**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

In plants, temperature has a significant impact on physiological processes like food intake and pigment accumulation. In this experiment, the temperature effect on dye accumulation in beetroots, which represent plant pigments like betalains that give them their vivid hues, will be investigated. by investigating how temperature affects dye agglomeration. Understanding the mechanism of pigment creation will help us develop more effective crop cultivation methods. The pigment absorption was determined using the color meter.

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*

*The permeability of the membrane increases with temperature, causing the dye to disperse and changing how the color is absorbed.*

**Scientific explanation for hypothesis**   
  
*Temperature affects the fluidity of the lipid bilayer that makes up the cell membrane, which is made up of proteins encased in a lipid bilayer.*

*Chemicals, including the dye, can permeate through the membrane more easily due to its higher permeability. Diffusion is the movement of molecules from one area of higher concentration to another of lower concentration.*

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 ? Celsius, cm
* How will it be changed stating the instruments that you will be using
* Will you be doing a control experiment ? yes
* Why did you choose this range ? it was given to us by the teacher

**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?**

* Beetroot (3 cm) was sliced into uniform sizes using a cork borer.
* Three test tubes containing distilled water were used for the three pieces of beetroot.
* We placed one test tube in a water bath that was 40°C, one in an ice bath that was 0°C, and one in a room temperature (25°C) environment.
* Each test tube was maintained for 5 minutes at the appropriate water bath temperatures.
* Because each test tube had a slightly different shade of red, we drained the dyed water into fresh test tubes and measured each one using a color meter to get distinct findings.

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

1. To avoid spilling the red beetroot color, the raw beetroot sample must be handled carefully.

2. Because of the potential for significant injury from the sharp edges, the knife is handled carefully.

3. The readings for the solutions' absorbance are taken three times in order to obtain the average value.

4. Once the spectrophotometer has been tuned to read zero absorbance for clear water, the setting is left alone.

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

5. The cuvettes are properly cleaned with distilled water before adding the test tube solutions.

Environmental safeguards

Waste Disposal: Dispose of chemical waste, used materials, and biological substances in accordance with accepted norms and standards to prevent harming the environment.

Consider recycling or reusing the materials used in the experiment whenever possible to reduce waste output.

To conserve energy and resources, practice judicious energy and resource usage.

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 |