Course report 2019

Subject	Physics
Level	National 5

This report provides information on candidates' performance. Teachers, lecturers and assessors may find it useful when preparing candidates for future assessment. The report is intended to be constructive and informative and to promote better understanding. It would be helpful to read this report in conjunction with the published assessment documents and marking instructions.

The statistics used in this report have been compiled before the completion of any post-results services.

Section 1: comments on the assessment

Question paper

All questions were answered correctly by at least a proportion of the candidates, and there was a spread of performance across the range of available marks.

The general impression of markers was that the question paper was of a similar standard to previous years and that the paper included appropriate questions to provide good discrimination for candidates performing at grades A and B. The statistical analysis indicates very similar average marks compared to previous years.

The grade boundaries for this assessment were reduced below the notional values at the upper grade A boundary, at the grade A boundary, and at the grade C boundary.

Several markers observed that some responses suggest some candidates had not prepared effectively for the assessment or had been inappropriately presented. Statistical analysis shows that a number of candidates achieved marks well below the grade C boundary.

Assignment

The assignment assesses the application of skills of scientific inquiry and related knowledge and understanding of physics. Markers commented that candidates had the opportunity to achieve marks for all the skills, knowledge and understanding assessed. In addition, markers noted that many candidates achieved high marks, and few candidates achieved low marks.

The majority of candidates appear to be following the advice available to them within the ‘Instructions for candidates’ section of the course assessment task document, which details advice and guidance for the various stages of the assignment, and the marks available for each aspect of the report.

Section 2: comments on candidate performance

Areas that candidates performed well in

Question paper

Section 1: objective test

Questions 2, 5, 6, 7, 8, 14, 15, 17, 22 and 25 were answered particularly well (with most candidates selecting the correct response).

Section 2: restricted- and extended-response questions

Many candidates coped well with questions requiring the selection of a relationship followed by a calculation and final answer.

Candidates who successfully answered questions that required justifications, descriptions or explanations were able to structure their answers to present information that was clear and relevant to the question being asked. They used correct terminology and referred to appropriate physics concepts (for example in question 5(a)(ii), the effect of increasing the length of wire on its resistance and the relationship between current and resistance).

Question 1(a)(i)	The majority of candidates correctly calculated the magnitude of the resultant of multiple displacements acting at right angles.
Question 1(c)	Most candidates were able to determine the difference in time taken by the quadcopters to complete the race, given information about the average speed and distance travelled by the second quadcopter, and the time taken by the first quadcopter.
Question 2(a)(i)	The majority of candidates showed all the stages of the calculation required to determine the acceleration of the glider, given information about its motion in the form of a velocity-time graph. These stages included starting with a correct relationship, making the correct substitutions, and ending with the correct final value, including the unit.
Question 2(a)(ii)	Most candidates were able to calculate the mass of the glider, given information about its acceleration and the unbalanced force acting on it.
Question 2(a)(iii)B	Most candidates were able to suggest a design feature of the glider that reduces the frictional forces acting on it.
Question 4(a)	The vast majority of candidates were able to identify the elements present in a star, given a line spectrum from the star and the line spectra of a selection of elements.
Question 4(b)(i)	Most candidates were able to state what is meant by the term *light-year*.

Question 4(c)(ii)	The vast majority of candidates were able to state a suitable use of satellites.
Question 5(a)(ii)	The majority of candidates were able to explain the effect of increasing the length of wire on its resistance, given information about the length of the wire and the current in it, making reference to the relationship between current and resistance.
Question 5(a)(iv)	Most candidates were able to make a suitable suggestion as to how the experiment could be improved to give more reliable results.
Question 6(a)(i)	Most candidates were able to calculate the current in the circuit, given the resistances of the resistors connected in series and the voltage supplied to the circuit.
Question 6(b)(i)	Most candidates were able to determine the total resistance of the circuit consisting of a combination of resistors in series and parallel, given the resistances of the resistors.
Question 7(a)	Most candidates showed all the stages of the calculation required to determine the energy supplied to the water, given information about the power rating of the water dispenser and the time taken to heat a cup of water. These stages included starting with a correct relationship, making the correct substitutions, and ending with the correct final value, including the unit.
Question 7(b)(i)	The majority of candidates were able to calculate the minimum heat energy required to raise the temperature of a mass water to its boiling point, given information about its mass and starting temperature, as well as using an appropriate value for the specific heat capacity of water.
Question 8(b)	Most candidates were able to calculate the force exerted on the water by the pressurised air, given information about the pressure of the air and the area of contact between air and the water.
Question 9(a)	Most candidates were able to calculate the wavelength of the radio waves, given their frequency in MHz.
Question 9(c)(i)	Most candidates were able to calculate the maximum speed of the lifeboat as it enters the water, given information about its mass and the gravitational potential energy it loses before it enters the water.
Question 10(a)	Most candidates were able to state that infrared and gamma rays are members of the electromagnetic spectrum.
Question 10(b)	Most candidates were able to correctly compare the frequency of infrared to the frequency of gamma rays.

Question 10(c)(i)A	Most candidates were able to identify, from the examples shown, a detector of infrared.
Question 10(c)(i)B	Most candidates were able to identify, from the examples shown, a source of gamma rays.
Question 11(a)(ii)	Most candidates were able to state that the normal is the name given to the dashed line shown in the diagram.
Question 11(a)(iii)	Most candidates were able to correctly label the angle of incidence on the diagram supplied.
Question 12(c)(ii)	The majority of candidates were able to calculate the radiation weighting factor of the source, given information about the equivalent dose received from the source and using a value of absorbed dose calculated in the previous part of the question.

Assignment

Section 1	The vast majority of candidates devised an appropriate aim for their investigation.
Section 3(b)	The majority of candidates provided sufficient raw data from an experimental activity that covered a suitable range of values for their stated aim and, where appropriate, included repetition.
Section 3(e)	The vast majority of candidates included in their report, data from an internet/literature source relevant to their experiment.
Section 3(f)	Most candidates provided a suitable reference for the source of internet/literature data included in their report; and either placed the reference next to the internet/literature data, or cited it and referred to it later in the report.
Section 4(a)	The vast majority of candidates selected an appropriate format for the graphical presentation of their experimental data. In the majority of cases this was in the form of a scatter graph.
Section 4(b)	Most candidates selected suitable scales for the axes of their graph that were linear across the data range.
Section 4(c)	Most candidates provided suitable labels and units for the axes of their graph.
Section 8(a)	The vast majority of candidates provided an informative title for their report.
Section 8(b)	The vast majority of candidates produced a clear and concise report.

Areas that candidates found demanding

Question paper

Section 1: objective test

Questions 10, 11, 12, 13, 16 and 18 were answered incorrectly by over half of the candidates.

Question 10	Although most candidates realised that both LEDs needed to be connected the same way round in order for them both to light, many candidates did not identify the correct polarity of the connections to the LEDs to allow this to happen.
Question 11	Although most candidates realised that the circuit was affected by a change in light level, many did not identify that the lamp would light when the light level decreased below a certain value, rather than increased above a certain value.
Question 12	Many candidates did not identify that the supply voltage V_s would always be equal to the sum of the voltages across the resistors R_1 and R_2.
Question 13	Only some candidates were able to identify the section of the graph which showed the time taken for the substance to melt, allowing the specific latent heat of fusion of the substance to be determined.
Question 16	Many candidates failed to convert the temperature given in degrees celsius into kelvin before carrying out the gas law calculation.
Question 18	Many candidates failed to convert the period given in milliseconds into seconds before calculating the frequency.

Section 2: restricted- and extended-response questions

In general, questions requiring justifications, descriptions or explanations are intended to be more demanding for candidates. There was often a lack of precision in candidates' responses, especially when using physics terminology and principles.

Question 1(a)(ii)	Although most candidates calculated an angle for the resultant of the displacements acting at right-angles, many candidates were unable to express this angle as a bearing or compass direction.
Question 1(b)	Many candidates calculated the average speed of the quadcopter, rather than its average velocity. Also, few candidates included a direction associated with the velocity, as is required when stating the value of a vector quantity.
Question 1(d)	Many candidates failed to identify that this situation involved balanced forces. Many simply stated that the forces acting on the quadcopter were equal without qualifying this by reference to their relative directions.

Question 2(b)	Few candidates recognised the fact that the velocity of the glider was changing during the first 8·0 s of its motion and therefore should either use a value of its average velocity in a calculation of its displacement, or use the 'area under the graph' method to calculate its displacement.
Question 3	Although many candidates identified factors such as the lower gravitational field strength on the Moon and the lack of air resistance, only some went on to develop their answer to explain how these factors related to the motion of the golf ball (for example by discussing how these factors affected the horizontal and vertical components of its motion).
Question 4(c)(i)	Few candidates were able to state a suitable advantage of using satellite-based telescopes. Many made vague statements such as 'to get a clearer image'. A common misconception was that satellite-based telescopes would be closer to the object being viewed.
Question 5(b)	This was intended to be a challenging question and few candidates realised that the resistance would be less than 5·2 Ω. Successful candidates were able to explain that folding the wire and connecting the ohmmeter as shown would mean that there were two sections of wire of shorter length in parallel, both aspects of which would reduce the resistance.
Question 6(b)(ii)	Although many candidates stated that the power dissipated by the resistor in the second circuit would be the same as in the first circuit, few were able to support this statement with a suitable justification in terms of the current in the resistor, or the voltage across it. Frequently candidates calculated the power of the whole circuit, which was not suitable justification for their response.
Question 7(b)(ii)	Although most candidates realised that this question required a calculation involving latent heat of vaporisation, few were able to determine the energy that was available to vaporise the water before carrying out the calculation. Many candidates mistakenly used the energy value calculated in the previous part of the question, which was the energy required to raise the temperature of the water to its boiling point.
Question 7(b)(iii)	Few candidates were able to explain that the mass of steam produced would be less because of heat loss to the surroundings. Many simply stated that heat would be lost, rather than explaining where it would go to.
Question 8(a)	Many candidates demonstrated a poor understanding of the forces acting on the bottle. Often candidates stated forces that were not forces acting on the bottle (for example 'force of water on the ground'). Many candidates stated unsuitable names for the forces that were, in fact, not forces at all (for example, 'pressure of water'). In addition, candidates who were imprecise in their description of the downward force acting on the bottle (for example, 'gravity' alone, rather than 'weight' or 'force of gravity') did not achieve all the marks available.

Question 8(c)(ii)	Many candidates seemed not to realise that the question was referring to the situation after launch when the volume of air inside the bottle was increasing and, instead, tried to explain what was happening when air was being pumped into the bottle before launch (a situation where the volume was not increasing). Some candidates made incorrect statements about the motion of the particles; such as that 'they will travel slower'. Some candidates did not clearly indicate that it was the frequency of the collisions with the walls of the container that would decrease. Many candidates omitted to describe the effect of the increasing volume on the overall force acting on the container walls.
Question 9(c)(ii)	Few candidates were able to associate the concept of energy loss as being due to the frictional forces acting on the lifeboat.
Question 10(c)(ii)	Only some candidates were able to suggest a suitable application of the waves detected using fluorescent ink.
Question 11(a)(i)	Few candidates were able to correctly complete the diagram showing the path of the ray of light through and out of the glass block.
Question 11(b)	Although many candidates stated that the wavelength of the red light in the rectangular block is the same as that in the triangular block, few were able to support this statement with a suitable justification in terms of the blocks being made of the same material or that the speed of light in the blocks was the same.
Question 12(a)	Many candidates appeared to be unfamiliar with the experiment to determine the half-life of the radioactive source. Only some candidates described how the Geiger-Müller tube, counter and stopclock are used to determine a count rate. Instead, many candidates described how a ratemeter would be used, which was not one of the pieces of apparatus presented in the question. Only some candidates described how the count rate is corrected for background radiation.
Question 12(d)	Few candidates stated that the photographic film in the badge would be blackened or fogged by radiation. Many candidates attempted to describe how different windows on the badge could be used to identify the type of radiation, but made incorrect statements about which type of radiation would be absorbed or penetrated by which window (for example, 'gamma radiation will be blocked by the lead').
Question 13	Many candidates were imprecise in their description of the differences between fission and fusion. Often terms such as 'atoms' or 'particles' were used instead of 'nuclei'. There were some candidates who had the misconception that, in a chain reaction, a single nucleus repeatedly splits. There were also some candidates who simply repeated the stem of the question by stating that both types of reaction can be used to generate energy.

Assignment

Section 1	Although the vast majority of candidates were able to devise an appropriate aim for their investigation, there were some examples of candidates whose aims were not really aims, but more like descriptions of their experiment (for example 'I am going to measure the current in a lamp for different voltages.'). There were some examples of aims that could be answered with a simple yes or no conclusion (for example 'To find out **if** voltage affects current in a resistor.'); these are not acceptable as a National 5 assignment aim. There were also some assignments for which the aim was not at a level commensurate with National 5 Physics (for example, 'To find out how the mass of an object affects its weight.').
Section 2	Many candidates achieved one mark for demonstrating a limited understanding of relevant physics. Some candidates did not achieve marks for this section because they offered little or no relevant physics explanations and/or did not relate these to the topic being discussed. When candidates had selected topics for which the underlying physics was at a level above National 5 (for example, LDRs, thermistors or solar cells), it was often hard for them to demonstrate either reasonable or good understanding of the physics involved.
Section 3(a)	Many candidates were unable to provide a brief description of the approach used to collect experimental data and instead produced a description that amounted to a full procedure. Some candidates failed to identify either what was being changed in their experiment or what was being measured.
Section 3(b)	Although the vast majority of candidates included raw data, some candidates did not provide the raw results, and only included their average values. There were also some instances of candidates not providing repeated readings, when it was reasonable to expect repetitions to have been made.
Section 3(c)	Some candidates did not obtain the mark for presenting data in a correctly-produced table, as the overarching heading for the data columns did not extend to include the mean column. Occasionally candidates omitted to provide units for all the columns in their table.
Section 3(d)	There were many instances of candidates not rounding mean or derived values correctly, or not stating calculated values to an appropriate number of significant figures. Some candidates who included derived variables in their aim did not calculate values for these derived variables (for example, resistance from experimental values of current and voltage). Some candidates who did not put their mean or derived values into a table, did not include units with their calculated values. Some candidates who calculated the gradient of the line in their graph made incorrect substitutions, using values from their data, rather than points on their line.

Section 3(e)	Some candidates did not provide data from an internet/literature source that was comparable to their experimental data.
Section 3(f)	Some candidates, who chose to state their references elsewhere in the report, did not clearly identify which reference referred to their source of internet/literature data by citing it appropriately.
Section 4(a)	Some candidates did not produce a graph of an appropriate format for their experimental data (for example, by connecting their data points with straight line segments to produce a line graph, when a scatter graph was the appropriate presentation format).
Section 4(b)	Some candidates produced graphs with non-linear scales that, in addition to not attracting any marks for this section, also made it impossible to award marks for accuracy of plotting points in section 4(d).
Section 4(c)	Some candidates did not include suitable labels and units for the axes of their graph.
Section 4(d)	Only some candidates achieved the mark for this section. There were frequent errors in plotting data points and some candidates used overly large markers for their data points that made it impossible to determine their accuracy. Some candidates did not draw a suitable line of best fit: either by drawing a straight line when a curve was more appropriate; by forcing a straight line through the origin; by drawing a 'wobbly' curve that did not show a consistent trend; or by drawing overly heavy or 'hairy' lines.
Section 5	Some candidates did not make a valid comparison between their experimental data and the data from their internet/literature source. Often this was because candidates were making claims about the comparison that were not justified (for example 'both sources show that pressure is directly proportional to temperature', where at least one of the sources did not support this claim).
Section 6	Some candidates were not awarded the mark for this section because they did not address their aim in sufficient detail. For example, when candidates had a stated aim of 'demonstrating a relationship between two variables', they failed to identify this relationship in their conclusion (for example, 'For a fixed mass of gas at constant temperature, pressure is inversely proportional to volume.' or 'The braking distance and velocity squared of an object have a linear relationship.'). Some candidates failed to achieve this mark as their conclusion was not supported by all the data presented in the report. Some candidates, whose aim was to find the value of a particular quantity, were not awarded the mark as they failed to acknowledge the

value given in their internet/literature data as well as the value they obtained experimentally.

Section 7	Many candidates did not identify a factor that could have been expected to have a substantive effect on the reliability, accuracy or precision of the experiment. Many candidates simply stated that they would repeat the experiment more often or that they would take more data points in order to improve it, without recognising that there was little evidence for this statement in their experimental results. In addition, many candidates did not use the terms reliability, accuracy and precision correctly in their explanation of the factor they identified. There is no requirement to use these terms but when used, candidates must use them correctly.
Section 8(a)	A few candidates did not provide an informative title.

Section 3: preparing candidates for future assessment

Question paper

Each year, the question paper samples the full range of course content. This means that candidates should be familiar with all aspects of the course.

Candidates sometimes did not give any answer to particular questions, which could suggest lack of familiarity with the relevant course content. The question paper assesses application of knowledge and understanding, and application of the skills of scientific inquiry, scientific analytical thinking and problem solving. Candidates should have the opportunity to practise these skills regularly to familiarise themselves with the type and standard of questions that may be asked.

Section 1 is worth 20% of the marks available for the course assessment. At this level, candidates may spend too much time completing section 1 of the question paper, which then reduces the time left for completing section 2, which is worth 60% of the marks. Candidates should practise objective test items for section 1 and extended-response questions for section 2 to ensure they can complete them in a time proportionate to the mark allocation on the question paper.

Questions that require justifications, descriptions or explanations always feature in the assessment but are often answered poorly. These types of questions are frequently based on practical coursework and data obtained from experiments. Candidates should, where possible, have the opportunity to experience a wide range of practical work including those experiments specified in the course content to help improve understanding of concepts, procedures and apparatus. Frequent use of physics terms and 'language' may help candidates develop their communication skills when answering such questions.

Candidates should be made familiar with the various 'command words' used in physics questions and how to respond to them. For example, when candidates are asked to 'show' a particular answer is correct, they should start their response with an appropriate relationship, show the correct substitutions, and end with a final answer, including the correct unit, to obtain all the marks available. In a 'must justify' question, they must not only state or select the correct response, but also provide supporting justification to achieve marks.

For questions requiring calculations, the final answer sometimes had the wrong or missing unit. Centres should remind candidates that a final answer usually requires both a value and a unit. Candidates should also be familiar with the full range of units used for quantities covered in the National 5 course.

In calculations, some candidates were unable to provide a final answer with the appropriate number of significant figures (or to round these correctly). It was evident that some candidates confuse significant figures with decimal places. Centres should ensure that candidates understand and can use significant figures correctly.

Candidates should be strongly discouraged from copying down answers from their calculator containing a large number of significant figures, or using ellipses, as a penultimate stage in their response before stating their final answer, as this can often introduce transcription or rounding errors into their calculations. They should be strongly encouraged to show only the selected relationship, the substitution and then the answer, including units, to the appropriate number of significant figures.

Candidates should be given the opportunity to practise open-ended questions at appropriate points during the course. They should be encouraged to both state relevant physics concepts and relate them to the situation described in the question. Having attempted such questions, it may be beneficial for them to have sight of a range of responses and to discuss how marks would be awarded for these responses. Such responses can either be generated by their peers or are available from sources such as SQA's Understanding Standards website.

The published marking instructions contain general marking principles, and also detailed marking instructions for specific questions. Candidates should be encouraged to become familiar with the allocation of marks and the importance of complete final answers when answering numerical questions. Candidates should have access to specific marking instructions when practising exam-type questions. The marking instructions published on SQA's website illustrate how marks are apportioned to responses.

Centres should also refer to the *Physics: General Marking Principles* document on SQA's website for generic issues related to the marking of question papers in SQA qualifications in Physics at National 5, Higher and Advanced Higher levels. Centres are advised to adopt these general principles for the marking of prelim examinations and centre-devised assessments for any SQA Physics course.

Assignment

Centres are advised to consult the National 5 Physics course specification document on SQA's website in conjunction with the coursework assessment task for National 5 Physics. The latter document contains full details of the nature of the assignment task together with instructions for teachers and lecturers, detailed marking instructions, and instructions for candidates.

Centres are also advised to consult the generic document *Guidance on Conditions of Assessment* for clarification and exemplification on acceptable conduct during coursework assessments.

Further support and candidate evidence with commentary for the assignment task is available on SQA's Understanding Standards website.

When choosing a topic, teachers or lecturers must provide advice on the suitability of the candidate's aim, taking into account health and safety considerations, the availability of resources, and availability of internet/literature data, in order to ensure that all aspects of the assessment task are achievable. There must be a choice of topic for candidates and the topics chosen should be at a level commensurate with National 5 Physics.

As far as the reporting stage of the task is concerned the following points should be noted:

Section 1	The aim should be one that is either experimentally investigable or one that can be modelled by an experiment. Aims that can be answered with a simple yes or no conclusion (for example ‘To find out if voltage affects current in a resistor’) are not acceptable as a National 5 assignment aim. Candidates should be made aware that when they choose to investigate the relationship between two variables, this will require them to establish the relationship for the conclusion mark to be awarded later in the report (for example, direct proportionality). It is not appropriate to have ‘correlation’ in an aim. Correlation is a measure of the numerical relationship between the variable values and has nothing to do with causality. Candidates should be looking for a relationship between variables that can be explained in terms of the underlying physics.
Section 2	To allow candidates to access all the marks for this section, careful advice on the choice of topic is essential. It was clear that some candidates chose topics for which the underlying physics was at a level above National 5 (for example, solar cells). Consequently, they struggled to explain the physics involved or ended up copying verbatim from references.
Section 3(a)	Candidates should be made familiar with the skill of producing brief descriptions of experiments in preparation for the assignment by practising during normal classroom activities. Brief descriptions should include, as a minimum, an indication of what was being changed and what was being measured.
Section 3(b)	Candidates should be made aware of the need to provide the actual raw results of their experiment, rather than just their average values. They should also ensure that they include repeated measurements. The data provided in this section must be from an experimental activity, carried out either individually or as part of a small group. Data that is produced from a (computer) simulation, such as half-life or stopping distance of cars for various road conditions, is not acceptable as experimental raw data.
Section 3(c)	Centres should advise candidates to check thoroughly that they have included all appropriate headings and units for their data presented in tables. In particular, they should ensure that columns for mean values are not separated from overarching headings. Centres are not permitted to provide a blank or pre-populated table for experimental results.

Section 3(d)	Candidates should be made familiar with the requirement to calculate mean and/or derived values accurately, both in terms of stating the value to an appropriate number of significant figures and in terms of rounding. Centres are advised to consult the *Physics: General Marking Principles* document on SQA's website for further details on these issues. Candidates should also be encouraged to carefully check their calculations, as simple transcription errors often prevented the awarding of the mark for this section. Candidates should be made aware that all the data they process in the report is considered when awarding the mark for this section; this includes any calculations of gradients, as well as all mean and derived values.
Section 3(e)	Candidates should be able to find suitable internet/literature data to compare against their experimental data. Ideally, the choice of topic would allow access to a wide range of sources. Centres must not provide candidates with a set of experimental data to compare with the candidate's own data. Centres are also reminded that where internet access is an issue and they are providing a minimum of six sources for candidates to select appropriate data from, this must be to websites, journals or books. Centres should also note that a website such as BBC Bitesize is one source, so another five different sources would need to be provided rather than links to six different pages of BBC Bitesize. The experience for a candidate who is provided with at least six sources must mirror as much as possible the experience of the majority of candidates who are doing their own internet/literature research, so that the candidate is having to make real choices about which data they will use.
Section 3(f)	Centres should ensure that candidates know that 'in sufficient detail to allow them to be retrieved by a third party' means candidates must give the full URL for a website; and for a text book give the title, author, page number, and either edition number or ISBN. Candidates should also be familiar with the requirement that the reference appears beside the internet/literature data or is cited and referenced later in the report.
Section 4(a)	Candidates should be familiar with selecting an appropriate format for the graphical presentation of their data: ♦ A scatter graph is appropriate when both the dependent and

independent variable are continuous and any change in the dependent variable is brought about by a change in the independent variable. This is usually the case in physics experiments.

- A line graph is appropriate when both the dependent and independent variable are continuous and any change in the dependent variable is not directly brought about by a change in the independent variable. This is not usually the case in physics experiments.
- A bar graph should be used when the independent variable is discrete.

Candidates should be made aware that there are no marks available for presenting the data obtained from an internet/literature source, or from a simulation, in a graphical format.

When candidates are hand-drawing graphs they should be provided with graph paper that includes major and minor gridlines; squared paper is not appropriate.

Section 4(b) Candidates should be encouraged to double check that graph axes have suitable scales. In particular they should ensure the scales are linear over the data range and that some values have not inadvertently been omitted.

Candidates should be advised to use scales that allow the accuracy of plotting to be readily checked.

Section 4(c) Candidates should be familiar with the requirement to provide suitable labels and units for the axes of their graph. These can often simply be transcribed from their data table.

Section 4(d) Candidates should be familiar with the requirement to plot data points accurately to within half a minor division on the scale.

Candidates should be advised to avoid the use of overly large data markers (avoid large ‘blobs’ and use a neat ‘×’ or ‘+’) when plotting points on their graph.

Candidates should be given the opportunity to practise their graph-drawing skills using real experimental data. In particular, the skill of drawing a line of best fit that is appropriate for the data.

When using Excel or other software packages to draw graphs, candidates should ensure that the accuracy of the data points can be ascertained by markers (for example by using small data point markers and including both major and minor gridlines).

Section 5	Candidates should be familiar with the skill of making valid comparisons between sets of data. Again, this is a skill that can be rehearsed during normal laboratory activities.
Section 6	Candidates should be aware that their conclusion must relate to their aim and must be supported by all the data in their report. Where the data provided in the report provides conflicting results, this should be acknowledged in the candidate's conclusion (for example 'The internet data shows that the specific heat capacity of water is 4180 J kg^{-1} $^{o}C^{-1}$, but my experiment gave a value of 5600 J kg^{-1} $^{o}C^{-1}$.'). As mentioned previously, candidates should be made aware that when they choose to investigate the relationship between two quantities, this will require them to establish the relationship for the conclusion mark to be awarded later in the report (for example, direct proportionality or a 'linear relationship').
Section 7	Centres should ensure that candidates are provided with opportunities to develop the skill of evaluating experimental procedures during the course. This can be achieved by regular exposure to practical activities, together with appropriate questioning related to these activities. It should be made clear to candidates that blanket statements, such as 'repeat more often' or 'increase the number of data points' are unlikely to attract any marks for the evaluation, unless they are justifiable in terms of the candidate's experimental results. Candidates should be able to use the terms reliability, accuracy and precision correctly in their explanations.
Section 8	Although not a requirement, candidates should be encouraged to follow the structure suggested in the 'Instructions for candidates' in order to produce a clear and concise report. The use of headings can often assist markers when identifying where to award marks.

Centres are also advised to consult the generic document *Guidance on Conditions of Assessment* for clarification and exemplification on acceptable conduct during coursework assessments.

While it was pleasing to see that the conditions of assessment for coursework were adhered to in the majority of centres, there were a small number of examples where this may not have been the case. Following feedback from teachers and lecturers, we strengthened the conditions of assessment criteria at all levels. These criteria are published clearly on our website and in course materials and must be adhered to. SQA takes its obligation to ensure fairness and equity for all candidates in all qualifications through consistent application of assessment conditions very seriously and investigates all cases where conditions may not have been met.

Grade boundary and statistical information:

Statistical information: update on courses

Number of resulted entries in 2018	13699

Number of resulted entries in 2019	13792

Statistical information: performance of candidates

Distribution of course awards including grade boundaries

Distribution of course awards	Percentage	Cumulative %	Number of candidates	Lowest mark
Maximum mark				
A	31.8%	31.8%	4384	86
B	22.5%	54.3%	3104	72
C	20.3%	74.6%	2801	58
D	14.7%	89.3%	2022	44
No award	10.7%	-	1481	-

General commentary on grade boundaries

SQA's main aim is to be fair to candidates across all subjects and all levels and maintain comparable standards across the years, even as arrangements evolve and change.

SQA aims to set examinations and create marking instructions that allow:

- a competent candidate to score a minimum of 50% of the available marks (the notional C boundary)
- a well-prepared, very competent candidate to score at least 70% of the available marks (the notional A boundary)

It is very challenging to get the standard on target every year, in every subject at every level.

Therefore, SQA holds a grade boundary meeting every year for each subject at each level to bring together all the information available (statistical and judgemental). The principal assessor and SQA qualifications manager meet with the relevant SQA head of service and statistician to discuss the evidence and make decisions. Members of the SQA management team chair these meetings. SQA can adjust the grade boundaries as a result of the meetings. This allows the pass rate to be unaffected in circumstances where there is evidence that the question paper has been more, or less, challenging than usual.

- The grade boundaries can be adjusted downwards if there is evidence that the question paper is more challenging than usual.
- The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual.
- Where standards are comparable to previous years, similar grade boundaries are maintained.

Grade boundaries from question papers in the same subject at the same level tend to be marginally different year to year. This is because the particular questions, and the mix of questions, are different. This is also the case for question papers set by centres. If SQA alters a boundary, this does not mean that centres should necessarily alter their boundary in the question papers that they set themselves.