Course report 2024

National 5 Engineering Science

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. You should read the report with the published assessment documents and marking instructions.

We compiled the statistics in this report before we completed the 2024 appeals process.

Grade boundary and statistical information

Statistical information: update on courses

Number of resulted entries in 2023: 1,876

Number of resulted entries in 2024: 2,002

Statistical information: performance of candidates

Distribution of course awards including minimum mark to achieve each grade

A	Number of candidates	986	Percentage	49.3	Cumulative percentage	49.3	Minimum mark required	112
B	Number of candidates	318	Percentage	15.9	Cumulative percentage	65.1	Minimum mark required	96
C	Number of candidates	291	Percentage	14.5	Cumulative percentage	79.7	Minimum mark required	80
D	Number of candidates	166	Percentage	8.3	Cumulative percentage	88.0	Minimum mark required	64
No award	Number of candidates	241	Percentage	12.0	Cumulative percentage	100	Minimum mark required	N/A

We have not applied rounding to these statistics.

You can read the general commentary on grade boundaries in the appendix.

In this report:

- ‘most’ means greater than 70%
- ‘many’ means 50% to 69%
- ‘some’ means 25% to 49%
- ‘a few’ means less than 25%

You can find statistical reports on the statistics and information page of our website.

Section 1: comments on the assessment

Question paper

The question paper sampled the content as detailed in the course specification. The balance of A-to-C-type questions was found to be appropriate and provided suitable discrimination.

Marker feedback and item analysis confirmed that all questions functioned as intended, and that every mark was accessible.

Assignment

The assignment performed as intended, with the full range of marks awarded in each task.

Markers indicated that the assignment was fair and balanced, and that it effectively sampled the engineering skills and knowledge laid out in the course specification.

Tasks were of a similar standard and structure to the last assignment in 2019. However, candidates did not appear to be as well-prepared.

Section 2: comments on candidate performance

Areas that candidates performed well in

Question paper

Question 2

Most candidates named the symbol for a transistor and identified the base connection.

Question 4(a)

Most candidates calculated the velocity ratio of the simple gear train correctly.

Question 5(a)

Most candidates stated the type of engineers responsible for monitoring the road construction and the impact on the land.

Question 7(a)

Most candidates described how to reduce wear on the moving parts of a drive system.

Questions 9(d) and 9(e)

Most candidates described the environmental and social impacts of using an electric bike.

Question 13(c)

Most candidates identified the most suitable material for the hydrofoil mast and justified their choice.

Question 14(c)

Most candidates completed the truth table for the logic diagram.

Assignment

Task 2(a)

Most candidates correctly simulated the flowchart and electronic circuit. However, some candidates incorrectly orientated the battery symbol. Some candidates also renamed microcontroller pins to match the pin numbers given in the task, rather than correctly selecting an appropriate microcontroller. This then affected their code in task 2(b).

Task 4(b)

Most candidates correctly designed the gear train to give correct reduction in speed for this task.

Task 4(c)

Most candidates correctly simulated or constructed the designed gear train from task 4(b).

Task 5(a)

Most candidates completed the logic circuit design correctly.

Task 5(b)

Most candidates correctly simulated the logic circuit.

Areas that candidates found demanding

Question paper

Question 4(b)

Many candidates did not state the effect on the output velocity if the number of teeth on the idler gear B were reduced.

Question 8(c)

Many candidates did not state the effect of increasing the resistance on the voltage V_1 or the current A_1.

Question 8(d)

Some candidates did not explain an advantage of simulating before constructing, and responded with either two benefits or a cause and an unrelated effect.

Question 9(a)

Some candidates who used the gear ratio (movement multiplier) to calculate rotational speed did not perform as well as those who applied the method given in data booklet.

Question 10(d)

Some candidates did not refer to the resistance of the thermistor or the voltage V_{out} in their description of the operation of the electronic circuit.

Question 10(e)

Many candidates did not identify an appropriate emerging technology, and instead explained the impact of something already used in a commercial product or system.

Question 12(a)

Many candidates did not relate the limiting of climate change to greenhouse gases.

Question 14(a)(i)

Some candidates were unable to correctly apply the principle of moments to calculate the reaction force.

Question 15(a)

Many candidates did not use appropriate terminology when describing the operation of the pneumatic circuit.

Question 15(b)

A few candidates did not calculate the cross-sectional area of the piston, and substituted the value for the diameter directly into the pressure formula. Additionally, some candidates opted to use Nm^{-2} or Pa for air pressure, but without converting the diameter from millimetres into metres.

Assignment

Task 2(c)

Many candidates did not describe their initial test results in terms of action of the motor and LEDs.

Task 3(a)(i)

Many candidates did not identify the correct input and outputs to the systems diagram, and instead stated components for the input and outputs.

Task 3(a)(ii)

Many candidates did not include the two feedback switches in their sub-systems diagram.

Task 3(c)

Many candidates did not describe the expected results in terms of V_{out} as directed in the task.

Task 5(c)

Many candidates did not identify a correct modification that they could make to the logic circuit.

Section 3: preparing candidates for future assessment

Question paper

Teachers and lecturers should ensure that candidates have a clear understanding of the expected response to 'explain' questions. Candidates typically only need to give a single cause and a related effect to gain full marks.

Candidates must be familiar with what qualifies as an 'emerging technology' – something new and still to be tried commercially in a product or system. Unsuitable examples, such as artificial intelligence, electric vehicles, or self-driving cars, cannot be awarded full marks. This year, markers accepted 'graphene' as an emerging technology, but this will not be accepted as a correct answer in the future.

Teachers and lecturers should ensure candidates are clear on how to respond to descriptive questions about pneumatic circuits. Candidates must use appropriate terminology, with a statement referring to 3/2 valves actuating, 5/2 valves changing state, and a piston instroking or outstroking.

Assignment

Candidates may benefit from developing simulation skills that relate to flowcharts and electronic circuits, including the orientation of symbols within a circuit.

Candidates will benefit from spending more time drawing system- and sub-system diagrams. Additionally, candidates will benefit from preparing evaluation responses – such as referring to a given specification or context and making evaluative comments.

Teachers and lecturers should encourage candidates to read the requirements of each task carefully. While some tasks may appear similar to a previous assignment, there may be significant differences.

Teachers and lecturers must strictly adhere to the assessment conditions for the assignment as outlined in the National 5 Engineering Science course specification and the assignment documentation.

More information and supporting documentation on the full course assessment is available on the National 5 Engineering Science subject page. This includes the course specification, past papers (question paper and assignment), specimen assignment and question paper, and previous years' course reports. Teachers and lecturers should continue to use the published materials available on the Understanding Standards website, which contains candidate evidence from past question papers and assignments, with supporting commentary, presentations, and webinar recordings.

Session 2023–24

SQA will be changing the marking method for the National 5 Engineering Science assignment in session 2024–25 and beyond. This will not affect candidates, or how they approach the assignment. However, the assignment documentation will be different to past sessions,

particularly with regard to instructions for teachers and lecturers. To support teachers, lecturers and candidates, SQA has updated the specimen assignment to reflect this change.

Appendix: general commentary on grade boundaries

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

For most National Courses, SQA aims to set examinations and other external assessments and create marking instructions that allow:

- a competent candidate to score a minimum of 50% of the available marks (the notional grade C boundary)
- a well-prepared, very competent candidate to score at least 70% of the available marks (the notional grade 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 for each course to bring together all the information available (statistical and qualitative) and to make final decisions on grade boundaries based on this information. Members of SQA's Executive Management Team normally chair these meetings.

Principal assessors utilise their subject expertise to evaluate the performance of the assessment and propose suitable grade boundaries based on the full range of evidence. SQA can adjust the grade boundaries as a result of the discussion at these meetings. This allows the pass rate to be unaffected in circumstances where there is evidence that the question paper or other assessment has been more, or less, difficult than usual.

- The grade boundaries can be adjusted downwards if there is evidence that the question paper or other assessment has been more difficult than usual.
- The grade boundaries can be adjusted upwards if there is evidence that the question paper or other assessment has been less difficult than usual.
- Where levels of difficulty are comparable to previous years, similar grade boundaries are maintained.

Every year, we evaluate the performance of our assessments in a fair way, while ensuring standards are maintained so that our qualifications remain credible. To do this, we measure evidence of candidates' knowledge and skills against the national standard.

During the pandemic, we modified National Qualifications course assessments, for example we removed elements of coursework. We kept these modifications in place until the 2022–23 session. The education community agreed that retaining the modifications for longer than this could have a detrimental impact on learning and progression to the next stage of education, employment or training. After discussions with candidates, teachers, lecturers, parents, carers and others, we returned to full course assessment for the 2023–24 session.

SQA's approach to awarding was announced in March 2024 and explained that any impact on candidates completing coursework for the first time, as part of their SQA assessments, would be considered in our grading decisions and incorporated into our well-established grading processes. This provides fairness and safeguards for candidates and helps to

provide assurances across the wider education community as we return to established awarding.

Our approach to awarding is broadly aligned to other nations of the UK that have returned to normal grading arrangements.

For full details of the approach, please refer to the National Qualifications 2024 Awarding — Methodology Report.