



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 different temperatures (0, 25, 45 degrees celcius) on the permeability of the memberane measured by putting 3 different slices of beetroot in different temperatures, and then measuring the colour shade on a colour meter.

Scientific background

Higher temperatures increase the energy and therefore the movement of the molecules, increasing the rate of diffusion. Lower temperatures decrease the energy of the molecules, thus decreasing the rate of diffusion. Source:

[https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_\(Boundless\)/05%3A_Structure_and_Function_of_Plasma_Membranes/5.06%3A_Passive_Transport_-_Diffusion#:~:text=Temperature%3A%20Higher%20temperatures%20increase%20the,decreasing%20the%20rate%20of%20diffusion.](https://bio.libretexts.org/Bookshelves/Introductory_and_General_Biology/Book%3A_General_Biology_(Boundless)/05%3A_Structure_and_Function_of_Plasma_Membranes/5.06%3A_Passive_Transport_-_Diffusion#:~:text=Temperature%3A%20Higher%20temperatures%20increase%20the,decreasing%20the%20rate%20of%20diffusion.)

Set the colorimeter to a blue filter and zero using a cuvette with distilled water Measure the absorbance for each solution. A higher absorbance indicates higher pigment concentration, and hence a more permeable membrane.

Source: <https://pmt.physicsandmathstutor.com/download/Biology/A-level/Notes/AQA/Practical-Skills/RP%2004%20-%20Investigating%20Cell%20Membrane%20Permeability.pdf>

2) 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*)

If the temperature increases then the permeability of the membrane will increase

Scientific explanation for hypothesis (This is the explanation to the previous hypothesis. Why do you think that your hypothesis is correct? Explain it in detail with reasons and causes. You may also find research at this point if allowed).

Because:

3) 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?
Same amount of water	Measuring cylinder	Different rates of diffusion
Time	Stopwatch	More or less diffusion could occur depending on time
size of beetroot	Same corkborer	Different rates of diffusion

4) Materials and Method:

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

1. water baths pre-set at required temperatures
2. thermometer
3. distilled water
4. syringe
5. large beetroot
6. cork borer
7. ruler
8. white tile
9. knife
10. 10 cm³ syringe
11. pipette
12. test tubes
13. colorimeter
14. nine cuvettes
15. labels or pens for labelling
16. forceps
17. crushed ice

Method : What are the steps of the investigation?

1. Prepare 3 beetroot slices of the same size
2. Fill 10cm of distilled water in a measuring cylinder
3. Add the Distilled water to the Test Tube
4. Add the beetroots to the Test Tubes
5. mark each testube
6. Add test tubes to each different temperature (0, 25, 40 Degrees Celsius)
7. Leave for 5 minutes
8. Take out the test tubes and remove the beetroot
9. Add the test tubes into a colorimeter
10. Measure the values and plot results (the darker the more diffusion)

- o State step by step your method [must be clear and easy to follow]
- o **Draw and annotate a diagram or add an annotated photo in the space** (This annotated (labeled) diagram of your equipment set up.

- O State the number of trials per increment of the independent variable

5) Safety, Ethical and Environmental issues

1. Be careful around hot water
2. Be careful around sharp tools
3. No animals were used
4. Beetroot was used in composition

6) 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.

Temperature	each temperature saw different shades in colors

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

0 Degrees	Brighter Color Shade
25 Degrees	Regular Color Shade
45 Degrees	Darker Color Shade

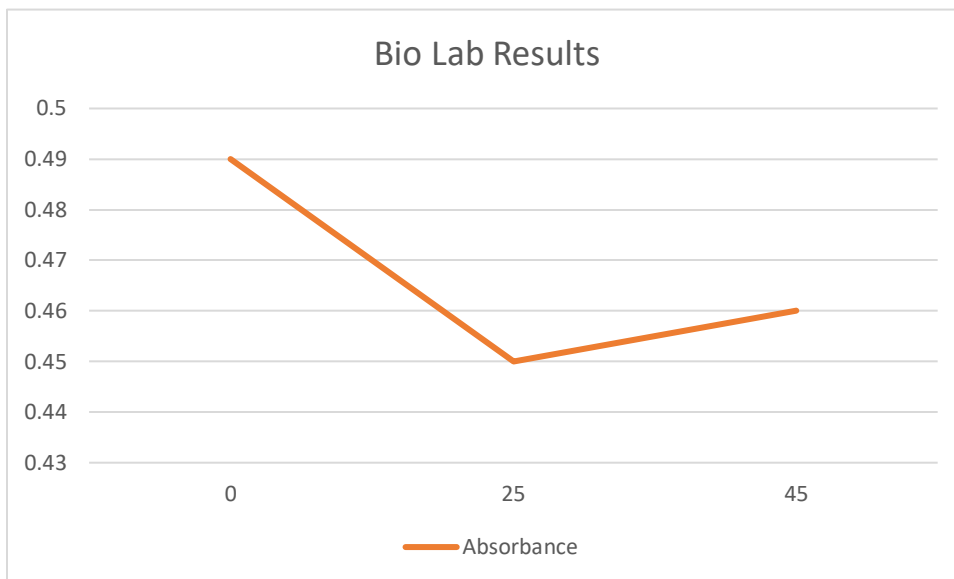
0 Degrees	0.49 Absorbance
25 Degrees	0.45 Absorbance
45 Degrees	0.46 Absorbance

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

7) Graphing your results

- The independent variable is usually plotted on the x-axis and the dependent variable on the y-axis.
- Label the axes fully to include the units and add a fully detailed title .



X Axis: Temperature

Y Axis: Absorbance Value

8) Describe your graph

- Describe the trend in the graph without explanation
- Discuss any relationship between independent and dependent variable

As the Temperature increases so does the color absorbance value, however due to human error the graph is not correct.

9) Conclusion and evaluation:

a) Restating the purpose (hypothesis)

If the temperature increases then the permeability of the membrane will increase

b) Interpret your data and describe a conclusion based on your results.

Raising temperatures the temperature will make the beetroot membranes more permeable and as a result will increase the absorbance value as more and more color diffuses from inside the cell to the water outside. On the contrary, lowering the temperatures will limit the amount of color which can pass, lowering the absorbance value. However, due to human error the results on the graph are not correct.

c) Determine whether the original hypothesis was supported or rejected by the investigation?

It would've been supported if the results were correct but due to a human error the graph is not correct, rather it should've been a straight line from the bottom left to the top right.

d) State *numbers from the graph* that support your views

The Graph is not correct.

e) Justify your conclusion with a scientific explanation from at least two different sources
Try to find any similar experiment done to compare your results to it

f) Points of strength in the investigation :

j)

Errors and limitations	Impact of errors on data	Modifications
Human Error	Results were not perfect	Repeat the experiment for more reliable results