# Government of South Australia LogoSACE Board Logo2024 Biology Subject Assessment Advice

Overview

This subject assessment advice, based on the 2024 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. It provides information and advice regarding the assessment types, the application of the performance standards in school and external assessments, and the quality of student performance.

The Subject Renewal program has introduced changes for many subjects in 2025; these changes are detailed in the change log at the front of each subject outline. When reviewing the 2024 subject assessment advice, it is important to consider any updates to this subject to ensure the feedback in this document remains accurate.

# School Assessment

Teachers can improve the moderation process and the online process by:

* thoroughly checking that all grades entered in school online are correct and match the marking decisions made
* ensuring student samples are marked and have relevant annotations to support assessment decisions made against the performance standard in both assessment types
* ensuring student work has accurate word counts indicated on student samples for the Investigations Folio tasks. In addition, teachers should guide students to ensure they do not exceed the word count or page limit for specific tasks.
* ensuring completion practicals are not overly scaffolded
* uploading each student sample for each assessment type in a single accessible file where possible
* ensuring that the deconstruct, especially if using mind maps and brainstorming, is legible.

Assessment Type 1: Investigations Folio

* The Investigations Folio should include one or two practical investigation tasks and one Science as a Human Endeavour investigation. In the practical investigation tasks, the students should have had at least one opportunity to deconstruct a problem for which the outcome is uncertain. They should then design a method to investigate one aspect of this problem. The design of method should include details/ annotations that justify the choices made regarding the method, and how it links to the deconstruct.
* Assessment design criteria to be used for this assessment type are Investigation, Analysis and Evaluation, and Knowledge and Application.

Teachers can elicit more successful responses by:

* ensuring students are including the appropriate components of the report to the word count or page limit. Teachers are reminded that in investigation reports the introduction including the hypothesis and all variables (independent, dependent, constant, and their explanations), any summary or analysis of the results, and evaluation of the procedure, and conclusion with limitations are included in the word count. The use of appendices or tables does not remove these from the word counts and must still be included
* being careful not to over-scaffold tasks, especially if undertaking completion practicals, to ensure students have opportunity to show evidence for the higher level of performance. Excessive scaffolding restricts the student from showing their critical thinking and ability to analyse and evaluate
* ensuring choice of Science as a Human Endeavour topics are appropriately linked to the Stage 2 Biology subject outline, and have clear reference to Biology, not other sciences
* assisting students to choose topics that will enable them to explore the connection between society and science, and not simply regurgitate biological information, for example a generic CRISPR-Cas 9 or Genetic Engineering focus will not enable the student to critically examine this connection
* choosing a deconstruct and design investigation where the outcome is uncertain and requires the student to undertake some research and then use the information found to design a method that is more than just selecting an alternative independent variable
* ensuring that students do not include a discussion of improvements to experimental design. This is not a requirement for this task in the current subject outline and will limit their opportunity to use the word count for aspects of the task that are required
* ensuring students are addressing the key concepts in the evaluation of the data, and effect of errors of uncertainty, in practical investigations including the terms, precision, reliability, accuracy and validity, when appropriate, and linking this to the actual data obtained
* not requiring students to include extensive statistical analysis of the data which is not a requirement of the subject outline. When used incorrectly, this can impact the understanding demonstrated by the student.

The more successful responses commonly:

* provided detailed and highly relevant evidence of their deconstruction within the maximum of four sides of an A4 page (IAE1/KA4)
* provided an appropriate and creative deconstruction of a problem for which the outcome was uncertain (IAE1)
* included justification and sufficient evidence to show their depth of understanding of the problem, and how various relevant factors should be considered to enable that specific problem to be investigated (IAE1)
* developed a clear, highly logical design using their deconstruction, to investigate one aspect of the problem; clearly showing knowledge in relation to all the types of variables, including considering a single independent variable to be investigated (IAE1)
* developed a design which included a highly relevant and detailed list of materials and a method that was logical and able to be performed (IAE1)
* provided appropriate justification
* for the materials chosen, including, for example, details of equipment and brands
* for the key steps of the method suggested (IAE1)
* identified relevant factors appropriate to the investigation being carried out (and not generic) which could not be controlled and provided reason(s) why they could not be controlled (IAE1/KA4)
* designed a highly appropriate blank data table with correct columns and headings (including units) that could be used to record the data collected. This inclusion shows evidence of a few key understandings of designing an experiment; an understanding of sample size, measurement/units, and conventional representation of data (IAE1/IAE2)
* presented the data in a clear manner that was highly accurate. Use of titles, units, significant figures etc were all highly consistent. Graphs were well presented, with accuracy and were an appropriate size (IAE2)
* demonstrated a highly effective ability to analyse the data (including outliers), critically with depth, accuracy and effectively linked the trends to relevant biological concepts (KA1/IAE3)
* provided a plausible explanation for when a trend in the data was not as would be expected (IAE3)
* analysed the results clearly and explicitly, connecting to the relevant biology without the use of distractors, such as r2 values and other statistical analysis, which is not required (IAE3)
* constructed a critical and highly effective evaluation of the investigation (IAE4)
* identified relevant controlled variables and factors that cannot be controlled and accurately explained, within the word count, how they could potentially affect the data (IAE4)
* identified potentially relevant sources of random and systematic errors, with reference to how these could affect the data. In addition, specifically referenced the data to indicate where these errors may have affected the data (IAE4)
* used terminology with a high level of accuracy and effectiveness when discussing errors, and the key terms associated with these (IAE4/KA4)
* provided highly relevant limitations to the conclusions that were not simply a repeat of the evaluation of errors (IAE3)
* included relevant biological knowledge in both the practical reports and SHE Investigation that was well explained and referenced effectively (KA4)
* explored an appropriate and contemporary topic linked to the Stage 2 Biology subject in the Science as a Human Endeavour report. The biology was well explained, and clear and detailed connection between science and society was provided. It was evident which SHE key concept(s) were being explored, and there was an explicit and well-explained connection to specific people in society that may be affected (KA1/KA3/KA4).

*The less successful responses commonly:*

* provided a deconstruct which was brief, and consisted mostly of listing of ideas, with a focus on definitions and with minimal link to the design, and little or no justification about how the factors need to be considered in the design (IAE1)
* used a simplistic mind map as the format for the deconstruct but did not include much detail or any justifications linked to the design (IAE1)
* selected a sample size that was too small and offered limited and often unclear instructions for the method, which was often basic or not able to be performed (IAE1)
* included a hypothesis where the independent and dependent variable were not identifiable (IAE1)
* listed variables and did not explain how they could affect the data (IAE1/IAE4)
* presented data that was often not aligned to conventions used in science (IAE2)
* appropriate titles and units on graphs and tables were not provided (IAE2)
* not referencing the average, or how the average was determined (IAE2)
* not employing appropriate column and row structure in constructing the data table (IAE2)
* incorrectly using significant figures, especially when calculating averages (IAE2)
* repeating units in each cell rather than in the heading of the column (IAE2)
* displaying graphs inappropriately, often using the wrong format, with line of best fit missing or not accurately drawn (IAE2)
* displaying incorrect use of scales on the axis (IAE2)
* incorrect use of graphing programs producing graphs that did not represent the data appropriately (IAE2)
* provided a general summary of the data, omitting the outliers, with little reference to the actual data, or to the link to the relevant Biology (IAE3)
* did not provide a specific explanation for why variables must be controlled, often using very generic description rather than linking to how it might affect the data (IAE3)
* lacked limitations to conclusions or provided inappropriate descriptions. Often referred to limitations of the method or just repeated the need to increase the number of trials, or incorrectly referred to external factors such as running out of materials or time to conduct the experiment (IAE4)
* showed a lack of understanding of terms such as reliability, precision, accuracy, and validity. Often wasted words by simply providing definitions of these terms rather than linking to the actual data collected or the specific investigation (IAE4)
* used generic terms and/or only definitions when attempting to identify errors and their effect on the data and made no/little reference to the actual data (IAE4). Often reports were formulaic, copied and pasted and not specific to the investigation
* identified the sources of potential random and systematic errors incorrectly and/or mixed them up. Often referenced mistakes in the method rather than sources of uncertainty (IAE4)
* focused on the biology in the Science as a Human Endeavour (SHE) report, rather than on how the information demonstrated one of the SHE Key concepts (KA3)
* linked SHE Key concepts to biology not related to the subject outline (KA3)
* often the SHE Key Concept was not identifiable as it was not explicitly introduced or explained, or the work considered all concepts and so did not address them with sufficient detail (KA3)
* referencing was often incomplete and limited (KA4)
* the topic was inappropriate, not well chosen, or lacked sufficient connection to a SHE Key concept, e.g. generic topics such as CRISPR-Cas 9 or DNA manipulation (KA3).

Assessment Type 2: Skills and Applications Tasks

Three or four Skills and Applications Tasks provide evidence of students’ knowledge, understanding, and application of science inquiry skills, key biological concepts, and the connections with Science as a Human Endeavour by discussing the interaction between science and society.

Assessment design criteria to be used for this assessment type are Investigation, Analysis and Evaluation, and Knowledge and Application.

Teachers can elicit more successful responses by:

* ensuring tasks, in particular supervised tests, are well balanced with a sufficient proportion of question types (e.g. recall, difficult, and problem-solving questions)
* remembering each question does not need to be assigned to a particular specific feature of the performance standard, this can cause inaccurate reflection of achievement if there are few marks allocated
* holistically assessing across the whole task rather than assessed against a few questions or marks for example KA1 and KA4 grades
* ensuring the content of tests is broad and deep across the topic and tests do not have questions testing the same concept multiple times in the same task
* including questions that are not familiar in context to the student, enabling students to demonstrate their application of their knowledge and understanding more effectively
* ensuring that when marking student responses, correct answers are not inferred from poorly expressed answers, which results in inflation of the student’s achievement
* encouraging students to use the appropriate biological terminology when providing answers to written questions. When student responses are not well expressed, then this needs to be reflected in the assessment of KA4
* applying an appropriate reduction to the marks allocated when contradictory statements are provided, indicating that the student does not have a fully correct understanding of the concept or when key words are spelt incorrectly (i.e. ‘miteosis’) and so it is unclear if the student does know the correct response
* ensuring the time allocated for a supervised SAT has an appropriate number and type of questions included (KA1/KA2)
* ensuring that Science Inquiry Skills and Science as a Human Endeavour questions are sufficiently represented across the folio of tasks to not overinflate student achievement with IAE1 or KA3, for example
* providing opportunities for students to practise how to answer questions, remembering that one well-defined point is the equivalent of a mark. It is essential that the test is designed so that the allocation of questions and marks is adequate across all the specific features being assessed in the task, to ensure the result is reflective of student ability and the relevant achievement grade
* providing opportunities for students to do SATs using an online platform to better prepare them for assessment type 3, if possible
* ensuring when using online formats for tests that may have automated marking features that the marks awarded are accurate and reflective of the standard being assessed
* ensuring that percentages are only used to guide grade determination, and are not used as the sole determination of the achievement
* designing non-test SATs that are not overly scaffolded and that enable students to demonstrate deep and broad knowledge and understanding and critical and evaluative thinking.

*The more successful responses commonly:*

* answered a range of application and problem-solving scenarios highly effectively (KA1)
* had logical answers that directly responded to the question in a concise and accurate manner with an appropriate amount of detail to obtain full credit (KA4)
* used key terminology effectively to provide well-considered answers that had sufficient information for the number of marks allocated to the question (KA1/KA2)
* analysed data accurately and clearly, referring to data when required, thus showing their understanding of concepts (KA1/IAE3)
* featured evidence prompted by a broad range of item types (multiple choice questions, short answer questions, SHE, and science inquiry questions) and that applied to a variety of familiar and unfamiliar contexts (KA1/KA2)
* showed the ability to use the information provided in scenarios and then effectively analyse the information to demonstrate a clear understanding of the interaction between science and society and/or the SHE key concepts (KA3)
* answered science inquiry questions with appropriate detail and correctly by using key concepts and associated terminology highly effectively (IAE3/KA1/KA4).

*The less successful responses commonly:*

* answered basic definition or recall type questions either incorrectly and/or inconsistently, and were not able to provide clear answers to more difficult and/or application type questions (KA1/KA2)
* could not effectively connect one concept to another, even when provided with information in the source or stem of the question, or incorrectly applied knowledge of a concept to a question (KA1/KA2)
* used general terms to answer questions, rather than the correct biological terminology, and had answers that were not well structured or included contradictory information, suggesting the concept being tested was not well understood (KA1/ KA2/KA4)
* paraphrased the question rather than answering it or misinterpreted the meaning of the question and therefore provided an irrelevant answer (KA1/KA4)
* were not able to determine the difference in the level of detail required in “describe” and “explain” questions (KA1/ KA2)
* addressed SHE type questions with minimal detail, as they referred to generic statements, rather than specifically using the information provided in the stem of the question (KA3)
* were not able to use science inquiry skills terms, such as precision, random error, or accuracy correctly, and either were not able to provide an answer or incorrectly connected terms to a type of error (IAE3/KA1/KA4).

# External Assessment

Teachers can elicit more successful responses by:

* including assessment tasks throughout the year that provide students with the opportunity to demonstrate their biological knowledge, and their ability to analyse, interpret, and evaluate biological information in new and familiar contexts. Ideally, these tasks would be timed, and completed under the direct supervision of the teacher.

Assessment Type 3: Examination

The subject outline indicates that Stage 2 science inquiry skills and science understanding from all Stage 2 Biology topics may be assessed in the examination.

It also states that questions:

* will be of different types
* may require students to show an understanding of science as a human endeavour
* may require students to apply their science understanding from more than one topic.

All specific features of the assessment design criteria for this subject may be assessed in the external examination.

Section 1: Multiple-choice questions

Multiple-choice questions vary in difficulty from easy knowledge (recall) to difficult knowledge and problem solving. Many questions are intentionally discriminating so that more capable students will show a distinct preference for the correct response. In 2024, the top decile of students showed a clear preference for the correct response in all but one of the multiple-choice questions. We have provided feedback for questions in Section 1 that challenged a significant proportion of the cohort.

Question 2

The reference to a *non-dividing* plant cell means that linear chromosomes are bound to histones in the nucleus. Mitochondria (and possibly chloroplasts) in the cytoplasm have circular, unbound chromosomes.

Question 4

Only students in the top two deciles showed a clear preference for the correct answer. It is helpful to draw a diagram (on paper) when attempting to solve problems like this.

Question 6

Almost a third of students thought that ATP *synthesis* provides energy. It is very important to read the question carefully.

Question 7

Only students in the top decile showed a clear preference for the correct answer. More than a third of students thought that salts diffuse against the concentration gradient, while a significant number ignored the information in the table showing that there are no proteins in the tubule.

Question 8

Almost half of the students thought that adrenaline provides a nervous response.

Question 9

Almost a third of the students thought that the removal of carbon dioxide from the blood decreases blood pH.

Question 10

The spread of answers suggests that many students simply guessed. The top half of the students showed a clear preference for the correct answer.

Question 11

Most students identified the type of hypothyroidism as primary, but many did not realise that a low level of thyroxine would result in a high level of thyroid-stimulating hormone (due to reduced negative feedback).

Question 12

A significant number of students did not know that there were no (protein) enzymes in the RNA world, and that some RNA molecules may have acted as catalysts.

Question 14

Almost half of the students were not able to distinguish genetic drift from extinction.

Section 2

As for Section 1, the examiners aim to produce questions that vary in difficulty from easy knowledge through to difficult knowledge and problem solving.

Teachers and students should note the following:

* Many students fail to gain marks as a result of misinterpretation of questions. Students are encouraged to read questions carefully, so their responses are relevant to the questions asked.
* Providing multiple responses when instructed to only give one fact or reason risks introducing contradictory information, indicating that the student does not have correct knowledge and/or understanding.
* There are no marks awarded for rewriting or paraphrasing the question. Doing this wastes valuable examination time.
* Students need to be careful with their use of biological language. Clear and concise answers that use relevant terms from the subject outline correctly make it easier for markers to understand what a student is trying to convey in their response, and hence award marks.
* Students who usually depend on an autocorrect function when inputting text are reminded that, in the Biology e-exam, this function is not activated. Students are encouraged to use the spell-check option in each text box to ensure that their communication is as clear and accurate as possible.
* It is evident to markers that some students ignore the instruction to ‘Use Source X to answer question ...’ Consequently, the answer provided by these students lacked the reference to relevant information or concepts.
* Accessing the sample Biology examination and familiarising themselves with the assessment platform will enable students to focus more on the biology of the questions than the technology required to respond to them.

Question 16

(a) (i) Most students were able to correctly identify process C.

(ii) The less successful responses did not state that tRNA brings amino acids to the ribosome, or simply described translation.

(b) The less successful responses did not refer to both processes, or confused introns and exons*.*

(c) *The less successful responses* did not refer to EPSP-synthase, or discussed the implication of a mutation, which was not relevant to the question.

(d) The less successful responses attempted a discussion of both competitive and non-competitive inhibitors, and this led to confusion*.*

(e) The less successful responses were unable to state the steps in a logical sequence*.*

(f) *The less successful responses* did not refer to the **management** of the use of glyphosate and how this would depend upon the interaction between science and society.

Question 17

This question had the highest mean mark for Section 2.

(a) Most students were able to correctly state that the number of chromosomes is halved.

(b) (i) *The less successful responses* referred to crossing over.

(ii) *The less successful responses* did not refer to homologous chromosomes, nor use the terms maternal and paternal.

(c) Most students were able to correctly identify mitosis.

(d) *The less successful responses* simply listed the conditions mentioned in the question, but they did not offer an explanation.

(e) *The less successful responses* stated ‘photosynthesis’.

(f) The more successful responses recognised that there would less energy available, and that this would impair the muscles of the mandibles, so the ants would be not able to remove themselves from the leaves.

*The less successful responses* did not make the link between energy and muscles.

(g) The more successful responses stated a simple link between the dependent and independent variables, without adding an unwarranted explanation.

Some less successful responses reversed the independent and dependent variables.

(h) *The less successful responses* did not correctly the address accuracy of the data, with many references to sample size and reliability.

(i) The less successful responses did not state that *the conclusion is not applicable to other species*. Some made suggestions about improving the design, but they did not state any limitations.

(j) The less successful responses missed that this question was referring to the discovery of new substances, and either concentrated more on the parasitic relationship research, or provided generic answers related to science as a human endeavour.

Question 18

This question had the lowest mean mark for Section 2.

(a) (i) *The less successful responses* offered a description rather than a name, or they confused internal and external factors.

(ii) *The less successful responses* did not refer to regulation of cell division.

(b) The less successful responses did not refer to information from the graph, or they misinterpreted the graph*.*

(c) *The less successful responses* did not explain the importance of DNA replication in the S phase.

(d) The more successful responses recognised the need to get past the M checkpoint and allow mitosis to proceed (to anaphase).

The less successful responses incorrectly suggested that a decrease in cyclin B was needed for mitosis to occur.

(e) Many less successful responses stated ‘mutation’ or ‘temperature’.

(f) *The less successful responses* did not make the link to uncontrolled cell division.

Question 19

(a) *The less successful responses* either did not state a process, or they stated a process that led to genetic change rather than epigenetic change.

(b) The less successful responses simply defined epigenetic change and mutation, without clearly describing the difference between the two.

(c) *The more successful responses* explicitly explained the benefit to a person with cancer of monitoring the level of ctDNA in their blood.

The less successful responses simply repeated information from the question.

Question 20

(a) This was generally answered well.

(b) The less successful responses provided vague or inaccurate descriptions of a structural difference, or they described a function of the two types of neuron.

(c) *The less successful responses* stated an effect rather than an effector.

(d) The less successful responses did not refer to the maintenance of blood pressure when explaining negative feedback.

(e) The more successful responses clearly identified three steps in the process.

Question 21

(a) This was generally answered well.

(b) (i) *The more successful responses* clearly explained that the increased blood glucose level is due to reduced uptake of glucose from the blood.

(ii) *The less successful responses* simply repeated their answer from the previous question, without explaining that the increased glucose concentration would increase the concentration gradient, and thus increase the rate of diffusion of glucose across the placenta from the mother to the foetus.

(c) This was generally answered well.

(d) *The less successful responses* did not provide sufficient detail about the role of glucagon.

Question 22

(a) *The more successful responses* referred to a mutation in a common ancestor of humans, which was passed down to all descendants.

(b) *The less successful responses* explained that lemurs are more closely related to owl monkeys because they are closer (vertically) on the phylogenetic tree.

(c) This was generally answered well.

*Many of the less successful responses* gave an answer of ‘9’.

(d) *The less successful responses* stated ‘number of mutations’ or ‘genetic drift’.

(e) *The less successful responses* omitted key details in the speciation process, confused the sequence of steps, or provided vague descriptions of natural selection.

(f) This was generally answered well.

(g) The less successful responses referred to collagen but made no mention of cell division.

(h) The less successful responses stated both the independent variable and the dependent variable.

(i) The less successful responses made conclusions about vitamin C.

(j) The more successful responses clearly connected gene expression to the gene products (proteins), and hence to cell structure and function.

Question 23

(a)The more successful responses elaborated on the information in the source by identifying that the stromatolites contain some of the earliest life forms on Earth.

*The less successful responses* simply re-stated information from the source*.*

(b) This was generally answered well.

(c) The less successful responses did not clearly identify a human activity that led to the rising sea level.

(d) *The more successful responses* clearly described how organisms alter the environment, making it more favourable to other species (and possibly less favourable for themselves)*.*

The less successful responses simply *st*ated the order in which organisms appear or described speciation or natural selection.

(e) *The less successful responses* stated an (often ecological) issue with moving the stromatolites, without demonstrating an understanding of why this would be an **ethical** issue.