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| [Image result for bremer state high school](https://www.google.com.au/url?sa=i&rct=j&q=&esrc=s&source=images&cd=&cad=rja&uact=8&ved=2ahUKEwjzzLSt_ZjeAhWCfH0KHfHdDC8QjRx6BAgBEAU&url=https://en.wikipedia.org/wiki/Bremer_State_High_School&psig=AOvVaw36FBqkF7pdP4_-0RJmVO0X&ust=1540260957498250) | **Bremer State High School** | |
| **Student Name:** | |
| **Teacher Name:** Mx Muller / Ms Taggart | |
| **Draft Due: 28/05/2025 at 9am** (week 6) | **Final due: 13/06/2025 at 9am** (week 8) |

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| **Subject** | | Biology | | **Instrument no.** | | FIA2 |
| **Technique** | | Student Experiment | | | | |
| **Unit** | | Unit 1: Cells and multicellular organisms | | | | |
| **Topic** | | Topic 2 – Exchange of Nutrients and Waste | | | | |
| **Conditions** | | | | | | |
| **Duration** | 10 hours class time | | | | | |
| **Mode** | Written response (scientific report) | | **Length** | | 1500 – 2000 words | |
| **Individual / group** | Group work with individual report | | **Other** | |  | |
| **Resources available** | * School science laboratory and library * Online: internet and school intranet, databases, journals | | | | | |
| **Context** | | | | | | |
| You have completed the following practicals in class:   * Mandatory practical: Investigate the effect of temperature on the rate of reaction of an enzyme. | | | | | | |
| **Task** | | | | | | |
| Modify (i.e. refine, extend or redirect) an experiment in order to address your own related hypothesis or question. 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. | | | | | | |
| 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. | | | | | | |

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| **Checkpoints** |
| ☐ Term 1 Week 5: Select experiment and identify proposed modifications. |
| ☐ Term 1 Week 6: Perform experiment and process data. |
| ☐ Term 1 Week 6: Analyse and evaluate evidence. |
| ☐ Term 1 Week 7: Submit draft. |
| ☐ Term 1 Week 9: Submit final response. |
| **Assessment 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. |
| **Authentication strategies** |
| • 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. |

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| **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 *Elodea* spp. | | Identify the methodology to be used | [www.nuffieldfoundation.org/practical-biology/ investigating-factors-affecting-rate-photosynthesis](http://www.nuffieldfoundation.org/practical-biology/investigating-factors-affecting-rate-photosynthesis) | | 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 *Elodea* spp.? | | Present research question to teacher for approval | Does a 2.0 mM concentration of carbon dioxide increase the photosynthetic rate of *Elodea* spp.? |   **Note:** You cannot use this sample research question for your experiment. |

# Instrument-specific marking guide (ISMG)

### Criterion: Forming

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| **The student work has the following characteristics:** | **Marks** |
| * a considered rationale for the experiment * justified modifications to the methodology * a specific and relevant research question * a methodology that enables the collection of sufficient and relevant data * appropriate use of genre and referencing conventions | 4 - 5 |
| * a reasonable rationale for the experiment * feasible modifications to the methodology * a relevant research question * a methodology that enables the collection of relevant data * use of basic genre and referencing conventions | 2 - 3 |
| * a vague or irrelevant rationale for the experiment * inappropriate modifications to the methodology * an inappropriate research question * a methodology that causes the collection of insufficient and irrelevant data * inadequate use of genre and referencing conventions. | 1 |
| * The student response does not match any of the descriptors above. | 0 |

### Criterion: Finding

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| **The student work has the following characteristics:** | **Marks** |
| * considered management of risks/ethical issues/environmental issues * collection of sufficient and relevant raw data * fluent and concise use of scientific language and representations | 4 – 5 |
| * management of risks/ethical issues/environmental issues * collection of relevant raw data * competent use of scientific language and representations | 2 – 3 |
| * inadequate management of risks/ethical issues/environmental issues * collection of insufficient and irrelevant raw data * simplistic use of language and representations. | 1 |
| * The student response does not match any of the descriptors above. | 0 |

### Criterion: Analysing

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| **The student work has the following characteristics:** | **Marks** |
| * + correct and relevant processing of data   + thorough identification of relevant trends/patterns/relationships   + thorough and appropriate identification of the uncertainty and limitations of evidence | 4 – 5 |
| * + basic processing of data   + identification of obvious trends/patterns/relationships   + basic identification of uncertainty and/or limitations of evidence | 2 – 3 |
| * + basic processing of data   + identification of obvious trends/patterns/relationships   + basic identification of uncertainty and/or limitations of evidence | 1 |
| * The student response does not match any of the descriptors above. | 0 |

### Criterion: Interpreting and Evaluating

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| **The student work has the following characteristics:** | **Marks** |
| * + justified conclusion/s linked to the research question   + justified discussion of the reliability and validity of the experimental process   + suggested improvements and extensions to the experiment that are logically derived from the analysis of evidence | 4 – 5 |
| * + reasonable conclusion/s relevant to the research question   + reasonable description of the reliability and/or validity of the experimental process   + suggested improvements and/or extensions to the experiment that are related to the analysis of evidence | 2 – 3 |
| * + inappropriate or irrelevant conclusion/s   + cursory or simplistic statements about the reliability and validity of the experimental process   + ineffective or irrelevant suggestions. | 1 |
| * The student response does not match any of the descriptors above. | 0 |