

Planning

The notes you make in relations to the planning of your experiment are to be made in your log book. Remember your log book forms part of your assessment.

1. Deciding on a topic

For the Unit 4 Area of Study, 'Practical Investigation' you have to choose a topic related to any of the physics content you have covered this year.

This includes:

- Motion,
- Fields,
- Electrical Energy,
- Waves and Light,
- Light and Matter.

You may wish to get together with some classmates to brainstorm some possible topics.

You may wish to look through some lists of topics for one that catches your eye.
See Topic List.

Once you have a short list or a possible topic in mind. You should give it a clear title and preferably a couple of questions that you would like to find answers to. This helps focus your curiosity.

You will need to submit it to your teacher for their approval. They will be concerned about the following matters:

- Does the topic have sufficient depth for a Year 12 investigation?
- Is there scope for **two independent continuous variables**?
- Is the topic practicable? that is,
 - Does the school have the equipment?
 - Can you make a good start and obtain preliminary measurements in the first double period?
 - Can it be completed in the class time available?

2. Identifying variables

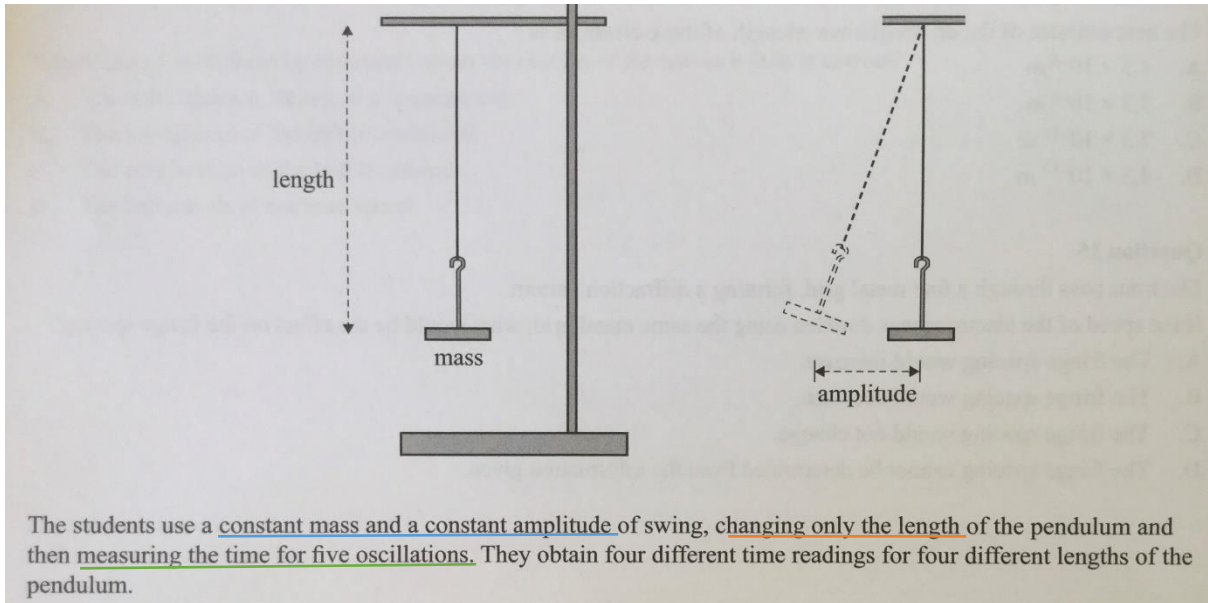
Independent variables: is the variable that is controlled by you. (the one that is selected and changed).

Dependent variables: Aspects that may change in response to you changing something else. This is the variable that will be measured or observed.

Controlled variables: are all the variables that must be kept constant during the investigation. Only test one variable at a time, otherwise it cannot be stated that the changes in the dependent variable are the result of changes in the independent variable.

On the 2019 Year 12 VCAA Exam – Section A Question 18, asked about independent, dependent and controlled variables.

The information



The question

Question 18

Which of the following best identifies the independent, dependent and controlled variables in the students' experimental investigation?

	Independent	Dependent	Controlled
A.	length	time	mass, amplitude
B.	time	length	mass, amplitude
C.	mass	time	length, amplitude
D.	amplitude	length	time, mass

The variables a can provide different types of data.

Qualitative data can be observed but not measured. They can only be sorted into groups or categories such as brightness, type of material of construction, or type of device. Not useful in this context.

Quantitative data can be measured. Length, area, weight, temperature and cost are all examples of quantitative data. This is the type of data we wish to collect in this context.

- **Discrete** consist of only integer numerical values, not fractions; for example, the number of pins in a packet, the number of springs connected together, or the energy levels in atoms. These can only be presented as a column graph that enables comparison.
- **Continuous** allow for any numerical value within a given range; for example, the measurement of temperature, length, weight and frequency. This means they can be graphed using x - y axes. A graph can reveal a relationship between two quantities.

In thinking about your topic, you need to explore the full range of both the dependent and independent variables. For example, if you were about to investigate the motion of a parachute, the terminal velocity of the falling parachute would be an obvious dependent variable, but you should also mention other dependent variables, even if you may not subsequently investigate them, for example, the distance travelled before terminal velocity is reached, or the time taken, or possibly the average acceleration.

Similarly, there are likely to be numerous factors that will affect your dependent variables. It shows your insight into the topic if you can list a good number even if they might not be significant or that you choose not to pursue them.

Resources

A Level Physics Online, <https://www.alevelphysicsonline.com/practical-skills> has a series of short YouTube videos on variables, uncertainty, percentage uncertainty and graphing.

3. Formulating a plan

You will need to prepare a detailed plan. This goes in your logbook. If you are working in a pair, each person will need to prepare a plan.

A plan should include some or all of the following:

- Title
- Dependent variables
- Independent variables
- Physics equations that you plan to use to calculate the value of relevant quantities from your measurements, possibly with sample calculations.
- Equipment and instruments that you will need.
- Equipment layout
- Procedure: A description of your plan including details of the range of values you will investigate for your independent variables as well as the number of trials for each data value. Any data analysis software, e.g. Tracker, that you plan to use should also be mentioned.

Once your plan is approved you will need to complete an equipment request form, so that the equipment can be compiled for you. There may be the occasional special item that you wish to bring from home.