Error categories	Example	Improvement
Inconsistencies in biological samples	Different potato strip from different potato sources would give right to different starting water potentials	Ensure all potato strips performed in the experiment was taken from the same potato
Judgment of colour changes can be subjective	Colour change in Benedict's test might be subjective as it is affected by differences in individual perception	Use a colorimeter that provides a quantitative value to the colour detected.
Environmental factors	Fan switch on, without lids on petri dishes, can cause evaporation of water from salt solutions, hence causing changes in concentration to the solutions	Use a lid, switch off the fan
Limitations in measuring instruments	Ruler does not measure length as accurate as a pair of vernier callipers as a ruler is correct only to 1 dp.	Use vernier callipers instead.
Experiments that require temperature to be controlled	Having an enzyme in a testtube heated to a particular temperature. The temperature cannot be kept constant as the temperature may change over the course of the experiment	Insulate the test tube with a Styrofoam wrap or a bubble wrap to reduce heat loss to the environment.
Other variables besides the independent variable being changed	In investigating the effect of wind speed on rate of transpiration, other factors like temperature, humidity, and light intensity was not ensured to be constant	Ensure other factors are constant by…

Planning Questions Example

A protease is added to 5cm^3 of egg white and the time taken for the suspension to turn clear is measured. Plan an experiment to show how the activity of the protease is affected by temperature.

[Describe an approach to your investigation]

To determine the effect of temperature on protease activity, an investigation can be done by allowing enzyme reactions to take place at varying temperatures, then measuring its effect on time taken for completion of the reaction. This will be further described in detail.

[State independent variable **with units**]

The independent variable is the temperature, in oCelsius, at which reaction takes place.

[State range and increments of independent variable to be used]

Place 2cm3 of enzyme protease in a beaker of ice for 5 minutes. This is to allow time for the protease to acclimatise to the temperature of 0◦C. Do the same for other temperatures.

Using ice and hot water, maintain beakers of water baths at **10◦C, 20◦C, 30◦C, 40◦C, 50◦C and 60◦C.** (**at least 5 different data points) .**

[State dependent variable, with units]

The dependent variable is the **time taken, in seconds**, for suspension to turn clear.

[State two control variables and how they can be controlled]

The variables to control are the volume of protease used and the amount of mixing involved.

[State how your data collected can be used to reach a conclusion (refer to aim)]

Pour the protease into the test tube containing **5cm3** of egg white solution and **start the stopwatch** immediately. Stop the stopwatch as soon as the egg white solution turns clear. Repeat the experiment at all temperatures stated. **Using the data obtained, plot a graph** to show how the average time taken varies with temperature.

[State how to ensure reliability of the investigation]

To ensure reliability of the investigation, repeat the experiment three times, using 3 samples at each temperature each time. Then, obtain average readings.