

Biology Subject Assessment Advice

Overview

Subject assessment advice, based on the previous year's assessment cycle, gives an overview of how students performed in their school and external assessments in relation to the learning requirements, assessment design criteria, and performance standards set out in the relevant subject outline. They provide information and advice regarding the assessment types, the application of the performance standards in school and external assessments, and the quality of student performance.

Teachers should refer to the subject outline for specifications on content and learning requirements, and to the subject operational information for operational matters and key dates.

School Assessment

Assessment Type 1: Investigations Folio

The Investigations Folio must include at minimum 2 practical tasks and one Science as a Human Endeavour investigation. Included as a part of at least one of the practical tasks is the opportunity for students to deconstruct a problem and design a method to investigate one aspect of the problem. Assessment design criteria to be used for this assessment type include Investigation, Analysis and Evaluation and Knowledge and Application.

The more successful responses commonly:

- deconstructed a problem that was open-ended, in a logical and clear manner and using a suitable format
- provided detailed justification for the relevant components of the deconstruct and/or steps of the method designed. This often included justifying:
 - the choice of independent variable to test and how the results would be obtained
 - why a particular number of repeat samples was chosen
 - how and why some variables needed to be controlled
- had detailed materials and equipment lists and methods that were logical and could be repeated, as each step was detailed
- appropriately and accurately identified the independent and dependent variables, controlled variables, factors that cannot be controlled and a suitable corresponding hypothesis written in a testable format
- analysed all of the data collected and logically explained the trends and reasons for the patterns (or lack thereof) found in the results
- evaluated procedures and suggested how the different types of errors of uncertainty may have affected the data collected
- made reference to the data collected when analysing data and evaluating procedures
- made effective connections to the relevant biological concepts
- effectively identified appropriate limitations of the conclusion based on the method used and the results obtained

- included all components of a practical report that are specified in the subject outline for each practical investigation report
- chose a relevant contemporary topic, with a clear focus to investigate in their Science as a Human Endeavour (SHE) Investigation
- clearly identified the SHE Key concept(s) being investigated
- explicitly linked the SHE Key concept to their topic and logically explained how their evidence demonstrated the interaction between science and society
- articulated the way the science would benefit or effect specific individuals or groups in society.

The less successful responses commonly:

- had limited evidence of deconstruction of a problem
- provided little or no evidence of justification for the method designed
- provided limited analysis of some of the data and made little reference to the data collected or relevant biological concepts
- provided a generic evaluation of the procedures with limited consideration of the effect the errors of uncertainty could have on the data
- were not able to correctly identify and explain the effect of random and/or systematic errors
- lacked sufficient detail or did not use appropriate terminology
- were repetitive when attempting to evaluate procedures and inappropriately referred to strengths and weaknesses
- referred to improvements to the design of the experiment rather than the effect that errors of uncertainty have on the data
- chose topics for their Science as a Human Endeavour (SHE) investigation that were not contemporary in nature and/or related to a topic in Stage 2 Biology
- presented information reports that neither explicitly explored the interaction between science and society nor identified any SHE key concept(s)
- resembled an issue investigation, debating the different perspectives of an issue rather than focussing on a SHE key concept and exploring the interaction between science and society
- did not show the connection between the SHE key concept (if identified) and science and society
- used terminology incorrectly or used language conventions that were not appropriate for scientific communications.

Assessment Type 2: Skills and Application Tasks

Students demonstrate their knowledge and understanding across a set of tasks that are designed to enable students to apply their science inquiry skills, demonstrate knowledge and understanding of key biological concepts and learning, and explain connections with science as a human endeavour. A minimum of three tasks is required for this assessment type. These tasks must be done under direct teacher supervision within a maximum time frame of 90 minutes. Relevant assessment design criteria include Investigation, Analysis and Evaluation and Knowledge and Application.

The more successful responses commonly:

- provided detailed responses and used correct terminology
- demonstrated deep and broad of knowledge and understanding across concepts from all topics and question formats including new areas of the subject outline

- logically answered application questions
- demonstrated an ability to analyse information, and to apply knowledge in unfamiliar contexts
- comprehensively answered paragraph-answer questions with accuracy and sufficient detail to demonstrate deep and broad knowledge of the concept(s)/theme(s)
- reflected the student's ability to draw together more than one concept to answer questions
- communicated effectively by answering 'describe', 'explain', and 'discuss' questions.
- provided well explained responses to SHE questions that not only identified where Science as a Human Endeavour key concepts were evident in a text but also clearly and explicitly linked the key concept to science and society, relevant to the question.
- succinctly analysed and explained data from graphs and tables.

The less successful responses commonly:

- demonstrated limited knowledge and understanding of biological concepts
- were not able to provide correct responses across all question formats
- showed basic knowledge in simple recall questions across some concepts
- did not successfully analyse information, and were not able to apply knowledge in unfamiliar contexts
- consistently provided limited answers to application, problem solving, or paragraph-answer questions
- were not able to present or interpret data accurately
- were unable to satisfactorily describe, explain, or discuss, and often left these types of questions unanswered.
- were not able to identify or discuss the SHE key concepts
- could not explicitly connect the SHE key concept identified to the information provided in the question and describe its effect on science and/or society
- used generic or inappropriate terminology
- were unable to provide detailed answer to application or problem solving type questions.

External Assessment

Assessment Type 3: Examination

In 2018 a new Biology curriculum was introduced, and this included a change to the examination format. The examination is now two hours instead of three, and is marked out of 120 'single' marks, not 200 'double' marks. It is important to keep these changes in mind when drawing comparisons between this examination and examinations in previous years.

The mean score for the 2018 examination was 51.4%, which compares with previous means of 59.4% (2017), 58.1% (2016), 59.3% (2015), 55.4% (2014), and 53.2% (2013).

The mean marks for Sections 1 and 2 were 54.7% and 50.9% respectively.

Section 1: Multiple-choice questions

Multiple-choice questions vary in difficulty from easy knowledge (recall) to difficult knowledge and problem solving. This variation in question difficulty is reflected in the range of the question facility. In 2018 the facilities ranged from 23 to 96. (The facility for a question is the percentage of students who gave the correct response.) Many questions are intentionally discriminating so that more capable students will show a distinct preference for the correct response. In 2018, the top students showed a clear preference for the correct response in each of the multiple-choice questions. Note that for the first time there were fifteen multiple-choice questions, and each was worth one mark.

Question 1

The vast majority of students answered this question correctly.

Question 2

The most popular incorrect answer was J, indicating that some students ignored the word 'all'. Also, it is important to read every alternative before choosing the best answer, rather than choosing the first one that appears to be correct.

Question 3

The students who answered correctly realised that mutations occur in genes, not their products.

Question 4

This was the most difficult multiple-choice question, with only the top decile of students showing a clear preference for the correct alternative. The probe contains the sequence 'CCC', and only one of the fragments contains the complementary 'GGG'. If the probe (or the fragment) is reversed, there is a match.

Question 5

Presumably, the students who chose alternative J thought that ribosomes are membrane-bound.

Question 6

Most students answered this question correctly, with alternatives J and L being the most popular incorrect choices.

Question 7

Students who chose alternative K did not realise that DNA replication occurs before mitosis.

Question 8

Most students answered this question correctly.

Question 9

Many students found this question difficult, with the most popular choice being alternative M. The students who read and understood the information presented in the question were able to choose the correct alternative.

Question 10

Most students answered this question correctly.

Question 11

This question provides an example of a correct statement but this is not the best alternative to answer the question. Most students chose alternative K, but that statement does not allow a comparison between prokaryotic cells and eukaryotic cells. Students in the top two deciles showed a clear preference for the correct alternative.

Question 12

Most students knew that fatty acids would most likely have functioned as membranes in primitive cells, but only the top four deciles demonstrated an understanding of the possible role of ribozymes.

Question 13

Most students answered this question correctly.

Question 14

This question had the highest facility, with 96 percent of students answering it correctly.

Question 15

The relatively low facility for this question (less than 40) indicates that many students struggle to understand the concepts of random and systematic errors.

Section 2

Note that the 'double-mark' system – two marks for each well-expressed point – is no longer used. Many parts of questions are now worth one mark.

The mean mark for Section 2 was 50.9%. As with Section 1, the questions varied in difficulty from easy knowledge through to difficult knowledge and problem solving.

Teachers and students should note the following.

- Many students misinterpreted questions. Students are encouraged to read questions carefully so that their responses are relevant to the questions asked.
- Many students did not adhere to the instruction to give *one* fact or reason and, instead, give multiple answers. Students are reminded that in this circumstance any single wrong answer will lose the student all relevant marks.
- A number of students rewrote or paraphrased the question. There are no marks for this and valuable examination time is wasted through this practice.
- Students need to be careful with their use of biological language. Credit was given for the correct and relevant use of terms from the subject outline.
- Students are reminded that they may use the additional page in each booklet if more space is needed to answer a question. However, students should make clear in the first part of their answer that the rest of their answer or a replacement answer is given on another page. Students are also reminded to use the additional page in the *same* booklet as the question appears.

Question 16

- (a) Most students answered this question correctly.

The less successful responses commonly stated thymine, CDKN1C, or DNA.

- (b) *The more successful responses commonly said this decreased/stopped/silenced gene expression.*

The less successful responses commonly suggested that increased DNA methylation leads to uncontrolled cell division, without any mention of the gene expression.

- (c) Most students answered this question correctly.

The less successful responses commonly mentioned mutations to the protein, which did not answer the question.

Question 17

- (a) Most students answered this question correctly.

The less successful responses commonly answered 'enzyme'.

- (b) The less successful responses did not make a link to how this affects cells.

- (c) The less successful responses confused the enzyme and the substrate.

- (d) Many students answered this question well.

The less successful responses confused the enzyme and substrate names.

Question 18

- (a) Most students answered this question correctly.

The less successful responses commonly stated 'concentration of oxygen'.

- (b) The more successful responses commonly stated that increasing light intensity increased the rate of photosynthesis.

The less successful responses stated that increasing light intensity increased oxygen output without connecting it to photosynthesis.

- (c) Most students answered this question correctly.

The less successful responses did not write a balanced equation, or included ATP.

- (d) (i) The less successful responses answered '8'.

- (d) (ii) The more successful responses indicated that at one point the rates of respiration and photosynthesis were equal.
- (e) The more successful responses stated a factor and why it should be controlled.
The less successful responses were not able to state why the factor should be controlled.
- (f) Most students answered this question correctly.
- (g) Most students answered this question correctly.
- (h) The more successful responses stated that increasing the sample size meant an average could be taken.
The less successful responses confused increasing the sample size (replication) with repeating the investigation. Many did not mention the importance of averaging.

Question 19

- (a) Most students did not answer this question correctly.
The less successful responses commonly referred to the amount of genetic information instead of the diploid and haploid states.
- (b) Most students answered this question correctly.
The less successful responses confused mitosis and meiosis.
- (c) The less successful responses stated either that the cells are 'identical' (without qualification), or simply that they have the same number of chromosomes.
- (d) The less successful responses did not acknowledge that all clones would be the same gender.
- (e) Most students answered this question correctly.
- (f) (i) Most students answered this question correctly.
- (f) (ii) Most students answered this question correctly.

Question 20

- (a) Most students did not answer this question correctly.
The less successful responses commonly referred to DNA-DNA hybridisation, although the question required evidence that does not involve analysing DNA.
- (b) Most students answered this question correctly.
The less successful responses stated 'geographical isolation'.
- (c) Most students answered this question correctly.

Question 21

- (a) The answers to this question were of varying quality.
The more successful responses stated that the guide RNA needed to be complementary to part of the gene of interest.
The less successful responses commonly referred to DNA probes (or gene probes) and restriction enzymes. Some mentioned primers or mRNA.
- (b) Most students did not answer this question correctly.
The less successful responses stated that the guide RNA needed to be the length of the entire gene.
- (c) The less successful responses stated that Cas9 protein 'cuts out' the gene, rather than cuts DNA at a specific site.

Question 22

- (a) The less successful responses commonly did not draw endoplasmic reticulum correctly, or did not label the folded membrane.
- (b) The more successful responses included the idea that the vesicle fuses with the cell membrane.
The less successful responses described the release of insulin from the pancreas, rather than the mechanism of insulin secretion from the cell.
- (c) Most students answered this question correctly.
The less successful responses confused insulin and glucagon.
- (d) Many students answered this question correctly.
The less successful responses did not refer to a decrease in insulin (or alternatively an increase in glucagon), or simply said that the sugar level was not controlled, rather than indicate that blood sugar would remain high.
- (e) The less successful responses incorrectly explained that the bacteria only had the proinsulin gene and not the active insulin gene.
- (f) Most students answered this question correctly.
- (g) Most students answered this question correctly.
The less successful responses identified relevant information but did not clearly articulate how it demonstrated a key concept of science as a human endeavour.

Question 23

- (a) Most students answered this question correctly.
- (b) The less successful responses included a discussion of inappropriate responses, such as vasoconstriction or shivering.
- (c) Most students answered this question correctly.
The less successful responses were vague about which system they were describing.
- (d) Many students answered this question correctly.
The less successful responses did not indicate whether the effect they chose was due to an increase or a decrease in temperature.

Question 24

- (a) Most students answered this question correctly.
- (b) Many students did not answer this question correctly.
The less successful responses simply described natural selection, without explaining how reduced genetic diversity could affect a population in the event of environmental change. Little reference was made to the ideas of survival and reproduction.
- (c) The less successful responses did not indicate that ethics is about right and wrong.

Question 25

Many students did not answer this question correctly.

The less successful responses were repetitive, did not use appropriate terminology, and did not describe how the human activities they had chosen affected the ecosystem of the koala.

Question 26

- (a) Most students answered this question correctly.

- (b) Most students answered this question correctly.

Question 27

- (a) Many students did not answer this question correctly. The most common incorrect answer was 'community'.
- (b) Most students answered this question correctly.
- (c) Many students did not answer this question correctly.

The less successful responses described natural selection rather than succession.

Please note:

This year, one of the questions had the following statement: Credit will be given for answers to part (b) that are coherent and contain only relevant information. (2 marks). This will not be the case in 2019.

All answers are expected to be relevant and coherent.