**IB Foundation Years (9 & 10) Lab Report**

**1) Writing a fully focused research question**

o Must include the range of the independent variable with units

o Must include the dependent variable

o Method of measuring the dependent variable

*What is the effect of temp (0,25,40) on the permeability of the membrane of the dye found in the beetroot measured by the absorption by the color meter.*

1. **Scientific background** 
   * Research your independent variable
   * Research its effect on your dependent variable
   * Research the method of measuring the dependent variable
   * Include citation

*Temperature plays a vital role in plant physiology, influencing processes like nutrient uptake and pigment accumulation. This experiment focuses on examining how temperature affect dye accumulation found in beetroots, which represents plant pigments like Betalains, responsible for their vibrant colors. By studying the impacts of temperature on dye accumulation. We can gain valuable insights into the mechanism of pigments synthesis and potentially improve crop cultivation techniques. The color meter was used to detect the absorption of the pigment*

1. **Hypothesis:** Outline a hypothesis to predict the outcome of the experiment and

explain it using logical scientific *reasoning (what do you think is going to happen*

*As the temperature increases the permeability of the membrane increases, which causes the dye to diffuse, the increase affects absorption using the color.*

**Scientific explanation for hypothesis**   
  
*The fluidity of the lipid bilayer that makes up the cell membrane, which is composed of proteins embedded in a lipid bilayer, is influenced by temperature.*

*The membrane's increased permeability makes it easier for chemicals, like the dye, to diffuse through the membrane. The movement of molecules from a region with a greater concentration to one with a lower concentration is known as diffusion.*

A color meter can be used to find and quantify the dye molecules as they leave the cell.

Because:

1. **Manipulating the variables:**

**What is your independent variable ?**

* What are the units ?
* How will it be changed stating the instruments that you will be using
* Will you be doing a control experiment ?
* Why did you choose this range ?

**Discuss your dependent variable [ the method of measurements + units+ time frame]**

|  |  |  |
| --- | --- | --- |
| **Controlled Variable** | **How will you keep this controlled? Stating the values and the equipment that you will be using** | **How could it affect your results if not controlled?** |
| Temperature used for each trial: (0,25,40) °C | By using test tubes and inserting them in water baths &ice baths. | Different temperatures lead to different amounts of pigments to diffuse (because as the temperature increases the permeability of the membrane increases), we should keep the temperature stable to get the same final result |
| time | We used a stopwatch and timed it for 5 minutes for each trial | If we didn’t control the time, it will lead into different results since the color will diffuse in a different shade and we will not have an accurate result |
| Same size / type of beetroot | We used a cork borer to get the same size of beetroot, all trial pieces were taken from the same beetroot | If we used different sizes of beetroot we would end up with different results since a bigger size of beetroot will contain more pigment than the others and this will ruin the results of the experiment. |

1. **Materials and Method**:

State your materials [ number needed + units] (Be descriptive, example: 10cm3 graduated cylinder) include the uncertainties for each piece of apparatus

**Method: What are the steps of the investigation?**

* A cork borer was used to cut even sizes of beetroot (3cm)
* Each piece of beetroot was placed in a different test tube (three test tubes) with distilled water
* We put one test tube in a water bath with a temperature of 40℃, one in an ice bath with a temperature 0℃ and one in room temperature (25℃)
* Each test tube was left in the required water bath temperatures and was kept in for 5 minutes
* We drained the pigmented water into new test tubes we measured each test tube in the color meter for different results since each one was a slightly a different red shade.

1. **Safety, Ethical and Environmental issues**

1. Care must be taken to handle the raw beetroot sample to prevent spillage of the red beetroot color.

2. The knife is handled carefully because if it is not, the sharp edges could cause serious harm to the user.

3. To get the average reading, the readings for the solutions' absorbance are taken three times.

4. The spectrophotometer's setting is left alone once it has been adjusted to read zero absorbance for clear water.

This is done to make sure that the readings are fairly accurate.

5. Prior to adding the solutions from the test tubes, the cuvettes are thoroughly cleaned with distilled water.

Environmental safeguards

Waste Disposal: To avoid contaminating the environment, dispose of chemical waste, used materials, and biological substances in accordance with recognized protocols and regulations.

Recycling and Reuse: To reduce waste production, whenever possible, think about recycling or reusing the items used in the experiment.

Practice careful energy and resource consumption to conserve energy and resources.

1. **Results**

**Add a table for qualitative results e.g. Variation within the organism/biological material being are dealt with; Color, texture, shape, size, heat changes; Anything you notice that might affect results.**

**Raw Data**

* Construct a table to add your raw data , add a fully detailed title to your table .
* Label your table ( table 1, table 2…)
* Add suitable headings with units and uncertainties to your table.
* Unify your decimal points

Table 1

|  |  |
| --- | --- |
| Temperature (c) | Absorbance |
| 0 degrees | 0.49 absorbance |
| 25 degrees | 0.45 absorbance |
| 40 degrees | 0.46 absorbance |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | |  |  | | --- | --- | | Temperature ( c ) | Observation | | 0 degrees | Lightest shade of red since the temperature is the coldest | | 25 degrees | It was a bit darker than the 0 Celsius red shade since the temperature is warmer than the 0℃ | | 40 degrees | Darkest of all trials because as the temperature increase the shade of color increases |   **Processed data**   * Justify the reason for data processing * Add screenshots from excel to provide evidence for your work, or provide a sample calculation * Construct a table to add your results * Add a title for your table and label it * Unify your decimal points |