Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction
E.g. temperature on the rate of amylase activity

1. Prepare a series of tubes, of equal volume, with starch and amylase, in a buffer solution. Keep the tubes on ice till needed.

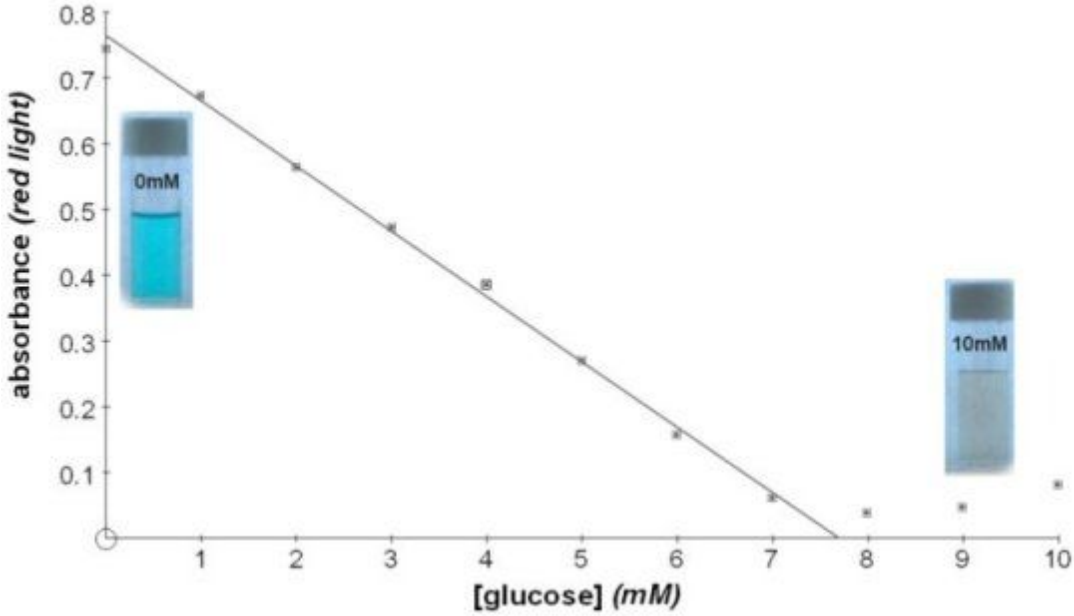
2. Prepare water baths between temperatures of 10C-80C, at 10C intervals

3. Seal the tubes and place in the water bath for 30 minutes.

4. Add Benedict's solution (same volume) to each tube. Warm gently.

5. Record the intensity of colour using a colorimeter

6. Plot data of conc (X-axis) against absorbance (Y-axis) and draw a curve


absorbance (red light)
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0mM
10mM
1
2
3
4
5
6
7
8
9
10
[glucose] (mM)

Produce a calibration curve to identify the water potential of plant tissue

1. Cut potato cubes of uniform size, using a cork borer

2. Prepare a series of dilutions of sucrose, from 0-100% at 10% intervals. Tube ‘0’ is the control tube

3. Weight the potato cube and add it to one of the tubes. Repeat for each concentration of sucrose

4. Incubate for 1 hour at 25C

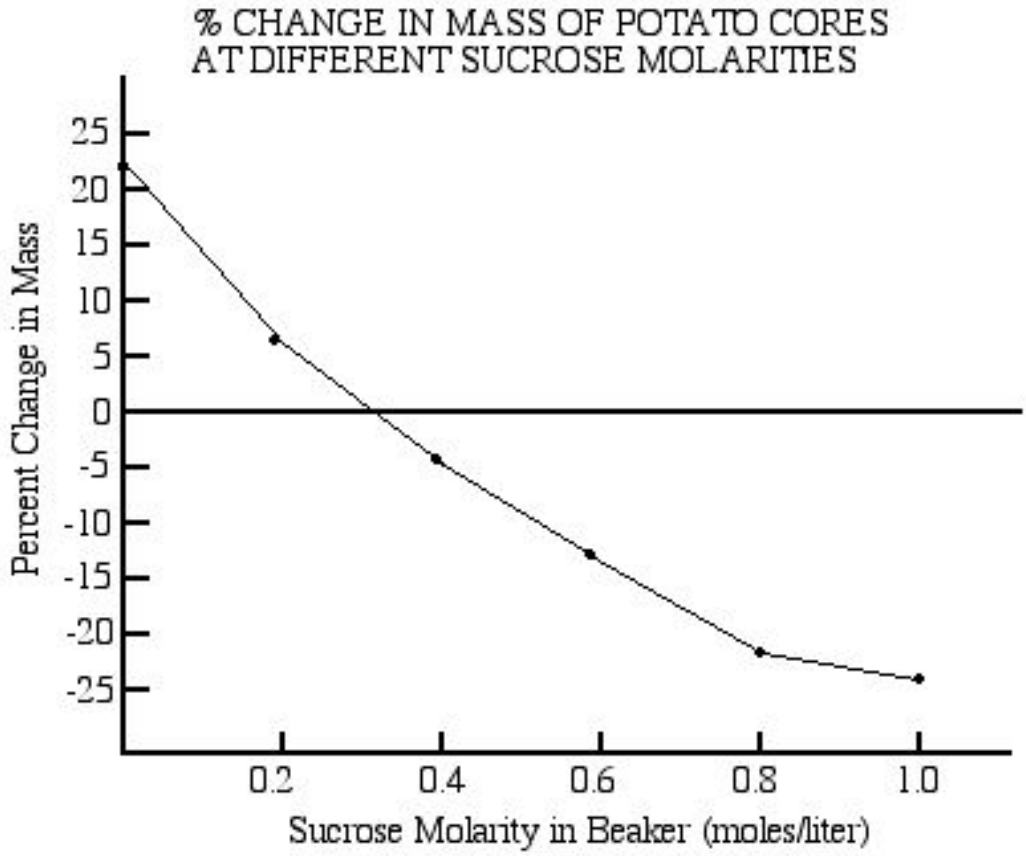
5. Remove the potato cubes from the tubes and weigh

6. Record the change in mass - convert to %

7. Plot a graph of concentration of sucrose on the X-axis to change in mass on the Y-axis

8. Draw a line of best fit.

9. The concentration of sucrose, where the line of best fit crosses the X-axis, is equal to the water potential of the potato cubes.


% CHANGE IN MASS OF POTATO CORES
AT DIFFERENT SUCROSE MOLARITIES
Percent Change in Mass
25
20
15
10
5
0
-5
-10
-15
-20
-25
0.2
0.4
0.6
0.8
1.0
Sucrose Molarity in Beaker (moles/liter)

Use of chromatography to investigate the pigments isolated from leaves of different plants

1. Crush some leaves with a mortar and pestle, and dissolve the pigments in a water-ethanol mixture

2. Transfer the contents to a test tube, and separate the leaf cell debris from the supernatant using a centrifuge

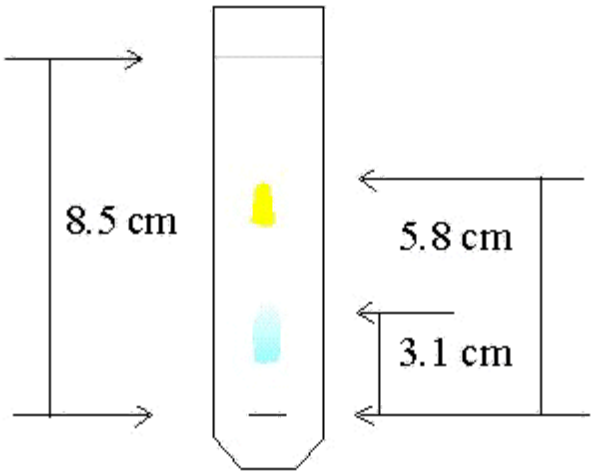
3. Cut a rectangular strip from chromatogram paper, and draw a line around 2 cm^3 from one end

4. Using a capillary, carefully spot a few drops of the sample onto the line, taking care to not allow the sample to spread too much on the paper.

5. Place the chromatogram in a beaker with solvent (ethanol:water, or water:organic solvent), and seal the chamber

6. Allow the solvent to rise to nearly the top of the paper

7. Remove the paper and allow the solvent to dry. Calculate Rf values. (Distance travelled by the solute ÷ Distance travelled by the solvent front



$$R_f \text{ (yellow)} = \frac{5.8\text{ cm}}{8.5\text{ cm}} = 0.72$$

$$R_f \text{ (cyan)} = \frac{3.1\text{ cm}}{8.5\text{ cm}} = 0.36$$

Investigation into the effect of a named variable on the rate of respiration of cultures of single-celled organisms e.g. type of sugar or temperature

1. Grow a fresh culture of yeast

2. Dispense 8 cm^3 sugar solutions in test tubes (all sugars must be at the same concentration)

3. Add 1 cm^3 yeast culture to 8 cm^3 of sugar solution.

4. A control tube is made by heating the yeast cells (to around 80C) before adding it to the sugar solution. A second control is made by mixing the sugar solution with 1 cm^3 of water and 1 cm^3 of methylene blue.

5. Add 1 cm^3 methylene blue to each tube

5. Incubate the tubes at 25C

6. Record the time it takes for the the blue colour to disappear

7. Repeat and calculate a mean time, and calculate the mean rate per minute.

Investigation into the effect of a named variable on the permeability of cell-surface membranes e.g pH/temperature

1. Cut beetroot into uniform cylinders using a cork borer, or cut into even-sized strips

2. Blot the outside of the cubes

3. Prepare pH solutions from pH 2-pH 8, at 1 pH unit intervals

4. Dispense 10cm^3 of each solution into test tubes

5. Add the same number of beetroot cylinders to each tube

6. Incubate the tubes at 25C for 1 h

7. Remove the supernatant, and record the intensity of the colour using a colorimeter