The Biology essay

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The essay is a synoptic exercise

- As in the legacy Specification, BIOL5, a free response essay addressing a theme in a title, with a choice from two titles (Paper 3).

- The essay is designed to assess whether students can bring together material from a range of topics to illustrate and explain an important concept or idea.

- The essay is not just a memory test of what a student knows – it is also a test of whether they have some understanding of what they have learnt and can apply what they know.

- The essay will be marked in a similar way to the current system giving separate scientific content, breadth, relevance and QWC marks.
What we expect from students in the essay

• To identify an underlying theme or idea in an essay title – it will be a ‘big idea’, not a minor topic.

• To select five or six different examples that they can use to illustrate the theme or idea.

• To write a reasonable paragraph about each example (using appropriate A-level terminology) **pointing out how it illustrates the theme or idea.**

• **It is not** – ‘Think of every possible thing that relates to the title and write as much as you can about it, with no thought of the main theme/idea’.
  • This would make it just a memory test (AO1).

• **It is not** – ‘Write at a very high level (above A-level) about one or two topics’.
  • This is not a synoptic approach. We do not wish to encourage learning of rote answers involving one or two important topics which might apply to many titles – eg respiration.
Feedback from 2016 examinations

General comments:

• Students’ hand writing – each year examiners in all papers comment that students’ answers can be difficult to read.

• Remember that the majority of scripts are scanned and marked by examiners at home on a computer screen, rather than in hard copy.

• There are still students who are not using black ink.

• Very small or difficult to read handwriting is likely to negatively affect marks.
Feedback from 2016 examination

- Many students wrote about relevant topics but failed to relate the content to the theme of the title.

- The vast majority of students appeared to understand that this is a synoptic exercise, where they have to attempt to draw on a wide range of examples to obtain a high mark.

- Examiners reported that substantive attempts at extension material were uncommon.

- GCSE-level content was common; as in previous years, the use of examples that any member of the public might use did not gain any extra credit.
Feedback from 2016 examination

• Extension material has to be at least of A-level standard and accurately described using appropriate scientific terminology.

• Appropriate terminology was often poorly used or absent. For example, many students wrote about ‘signals’ and ‘messages’ rather than impulses/action potentials. The use of ‘levels’ and ‘amounts’ for concentration was also very common.

• The essay is supposed to be written using appropriate terminology, at a level to be expected after two years of A-level study.
Feedback from 2016 examination

- Remind your students that the essay has roughly equal AO1 and AO2 weighting, with AO1 being factual recall and AO2 being the application of knowledge.

- In this case, AO2 being the biological importance of the factual content.

- If a student failed to address importance at all, then according to the essay descriptors, they could only achieve a maximum of 8 marks for content. They could still get 3 each for breadth, relevance and quality of written communication. This would give them a maximum mark of 17 for the essay.
Marking the essay

• The essay carries about equal numbers of marks for factual recall (AO1) and application of knowledge (AO2) – and did in previous specifications.

• Essay descriptors – students who give facts but don’t use these to illustrate or explain the theme/concept in the title should get a mark in the 11 to 15 range – fundamental errors also limit the mark range.

• Last summer, the mean mark for the essay was 13.6 (the SD was +4.14) – students generally were poorer at the AO2 element.

• The essay is marked online. Examiners use tick charts to help them make notes whilst marking the essays.

• Guidance for examiners tells them how to construct a tick chart when marking an essay – to remember decisions they have made.*

• This method has been used for the last four years with BIOL5 and is based on method used when marking NEAB Spec B essays.
Marking the essay

- Examiners report that the system is easy to use and they feel confident that they are being consistent and fair in their marking.

- One in twenty essays is double-marked; two examiners mark the same essay and the marks they award are compared – the examiners do not know which essays are double-marked.

- A research study of essay marking in 2014 showed that examiners using the tick chart method gave exactly the same mark to 40% of double-marked essays.

- 85% of the marks were within a 4-mark agreement – the ‘normal’ tolerance for a 25-mark question marked using descriptors is 5.

- It should be remembered that the essay is marked against descriptors – not using (numbered) marking points – so there is always some element of interpretation/judgement by an examiner.

- Marks may rise slightly with new spec – easier to get the 2 A* marks.*
Preparing students for the essay

• **Practice!** Could start at AS, with titles that address ‘big ideas’ in sections.

• When teaching, point out connections between parts of the specification, especially through the ‘big ideas’ outlined at the start of each section.

• Encourage outside reading – eg Biological Science Review – which will help them to put what they learn into broader contexts. To get a top mark (24 or 25) in the essay, we will look for some evidence (at least in one topic) of reading beyond the specification.

• Example – Membranes are important in many processes in cells.

• What could be the theme of the essay?

• What might be suitable topic areas?
Preparing students for the essay

- **Theme/idea** – the role of membranes in processes – **not just** processes that involve membranes.

- Suitable topics – eg transport across membranes, protein synthesis, immune response, exchange surfaces, photosynthesis, respiration, receptors (in various topics such as insulin action), neurones, synapses, muscle contraction.

- Take one example – photosynthesis.

- Weaker answers will focus on all of photosynthesis – as a process involving membranes – perhaps mention membranes in chloroplasts (this approach gets a maximum of about 18 out of 25).

- Good answers will focus on thylakoid membranes in the chloroplast and the roles of components of these membranes in holding pigments, components of the electron transfer chain, ATP synthase and the membrane as a barrier allowing maintenance of a proton gradient – and, perhaps, role of membranes in maintaining the special chemical environment inside chloroplasts.
Preparing students for the essay

Examples of what teachers can do to prepare their students

• At the end of each topic, make links to other topics to encourage answers to the essay question to become more synoptic.

• Regularly give students an essay title. Ask them to list the topics that could be written about for that title.

• Draw mind maps with students showing the topics that could be linked to an essay title and the links between them.

• At the end of teaching each topic, give a series of essay titles and ask students to write a paragraph on the topic and how it links to that title.

• Students write essays and peer-assess each others’ work.

• Remember students should include 5 – 6 topics in the essay, and the essay should take about 40 minutes to write.
The control of processes in cells and the importance of these controls

• Some weaker essays included long, rambling discussions of the importance of control with little relevant detail to illustrate the points being discussed.

• Some students ignored ‘in cells’ and wrote at length about systems in organisms: for example homeostatic control systems in mammals.

• Popular examples used: cholera, cystic fibrosis, ion movement into roots related to control of water uptake, enzymes and factors controlling their activity, transcriptional factors, proto-oncogenes and tumour suppressor genes – possible triggers by questions in the paper, control of DNA replication and cell division.

• Some students showed poor recollection of the control of blood glucose concentration and many failed to discuss its importance. There was considerable confusion about the different cellular mechanisms involved in the production of oestrogen, insulin, glucagon and adrenaline.
Additional essay feedback from 2016: Essay a

- There were some potentially A* accounts of ADH in control of water uptake in the kidney.

- Some of the better attempts to discuss control were associated with the accounts of the roles of IAA in controlling tropisms.

- Accounts of the nervous system were very common. The best included consideration of the importance of unidirectional transfer of information across synapses, the control of the propagation of a nerve impulse and the importance of the refractory period. Many accounts were heavy on facts but with limited consideration of control.

- There were many accounts of ATP, respiration and photosynthesis but these were frequently little more than statements of fact, with few references to control.
The importance of ions in Biology

• A very large number of students wrote very fact-filled essays about ions in Biology but with little or no consideration of their importance. There were several topic areas that were common to the other essay title but with factual content relevant in a different way.

• Surprisingly few wrote about ions in biological molecules, and cellular structures, or pH.

• Attempts to discuss the roles of ions in haemoglobin were often superficial.

• The nitrogen cycle was a popular topic and there were many good accounts of the facts. Few linked the cycle to amino acid or nucleotide synthesis. Some students gave good accounts of the use of fertilisers and the potential problems of eutrophication.
Additional essay feedback from 2016: Essay b

• Popular topics: the role of ions in generating and maintaining water potential gradients in the context of cholera, co-transport of glucose, uptake by root hairs and the role of the endodermis in the generation of root pressure.

• Cystic fibrosis was used by some students and offered an opportunity for A* content. A discussion of the role of sodium ion gradients in the re-absorption of water in the kidney was also included by many students.

• From nerve impulses and synapses, many students moved on to the roles of calcium ions in muscle contraction. Again, not many students attempted to explain importance.
Additional essay feedback from 2016: Essay b

• Respiration and photosynthesis were also commonly discussed, with the emphasis on the role of protons. There were good accounts of how proton gradients are generated and then used to produce ATP and/or reduced NADP (in photosynthesis). Once again, students often failed to follow up with the importance of these processes; for example the use of reduced NADP in the synthesis of sugars that can be used for respiration or in the synthesis of other biological molecules.

• Poor expression often marred students’ accounts – it was quite common to see references to H+ being used/passing down the electron transfer chain. There were some attempts to discuss uses of ATP that involved the transfer of phosphate groups but these tended to be vague.
Thank you

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