**ATAR Human Biological Science**

Practical Task and Report Criteria – Transport across the Cell Membrane

Name: Date: **TOTAL: /38**

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| --- | --- | --- |
| **Component : Planning** | **Score** | **Comment** |
| Report Format | /3 | 1- some kind of organised report, lacking in detail  2- detailed report, quite well presented  3- highly detailed report, all sub-headings, easy to follow, correct format |
| Hypothesis | /2 | 0- simple suggestion/statement but not hypothesis (only one solution mentioned)  1- simple hypothesis, minor error  2- Succinct if and then hypothesis eg If the concentration of sugar solution is increased then the potato will loss more mass. |
| Variable | /3 | 1- both independent and dependent stated, no explanation/no details how or why  2- both stated correctly with details eg change the sugar solution concentration – 0%, 5%, 10%, 15%, 20%  3- both stated correctly, with details (range & how measure) |
| Controlled variables | /3 | 1- controlled variables stated but not explained eg amount of solution (must have min 3)  2- controlled variables stated and explained eg amount of solution, 100ml  3- controlled variables stated, explained and stated why needs controlling eg as 2 plus eliminates an chance of differences in rates of osmosis cause by different amounts of solution. Explained how minimise effect of uncontrolled variable |
| Planning | /7  (4 – method  3- data collection) | 1- limited summary of method  1- way data collected implied  2- sequences method with some errors  2- data collection identified, and feasible  3- sequenced method, all main details with minor error, easily repeated, variables included  3- data collection method specific, allowing for accuracy and reliability of data collected– all aspects covered and how process data eg weighing before and after, drying before weighing, how many decimal points for accuracy  4- method is sequenced, functional, all detailed included and no errors, (all variables covered and how controlled eg dry potato before weighing) |
| **Data, analysis & conclusion** | [20] |  |
| Data processing | /3 | 1- raw data collected and presented in a basic table  2- raw data organised, presented in a table and some processing/averaging  3- raw data organised in a table with headings – units in heading only, averages calculated %mass increase calculated (outliers must be identified if they exist) |
| Graphing | /3 | 1- draws a line graph of data, some errors  2- draws an appropriate line graph, (all six points of graphing technique covered – title, scale, units, axis headed, points plotted accurately, positive and negative scale )  3- as for “2” but must be a graph of %mass increase or decrease, line must cross axis to indicate water conc of potato. |
| Analysis and Evaluation | /12 | Trends and patterns in the data are described. (total = 4)   * Need to describe in high concentration water mass increases, in low concentration water mass decreases and a point where no increase or decrease, plus identification of levelling off as reach limits of loss or gain (equilibrium in concentration gradient) Need to mention concentration gradient for full marks.   Science knowledge and understanding is used to explain the results. (total = 6)   * Link to osmosis (including correct definition / description) (1) * Concentration gradient set up in sugar solutions and resultant movement of water described in each beaker (3) * Naming of concentration where equilibrium has been reached with reference to their graph/fries (must state it is where lines intersect (2)   Reliability and Validity   * States what makes it reliable/unreliable or viable (1) * Explains why the example makes it unreliable/not valid (1)   or explains how a source of error could be minimised and how this would have affected the results |
| Conclusion | /2 | 1 - Results related to the hypothesis  2 - what results were and how they related to the hypothesis and whether it was supported or refuted |
| **Total** | **/38** |  |

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**Teacher Guidelines:**

**Timing:**

Part A: Students are to be given page 1 of this task separately. They are to complete this section in 1 hour, individually, in silence on separate lined paper. Part A is to be collected by the teacher at the end of 1 hour.

Part B: Students are to be given page 2 of this task during the second lesson. They should be given 30 minutes to set up their experiment (more if needed due to access to balances) They are permitted to work in groups of 4. Students will need to record their initial weight and final weight on page 2 (in raw format) Teachers are to collect this page between initial and final weighings. Students should be given 30 minutes of the following lesson to reweigh their potatoes and record results

Part C: Students are to be given 1 hour to complete Part C in silence. Students are permitted to keep Part B on their desk while completing Part C. Teachers will also need to supply lined paper for students to write their analysis and discussion

**Context/setting:**

Students are expected to carry out an investigation using potato cells as living material to illustrate the process of osmosis.

Students will need considerable practice at developing investigations: to plan, carry out, record, process and interpret data; develop a conclusion; discuss biological concepts and processes relating to the investigation (i.e. what the investigation showed about the concept or process), and evaluate the investigation.

This investigation involves the manipulation of variables (fair test) .

The investigation is to be carried out with teacher *supervision* by giving the students guidelines for the investigation.

It is expected that students will work through the complete investigation process and will have opportunity to make changes to their initial method as they carry out the investigation .

**Conditions:**

**Task 1 :** To be completed individually – hand in work to be marked

**Task 2** : To be completed as a group

**Task 3 :** To be completed individually.

### Resource requirements:

Potatoes, knives, water, weighing balance, containers, lids, gladwrap, paper towels, a range of sugar solutions (see below), normal lab equipment e.g. measuring cylinders.

Sugar solutions that students can make up as follows:

0% = water

5%= 25g sugar in 500 ml water

10%= 50 g sugar in 500 ml water

15%= 45 g sugar in 500 ml water

20%= 100 g sugar in 500 ml water

**Additional information:**

To gain B and A students need to **discuss and evaluate** the investigation. In the discussion they need to show understanding of how and why osmosis occurs and be able to relate this to their results by discussing what their results (ie gain of mass and loss of mass) show. In the evaluation they must show understanding by discussing how they ensured that the method they used was **valid and reliable** ie how sources of errors were minimised, limitations overcome, how bias (the lack of objectivity when carrying out the investigation) was removed and how they know they gathered sufficient data.