## **Stage 2 Nutrition – Assessment Type 1: Investigation Folio Task**

## **Topic 1: Principles of nutrition, physiology, and health**

## **Practical Completion task: Carbohydrate absorption**

**Introduction and Purpose of Task**

Digestion is the physical and chemical breakdown of macromolecules into mono units so that they can be absorbed by the villi into the blood stream. The rate at which carbohydrates are digested into mono units and absorbed will determine it GI. Food with a low GI are absorbed more slowing than foods with a high GI.

Type II diabetics use this information to select foods that are slower to be absorbed by the body to control their blood glucose levels. Foods with a low GI are preferred over foods with a high GI. The less processed a food is the more complex its carbohydrate content.

Aim

To investigate the absorption rate of a monosaccharide (glucose), disaccharide (sucrose), and polysaccharide (starch).

**Part A: Design** (IAE1) Formative

1. Design an experiment to test one factor that could determine:

How effective are digestive enzymes supplements?

In the design include all details required to undertake a reliable and valid experiment. The safety aspect of the experiment must also be considered. Reference the information appropriately. **Your design should not mirror the following method being used and be approximately 3 to 4 A4 pages (single sided) in length.** Remember to justify the method were appropriate

1. Variables of the experiment
2. Independent variable for the experiment
3. Measurement of the dependant variable for the experiment
4. Controlled/constant variables of the experiment
5. Identify which variables could not be controlled and discuss why not
6. The hypothesis for the experiment
7. Materials and equipment required
8. Method suitable to test the hypothesis
9. Identify the type and amount of data to be collected
10. Draw an appropriate table that will be used to record the data being collect

This write up will be/could be conducted in class under supervision and handed up at end of the lesson.

**Part B: Practical Completion**

1. In groups undertake the following experiment designed, to test the ‘digestion’ and ‘absorption’ of glucose, sucrose, and starch in solution. The practical design has been chosen, based on equipment availability and feasibility.
2. In groups of 3 or 4 complete the experiment and record the data in an appropriate results table(s).
3. Collect data from other groups to increase sample size of the test under investigation.
4. Write the report, with the discussion component focused on the data collected.

**Materials**

1% starch suspension (corn flour) Beaker amylase powder

1% sucrose solution Test tubes thermometer

1% glucose solution Pipette Scissors

Distilled water Iodine solution Benedict’s solution

Water bath or Bunsen burner Dialysis tubing and thread

**Method**

1. Close one end of the 15cms dialysis tubing by tying it up tightly using a piece of thread.
2. Using a syringe fill the dialysis tubing with a 1% glucose solution.
3. Once filled seal the other end of the dialysis tubing using the piece of thread.
4. Rinse the outer surface of the dialysis tubing by placing it under running water.
5. Place the dialysis tubing in a large test tube (volume) filled with distilled water.
6. Place the test tube with the dialysis tubing in a water bath set at 370C.
7. Using a pipette immediately remove two samples of the distilled water from the test tube.
8. With one sample of distilled water test with iodide solution to determine the presence of starch.
9. With the second sample of distilled water test with benedict solution to determine the presence of glucose.
10. Repeat both tests at 10-minute intervals for 30 minutes.
11. Repeat steps 1 to 10 placing a 1% sucrose solution in the dialysis solution.
12. Repeat steps 1 to 10 placing a 1% starch suspension in the dialysis solution.
13. Repeat steps 1 to 10 for 1% glucose solution, 1% sucrose solution and 1%starch suspension a further two times to verify the data collected.
14. Replicate steps 1 to 10 for 1% glucose solution, 1% sucrose solution and 1%starch suspension to increase the sample size of the data collected.
15. Record and collate the data in a suitable table.
16. Using a suitable graph, present the data

Reference: Gan Wan Yeat, (2007). *Success* *Biology SPM.* Malaysia Oxford Publications.

1. Make a 5% amylase solution by dissolving 1 gram of amylase powder in 20mls of distilled water at 250C
2. Repeat steps 1 to 10 for 1% glucose solution, 1% sucrose solution and 1%starch suspension with 2mL of the amylase solution added to the dialysis tubing.
3. Replicate steps 1 to 10 with the added amylase solution to increase the sample size of the data collected.
4. Record and collate the data in a suitable table.
5. Using a suitable graph, present the data.

**Note:** *Glucose levels in the solution can be tested with Benedict solution (cheaper), refractometer, glucose metre, or multistix (expensive).*

*This design has not actually been tested hence it cannot be validated at the present time.*

**Results**

**Table 1: Testing absorption of glucose, sucrose and starch in solution (without amylase)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Dialysis tubing in test tube** | **Enzymes** | **Water bath temperature** | **Recording time of dialysis tubing in test tube** | | | |
| **0 mins** | **10mins** | **20mins** | **30mins** |
| Glucose | Absent | 370C |  |  |  |  |
| Sucrose | Absent | 370C |  |  |  |  |
| Starch | Absent | 370C |  |  |  |  |

**Table 2: Testing absorption of glucose, sucrose and starch in solution (with amylase)**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Dialysis tubing in test tube** | **Enzymes** | **Water bath temperature** | **Recording time of dialysis tubing in test tube** | | | |
| **0 mins** | **10mins** | **20mins** | **30mins** |
| Glucose | Present | 370C |  |  |  |  |
| Sucrose | Present | 370C |  |  |  |  |
| Starch | Present | 370C |  |  |  |  |

***Note:*** *Ideally it would be the students who construct the tables to record that data collected and determine the most suitable graph to use.*

*Also, the safety assessment should be completed before the practical is conducted*

**PART C: Safety Assessment**

You need to provide an overall hazard assessment and then identify potential hazards and provide advice on the safe operating procedure to avoid the hazard from causing an issue in the laboratory.

**Safety Assessment: Sucrose concentration practical (IAE2) *prior to practical***

|  |  |
| --- | --- |
| **Identified hazards** | **Suggested safe operating procedures** |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

**Risk assessment**

I consider the inherent level of risk (risk level without control measures) to be:

|  |  |  |  |
| --- | --- | --- | --- |
| low risk | medium risk | high risk | extreme risk |

**Control measures**

Where the level of risk is ‘low risk’, ‘medium risk’, ‘high risk’, or ‘extreme risk’ the following control measures will be employed.

|  |  |  |  |
| --- | --- | --- | --- |
| safety glasses | gloves | lab apron | Fume cupboard |

**PART D: The Investigation Report (individual report)**

The investigation report needs to be an individual report

Aspects in bold font are **included** in the word count of the report.

*Write a report, using appropriate and effective nutritional language, of this investigation in which you include each of the following sections.*

1. **An appropriate introduction which introduces the theory behind the practical. Reference any information sources and diagrams used.**
2. **Aim: What is the purpose of the experiment?**
3. PART A: Design component (FORMATIVE approximately 3 to 4 A4 pages 1 sided)

Hypothesis and identification of all the variables

Materials and method written in present tense, with Safety considerations

Reference list (Harvard Referencing System)

1. PART B: Completion component

**Hypothesis suitable to the experiment that was undertaken**

Method rewritten in past tense

Results table(s) and graph(s)

1. **Discussion which includes** **analysis of data, identifying trends and linking results to concepts. Evaluation of procedures and data and identifying sources of uncertainty and its effect on the data.**
2. **Conclusion** **with justification,** **(identified** **appropriate limitations of the conclusion based on the method used and results obtained).**

**Assessment conditions for the task**

Class time will be given to complete the individual design of a possible investigation (formative task approximately 3 to 4 A4 pages 1 sided).

A double lesson will be given to undertake the completion practical in groups. Each student to submit an individual practical report.

Students may submit one draft for feedback, due one week after the experiment is completed.

Word count: **Maximum of 1500 words** for the introduction, analysis, evaluation and conclusion sections of the report.

**Note:** *The individual design should be attached to the report as an Appendix (not part of the word count for this practical).*

Performance Standards for Stage 2 Nutrition

| - | Investigation, Analysis, and Evaluation | Knowledge and Application |
| --- | --- | --- |
| A | Critically designs and conducts investigations using appropriate methodologies with detailed justification.  Obtains, records, and displays findings of investigations, using appropriate conventions and formats accurately and highly effectively.  Systematically analyses and interprets data and/or information to justify logical conclusions.  Critically and logically evaluates methodologies and/or research processes and their effect on data or findings. | Demonstrates deep and broad knowledge and understanding of a range of nutrition concepts.  Applies nutrition concepts highly effectively in familiar and unfamiliar contexts  Critically explores and understands the relationship between nutrition science and society.  Coherently and clearly communicates nutrition concepts and nutrition literacy and numeracy. |
| B | Logically designs and conducts investigations using appropriate methodologies with reasonable justification.  Obtains, records, and displays findings of investigations, using appropriate conventions and formats mostly accurately and effectively.  Analyses and interprets data and/or information to justify reasonable conclusions.  Logically evaluates methodologies and/or research processes and their effect on data or findings. | Demonstrates some depth and breadth of knowledge and understanding of a range of nutrition concepts.  Applies nutrition concepts mostly effectively in familiar and unfamiliar contexts.  Logically explores and understands the relationship between nutrition science and society.  Mostly coherently and clearly communicates nutrition concepts and nutrition literacy and numeracy. |
| C | Designs and conducts investigations using appropriate and clear methodologies with some justification.  Obtains, records, and displays findings of investigations, using appropriate conventions and formats, with some errors but generally accurately and effectively.  Interprets data and/or information to justify generally appropriate conclusions.  Evaluates methodologies and/or research processes and some of their effect on data or findings. | Demonstrates knowledge and understanding of a general range of nutrition concepts.  Applies nutrition concepts generally effectively in familiar and unfamiliar contexts.  Explores and understands aspects of the relationship between nutrition science and society.  Generally coherently and clearly communicates nutrition concepts and nutrition literacy and numeracy. |
| D | Prepares and conducts investigations using some appropriate methodologies.  Obtains, records, and displays findings of investigations, using appropriate conventions and formats inconsistently, with occasional accuracy and effectiveness.  Describes data and/or information to formulate basic conclusions.  Attempts to evaluate methodologies and/or research processes and suggest an effect on data or findings. | Demonstrates some basic knowledge and partial understanding of nutrition concepts.  Applies some nutrition concepts in familiar contexts.  Partially explores and recognises aspects of the relationship between nutrition science and society.  Clearly communicates some nutrition concepts and nutrition literacy and numeracy. |
| E | Attempts to prepare and conduct investigations using simple methodologies.  Attempts to record and represent some data, with limited accuracy or effectiveness.  Attempts to describe data and/or information and formulates a simple conclusion.  Acknowledges that methodologies and/or research processes affect data or findings. | Demonstrates limited recognition and awareness of nutrition concepts.  Attempted to apply nutrition concepts in familiar contexts.  Attempts to explore and identify an aspect of the relationship between nutrition science and society.  Attempts to communicate nutrition concepts and nutrition literacy and numeracy. |