

# Biology 2019 v1.2

## Unit 1 sample assessment instrument

August 2018

### Student experiment

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

Schools develop internal assessments for each senior subject, based on the learning described in Units 1 and 2 of the subject syllabus. Each unit objective must be assessed at least once.

### Unit objectives

This assessment instrument is used to determine student achievement in the following objectives:

2. apply understanding of cells as the basis of life, and multicellular organisms
3. analyse evidence about cells as the basis of life, and multicellular organisms
4. interpret evidence about cells as the basis of life, and multicellular organisms
5. investigate phenomena associated with cells as the basis of life, and multicellular organisms
6. evaluate processes, claims and conclusions about cells as the basis of life, and multicellular organisms
7. communicate understandings, findings, arguments and conclusions about cells as the basis of life, and multicellular organisms.

**Note:** Objective 1 is not assessed in this instrument.

<b>Subject</b>	Biology		
<b>Technique</b>	Student experiment		
<b>Unit</b>	Unit 1: Cells and multicellular organisms		
<b>Topic</b>	Topic 1: Cells as the basis of life Topic 2: Multicellular organisms		
<b>Conditions</b>			
<b>Duration</b>	10 hours class time		
<b>Mode</b>	Written response — scientific report	<b>Length</b>	1500–2000 words
<b>Individual/group</b>	Group work with individual report	<b>Other</b>	—
<b>Resources available</b>	School science laboratory and library (online: internet and school intranet, databases, journals)		
<b>Context</b>			
<p>You have completed the following practicals in class:</p> <ul style="list-style-type: none"> <li>• Mandatory practical: Investigate the effect of surface area to volume ratio on cell size.</li> <li>• Mandatory practical: Prepare wet mount slides and use a light microscope to observe cells in microorganisms, plants and animals to identify nucleus, cytoplasm, cell wall, chloroplasts and cell membrane.</li> <li>• Mandatory practical: Investigate the effect of temperature on the rate of reaction of an enzyme.</li> <li>• Suggested practical: Measure outputs of photosynthesis and/or respiration using plants and/or yeast as examples.</li> <li>• Suggested practical: Investigate the effect of pH on the rate of reaction of an enzyme (e.g. catalase, lipase, amylase).</li> <li>• Suggested practical: Investigate the conditions necessary for photosynthesis, e.g. compare starch present in normal, variegated and de-starched leaves.</li> </ul>			
<b>Task</b>			
<p>Modify (i.e. refine, extend or redirect) an experiment in order to address your own related hypothesis or question.</p> <p>You may use a practical performed in class, a related simulation, or another practical related to Unit 1 (as negotiated with your teacher) as the basis for your methodology and research question.</p>			

**To complete this task, you must:**

- identify an experiment to modify\*
- develop a research question to be investigated\*
- research relevant background scientific information to inform the modification of the research question and methodology
- conduct a risk assessment and account for risks in the methodology\*
- conduct the experiment\*
- collect sufficient and relevant qualitative and/or quantitative data to address the research question\*
- process and present the data appropriately
- analyse the evidence to identify trends, patterns or relationships
- analyse the evidence to identify uncertainty and limitations
- interpret the evidence to draw conclusion/s to the research question
- evaluate the reliability and validity of the experimental process
- suggest possible improvements and extensions to the experiment
- communicate findings in an appropriate scientific genre, i.e. scientific report.

\* The steps indicated with an asterisk above will be completed in groups. All other steps must be completed individually.

**Stimulus**

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**Checkpoints**

- Term 2 Week 3: Select experiment and identify proposed modifications.
- Term 2 Week 4: Perform experiment and process data.
- Term 2 Week 6: Analyse and evaluate evidence.
- Term 2 Week 7: Submit draft.
- Term 2 Week 9: Submit final response.

**Feedback****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 drafts.
- Students will use plagiarism-detection software at submission of the response.
- Students must acknowledge all sources.
- The teacher will compare the responses of students who have worked together in groups.

## Scaffolding

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

- a research question
- a rationale for the experiment
- reference to the initial experiment and identification and justification of modifications to the methodology
- raw and processed qualitative and/or quantitative data
- analysis of the evidence
- conclusion/s based on the interpretation of the evidence
- an evaluation of the methodology and suggestions of improvements and extensions to the experiment
- a reference list.

### An example of how one of the practicals could be modified to develop a research question

**Practical that will be modified:** Investigate the conditions necessary for photosynthesis, e.g. compare starch present in normal, variegated and de-starched leaves.

**Research question:** Does a 2.0 mM concentration of carbon dioxide increase the photosynthetic rate of *Elodea* spp.?

### Developing the research question:

Description	Example
Identify the independent variable to be investigated	Concentration of carbon dioxide
Identify the dependent variable	Photosynthetic rate of <i>Elodea</i> spp.
Identify the methodology to be used	<a href="http://www.nuffieldfoundation.org/practical-biology/investigating-factors-affecting-rate-photosynthesis">www.nuffieldfoundation.org/practical-biology/investigating-factors-affecting-rate-photosynthesis</a>
Draft research questions	Does carbon dioxide affect the rate of photosynthesis in aquatic plants?
Refine and focus the research question	Does a set concentration of carbon dioxide affect the photosynthetic rate of <i>Elodea</i> spp.?
Present research question to teacher for approval	Does a 2.0 mM concentration of carbon dioxide increase the photosynthetic rate of <i>Elodea</i> spp.?

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