

Chief Examiner's Report

**T Level Technical Qualification
in Science (Level 3)
(603/6989/9)**

Autumn 2023 – core A and B

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Assessment dates: **core A – 11 December 2023**

core B – 15 December 2023

Paper number: **P002410**

P002411

This report contains information in relation to the externally assessed core sub-component provided by the chief examiner, with an emphasis on the standard of student work within this assessment.

The report is written for providers, with the aim of highlighting how students have performed generally, as well as any areas where further development or guidance may be required to support preparation for future opportunities.

Key points:

- grade boundaries
- standard of student work
- responses to the external assessment questions
- administering the external assessment

It is important to note that students should not sit the core exam until they have received the relevant teaching of the qualification in relation to this sub-component, and that both papers must be taken in any given series that a student sits the core exam.

Grade boundaries

Raw mark grade boundaries for the series are:

	Overall	Notional boundaries	
		Paper A P002410	Paper B P002411
Max	231	112	119
A*	193	93	99
A	168	81	87
B	143	69	74
C	119	57	61
D	95	45	49
E	71	34	37

Grade boundaries are the lowest mark with which a grade is achieved.

Students receive a grade for the core exam sub-component as whole, and although there are no official grades for the individual assessments in the core exam, it can be useful for students and tutors to see how the core exam grade was achieved. The grade boundaries given for each assessment are known as 'notional grade boundaries', as they are for illustrative purposes only. For further information on notional grade boundaries, please see our guide, T Levels: Notional boundaries for the core exam assessments available on the qualification page on the NCFE website.

For further detail on how raw marks are scaled and the aggregation of the core component, please refer to the Qualification Specification.

Responses to the external assessment questions

Core paper A

Section A: working within the science sector

Whilst the majority of students were able to accurately recall the purpose of a person specification, far fewer successfully gave the purpose of safeguarding policies in terms of protecting individuals from harm. Many incorrect responses referred to health and safety practices, with some students giving fairly detailed accounts of risk assessment procedures.

Questions relating to quality standards and practices were generally well answered, as was the question about career progression in the science sector. Where marks were lost on these items, this was largely due to lack of detail being provided rather than responses being incorrect. Similarly, in question 5 where students were asked to provide an explanation of the impacts of not following maintenance correctly, students needed to expand the points they were making to achieve the higher marks which frequently were missed as they made lower-level statements without fully developing these.

In the first extended-response question on this paper, students needed to consider the implications of spending money on innovation in a commercial research and development company. Those achieving highest marks here gave a comprehensive evaluation of both the benefits and potential limitations of investing time and money into innovation in this sector, covering a wide range of aspects including the

importance of new developments and discoveries, the economic and societal benefits of these, and the importance of this on both the company themselves and the science sector.

Where students scored fewer marks, this was generally as a result of these responses not considering how the underlying knowledge and understanding is applied to the context given in the question and then not linking this to fully evaluate this and come to a conclusion with a reasoned justification. For this aspect of these responses, students should be encouraged to make a firm conclusion either supporting the statement in the question or not, supported with the application and evaluation of the relevant underlying knowledge and understanding. Students whose responses try to hedge their bets by, for example, stating that the statement in the question is both right and wrong find it difficult to then provide a fully developed reasoning for this and subsequently are unable to be awarded the highest marks in the relevant marking bands for these responses.

Section B: ethics, data and managing personal information in the science sector

Question 8 asked students to give two data collection methods used in scientific investigations. Many students gave incorrect answers to this as they provided data types rather than collection methods – quantitative or qualitative, continuous or discrete, primary or secondary.

Advantages and limitations of the use of a LIMS were relatively well explained. Where marks were lost, this was again largely due to lack of detail being provided and simple statements not being developed sufficiently to be able to be awarded higher marks.

Where students were asked to explain how researchers can demonstrate scientific integrity, this was frequently answered in very superficial terms relating to scientists not cheating by fabricating results or to scientists being respectful to others, which could be counterproductive in the context of this question where the aim was to challenge published data. Students often missed points about objectivity, bias and experimental design which are cornerstones of scientific integrity.

The extended-response question in this section required students to evaluate the responsible use of IT systems, and whilst many students provided reasonably good demonstrations of their knowledge and understanding, they often failed to develop these responses to apply and evaluate these factors, meaning the marking bands available were limited in these cases. Again, very limited numbers of students provided a firm, reasoned conclusion to their responses as directed in the question.

Section C: health and safety in the science sector

Surprisingly few students were able to correctly identify steps 4 and 5 of the HSE's steps to risk assessment; however, the vast majority scored well on the completion of the risk assessment document the lost marks were largely due to students incorrectly calculating the total risk by adding, rather than multiplying, the figures for likelihood and severity.

Many students gave a reasonably good understanding of the key principles relating to the actions of the technician in dealing with an unknown chemical spill; however, few developed these sufficiently to fully assess the actions given in the question meaning the marks available were limited.

Again, in the extended-response question in this section, many students provided reasonably good demonstrations of their knowledge and understanding; however, they often failed to develop these responses to apply and evaluate these factors, meaning the marking bands available were limited in these cases and again, very limited numbers of students provided a firm, reasoned conclusion to their responses as directed in the question.

Section D: scientific methodology, equipment and techniques

Disappointingly few students correctly identified that the purpose of a negative control in experimental design is to confirm that no other variable is responsible for positive results in the test, with many students answering D instead, which is the definition of a positive control. On the other hand, the questions about safe use of hazardous chemicals and fault finding were reasonably well answered.

Many students were able to provide a good overview of the importance of aseptic technique, although many did not develop these points sufficiently to provide a full discussion and consequently marks awarded were limited. Students should be encouraged to pay particular attention to the command verbs given in the questions alongside the number of marks available to ensure they are giving the correct level of depth and detail required.

The final extended-response question was the lowest scoring of these on the paper. Whilst some of this could be attributed to students running out of time, there were a relatively large number of responses which set off on an incorrect tangent in attempting to correct the mathematics given in the stem of the question, which were actually not incorrect. Some students demonstrated very limited understanding of the use of the haemocytometer, and as before many responses were not well developed, showing little to no application or evaluation as required by assessment objectives 2 and 3.

Core paper B

Section A: biology

Some students correctly identified the different groups of lipids required for question 3 (a); however, a significant proportion of those not achieving this mark gave the components of a lipid molecule – fatty acids and glycerol – rather than the groups of lipids specified in the question. Many students were able to correctly give roles of lipids in living organisms, however.

Many students showed good graph interpretation skills for question 4 (a), and successfully made the link between the disease and transmission method for 4 (b).

Very few students, however, were correctly able to define the term infection, with lots of the incorrect responses trying to phrase the definition in terms of an organism causing infection, which cannot be awarded as this is the word given in the question. However, the second part of this question was significantly better answered, with many students giving a good discussion of the validity of the statement given and also being able to distinguish between genetics and genomics.

In question 6, many students correctly identified the Gram stain as the correct answer; however, some then gave the same response in part (b) which asks for other techniques. Many students did answer this part of the question well, however.

Many students missed the point in question 7 (a) where a research student needs to study motile, living organisms, making the electron microscope unsuitable for this purpose. The other aspects of this question were well answered, however.

Very few students were able to correctly identify the role of centrioles, with many incorrect answers referring to the roles undertaken by the spindle fibres themselves during cell division. However, most students were able to correctly identify telophase as the stage in mitosis in which the nuclear envelope re-forms.

The first extended-response question in this paper required students to evaluate the idea of a hypothetical three-base DNA system. Most grasped the basic concept of this question well; however, they gave only very

low level responses with little or no evidence of application or evaluation, meaning total marks awarded was low. It is also worth noting that many students lost marks for quality of written communication due to the lack of paragraphs and punctuation being used, as well as the low level of technical language employed.

Section B: chemistry

Most of the first part of this section was answered as well as expected. Surprisingly few students were able to correctly determine the molecular formula of the compound from the provided information.

Many students demonstrated a clear misunderstanding regarding the terms ductility and malleability, often using these interchangeably or transposing the meaning of one for the other. This limited some of the marks available in this section of the paper.

In the question about chromatography, a very large proportion of the responses referred to the idea that solvent 1 produces a larger separation which is therefore better. This is not the case, and the observation that the mixture of solvents produces an additional spot on the chromatogram was often missed as a result. Students are urged to understand that as long as separation is clear and an R_f value can be calculated then a greater degree of separation is not, in itself, a benefit.

The extended-response question in this section was marginally better answered overall than others in this paper; however, again many students scored only low marks due to the lack of application of the response to the question and the lack of evaluation being demonstrated. The fundamental demonstration of knowledge and understanding was often good, however.

Section C: physics

Questions about magnetism and electricity were generally well answered, as was the question about hydrostatic pressure.

Question 20 required students to select a suitable radioisotope for use in an investigation. Many students failed to communicate the idea that a very long half-life can be better as it means little radiation is released during the period of the investigation, focussing instead on the fact that it takes a very long time for the radiation to completely dissipate.

Section D: scientific concepts

Responses to question 21 were reasonably good; however, marks awarded were restricted due to the previously mentioned issues about students showing a lack of understanding about ductility and malleability. A similar issue was evident in question 23.

Questions relating to magnetism and the uses of electromagnets were well answered.

The final extended-response question in this paper requires students to include reference to knowledge and understanding from at least two of the three scientific disciplines; however, a very large majority of responses to this question did not include any reference to the movement of molecules as temperature increases. As a result, the marks awarded for knowledge and understanding were limited in many cases, which compounded the previously mentioned issues with lack of application, analysis and evaluation. Also here, again students often did not provide any firm, justified conclusion as required by the question.

Administering the external assessment

The external assessment is invigilated and must be conducted in line with our [Regulations for the Conduct of External Assessment](#).

Students must be given the resources to complete the assessment, and these are highlighted within the [Qualification Specific Instructions for Delivery](#) (QSID).