Stage 1 Biology

**Deconstruct & Design**

Summative Completion Practical & Deconstruct and Design

PART B – Deconstruct & Design

Factors that Affect the rate of Cellular Respiration

**Assessment: IAE 1**

**One 45 min lesson supervised.**

**Requirements:**

* Minimum = size 11 font
* Maximum = 4x A4 pages
* Referencing – only points from your research on specific information that relates (use footnotes for this)

## **Deconstruct and Design Task:**

## **Effect of a factor on the rate of cellular respiration.**

## Introduction and Purpose of Task:

Each individual cell is responsible for the production and use of energy in order function and stay alive. Cells accomplish this task by breaking down nutrient molecules (such as glucose) to generate ATP (adenosine triphosphate), which can then be used to enable cellular processes that require energy to occur.  This process is called cellular respiration. Respiration may occur in the absence (anaerobic) or presence (aerobic) of oxygen.

Measuring the rate of cellular respiration can either rely on measuring the volume/amount of oxygen taken in, or the volume/amount of carbon dioxide being released.   There are numerous techniques, types of equipment or methods that can be used to measure respiration.

Your task is to design an investigation to test the effect of a factor on the rate of cellular respiration in an organism, to investigate the question, *What factors affect the rate of ATP production (respiration) in cells*?

You will need to do research and determine what type of organism could be used (consider safety, the ethics, ease of working with the organism) and what method of measurement will be used to test your hypothesis.

To deconstruct this problem, you may need to consider the various aspects of this question including but not limited to: type of organism (e.g. algae, meal worms, yeast), what factors effect respiration, how to measure respiration, equipment that could be used, anaerobic or aerobic respiration, other variables. ASK questions about the question, show what you find, and then make your decisions (showing your justification).

1. *Deconstruct a problem:*

Brainstorm the various aspects of the question: *What factors affect the rate of ATP production (respiration) in cells?*

A table may be an appropriate way to organise your thinking and ideas. Using numerous sources research the questions about the key question. Record what you find and show your thinking behind what you finally decide/choose. SHOW ME YOUR FINDINGS AND YOUR THINKING/SELECTION PROCESS!

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Considerations | Aspects of the Question:  *What factors affect the rate of ATP production (respiration) in cells?* | | | | |
| type of organism | type of respiration | Method options | Measurement of respiration | Other variables |
| Options |  |  |  |  |  |
| Questions to research |  |  |  |  |  |
| Findings: |  |  |  |  |  |
| Possible Limitations |  |  |  |  |  |

1. *Design*:

Design an **experiment** to test the effect of one factor on the rate of cellular respiration. You will need to determine your independent and dependent variable, as well as relevant controlled variables to do this effectively. In the end you should get an aim like this to design your experiment around:

**Aim:**

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

In your design include all details required to undertake a reliable and valid experiment. You must also consider the ethical and safety aspects of this experiment.

* 1. Aim
  2. Variables, measurement of the dependent variable, one independent variable, constant variables
  3. Hypothesis
  4. Materials and Equipment required
  5. Method suitable to test the hypothesis
  6. Blank data table – be clear on what you measure; how you measure; what data you might get; how many trials you will conduct; an average column, 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.

**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’) ☺

The more successful responses for the deconstruct and design commonly:

* provided detailed evidence of their deconstruction within the maximum of four sides of an A4 page (IAE1/KA4)
* constructed hypothesises using appropriate scientific conventions rather than forms such as: “I guess that X will happen” or “The reaction will increase as the temperature rises because there is an increase in kinetic energy and velocity resulting in molecules reaching the activation energy and increasing the reaction of the enzyme.” (IAE1)
* provided an individual, creative, and thoughtful deconstruction of a problem for which the **outcome was uncertain**. (IAE1)
* from their deconstruction, developed a clear, logical design to investigation one aspect of the problem in which a single variable was manipulated (IAE1)
* produced a design which included a detailed list of materials and a method in a well-structured format and with sufficient detail that it could be implemented without further information. There were also justifications for the materials chosen and the method suggested. For example, reasons for choosing a particular range of pHs, or a specific number of samples for each concentration of plant hormone. (IAE1)
* identified factors which could not be controlled and why they could not be controlled (IAE1/KA4)
* included a blank data table with correct columns and headings (including units) that could be used to record the data collected. This provides evidence of both an understanding of sample size, measurement to be made and representation of data (IAE1/IAE2)
* made it clear where the four A4 pages of their deconstruction and design finished and where the report on their investigation began

**Class Discussion:**

**Overall Question:**

*What factors affect the rate of ATP production (respiration) in cells?*

**Deconstruct**

**Design**

*Design an experiment to address the refined/narrowed down question:*

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