Biology 2019 v1.3

IA3: Sample assessment instrument

Research investigation (20%)

This sample has been compiled by the QCAA to assist and support teachers in planning and developing assessment instruments for individual school settings.

Student name

Student number

Teacher

Issued

Due date

Marking summary

Criterion	Marks allocated	Provisional marks
Research and planning	6	
Analysis and interpretation	6	
Conclusion and evaluation	6	
Communication	2	
Overall	**20**	

Conditions

Technique	Research investigation
Unit	Unit 4: Heredity and continuity of life
Topic/s	Topic 1: DNA, genes and the continuity of life Topic 2: Continuity of life on Earth
Duration	10 hours class time
Mode/length	Written (e.g. scientific essay): 1500–2000 words
Individual/group	Individual
Resources	School library (online: internet and school intranet, databases, journals)

Context

Investigate one of the following claims:

- Gene therapy can reverse ageing.
- DNA testing can prove genealogical ancestry.
- Transgenic organisms offer a viable and effective future for human health.
- Sustainable reserve size should be based on the data from gene pool variability.

You may identify an alternative claim in consultation with your teacher. This claim must be related to Unit 4 subject matter.

Task

Gather secondary evidence related to a research question in order to evaluate the claim. Develop your research question based on a number of possible claims provided by your teacher.

Obtain evidence by researching scientifically credible sources, such as scientific journals, books by well-credentialed scientists, and websites of governments, universities, independent research bodies or science and technology manufacturers. You must adhere to research conventions.

To complete this task, you must:

- select a claim to be evaluated
- identify the relevant scientific concepts associated with the claim
- pose a research question addressing an aspect of the claim
- conduct research to gather scientific evidence that may be used to address the research question and subsequently evaluate the claim
- analyse the data to identify sufficient and relevant evidence
- identify the trends, patterns or relationships in the evidence
- analyse the evidence to identify limitations
- interpret the evidence to construct justified scientific arguments
- interpret the evidence to form a justified conclusion to the research question
- discuss the quality of the evidence
- evaluate the claim by extrapolating the findings of the research question to the claim
- suggest improvements and extensions to the investigation
- communicate findings in an appropriate scientific genre, i.e. empirical essay.

Checkpoints

☐ Week 1: Select claim and develop research question.

☐ Week 2: Identify sources and conduct research.

☐ Week 3: Analyse and evaluate evidence.

☐ Week 4: Submit draft.

☐ Week 5: Submit final response.

Authentication strategies

- The teacher will provide class time for task completion.
- Students will provide documentation of their progress at indicated checkpoints.
- The teacher will collect and annotate one draft.
- The teacher will conduct interviews or consultations with each student as they develop the response.
- Students will use plagiarism-detection software at submission of the response.
- Students must acknowledge all sources.

Scaffolding

The response must be presented using an appropriate scientific genre (i.e. scientific essay) and contain:

- a claim
- a research question
- a rationale for the investigation
- justified scientific arguments using evidence
- a conclusion to the research question based on the interpretation of the evidence
- evaluation of the claim and suggestions of improvements and extensions to the investigation
- a reference list.

An example of how one of the claims could be developed into a research question

Claim: Sustainable reserve size should be based on the data from gene pool variability.

Research question template: Does **x** of **y** increase the **z** of **c** to (maintain 90% heterozygosity)?

Research question: Does supplementing the prey population of the cheetah (*Acinonyx jubatus*) increase the carrying capacity in the [named] reserve to maintain 90% heterozygosity?

Developing the research question:

1. Identify the key (important) terms in the claim.
    a. ‘gene pool’, ‘variability’, ‘sustainable reserve size’

2. Propose refining questions that need to be addressed to refine key terms and narrow the focus of the claim.
    a. The gene pool for which animal?
    b. Where is the reserve?
    c. What size reserve is needed to maintain variability?
    d. How would we know the variability was sustainable?
3. Provide an example of how one of the claims could be developed into a research question. Conduct research to gather information to address the refining questions.
    a. The [named] cheetah reserve maintains genetic diversity.
    b. The [named] cheetah reserve maintains 90% genetic diversity by supplementing the prey population.
    c. Does supplementing the prey population of the cheetah in the [named] reserve maintain 90% genetic diversity?
4. Draft the research question to address the claim.
    a. Does supplementing the prey population of the cheetah in the [named] reserve maintain 90% genetic diversity?
5. Refine and focus the research question.
    a. Does supplementing the prey population of the cheetah (*Acinonyx jubatus*) in the [named] reserve maintain 90% heterozygosity?
6. Present the research question to the teacher for approval.
    a. Does supplementing the prey population of the cheetah (*Acinonyx jubatus*) increase the carrying capacity in the [named] reserve to maintain 90% heterozygosity?

    Note: You cannot use this sample research question for your investigation.

Instrument-specific marking guide (IA3): Research investigation (20%)

Criterion: Research and planning

Assessment objectives

2. apply understanding of DNA, genes and the continuity of life or the continuity of life on Earth to develop research questions.
5. investigate phenomena associated with DNA, genes and the continuity of life or the continuity of life on Earth through research

The student work has the following characteristics:	Marks
• informed application of understanding of DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by a considered rationale identifying clear development of the research question from the claim • effective and efficient investigation of phenomena associated with DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – a specific and relevant research question – selection of sufficient and relevant sources.	5–6
• adequate application of understanding of DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by a reasonable rationale that links the research question and the claim • effective investigation of phenomena associated with DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – a relevant research question – selection of relevant sources	3–4
• rudimentary application of understanding of DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by a vague or irrelevant rationale for the investigation • ineffective investigation of phenomena associated with DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – an inappropriate research question – selection of insufficient and irrelevant sources	1–2
• does not satisfy any of the descriptors above.	0

Criterion: Analysis and interpretation

Assessment objectives

3. analyse research evidence about DNA, genes and the continuity of life or the continuity of life on Earth
4. interpret research evidence about DNA, genes and the continuity of life or the continuity of life on Earth

The student work has the following characteristics:	Marks
• systematic and effective analysis of qualitative data and/or quantitative data within the sources about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – the identification of sufficient and relevant evidence – thorough identification of relevant trends, patterns or relationships – thorough and appropriate identification of limitations of evidence • insightful interpretation of research evidence about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by justified scientific argument/s	5–6
• effective analysis of qualitative data and/or quantitative data within the sources about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – the identification of relevant evidence – identification of obvious trends, patterns or relationships – basic identification of limitations of evidence • adequate interpretation of research evidence about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by reasonable scientific argument/s.	3–4
• rudimentary analysis of qualitative data and/or quantitative data within the sources about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – the identification of insufficient and irrelevant evidence – identification of incorrect or irrelevant trends, patterns or relationships – incorrect or insufficient identification of limitations of evidence • invalid interpretation of research evidence about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by inappropriate or irrelevant argument/s.	1–2
• does not satisfy any of the descriptors above.	0

Criterion: Conclusion and evaluation

Assessment objectives

4. interpret research evidence about DNA, genes and the continuity of life or the continuity of life on Earth

6. evaluate research processes, claims and conclusions about DNA, genes and the continuity of life or the continuity of life on Earth

The student work has the following characteristics:	Marks
• insightful interpretation of research evidence about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by justified conclusion/s linked to the research question • critical evaluation of the research processes, claims and conclusions about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – insightful discussion of the quality of evidence – extrapolation of credible findings of the research to the claim – suggested improvements and extensions to the investigation that are considered and relevant to the claim.	5–6
• adequate interpretation of research evidence about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by reasonable conclusion/s relevant to the research question • basic evaluation of the research processes, claims and conclusions about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – reasonable description of the quality of evidence – application of relevant findings of the research to the claim – suggested improvements and extensions to the investigation that are relevant to the claim.	3–4
• invalid interpretation of research evidence about DNA, genes and the continuity of life and or continuity of life on Earth demonstrated by inappropriate or irrelevant conclusion/s • superficial evaluation of the research processes, claims and conclusions about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – cursory or simplistic statements about the quality of evidence – application of insufficient or inappropriate findings of the research to the claim – ineffective or irrelevant suggestions.	1–2
• does not satisfy any of the descriptors above.	0

Criterion: Communication

Assessment objectives

7. communicate understandings and research findings, arguments and conclusions about DNA, genes and the continuity of life or the continuity of life on Earth

The student work has the following characteristics:	Marks
• effective communication of understandings and research findings, arguments and conclusions about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – fluent and concise use of scientific language and representations – appropriate use of genre conventions – acknowledgment of sources of information through appropriate use of referencing conventions.	2
• adequate communication of understandings and research findings, arguments and conclusions about DNA, genes and the continuity of life or the continuity of life on Earth demonstrated by – competent use of scientific language and representations – use of basic genre conventions – use of basic referencing conventions.	1
• does not satisfy any of the descriptors above.	0