

CIE Biology International A-level

Plan Experiments and Investigations Practical Notes



Planning experiments and investigations

Outlining the plan

A practical plan should be organised into different subsections with these headings: hypothesis, variables, method, risk assessment, collection and analysis of results.

Variables

The 3 variables that students should identify are the **dependent variable**, **independent variable** and **controlled variables**. The **dependent** variable is what is **measured** in the practical, the **independent** variable is what is **varied**, and the **controlled** variables are what are **kept constant** in the practical. Students should describe how these variables are **measured**, **varied** or **controlled**, including the **apparatus** needed eg. measure length with a ruler. When stating the dependent variable, state exactly what is being measured rather than the final processed result, eg. number of bubbles formed rather than the rate of photosynthesis.

Method

Outline the practical procedure. Make sure to specifically state the **apparatus** used, eg. **volume** of beakers and measuring cylinders used. It is important to select apparatus of the appropriate **precision** to make sure the measurements are **accurate**.

A **control** may be necessary. A control is to show the actual effect of the **independent variable** on the **dependent variable**. For example, this can be done by replacing enzyme solution with distilled water, or replacing a live organism with a dead organism.

Some examples of important procedures to keep in mind include: when inserting a shoot into a potometer, make sure the cut of the shoot is slanted and underwater; for respirometer practicals, the air must be replaced between each set-up.

Risk assessment

Identify any **safety hazards** in the practical, and state the **level of risk** involved. For every hazard, suggest a suitable **precaution** to take.

Some practicals involving animals may involve **ethical concerns**. If any, state the **ethical issues** and the steps you will take to **minimise** them. For example, minimise exposure to stressful testing conditions, and for humans, gain consent before testing and allow participants to stop at any point during the practical.

Suggested practical topics for paper 5

Respirometer

Potometer

Gel electrophoresis

Reaction time

Enzyme activity

Photosynthesis

Sampling (random and systematic)



Osmosis
Microscopy
Chromatography

Students can practise planning each of these practicals by outlining the procedure, dependent, independent and controlled variables, risk assessment and suggest improvements.

