowledge of the universe. View the night sky with a telescope. Radio telescopes, COBE, SETI, etc.	

National 5 Physics: Units and prefixes

This table applies to the Course and its component Units.

Units, prefixes and scientific notation	Notes
Units and prefixes	SI units should be used with all the physical quantities. Prefixes should be used where appropriate. These include nano (n), micro (μ), milli (m), kilo (k), mega (M), giga (G).
Significant figures	In carrying out calculations and using relationships to solve problems, it is important to give answers to an appropriate number of significant figures. This means that the final answer can have no more significant figures than the value with least number of significant figures used in the calculation.
Scientific notation	Learners should be familiar with the use of scientific notation and this may be used as appropriate when large and small numbers are used in calculations.

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 Course 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 concepts and explain and interpret information and data.

5.3 Applying
Applying 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.

5.4 Analysing and evaluating
Analysis is the ability to solve problems in physics and make decisions that are based on available information. It may involve the review and evaluation of relevant information and/or prior knowledge to provide an explanation.

It may build on selecting and/or processing information, so is a higher skill.

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 key Physics concepts and describe, clearly, physics issues in various media forms. 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
Learners can demonstrate creativity when learning Physics, in particular, when planning and designing experiments/investigations. Learners also have the opportunities to make, write, say or do 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, whenever appropriate.

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

Added value

Courses from National 4 to Advanced Higher include assessment of added value. At National 5, Higher and Advanced Higher, the added value will be assessed in the Course assessment.

Information given in the *Course Specification* and the *Course Assessment Specification* about the assessment of added value is mandatory.

Suggested investigations

Some suggested investigations are listed below which are likely to be familiar to assessors. Centres are free to select other appropriate investigations.

Topic	**Key area**
Car safety	Newton's laws
Electricity generation using nuclear sources	Nuclear radiation
Hybrid vehicles	Conservation of energy
Space exploration	Space exploration

A resource pack has been developed for one of these investigations and can be found in Appendix 2. This is not mandatory. Centres are free to develop their own investigations.

Preparation for Course assessment

Each Course has additional time which may be used at the discretion of the teacher or lecturer to enable learners to prepare for Course assessment. This time may be used near the start of the Course and at various points throughout the Course for consolidation and support. It may also be used for preparation for Unit assessment, and towards the end of the Course, for further integration, revision and preparation and/or gathering evidence for Course assessment.

During delivery of the Course, opportunities should be found:

- for identification of particular aspects of work requiring reinforcement and support

- to practise skills of scientific inquiry and investigation in preparation for the Assignment
- to practise question paper techniques

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

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.

Candidate 1

Assessment Standard	Evidence required	Evidence produced
1.1 Planning an experiment/ practical investigation	Aim of experiment	The aim is clear
	Dependent/independent variable	From the method and results table
	Variables to be kept constant	From the diagram
	Measurements/ observations to be made	From the diagram
	Resources	From the diagram
	Method including safety	Clear. No safety issue
1.2 Following procedures safely	Procedures have been followed safely	✓
1.3 Making and recording observations/ measurements correctly	Observations/ measurements taken are correct	✓
1.4 Presenting results in an appropriate format	Results have been presented in an	Table and graph

	appropriate format	
1.5 Drawing valid conclusions	What the experiment shows, with reference to the aim	✓
1.6 Evaluating experimental procedures	The suggestion given will improve the experiment	✓

This candidate has passed all six Assessment Standards for Outcome 1.

Comments

Assessment Standard 1.1: This could be presented more clearly but evidence can be found from the other sections of the report.

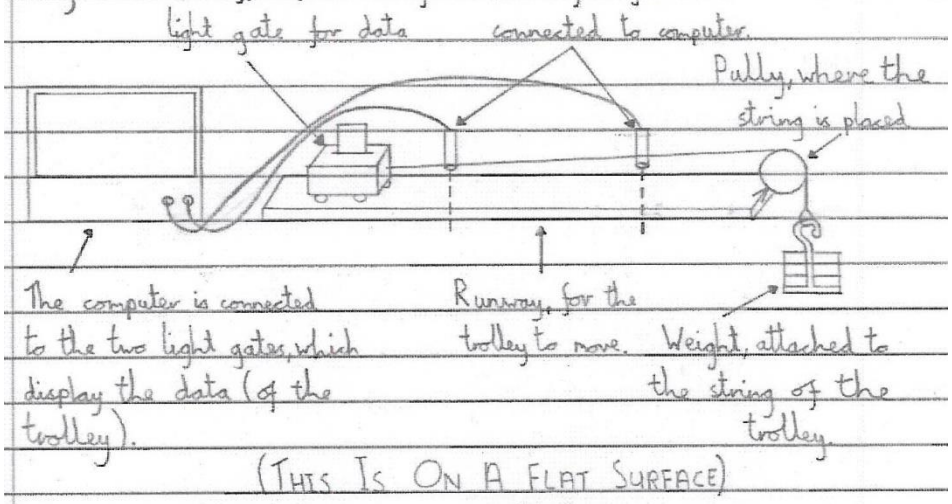
Assessment Standard 1.4: Graphs should show the best-fit line and not necessarily go through the origin.

Candidate 1

Newton's 2nd Law

Aim: To find how the size of an unbalanced force affects the acceleration of an object

Diagram:



(THIS IS ON A FLAT SURFACE)

Method: The trolley is accelerated by adding mass to an end of a string which is attached to the trolley. This will pull the trolley across the 2 light gates, which will give us the acceleration of the trolley, displayed on a computer.
The unbalanced force is increased by adding more masses to the pully.

Candidate 1 (contd)

Results:

Mass (kg)	Force (N)	Acceleration ($m\ s^{-2}$)		
0·02	0·2	① 0·289	② 0·295	③ 0·290
0·04	0·4	① 0·597	② 0·590	③ 0·586
0·06	0·6	① 0·874	② 0·869	③ 0·873
0·08	0·8	① 1·133	② 1·154	③ 1·176

Averages - 0·2 N average acceleration is 0·291 $m\ s^{-2}$
- 0·4 N average acceleration is 0·591 $m\ s^{-2}$
- 0·6 N average acceleration is 0·872 $m\ s^{-2}$
- 0·8 N average acceleration is 1·138 $m\ s^{-2}$

Conclusion: In the investigation we added weight's to one side of a trolley to give it an unbalanced force, on 1 side of the trolley. After the 3 repeated accel^, we found out the average.
The graph of the result drawn using the averages we found, was a straight line through the orgin. This tells us that the Force is directly proportional to accel^.

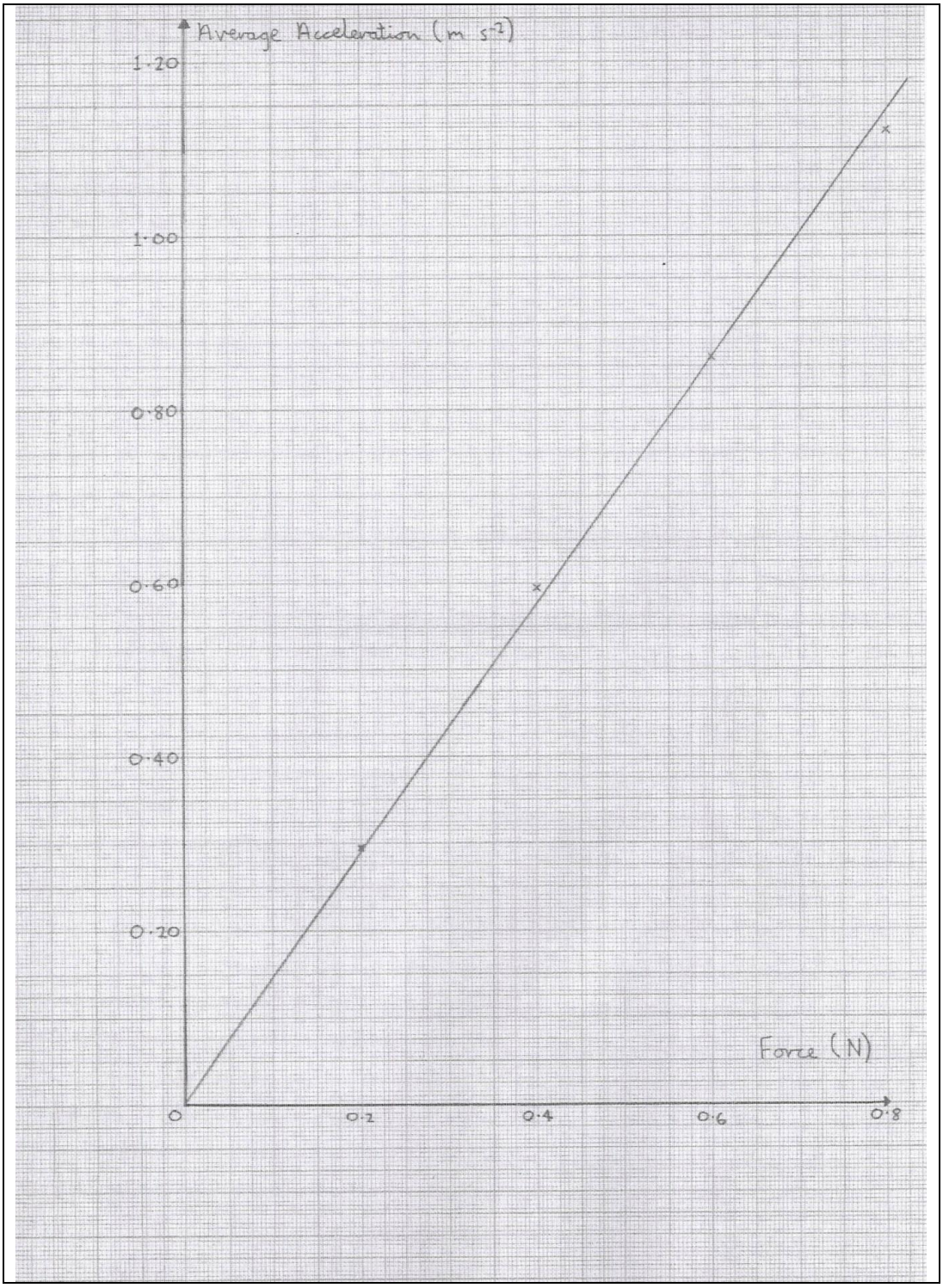
$$F \propto a$$

⇑

Directly proportional

Evaluation: To improve this investigation you could make the string shorter, so it doesn't hit the floor before the trolley goes past both light gates. To make it even better you could do more repeated accel^. You could also check if the surface is flat to be perfect.

Candidate 1 (contd)



Candidate 2

Assessment Standard	Evidence required	Evidence produced
1.1 Planning an experiment/ practical investigation	Aim of experiment	✓
	Dependent/independent variable	Clearly stated
	Variables to be kept constant	Clearly stated
	Measurements/observations to be made	Clearly stated
	Resources	Clear from diagram
	Method including safety	Clearly stated
1.2 Following procedures safely	Procedures have been followed safely	✓
1.3 Making and recording observations/ measurements correctly	Observations/measurements taken are correct	✓
1.4 Presenting results in an appropriate format	Results have been presented in an appropriate format	Table and graph
1.5 Drawing valid conclusions	What the experiment shows, with reference to the aim	✓
1.6 Evaluating experimental procedures	The suggestion given will improve the experiment	✓

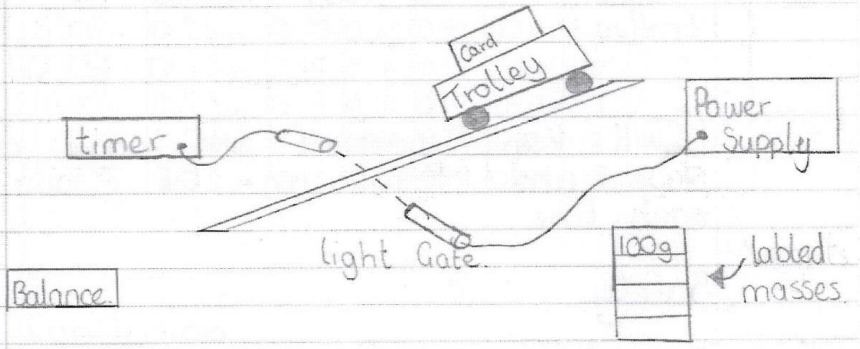
This candidate has passed all six Assessment Standards for Outcome 1.

Candidate 2

Mass of Trolley v Instantaneous Speed

Aim

My aim is to investigate how the mass of trolley affects the instantaneous speed of the trolley on a slope.



Method

- First I will measure the length of the card on the trolley
- Then I will weigh the trolley on the balance scale to find it's mass.
- I will then measure the time it takes for the card to pass through the light gate. I will do this 3 times to get an average.
- Then, I will find the instantaneous speed by dividing the length of the card by the time taken for the

Candidate 2 (contd)

card to pass through the light gate.

- I will then repeat this process but I will add an 100g labelled mass and find the instantaneous speed.

- I will then add another 100g until there is 600g masses on the trolley.

I will keep constant the angle of the slope and I will use the same trolley each time.

Safety

Keep fingers away from trolley when it rolls down the slope.

- Do not drop masses.
- Don't stare at light in light gate.
- Don't touch light gate as it may be hot.

Candidate 2 (contd)

Results Tabel

mass of trolley (g)	Card length (m)	time (s) 1	2	3	Avg	instantaneous Speed (ms^{-1})
670g	0·25m	0·19	0·19	0·18	0·19	1·3
770g	0·25m	0·18	0·18	0·19	0·18	1·4
870g	0·25m	0·17	0·18	0·20	0·18	1·4
970g	0·25m	0·19	0·18	0·18	0·18	1·4
1070g	0·25m	0·19	0·19	0·19	0·19	1·3
1170g	0·25m	0·19	0·19	0·19	0·19	1·3
1270g	0·25m	0·19	0·19	0·19	0·19	1·3

Conclusion

From my results I found that adding more masses to the trolley did not change the instantaneous speed

This was not what I expected to happen. I expected the speed to become slower the more masses I added.

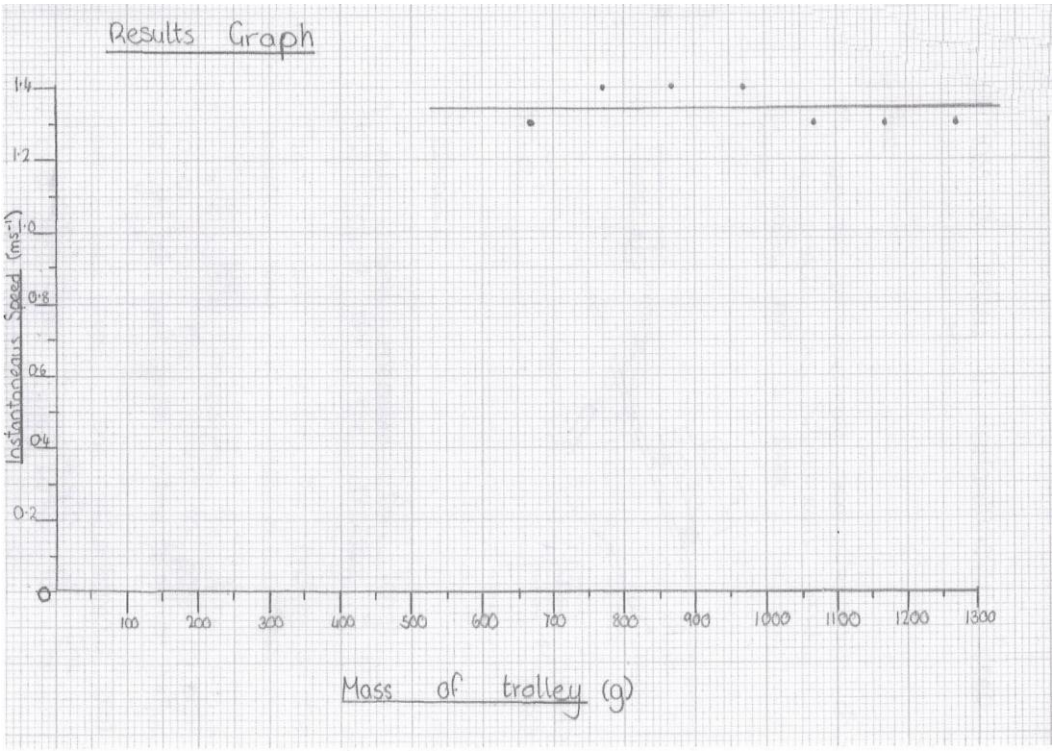
Candidate 2 (contd)

Evaluation

The method I used was suitable however it was difficult to keep the trolley in a straight line

I kept all the variables, such as the length of the card and the angle of the slope, the same.

Improvements that could be made to the experiment is to get a more accurate average speed would be to repeat the method more than 3 times. Also using more masses would prove that the instantaneous speed does not change.



Candidate 3

Assessment Standards can be achieved using one or a number of 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 an application	The application is related to a Key Area of the Course	Electromagnetic spectrum
	Application stated	A range of applications is given
	The description demonstrates clear physics knowledge and understanding of the application.	Appropriate. Clear understanding of physics

Individual evidence for Assessment Standard 2.3

Assessment Standard	**Evidence required**	**Evidence produced**
2.3 Describing a physics issue in terms of its effect on the environment/society	The issue is related to a key area of the Course.	Electromagnetic spectrum
	A physics issue is stated.	✓
	The physics issue is described in a way that its effect on the environment/society is clear.	Appropriate. Clear understanding of physics

This candidate has passed Assessment Standards 2.2 and 2.3.

Candidate 3

Infra-Red Radiation

(No notes used as reference)

Infra-red radiation on the electromagnetic spectrum is inbetween Microwaves and visible light. It has a wavelength shorter than Microwaves but longer than visible light. You are unable to see Infra-red radiation by the naked eye.

Infra-red can be used in lots of ways to benefit society, thermal cameras can be used to detect cancerous cells or tumors, because tumors are a higher temperature than normal human flesh so they show up a different colour on the thermal camera.

Infra-red is also used in things like TV remotes, controllers and there is now such a thing as an infra-red sauna, Infra-red saunas are fairly new sciences.

Infra-red only works over a small distance and must have an Infra-red reciever for it to work. It must have a straight path to the reciever and if anything blocks or interupts this path the device you are using will not work.

The ElectroMagnetic Spectrum

Radio Waves	TV Waves	Micro-Waves	Infra Red	Visible Light	UV	X-Rays	Gamma	//

Candidate 4

Assessment Standards can be achieved using one or a number of 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 an application	The application is related to a key area of the Course	Electromagnetic spectrum
	Application stated	✓
	The description demonstrates clear physics knowledge and understanding of the application.	Does not show a clear understanding of physics

Individual evidence for Assessment Standard 2.3

Assessment Standard	**Evidence required**	**Evidence produced**
2.3 Describing a physics issue in terms of its effect on the environment/ society	The issue is related to a key area of the Course.	Electromagnetic spectrum
	A physics issue is stated.	✓
	The physics issue is described in a way that its effect on the environment/society is clear.	Does not show a clear understanding of physics

This candidate has not passed Assessment Standards 2.2 or 2.3.

Candidate 4

14 Visible Light is the part of the electromagnetic spectrum that is bang in the middle.

Radio & TV Waves	Microwaves	Infrared Radiation	Visible Light	Ultra Violet	X-rays	Gamma Radiation

26 The further left on this, ↑ ~~[illegible]~~ the ~~[illegible]~~ longer the wavelength and smaller the frequency then vise versa on the right It is the only part that can be seen by the human eye. We are looking at it all the time. Light is a mixture of all the colours of the rainbow. Red, Orange, Yellow, Green, Blue, Indigo & Violet. Once light hits a material, some colours are absorbed, and

104 some ~~[illegible]~~ emitted back out. This is why everything is a different colour. The sky is blue because the atmosphere absorbs all colours apart from ~~[illegible]~~ that. Not all light is blocked though because if it was, there would be no colour, or anything at all really. This blockage is called "the 'Optical Window'". Materials emit all differently because their atomic structure is different. This is called the emmision

153 spectrum.

A LASER, Light Amplification of Stimulated Emmision Radiation, are beams of concentrated light of one colour. This works by ~~[illegible]~~ shooting ~~light through a material that absorbs all but on colour~~ a powerful light through a material that absorbs all but one colour. This is then directed out a straight channel and seen as a dot when it hits something. Intense lasers will burn. This is used in ~~Intense lasers will burn~~ laser eye surgery where the

215 conrea is smoothed out to help vision. Tattoos and birth marks can be removed as well. Cutting a large variety of materials is another use. Accurate grooves ~~can be~~ in discs and circuits are made with lasers too. Visible Light is only dangerous at high concentrations where it will cut through almost anything. At a low concentration it can also damage your eye sight.

Equality and inclusion

The following should be taken into consideration:

Situation	Reasonable Adjustment
Carrying out practical activities.	Use could be made of practical helpers if learners with physical disabilities, especially manual dexterity, need assistance to carry out practical techniques. Practical helpers may also assist learners who have visual impairment and have difficulty in 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 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 Question Paper and/or Assignment, where necessary. All adjustments currently available for the Question Paper would be available for Component 1. Learners will have a choice of Assignment topic for Component 2, for which reasonable adjustments can be made. 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 learners 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*
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- Principles and practice papers for Sciences curriculum areas
- Science: A Portrait of current practice in Scottish schools (Nov 2008)
- *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*

Appendix 2: Resource pack

National 5 Physics: Assignment

Resource pack: Car safety

This resource pack gives details of areas that are suitable for an assignment task.

Car safety research/investigation supports:

Unit: Dynamics and Space
Key area: Newton's laws

- Calculations involving the relationship between unbalanced force, mass and acceleration for situations where more than one force is acting
- Calculations involving the relationship between work done, unbalanced force and distance/displacement

Background information

Topical issue: Road vehicle safety

Road vehicle safety is a continuous process to find improvements which will reduce the number of road accidents and the severity of any injuries, making road travel safer for everyone.

Research

Car manufacturers research and develop safety features for their vehicles then promote the improvements in order to reassure buyers that their cars are safe. European and government agencies also carry out research in all areas connected with car safety.

Governments carry out vehicle tests to ensure that the cars produced by manufacturers perform safely and meet required standards. Government testing allows the public to compare the safety performance of different cars by using the same standard tests.

Euro NCAP is a European agency set up by the UK and other European governments to investigate vehicle safety, and publish their findings. Euro NCAP organises crash-tests and provides motoring consumers with a realistic and independent assessment of the safety performance of some of the most popular cars sold in Europe.

Energy

Cars have kinetic energy when moving. During braking, the kinetic energy is transferred into heat energy by the brakes. The brakes heat up and then transfer the energy to the surroundings. During collisions, the kinetic energy will not be completely transferred into heat energy in the brakes, but may cause damage to the car and occupants during the collision.

Modern cars have safety features that dissipate kinetic energy during collisions to reduce injury to car occupants.

Assignments

The following areas of car safety research are suitable for an assignment task. Your choice of research topic could be based on one (or more) of these areas

- The operation and benefit of seat belts.

  Since the introduction of seat belts, improvements such as the three-point seat belt, inertia-reel seat belts and pre-tensioning seat belts have been adopted by car manufacturers.

- The operation and benefit of car ‘safety cages’.

  The ‘safety cage’ provides a safe area for passengers in the event of an accident. It has features which protect passengers from certain injuries.

- The improvement of vehicle braking systems.

  Antilock braking systems and electronic stability control have improved car braking.

- The improvement of steering wheel design.

  Steering wheels have been designed to reduce driver injuries during a crash.

- The use of side-bars to reduce injury.

  These have been developed to protect passengers from side impacts.

- The operation and design of crumple zones.

  The front and rear parts of cars have been designed to steadily collapse during a collision to reduce injury to the car occupants.

- The design and operation of air bags to reduce injury.

  Air bags reduce injury to the driver and passengers during collisions.

- The design and use of pedestrian air bags to reduce injury.

  Car manufacturers are developing these to help protect pedestrians who are struck by cars.

- The use of dynamic car data to minimise injuries when an accident is happening.

  Car manufacturers are developing systems which detect whether emergency action is being taken by the driver, and then apply measures to reduce

injuries (for example, taking the slack out of seat belts by using reversible tensioners or closing windows and the sunroof if the car is likely to roll over) .

Websites

The following websites contain information about research which has been carried out into car safety.

http://hyperphysics.phy-astr.gsu.edu/hbase/carcr.html#cc1

http://www.nhtsa.gov/Research/Databases+and+Software

http://www.theaa.com/allaboutcars/ncap/ncap_car_results.jsp?make=Fiat&modelYear=Doblo:2004&publicationDate=2004-06-01

http://www.theaa.com/motoring_advice/euroncap/crash_tests.html

http://www.thatcham.org/safety/pdfs/bumper_test_development.pdf

http://www.euroncap.com/Content-Web-Page/c6f9d381-1889-4c66-bfcd-c5c0a69a364d/technical-papers.aspx

Administrative information

Published: June 2013 (version 1.1)

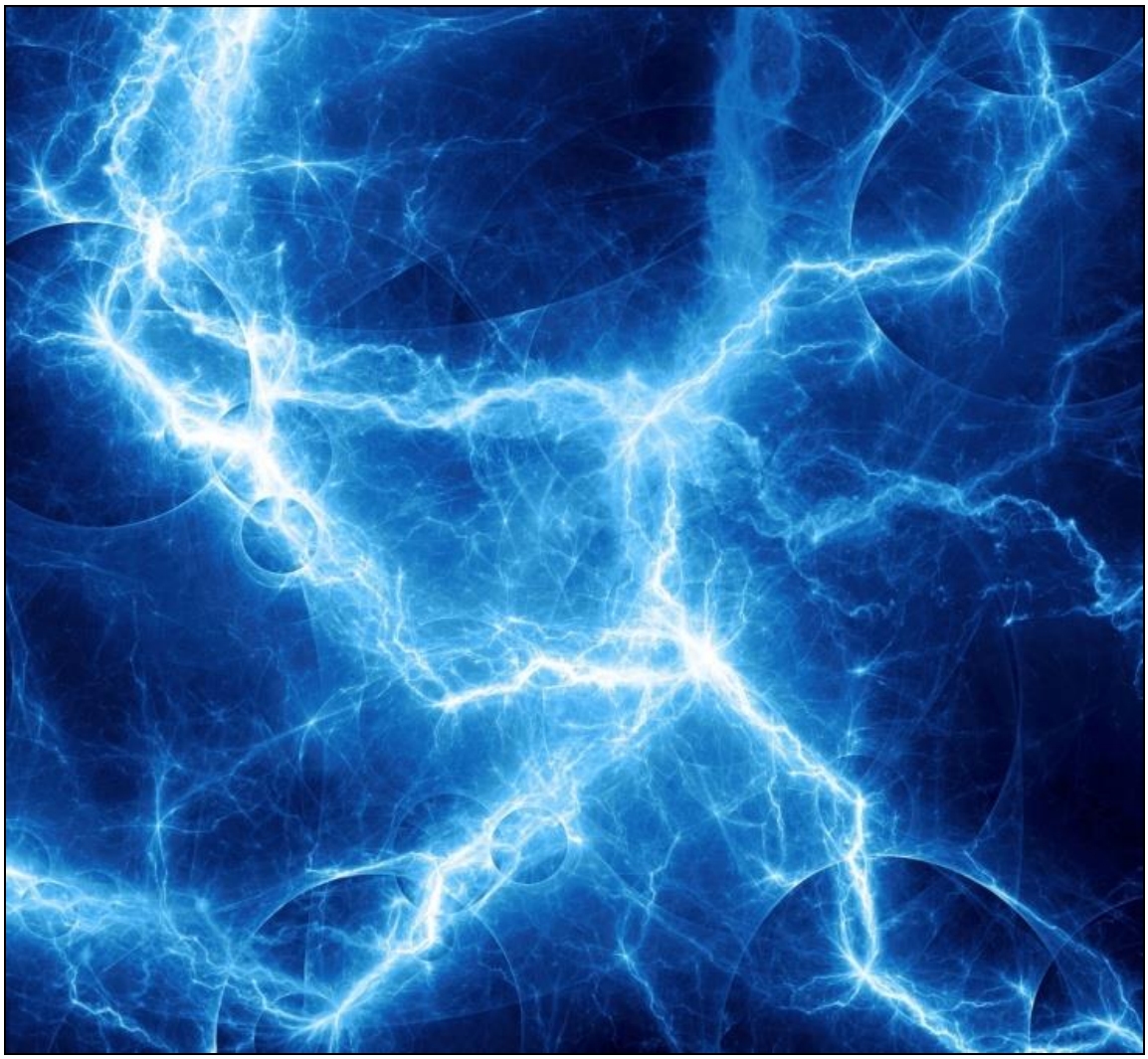
History of changes to Course Support Notes

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

Note: You are advised to check SQA's website (**www.sqa.org.uk**) to ensure you are using the most up-to-date version.

Unit Support Notes

Unit Support Notes — Physics: Electricity and Energy (National 5)



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 5) 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 Assessment Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit is to develop skills of scientific inquiry, investigation and analytical thinking, along with 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 transfer
- Heat
- The gas laws

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 4 Physics Course

There may also be progression from National 4 Biology, National 4 Chemistry, National 4 Environmental Science and National 4 Science Courses.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 5 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 a Unit when it forms part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units.

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 in the day-to-day delivery of the Units in a Course to observe learners providing evidence which satisfies completely or partially a Unit or Units. This is naturally occurring evidence and can be recorded as evidence for an Outcome or parts of an Outcome. In some cases, additional evidence may also be required to supplement and confirm the naturally occurring evidence.

Approaches to assessment might cover the whole Unit or be combined across Outcomes. A holistic approach can enrich the assessment process for the learner 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 for this Unit.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Unit Support Notes* 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 learners 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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- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- Principles and practice papers for Sciences curriculum area
- Research Report 4 — Less is More: Good Practice in Reducing Assessment Time
- Coursework Authenticity — a Guide for Teachers and Lecturers
- *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
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- 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

Unit details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials and resource pack added.	Qualifications Development Manager	June 2013

Note: You are advised to check SQA's website (**www.sqa.org.uk**) to ensure you are using the most up-to-date version.

Unit Support Notes

Unit Support Notes — Physics: Waves and Radiation (National 5)

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 5) 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 Assessment Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit is to develop skills of scientific inquiry, investigation and analytical thinking, along with 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:

- Waves
- Nuclear Radiation

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 4 Physics Course

There may also be progression from National 4 Biology, National 4 Chemistry, National 4 Environmental Science and National 4 Science Courses.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 5 Physics *Course Support Notes*.

If this Unit is being delivered on a free-standing basis, teachers and lecturers should cover the mandatory skills and key areas in ways, 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 a Unit when it forms part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units.

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 in the day-to-day delivery of the Units in a Course to observe learners providing evidence which satisfies completely or partially a Unit or Units. This is naturally occurring evidence and can be recorded as evidence for an Outcome or parts of an Outcome. In some cases, additional evidence may also be required to supplement and confirm the naturally occurring evidence.

Approaches to assessment might cover the whole Unit or be combined across Outcomes. A holistic approach can enrich the assessment process for the learner 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 for this Unit.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Unit Support Notes* 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 learners and/or those with additional support needs) — various publications on SQA's website: *http://www.sqa.org.uk/sqa/14976.html*
- *Building the Curriculum 3: A framework for Learning and Teaching*
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- *Building the Curriculum 5: A framework for assessment*
- *Course Specifications*
- *Design Principles for National Courses*
- *Guide to Assessment (June 2008)*
- *Overview of Qualification Reports*
- Principles and practice papers for sciences curriculum area
- Research Report 4 — Less is More: Good Practice in Reducing Assessment Time
- Coursework Authenticity — a Guide for Teachers and Lecturers
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- *SCQF Handbook: User Guide* (published 2009) and SCQF level descriptors (to be reviewed during 2011 to 2012): *www.sqa.org.uk/sqa/4595.html*
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Administrative information

Published: June 2013 (version 1.1)

Superclass: RC

History of changes to Unit Support Notes

Unit details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials and resource pack added.	Qualifications Development Manager	June 2013

Note: You are advised to check SQA's website (**www.sqa.org.uk**) to ensure you are using the most up-to-date version.

Unit Support Notes

Unit Support Notes — Physics: Dynamics and Space (National 5)

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: Dynamics and Space (National 5) 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 Assessment Specification*
- the *Course Support Notes*
- appropriate assessment support materials

General guidance on the Unit

Aims

The general aim of this Unit is to develop skills of scientific inquiry, investigation and analytical thinking, along with 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:

- Kinematics
- Forces
- Space

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 4 Physics Course

There may also be progression from National 4 Biology, National 4 Chemistry, National 4 Environmental Science and National 4 Science Courses.

Skills, knowledge and understanding covered in this Unit

Information about skills, knowledge and understanding is given in the National 5 Physics *Course Support Notes.*

If this Unit is being delivered on a free-standing basis, teachers and lecturers should cover the mandatory skills and key areas in ways 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 a Unit when it forms part of a Course may differ from approaches to assessing the same Unit when it is not being delivered as part of a Course. If an integrated approach to Course delivery is chosen, then there may be opportunities for combining assessment across Units.

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 in the day-to-day delivery of the Units in a Course to observe learners providing evidence which satisfies completely or partially a Unit or Units. This is naturally occurring evidence and can be recorded as evidence for an Outcome or parts of an Outcome. In some cases, additional evidence may also be required to supplement and confirm the naturally occurring evidence.

Approaches to assessment might cover the whole Unit or be combined across Outcomes. A holistic approach can enrich the assessment process for the learner 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 for this Unit.

It is recognised that centres have their own duties under equality and other legislation and policy initiatives. The guidance given in these *Unit Support Notes* 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 learners and/or those with additional support needs) — various publications on SQA's website: http://www.sqa.org.uk/sqa/14976.html
- Building the Curriculum 3: A framework for Learning and Teaching
- *Building the Curriculum 4: Skills for learning, skills for life and skills for work*
- *Building the Curriculum 5: A framework for assessment*
- Course Specifications
- Design Principles for National Courses
- *Guide to Assessment* (June 2008)
- Overview of Qualification Reports
- Principles and practice papers for curriculum areas
- Research Report 4 — Less is More: Good Practice in Reducing Assessment Time
- Coursework Authenticity — a Guide for Teachers and Lecturers
- Science: A Portrait of current practice in Scottish schools (Nov 2008)
- *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
- SQA Guidelines on e-assessment for Schools
- SQA Guidelines on Online Assessment for Further Education
- SQA e-assessment web page: www.sqa.org.uk/sqa/5606.html

Administrative information

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Superclass: RC

History of changes to Unit Support Notes

Unit details	Version	Description of change	Authorised by	Date
	1.1	Exemplar materials and resource pack added.	Qualifications Development Manager	June 2013

Note: You are advised to check SQA's website (**www.sqa.org.uk**) to ensure you are using the most up-to-date version.