**Stage 1 Biology**

**Deconstruct and Design – Photosynthesis** Underwater

**Introduction:**

Photosynthesis is the biochemical process by which green plants and microbes manufacture food (sugars). They need **carbon dioxide** from their environment (in the air or dissolved in water) and **water** as crucial reactants in the process. **Light** is also essential and is captured by chlorophyll which combines the carbon dioxide and water to produce glucose and oxygen gas.



The **glucose** produced may then undergo various reactions with other minerals and molecules to produce other sugars and carbohydrates, proteins, and fats.

The **oxygen** produced is critical to all life that depends on using oxygen for aerobic respiration (like you!).

Without photosynthesis, much of life on  would not be able to exist.

Research into photosynthesis, and the factors that affect it, is important for many industries and disciplines of science including agriculture, forestry, horticulture, biomass energy production, ecology, and environmental sciences.

Typically, we usually think of photosynthesis as taking place in terrestrial (land based) organisms like grasses or trees. However, more than half of the **oxygen** you breath in your lifetime comes from organisms that photosynthesize *under water* – mostly in **marine** environments or in **aquaculture**! Photosynthesis in underwater organisms is an important area of study that you will need to design an investigation around starting with the overarching question:

**Overarching Question:**

What factors affect the rate of photosynthesis in *underwater* organisms?

**Task:**

**Part A – Deconstruct the Question**

You will need to deconstruct (break down into key elements) the overarching question provided to develop a specific question you want to design an investigation into. This section requires you to *ask questions about the question* – research and brainstorm the different elements of this overarching question that could be investigated.

You will justify the specific choices that you make to design the investigation in Part B – specifically your choice and justification of the:

 Independent variable

 Dependent variable (including units)

* Method of measuring the dependent variable

 Controlled variables

 Uncontrolled variables

**Part B – Design an Investigation**

You will need to design an investigation to test the effect of ONE **factor** on the rate of a SPECIFIC underwater photosynthetic organism.

You will need to clearly identify your…

 Aim (final refined question that includes your chosen factor, etc.)

For example:

How does \_\_\_\_\_\_\_\_\_\_\_\_\_\_ affect the rate of photosynthesis in \_\_\_\_\_\_\_\_\_\_\_\_\_?

 Hypothesis

Independent variable

Dependent variable

Controlled variables

Uncontrolled variables

You will need to outline and justify your…

Materials (dot point list)

Method (numbered steps)

* For each step you should justify any choices/materials/amounts, etc.

**Annotate your deconstruction and** design to justify the decisions you have made about such things as the organism you have chosen, the independent and dependent variables, how and why you will control other variables, number of trials, measurements. \*Use a different colour of text to show your thinking/reasoning/justification.

You will need to make up a results table that could be used to record data.

* Ensure column and row headings and units
* Ensure 3 trials and an average can but placed in

**Assessment Conditions:**

**Performance standard** IAE 1

**Time in class** One 45 min lesson supervised.

**Requirements:** Minimum font size = 11

Maximum page length = 4x A4 pages

Referencing – only points from your research on specific information that relates (use footnotes for this); keep this to a minimum – about 2-3 references at most. \*HARVARD referencing style

**Key things that are being looked for:**

* Clear annotations that demonstrate your reasoning and thinking through
* Indication of your research questions and your findings
* Good to use a table to considering different aspects of the question when you deconstruct.
* Be clear on your variables – and explain what they do in the investigation and how they may impact data
* Justify decision you make when coming up with your ‘best’ method – why, etc.
* Justify materials and each method step clearly
* How you will measure results quantitatively and how you will record them
* Detail in method and materials. I.e. “Sugar” = is not detailed. State the type, brand, all volumes and measurements and units, etc.
* The ‘design’ part of this is really important to do well (so is the ‘deconstruct’) ☺

