Edexcel B Biology A-Level

Core Practical 8

Investigate the effect of environmental conditions on water uptake in a plant shoot

A **potometer** is a device used to measure the **uptake of water**, and therefore the **rate of transpiration**, in a leafy shoot. Potometers can be **mass** (based on measuring the change in mass of a plant over time) or **bubble** (based on measuring the movement of a bubble along a length of capillary tubing over time). When using potometry to measure rate of transpiration, it is important that the potometer is **airtight**. Rate of transpiration can be affected by **abiotic factors** such as **light intensity, humidity, wind speed and temperature**.

Equipment

- Large leafy shoot
- Capillary tubing
- Ruler
- Clamp and stand
- Beaker
- Stop clock
- Fan/dark cupboard/lamp/plastic bag/incubator
- Petroleum jelly
- Small cable ties
- Scissors

Method

1. Set up the **potometer**: fill the capillary tube and rubber connector with water and insert the leafy shoot into the rubber connector. Do this step **underwater.**
2. Clamp the capillary tube into the stand. Place the bottom of the capillary tube into the **beaker of water**.
3. Smear **petroleum jelly** around the join to maintain **airtight** conditions.
4. **Leave for 5 minutes** to allow a bubble to be drawn up into the capillary tube.
5. Either time the length of time for the bubble to move a certain distance along the capillary tube or measure the movement of the bubble along the capillary tube in a certain length of time.
6. Convert this measurement into a **rate of transpiration** via dividing volume of water taken up by time.
7. Repeat the experiment and **change the abiotic variable**, e.g. by placing the plant **10 cm further** from the light source.

Risk Assessment

Hazard	Risk	Safety Precaution	In emergency	Risk Level
Biohazard	Contamination	Use disinfectant; wash hands with soap after handling.	Seek assistance	Low
Lamps	Temporary damage to eyes	Do not look directly at lamp	Wait for afterimage to disappear; seek appropriate assistance if needed	Low
Bags/stools	Tripping	Keep under desks and away from workspace	Seek appropriate medical assistance; clean spillages	Low

Graph

- Plot a graph of **rate of transpiration** against **abiotic factor.**

Conclusion

- Rate of transpiration can be affected by various abiotic factors:
  - **Temperature** affects rate because it increases the rate of **diffusion and evaporation** from the stomata.
  - **Light intensity** affects rate because it affects rate of **photosynthesis**, which in turn affects number of stomata which are open.
  - **Humidity** affects rate because it affects the rate of diffusion and evaporation by **decreasing concentration gradient** between plant and the atmosphere.
  - **Wind speed** affects rate because it **increases concentration gradient** by mechanically removing water from the outside of the stomata.