



## Course Report 2017 – External Assessment

Subject	Engineering Science
Level	National 5

The statistics used in this report have been compiled before the completion of any Post Results Services.

This report provides information on the performance of candidates which it is hoped will be useful to teachers, lecturers and assessors in their preparation of candidates for future assessment. It 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.

# Section 1: Comments on the assessment

## Summary of the course assessment

### Component 1: question paper

This year's question paper was found to function as intended and the full range of marks were awarded in all questions. Item analysis and feedback from the markers confirmed that the paper appropriately sampled the course content and that it was fair, balanced and accessible.

A review of candidate performance found that the 2017 paper was set at a similar level of demand to previous years and, as a result, the grade boundaries were kept at the same level as 2016.

### Component 2: assignment

All verified centres used one of the three SQA assignments provided on the secure site, meaning that the instruments of assessment used were valid. As last year, the majority of centres used the CCTV assignment.

Of the centres verified, the majority were assessing to the national standard. This would indicate an improvement in the application of assessment criteria.

While the actual marking of the assignments was found to be more reliable, centres are reminded that candidates should not be given excessive guidance, and that the assignment must be administered in line with instruction provided. Where guidance is given to individual candidates (group support is not permitted), this should be reflected in the mark allocation to ensure equity and fairness of assessment of all candidates.

## Section 2: Comments on candidate performance

### Areas in which candidates performed well

#### Component 1: question paper

Question 2: most candidates correctly produced the Boolean equation from the logic diagram.

Question 4: the calculation of kinetic energy was well answered.

Question 9: candidates made a good attempt at completing the flowchart and there were fewer of the common errors previously seen such as no arrows on loops back, incorrect symbols or missing pin numbers.

Question 10 (a): candidates performed well with the calculation of output energy and mass.

## **Component 2: assignment**

Candidates performed particularly well in the construction/ simulation areas of the assignment as well as the inclusion of code — these are the parts of the assignment where marks are more accessible.

Flowcharts and mechanical system designs were also relatively well done.

Where there was a clear test plan, the actual testing was carried out well.

## **Areas which candidates found demanding**

### **Component 1: question paper**

Question 3(a): a number of candidates could not add the electrical symbol for a buzzer.

Question 6: the piping of the valves to achieve and control was poorly attempted by candidates.

Question 7(a)(ii): a number of candidates responded with statements referring to the direction rather than the speed impact of the use of an idler gear.

Question 8(d): calculation of the final answer was often not expressed to an appropriate number of significant figures.

Question 10(b): candidates appeared to confuse an electronic engineer with an electrical engineer or electrician.

Question 10(c): candidate responses were often based on environmental rather than economic impact.

Question 11(b): the symbol and orientation of a uni-directional restrictor proved difficult for a number of candidates.

Question 11(c): candidates substituted the piston diameter in place of the area in their calculation.

Question 13(a)(ii): responses indicated that many candidates could not distinguish between the role of an electrical engineer and that of an electrician or technician.

## **Component 2: assignment**

### **Section 1 - Analysing the Problem**

Candidates should start off by providing a 'Top Level' Universal System Diagram to exemplify the whole system. From this, they should identify the required sub-systems (as it is National 5, it should utilise closed-loop control) and then provide a detailed system specification. This specification should cover all sub-systems identified, in addition to other considerations for the whole system. Detail should reflect the level being assessed.

Please note that systems diagrams must have a box around the system, arrows for input and output lines, systems boundaries, etc. Specifications should not merely be repetition of the brief: they should include other aspects such as the structure, environmental conditions, etc.

### **Section 3a — Constructing / Simulating a Solution**

Many candidates missed out the justification of materials and components, or wrote a bare minimum by stating a material choice. This is an open-book assessment, where candidates have access to reference materials and the internet.

Justifications should compare material and component properties, and characteristics of a number of materials and components, before arriving at justified decisions. To attain the full 5 marks, a detailed response is required.

### **Section 4 — Testing the Solution**

An awareness of timing is vital for this section. Prior to the tests, candidates should provide detail of what tests they plan to carry out (including what hardware and software is required, what they are going to do, etc) and detail of what results they expect to get from each of the tests. The planned tests must cover every sub-system (as identified in the specification) and detail each expected result.

After the tests, candidates should detail the actual results of the tests, compare them against the expected results and detail any amendments made. Again, for full marks, this should be a detailed response — appropriate to the level being assessed and should cover all sub-systems.

### **Section 5 – Reporting**

Similar to Section 4, the evaluation should be detailed and well-argued, covering all sub-systems, comparing them with every item in the specification and making recommendations for improvement.

## **Section 3: Advice for the preparation of future candidates**

### **Component 1: question paper**

Centres may wish to highlight to candidates that all final answers to calculation-based questions must have units, where appropriate, and that these must be expressed in the same number of

significant figures as the data used in the question. Answers that have two more figures or one less figure than this will be accepted.

Candidates appear to be unclear on the difference between the roles of an electronic or electrical engineer to that of a technician or tradesperson.

Descriptive and explanation-based responses continue to be challenging for some candidates. Contexts are often ignored or brief generic statements are given. Candidates would benefit from additional support in answering these types of question.

Performance in the pneumatics questions was inconsistent. Skills in piping port to port, the use of a uni-directional restrictor, and circuit descriptions could be further developed.

Many candidates could not demonstrate knowledge of the electrical symbol for a buzzer, and centres may wish to instruct candidates on this aspect of the course.

## **Component 2: assignment**

As this is the final year of the course assignment in its current format, centres should take particular note of the SQA documentation published to support the administration of the task.

Whilst 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, we have strengthened the conditions of assessment criteria for National 5 subjects and will do so for Higher and Advanced Higher. The criteria are published clearly on our website and in course materials and must be adhered to. SQA takes very seriously its obligation to ensure fairness and equity for all candidates in all qualifications through consistent application of assessment conditions and investigates all cases alerted to us where conditions may not have been met.

## Grade Boundary and Statistical information:

### Statistical information: update on courses

Number of resulted entries in 2016	1831
------------------------------------	------

Number of resulted entries in 2017	1744
------------------------------------	------

### Statistical information: Performance of candidates

#### Distribution of course awards including grade boundaries

Distribution of course Awards	%	Cum. %	Number of candidates	Lowest mark
Maximum Mark -				
A	45.8%	45.8%	798	107
B	18.4%	64.2%	321	92
C	15.2%	79.4%	265	77
D	6.4%	85.7%	111	69
No award	14.3%	-	249	-

:

## General commentary on grade boundaries

- ◆ While SQA aims to set examinations and create marking instructions which will allow a competent candidate to score a minimum of 50% of the available marks (the notional C boundary) and 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.
- ◆ Each year, SQA therefore holds a grade boundary meeting for each subject at each level where it brings together all the information available (statistical and judgemental). The Principal Assessor and SQA Qualifications Manager meet with the relevant SQA Business Manager and Statistician to discuss the evidence and make decisions. The meetings are chaired by members of the management team at SQA.
- ◆ The grade boundaries can be adjusted downwards if there is evidence that the exam is more challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- ◆ The grade boundaries can be adjusted upwards if there is evidence that the exam is less challenging than usual, allowing the pass rate to be unaffected by this circumstance.
- ◆ Where standards are comparable to previous years, similar grade boundaries are maintained.
- ◆ An exam paper at a particular level in a subject in one year tends to have a marginally different set of grade boundaries from exam papers in that subject at that level in other years. This is because the particular questions, and the mix of questions, are different. This is also the case for exams set in centres. If SQA has already altered a boundary in a particular year in, say, Higher Chemistry, this does not mean that centres should necessarily alter boundaries in their prelim exam in Higher Chemistry. The two are not that closely related, as they do not contain identical questions.
- ◆ 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.