

# What is the effect of temperature on the permeability of beetroot cell membranes?...

[Science](#), [Genetics](#)



Plan:-

Independent Variable- Temperature is what I will be changing in the experiment. I want to find out what effect temperature has on the permeability of a cell membrane.

Controlling other Variables- I will use measures to ensure that everything stays the same in my test to gain the best and most reliable results possible

- Same volume of water that I put the beetroot into after heating.
- The beetroot I use will be the same size each time, I will ensure this using a cork borer.
- The beetroot will be heated for the same time for each one, also it will be left in the water for the same time after.

Equipment:-

Beaker

Thermometer

Heat proof mat

Tripod

Bunsen Burner

Cork Borer

10 Beetroot cylinders

<https://assignbuster.com/what-is-the-effect-of-temperature-on-the-permeability-of-beetroot-cell-membranes-essay-sample/>

Forceps

10 test tubes

Colorimeter

Measuring cylinder

Also to improve the reliability of the test I will repeat the results.

Method

- Heat 200ml of water in a beaker
- Whilst water is heating, place 10cm<sup>3</sup> of water into each of ten test tubes. Label 85-45 and place in a water bath at 20 degree Celsius
- Cut beetroot with a cork borer to length of 5cm. Use a borer with a diameter of 1cm
- Place the beetroot cylinder into a beaker of water at 85 degrees, after one minute use forceps to transfer to test tube of water in water bath at 20 degrees celsius
- As water in beaker cools repeat step 3 using fresh cylinder of beetroot.
- Complete this cycle for 10 cylinders
- Leave each cylinder in its test tube for 30 minutes

- After 30 minutes remove beetroot and shake solution well to get the best quality colour
- Take the solutions and transfer to small beakers and place into the colorimeters, change the setting to transmission and take the r reading. Record the results and plot a graph.

### Evaluation

My results show that temperature affects the permeability of beetroot cell membranes and makes it more permeable with a higher temperature. The graph shows how the colour of the beetroot solution is stronger with higher temperatures.

This is due to the structure of the cell surface membrane. It consists of a lipid bilayer with protein carrier molecules. As the cell membrane controls permeability it is the effect of temperature on the protein carriers that will alter the permeability of the beetroot cell membrane. At low temperatures the kinetic energy of the pigment molecules will be low so any movement in and out of the cell will be low.

As the temperature increases molecules gain kinetic energy so transport across the membrane becomes faster and there will be more pigment loss. A maximum rate is reached around 40°C. The carrier proteins begin to lose shape and cannot function properly therefore. This is what causes the proteins to lose more pigment, they cannot control what comes in and out of the cell.

Higher temperatures cause greater distortion of the protein molecule. Now the carrier may allow free passage of molecules through it, showing the greatest loss of pigment or the carrier protein may prevent any pigment molecules from passing through. This depends entirely on the original tertiary structure of the protein and how it deforms. The lipid bilayer may also begin to rupture depending on how it is anchored by other proteins, but essentially control over molecules entering and leaving the cell is lost.

## Conclusion

I was pleased with my results, they gave me a good graph to evaluate and I didn't have any major anomalies, I expected the results to go the way they did and I am satisfied with what I have got. I feel that the results were as accurate as I could have obtained under the conditions I was working in.

To obtain better more accurate results I could have measured things out using something more accurate than a measuring cylinder. Also when the beetroot cylinders were left in the cold water I would make sure I left them in for exactly 30 minutes to get better results, I was unable to record accurately how long they had been in the water for and had to use part guess work.