OCR (B) Biology A-level

Module 1: Development of practical skills in Biology

PAG 5: Colorimeter OR Potometer

Please note: You only need to do one from each PAG, and you don't need to do the PAGs listed here, as long as you show the same skills that these are testing (see 5f of the specification for more information). However, you need to at least be able to design your own method for most of these experiments in the exam.

You do need to know how to use a colorimeter and a potometer in the exam, although you don't need to do both PAGs.

Using a colorimeter:

1. Switch the colorimeter on and leave to stabilise for 5 minutes.
2. Select the red filter (for Benedict's – use a complementary colour to starting solution) on the colorimeter. If using Benedict's, centrifuge the solution or allow to sit to precipitate out the copper solid.
3. Set the colorimeter to zero using a cuvette ¾ filled with distilled water.
4. Ensure the cuvette is placed into the colorimeter so the light passes through the clear sides.
5. Make sure the slides are clean and there are no bubbles in the solution.
6. Using a pipette, fill the cuvette ¾ with the sample.
7. Place in the colorimeter and read the absorbance of light.
8. Less light is absorbed by the solution in a paler solution, so there is a greater transmission for a paler solution.

To measure the concentration of a solution (commonly of reducing sugars) using a colorimeter, a calibration curve is used. This is produced in the following method:

1. Standard solutions of the reducing sugar should be used. Standard solutions are those of known concentration.
2. Carry out a Benedict's test on each sample (the Benedict's solution must be in excess).
3. With the colorimeter, measure the percentage transmission for each sample.
4. Plot a graph of transmission against reducing sugar concentration.

When testing for reducing sugars, more transmission/less absorbance = more sugar present (greater concentration).

Using a potometer:

Potometers are used to **estimate the rate of transpiration of a plant**. Potometers measure water uptake by the plant – it assumes that water uptake by the plant is directly related to water loss by the leaves. Limitations of this method:

- Not all the water taken up by the plant is used for transpiration– for example some is used in cells to maintain turgidity.
- Some water is used in photosynthesis
- The plant is dying once you cut off its roots – it may take up less water as it begins to die.

1. Cut a shoot underwater to prevent air from entering the xylem. Cut it at a slant to increase the surface area available for water uptake.
2. Assemble the potometer in water and insert the shoot under water, again to prevent air from entering.

3. Remove the apparatus from the water but keep the end of the capillary tube submerged in a beaker of water.
4. Check the apparatus is watertight and airtight, using screws or petroleum jelly.
5. Dry the leaves
6. Allow time for the plant to acclimatise and then shut the tap.
7. Remove the end of the capillary tube from the beaker of water until one air bubble has formed, then put the end of the tube back into water.
8. Record the starting position of the air bubble.
9. Start a stopwatch and record the distance moved by the bubble at regular time intervals, e.g. every 30 mins.
10. Calculate the rate of air bubble movement by dividing the distance travelled by time. This is an estimate of the transpiration rate.