

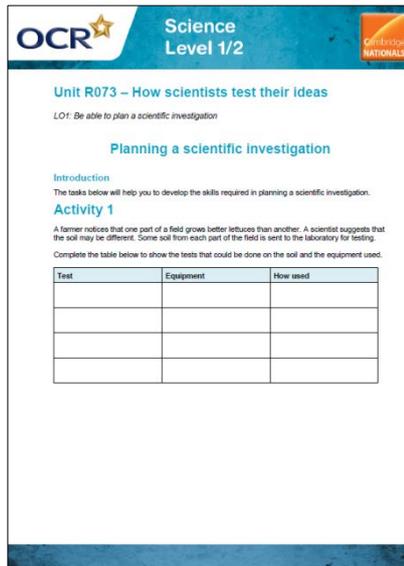
Unit R073 – How scientists test their ideas

Planning a scientific investigation

Instructions and answers for teachers

These instructions should accompany the learner tasks - OCR resource 'Planning a scientific investigation', which supports Cambridge Nationals in Science Level 1/2 Unit R073 – How scientists test their ideas.

The learner tasks cover LO1 – Be able to plan a scientific investigation



OCR Science Level 1/2 Cambridge Nationals

Unit R073 – How scientists test their ideas

LO1: Be able to plan a scientific investigation

Planning a scientific investigation

Introduction
The tasks below will help you to develop the skills required in planning a scientific investigation.

Activity 1
A farmer notices that one part of a field grows better lettuce than another. A scientist suggests that the soil may be different. Some soil from each part of the field is sent to the laboratory for testing. Complete the table below to show the tests that could be done on the soil and the equipment used.

Test	Equipment	How used

Associated Files:
Planning a scientific investigation

Expected Duration:

Activity 1 – 10 minutes

Activity 2 – 40 minutes

Activity 3 – 20–30 minutes

Activity 1

This task links with R071 LO6 measurement of non-living indicators.

A farmer notices that one part of a field grows better lettuces than another. A scientist suggests that the soil may be different. Some soil from each part of the field is sent to the laboratory for testing.

Complete the table below to show the tests that could be done on the soil and the equipment used.

Test	Equipment	How used

Suggested responses in the table below

Test	Equipment	How used
Temperature	Temperature probe	Same mass of soil from each sample.
pH	pH probe or universal indicator solution.	Same mass of soil from each sample. Shake up with equal volume of distilled water. Insert probe or test with indicator.
Water	Oven	Same mass of soil, weigh, dry to constant mass, reweigh.
Nitrates	Testing kit	Same mass of soil from each sample. Shake up with equal volume of distilled water. Test with reagent.

Activity 2

This task links to R071 LO3 and to R072 LO4 communicating scientific information.

Fuses are used in electrical circuits as a safety precaution. A student notices that the wire to an appliance gets hot. He thinks this is because the wire is overloaded. Work with a partner to plan an experiment to test his idea.

You need to think about:

- *the variables – independent, dependent and control variables*
- *the measurements you will need to make*
- *the equipment*
- *the range of readings*
- *the number of repeats.*

Draw a circuit diagram on poster paper and label with reasons for why you have selected that item of equipment.

Now give a presentation to the class about how you are going to do this experiment.

At the end of the presentations the class will vote on the method to be tried out.

Relationships between voltage, current and resistance. The learners should be familiar with creating circuits using voltmeters and ammeters. The task could be introduced by showing a video clip of a house fire caused by an overloaded circuit.

In this task learners will work in pairs to develop a plan. They will create a circuit diagram on poster paper which can be displayed to the class. The pair is then asked to give a presentation to the class about their experiment. A range of equipment could be put out at the front of the class for learners to look at and choose from. For low attaining learners the equipment may require labelling. The equipment should include:

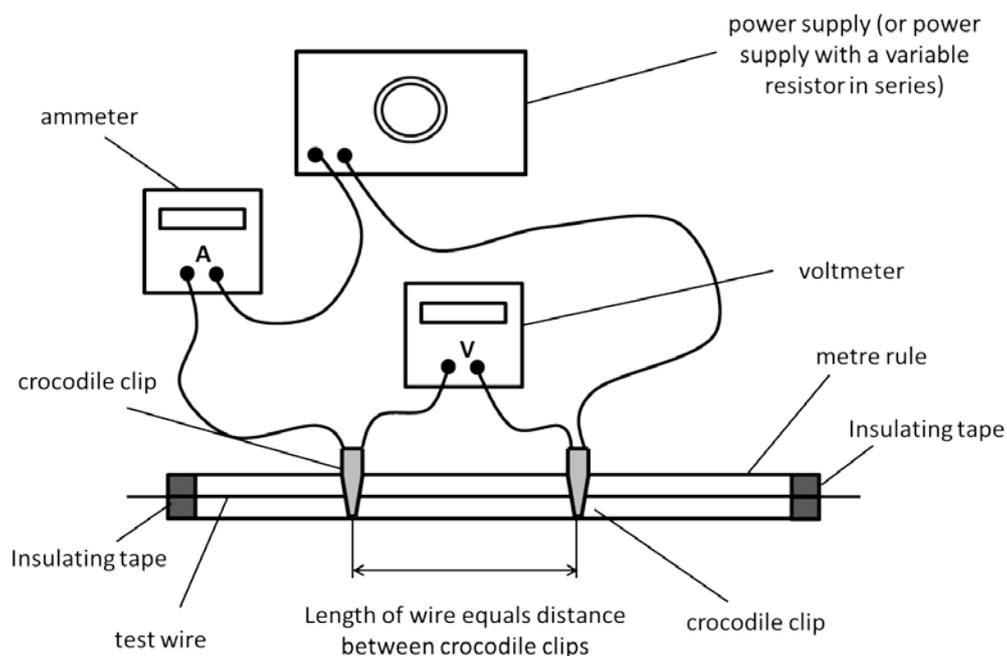
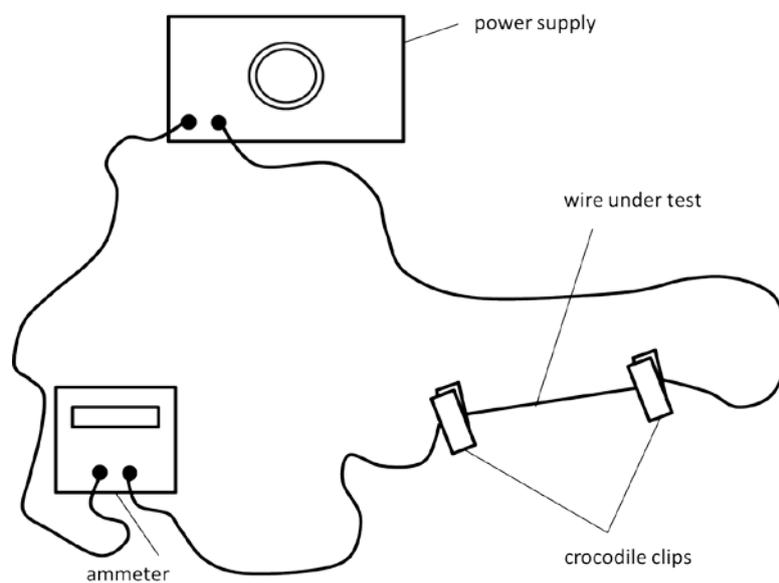
Power source such as low voltage power pack or batteries

- Ammeters
- Voltmeter
- Short length of fuse wire
- Crocodile clips and leads
- A variable resistor may be required depending on fuse wire selected.

The presentation and discussion of the plans should highlight the need for repeats, the range for the independent variable, the dependent variable and the need to control other variables.

The experiment the class decides on should involve a simple circuit with a short length of fuse wire.

The two circuits below could be used. The second one is more complicated and permits the measuring of both current and voltage.



Activity 3

This task links into R071 LO3.

Your teacher will trial the experiment the class voted on as being the best method to test whether a wire gets hot because it is overloaded.

What changes need to be made to the method? You should discuss these changes as a class and decide how the method could be improved.

Your teacher will now complete the experiment.

Fill in the table below:

Errors in the equipment or method	How they could be reduced?

The teacher should trial the experiment that has been chosen by the class. The learners will then suggest amendments to the method. The experiment is then completed and the class completes a table showing errors and how they could be minimised. The errors identified will depend on the plan the class has devised.

LESSONElements

The building blocks you need to construct informative and engaging lessons

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