**Stage 2 Biology: Assessment Type 2  
Non-Test SAT Biology Task**

Background of Task:

Students have the opportunity to use their knowledge to demonstrate a deep and broad understanding of a range of biological concepts linked to Topic 1, 2 and 4 by answering a series of questions. Using a scientific article as the initial source of information, students will have the opportunity to apply their knowledge in a new context, do additional research to demonstrate a deeper understanding, to explore the Science as a Human Endeavor links within the article provided. In addition, students will provide evidence of their science inquiry skills by designing a detailed investigation (which will not be performed).

Topics included:

Topic 1: DNA and proteins, Topic 2: Cells as the Basis of Life, Topic 4: Evolution

**Assessment Conditions:**

The article will be provided a week before the written aspect of the task. This will enable students to read the article and to consider the biology, do some initial additional research and ensure they understand the contexts included.

Article: Sole, R, “Back from the Brink”, New Scientist, 1 October, 2016 pp 36-37.

*\*See Note for teacher below.*

Students will then be given class time (90 minutes), to complete Part B in which they answer questions relating to the article, SHE and design an investigation.

This is a supervised task; however, students will have access to any resources required, including internet access.

*This will be an online task.*

**Assessment Design Criteria:**

Investigation, Analysis and Evaluation: IAE1 Knowledge and Application: 1, 2, 3

**Instructions for Students**

**Part A** (to be completed in the student’s own time and before the lesson that has been scheduled for Part B to be undertaken)

Read the articleprovided/online.

Undertake research to ensure that you fully understand the ideas and concepts presented in the article. Consider how these relate to the interaction between science and society.

Note to teachers:

This part is supplied to students at the beginning of the lesson in which it is to be completed. The task could be completed as an electronic response.

**Part B** (to be completed in supervised lesson time)

**Answer all of the following questions in the space provided:**

1. Explain, using examples from the article, why this article was titled “Back from the Brink”?

2. Many new solutions to solve the problems of ecosystem destruction were outlined in the article. What would be the **benefit** to organisms and humans of these solutions if they were used in a damaged ecosystem?

3. Explain why organisms may not survive if they are put into new environments.

4. Describe how bacteria could be engineered to produce a water-trapping polymer.

5. Consider the following key concepts of Science as a Human Endeavor and link your knowledge, your research, and the information from the article to write a response to explore and understand the interaction of society and science.

***Application and Limitation:***

* *Scientific knowledge, understanding, and inquiry can enable scientists to develop solutions, make discoveries, design action for sustainability, evaluate economic, social, cultural, and environmental impacts, offer valid explanation, and make reliable predictions.*
* *The use of scientific knowledge may have beneficial or unexpected consequences; this requires monitoring, assessment, and evaluation of risk, and provides opportunities for innovation.*

6. Investigation design.

Choose **one** of the following investigations, give a brief deconstruction, and design a logical, coherent and detailed method to test a hypothesis. Briefly annotate your design to justify the decisions you have made about materials, variables, measurements etc.

Design an experiment to obtain evidence to answer one of the following questions.

1. What is the best way to improve/enhance moisture retention in soil?

or

1. Are detergents labelled as “biodegradable” or “environmentally safe” actually better for the environment?

or

1. Can soil productivity be improved by adding bacteria?

Include:

* a hypothesis
* dependent and independent variables
* factors held constant (how and why they are controlled)
* factors that may not be able to be controlled (and why not)
* materials required
* the procedure to be followed
* the type and amount of data to be collected
* identification of ethical and safety considerations
* a blank data table
* annotations which justify decisions made about the design.

| - | Investigation, Analysis, and Evaluation | Knowledge and Application | |
| --- | --- | --- | --- |
| A | Critically deconstructs a problem and designs a logical and coherent biological investigation with detailed justification.  Obtains, records, and represents data, using appropriate conventions and formats accurately and highly effectively.  Systematically analyses and interprets data and evidence to formulate logical conclusions with detailed justification.  Critically and logically evaluates procedures and their effect on data. | | Demonstrates deep and broad knowledge and understanding of a range of biological concepts.  Applies biological concepts highly effectively in new and familiar contexts.  Critically explores and understands in depth the interaction between science and society.  Communicates knowledge and understanding of biology coherently, with highly effective use of appropriate terms, conventions, and representations. |
| B | Logically deconstructs a problem and designs a well-considered and clear biological investigation with reasonable justification.  Obtains, records, and represents data, using appropriate conventions and formats mostly accurately and effectively.  Logically analyses and interprets data and evidence to formulate suitable conclusions with reasonable justification.  Logically evaluates procedures and their effect on data. | | Demonstrates some depth and breadth of knowledge and understanding of a range of biological concepts.  Applies biological concepts mostly effectively in new and familiar contexts.  Logically explores and understands in some depth the interaction between science and society.  Communicates knowledge and understanding of biology mostly coherently, with effective use of appropriate terms, conventions, and representations. |
| C | Deconstructs a problem and designs a considered and generally clear biological investigation with some justification.  Obtains, records, and represents data, using generally appropriate conventions and formats, with some errors but generally accurately and effectively.  Undertakes some analysis and interpretation of data and evidence to formulate generally appropriate conclusions with some justification.  Evaluates procedures and some of their effect on data. | | Demonstrates knowledge and understanding of a general range of biological concepts.  Applies biological concepts generally effectively in new or familiar contexts.  Explores and understands aspects of the interaction between science and society.  Communicates knowledge and understanding of biology generally effectively, using some appropriate terms, conventions, and representations. |
| D | Prepares a basic deconstruction of a problem and an outline of a biological investigation.  Obtains, records, and represents data, using conventions and formats inconsistently, with occasional accuracy and effectiveness.  Describes data and undertakes some basic interpretation to formulate a basic conclusion.  Attempts to evaluate procedures or suggest an effect on data. | | Demonstrates some basic knowledge and partial understanding of biological concepts.  Applies some biological concepts in familiar contexts.  Partially explores and recognises aspects of the interaction between science and society.  Communicates basic biological information, using some appropriate terms, conventions, and/or representations. |
| E | Attempts a simple deconstruction of a problem and a procedure for a biological investigation.  Attempts to record and represent some data, with limited accuracy or effectiveness.  Attempts to describe results and/or interpret data to formulate a basic conclusion.  Acknowledges that procedures affect data. | | Demonstrates limited recognition and awareness of biological concepts.  Attempts to apply biological concepts in familiar contexts.  Attempts to explore and identify an aspect of the interaction between science and society.  Attempts to communicate information about biology. |

\*Note for teachers:

* Schools may have a subscription to New Scientist that enables students to log in and read the article online:

<https://www.newscientist.com/article/mg23130931-000-lets-harness-synthetic-biology-to-fix-our-broken-planet/>

* Other articles may be substituted for the article in this task and the questions suitable modified.