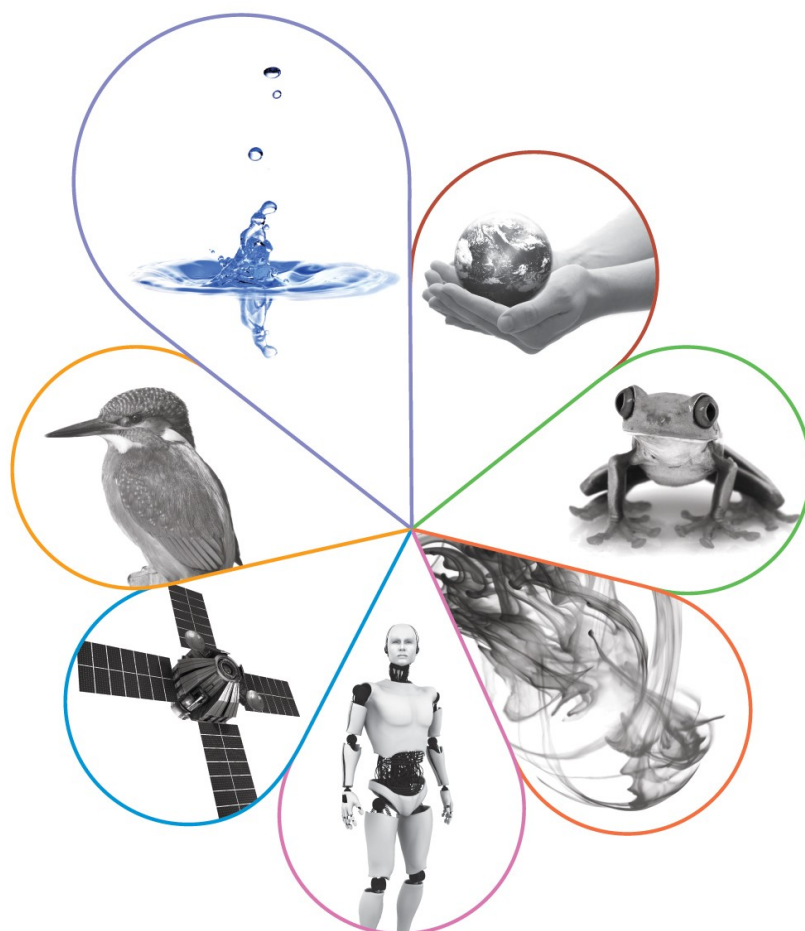


A-level SCIENCE

Science hub meetings

Research update: 7402 A-level biology essay

Published: Autumn 2019



Contents

Contents	Page
Introduction to research update	4
A-level Biology essay: History	5
Performance: The essay as an assessment tool	8
General guidance	12
More information	14

Introduction to research update

This document is intended to provide background information on a number of areas related to the 7402 essay that haven't previously been looked at in detail, as well as highlight guidance that has already been produced for this particular aspect of the assessment. The first section looks at the history and origins of the biology essay from predecessor board assessments and how those assessments have evolved into the essay questions used today. The second section looks at how the 7402 essay question performs in general, as well as in comparison to the essay performance of the legacy A-level Biology 2410 specification. The third section contains guidance to some of the most commonly asked questions that AQA receives from teachers about the 7402 biology essay.

Further guidance on where to find additional resources and information on the biology essay can be found in the final section of this document.

A-level Biology essay: History

AQA and its predecessor organisations have over 100 years of history as an exam board and awarding organisation. Some of our predecessor organisations may be familiar to anyone who sat exams in England before 2000, when AQA came into existence. The Joint Matriculation Board (JMB), the Northern Examinations and Assessment Board (NEAB) and Associated Examining Board (AEB) were all predecessor exam boards of AQA. Looking back at the Advanced Biology papers of all three predecessor boards there was always an expectation that students write in extended prose on a variety of topics.

In the archive of these Advanced Level papers, the Advanced level JMB assessments from the 1970s and 1980s included 20-mark questions on optional topics, with the expectation that students would write in sufficient detail to gain the marks available. Similarly, Paper 2 of AEB's legacy Advanced Biology and Advanced Human Biology contained a 20-mark question with a choice of three essay titles.

JMB Advanced Level Biology 1978

Option I **FRESHWATER INVERTEBRATES**
Answer two questions.

- 1 By reference to a pond and a stream, describe what you understand by "a closed" and "an open" ecosystem

20

JMB Advanced Level Biology 1980

Option H **FISHES**
Answer two questions.

- 1 Account for the fact that the number of living species of bony fishes far outnumbers that of cartilaginous fishes. 20

AEB Advanced Level Biology 1984

Section A

Answer one question

Credit will be given for clear, logical, written answers supported where appropriate by annotated drawings or diagrams.

1. Write an essay on "Energy flow through an ecosystem". (20 marks)
2. How has the electron microscope improved our understanding of cell structure? (20 marks)
3. Discuss the relation between structure and function in the support of plants in air. (20 marks)

The essay mark schemes showed variations in approach up to the late 1990s, but the general guidance would be as shown, using a points based mark scheme ie write twenty relevant points in your response and you could receive up to 20 marks.

NEAB Advanced Level Biology 1993

Paper

Option A APPLIED ECOLOGY (continued)
Answer one of the following questions.

2 Write an essay on the management of crop pests.

You should refer to arthropods, fungi and viruses. Discuss control by chemical, biological and integrated methods, and consider both beneficial and potential harmful effects of these methods.

20

Mark scheme

Marks
available

Question 2

To be marked flexibly on basis of one mark per fact adequately elaborated to maximum 20. Credit to be given for reference to specific examples (pests, crops, control 'agents'). Accept accounts of any animal pests additional to arthropods. However, weeds are not regarded as 'crop pests', so do not give credit. May expect references to:

General insecticides and fungicides.

Specific pesticides - targeted at certain types or restricted use.

Examples of biological control, especially in horticulture. Including resistant strains.

Integrated methods, e.g. balanced control with minimal chemical use combined with 'scientific' observation and prediction.

Beneficial effects: increased production, better quality, especial importance in modern monoculture systems.

Harmful effects: development of immunity in pests, biological control agent may get out of control, pollution by drift or leaching, chemical residues or food chain effects, dangers to workers during application.

20

By 2000, the biology essay mark scheme had evolved into the form that was in use until the end of the previous A-level Biology specification (2410) in 2016. The essay had become worth 25 marks, as opposed to 20 marks, a mark tariff that it still uses currently. Students responding to these essay questions could receive up to 16 marks for their biological content and up to 3 marks apiece for the relevance, breadth and quality of scientific language/communication of their essay.

NEAB/AQA Advanced Level Biology 2000

Section A

You are advised to spend about 45 minutes on this section.

1 Write an essay on **one** of the following topics.

EITHER (a) The roles of carbohydrates in living organisms.

OR (b) How substances are transported from one organ to another, both in animals and in plants.

OR (c) How cells divide, and the roles of different types of cell division.

The maximum number of marks that can be awarded is:

Biological knowledge and understanding	16
Breadth of knowledge	3
Selection of appropriate material	3
Quality of written English	3

Total = 25

Throughout the development of the current 7402 A-level Biology specification, AQA spoke to teachers and university experts about the biology essay. It was clear that that extended writing was seen as an important skill that biology students should be developing. 'Level of response' mark schemes have generally proven to be the most accurate way of achieving better marker agreement when assessing higher tariff and more subjective questions. The natural progression of the A-level Biology essay mark scheme was to move the old criteria into a 'level of response' structure. This means that overarching performance on the four aspects of the historical mark scheme are now assessed holistically via the levels, rather than a student essentially achieving four separate marks for different skills that add up to a possible score of 25 marks.

At first, teachers new to the specification may worry that this essay writing skill is difficult for their students and will mean a large amount of marking. In many ways, essays are a much more positive way of assessing than other forms of question that cover large areas of the specification. As there are two titles, students can pick the one that best fits their knowledge of biology to show what they know. The biology essay also produces a very satisfactory range of marks from all candidates, showing that the essay allows candidates of all abilities the opportunity to demonstrate their knowledge, understanding and ability to apply all that to a given essay theme or title.

Performance: The essay as an assessment tool

Table 1

The data in **Table 1** show that the biology essay has performed similarly across the final three summer series of the legacy 2410 specification (2014–2016) and the first three summer series of the reformed 7402 specification (2017–2019).

Series	Mean mark	Mean mark as % of maximum	Standard Deviation
2014	14.22	56.87	4.41
2015	13.10	52.39	4.01
2016	13.92	55.67	4.08
2017	14.15	56.59	4.98
2018	13.27	53.10	4.41
2019*	13.64	54.56	4.52

*2019 data are provisional taken during the summer series when marking was close to completion.

The mean mark on the essay has sat just above 50% of the total marks between 2014 and 2019 and the standard deviation has been somewhere between 4 and 5 marks during that time period. When looking at how the essay has distributed the cohort across the full 25 marks, we can see the similarities in the distribution across the 2014-2019 series as shown in **Figure 1**.

Figure 1

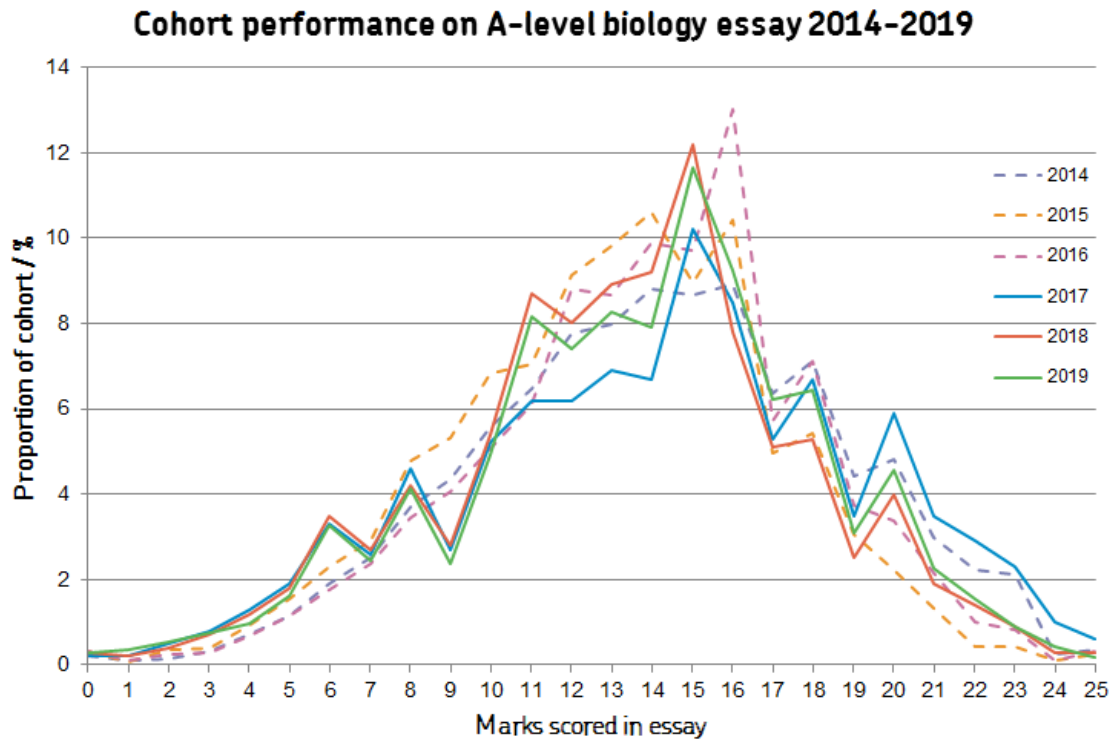
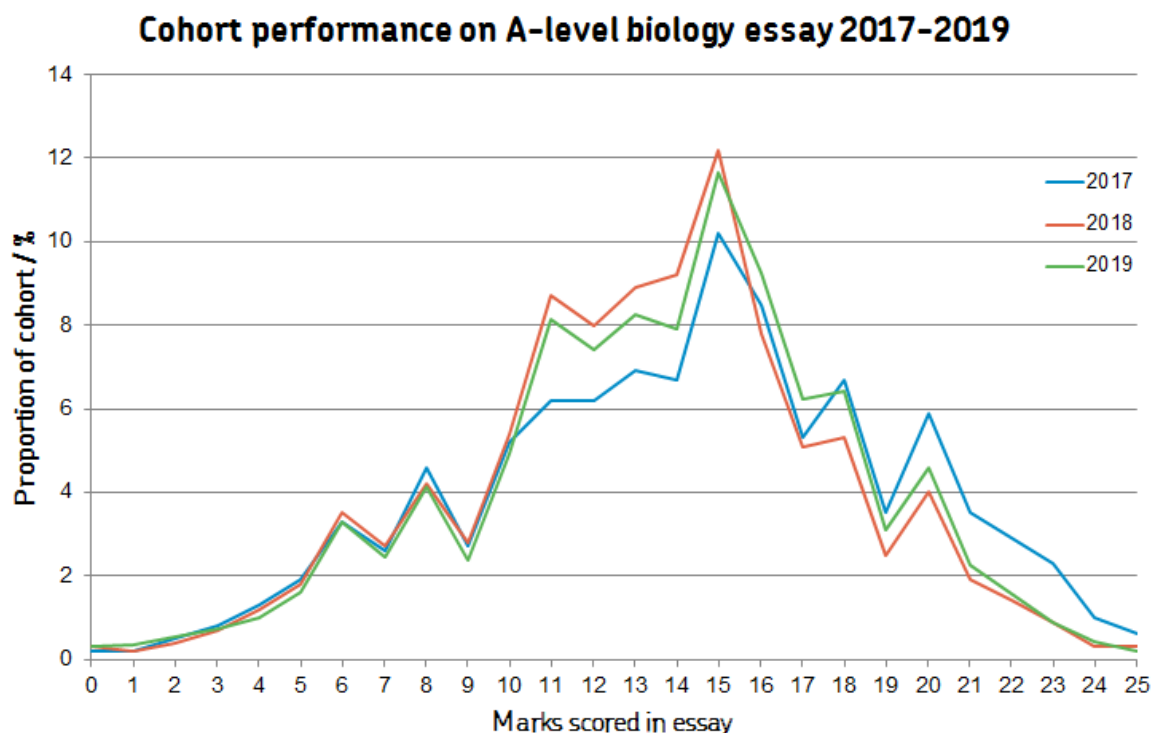


Figure 2

Focusing on the essay performance on the 7402 biology specification only, we can see how the 2017-2019 essays have performed in isolation in **Figure 2**.



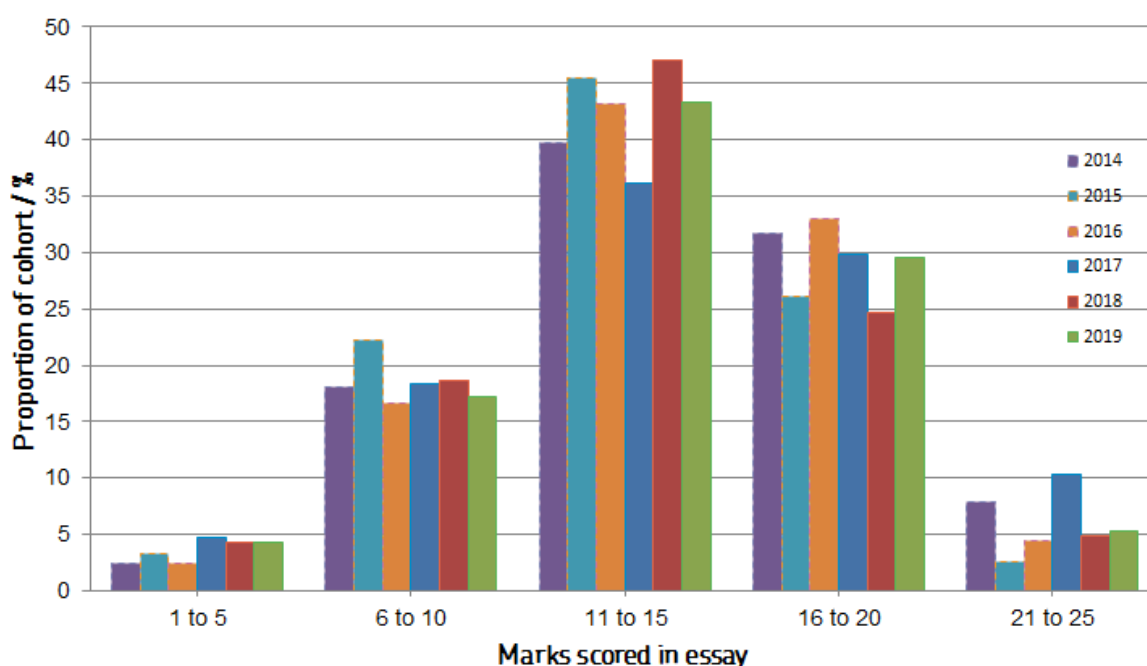
The 7402 essay has shown performance that skews slightly to the higher end of the mark scale, which is understandable given the mean mark sits just above 50%. The distribution of marks is generally as expected for a discriminating question, with students being broadly spread across the mark range. The most common marks are those found in the middle of the mark range and the least common marks are those found at either end of the mark scale. This shows how nearly all students gain marks by writing something on the essay and also that the requirements for gaining access to the top two marks on the essay only really impact the top 1% of essays currently. There aren't many students who score lower than 5 marks on the essay and similarly it's relatively rare that students score the top two marks of 24 and 25. Those top two marks are reserved for the responses that include material beyond the specification whilst also meeting **all** of the subsequent criteria required to reach a mark of 23.

Students are also more likely to score marks 10, 11, 15 and 20 than other marks that neighbour those values. All four of those marks highlighted signify the top/bottom of attainment within a given level. This outcome is likely due to essays either only just showing the skills required to reach the next level of attainment, or mistakes/lack of content in essays that limits overall performance to a certain level of attainment.

Figure 3

Figure 3 looks at performance by level/mark band as they exist on the current 7402 essay mark scheme (the levels weren't used for the legacy specification). We can see that performance across 5 mark ranges has stayed relatively stable between 2014-2019, with the most common mark band that essays fall into being the 11-15 level, followed by the 16-20 level and the 6-10 level. The 21-25 level is the next most common mark band for essays, highlighting that it is relatively rare that an essay meets the requirements to achieve a mark over 20 on the A-level biology essay.

Cohort performance on A-level biology essay 2014-2019



General guidance

There have been some common questions asked of the science curriculum team over the past four years about the 7402 biology essay. These frequently asked questions about the 7402 biology essay have been clarified below. This guidance is intended as much for students as teachers as it should help both in understanding the requirements of the 7402 biology essay.

1. Are introductions and conclusions required in the essay?

Students are encouraged to plan out their essays before starting to write, but introductions and conclusions don't form part of the marking criteria. Examiners aren't looking for overall judgements or summarised introductions in essays. The structure of the essay is less important to the examiners than the content of the essay and how well it approaches the theme/title of the essay. Some students will use their introductions in particular to rewrite the question, when their time would be better spent on aspects that the mark scheme will reward ie another topic or a more well-defined explanation of how a topic links to the theme/title of the essay.

2. Do plans or diagrams get marked in the essay?

Plans aren't usually creditworthy as they don't often add much that isn't already in the body of prose of the essay. A plan is generally for student use only as the examiners are looking for much more detail than the list of terms or topics that essay plans normally consist of.

Diagrams would need to be heavily annotated and used in the correct context to be creditworthy, but sometimes can be useful aids for students if used appropriately. However, it's worth noting that the annotations need to be so clear that they, rather than the artwork, score the marks, which usually makes the actual drawing a waste of student's time.

3. The level of response mark scheme seems to suggest that essay topics must be linked to each other as well as the title/theme of the essay?

The linking of topics to the next topic is too much to expect of students in a timed essay under exam conditions and the clarification provided with the level of response mark scheme states that students **only** need to link their essay topics to the title/theme of the essay, rather than every other topic they write about. Some students are able to link their topics together within an essay, but it isn't a pre-requisite of achieving full marks. Also, some topics won't naturally link together very easily, but might still be considered relevant to a particular theme of an essay.

4. What counts as an essay topic and how many topics are needed for an essay?

A discrete topic is a different numbered section of the specification – so sections 3.6.1.1 and 3.6.1.2 would count as two different topics for the essay, as long as they were covered in enough detail. The level of response mark scheme has been clarified in the additional guidance to define 'several' topics as a minimum of four to an A-level standard. This means that to reach at least 16 marks, a minimum of four topics are required. However, students are advised to write about five topics in case any of their topics are irrelevant to the theme of the essay and thus don't count towards their total of creditworthy topics. Focusing on more than five topics isn't generally recommended by examiners, as students sometimes run into time constraints that affect the overall quality of their response. The 6-10 mark level defines an essay that only provides one or two topics to an A-level standard. An 11-15 mark essay may only cover two to four A-level standard topics, but an essay in that level could also be defined by other deficiencies that limit the essay to that mark band.

5. How much do examiners look at spelling, punctuation and grammar in the essay?

These issues don't generally impact upon the mark of an essay unless it becomes difficult for the examiner to discern meaning from the written text. This is a biology essay, not an English exam, so the examiner's prime concern is the quality of the biological content in the response. Spelling mistakes and other grammatical errors wouldn't stop an essay worth full marks from achieving full marks as the level of response mark scheme doesn't expect this of students. Notable exceptions to the above are terms like 'meiosis' and 'mitosis', 'sucrose' and 'sucrase' and 'glucagon' and 'glycogen', where correct, clear spelling is important as both terms can look very similar handwritten and will impart a different meaning on to the examiner.

6. What counts as a 'significant error' and 'irrelevant material'?

A significant error is one which significantly detracts from the biological accuracy or correctness of a described example. This will usually involve more than one word and is likely to be a passage that betrays a significant misunderstanding in the biological content being discussed. Irrelevant material is several lines (or more) that, whilst potentially biologically correct, clearly fails to address the title, or the theme of the title.

7. What do the straight-line annotations I see drawn on marked essays mean?

This is a short-hand notation system that examiners have been using for a number of years to help them mark essays. A vertical line on the left-hand side of the essay response indicates relevant, creditable material. A vertical line on the right-hand side of the essay response means irrelevant material to the essay title. Underlined text within the essay response indicates that there is a significant biological error contained within that passage of text.

8. What do students need to do to achieve the top two marks in the essay?

Some evidence of reading beyond the specification to an A-level standard is required to achieve these marks. Students will sometimes use academic journals or magazines as sources of this information. However, students must have already met the preceding criteria in order for this additional information to bring them up to 24/25 marks and only around 1% of students currently achieve those two marks combined.

9. What differentiates an average essay from an essay within the top mark band?

Reaching the top two levels is generally limited by how well a student addresses the AO2 aspect of the essay. An A-level standard explanation is required to link the biological content to the title/theme of the essay. Recent essays have often used a title of 'The importance of x to a certain process'. Frequently students will try to explain that 'x is important because without it the organism would die'. Death isn't an A-level explanation as it doesn't require two years of A-level study to understand that death is something to be avoided. Examiners are looking for a greater depth of explanation from students that shows evidence of ability and understanding of the subject content that has been gained whilst studying for this qualification.

More information

There are more resources available for teachers on the 7402 biology essay on the AQA website.

Resource	Where to find it
Past papers, mark schemes and examiner's reports	aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/assessment-resources
Essay teaching resources - includes teacher training exercise and answers and commentaries	aqa.org.uk/subjects/science/as-and-a-level/biology-7401-7402/teaching-resources?f.Component%7C7=Paper+3
List of past essay questions and mark schemes (2007-2017)	filestore.aqa.org.uk/resources/biology/AQA-74023-ESSAY-TITLES.PDF
Past CPD materials ('A-level feedback' and 'essay writing skills' sessions). Includes exemplar essays for 2017 and 2018 series	Available on Centre Services.
Upcoming CPD sessions with 2019 exemplar essays – A-level feedback (Autumn 2019), essay writing skills (Spring 2020)	Sign up here aqa.org.uk/professional-development/search?f.Levels%7CG=A-level&f.Subjects%7CD=Biology

Contact us

T: 01483 477 756

E: gcscience@aqa.org.uk
8am–5pm Monday to Friday

aqa.org.uk