

GCSE Environmental Science - Specimen Material

Unit 2 Investigations in Environmental Science - ISA

Solar Cells – Teachers’ Notes **Valid for submission in xxxx**

This ISA relates to Section A: Environmental Issues

Area of investigation

This work should be carried out during the teaching of the section relating to:

A2.4: What alternative energy technologies are available?

Candidates should be aware of the fact that technologies have been developed to harness energy from sources other than fossil fuels, and that Environmental Scientists assess these options for their efficiency and potential environmental impact.

The practical activity will enable candidates to show their ability to investigate a renewable energy resource, ie solar and develop their understanding that most renewable energy resources:

- use kinetic energy to turn turbines to generate electricity, except solar which uses heat or light or geothermal which produces heat
- usually need larger areas than thermal power stations to yield the same amount of energy
- may be unreliable or cannot provide a constant supply of energy
- may detract from the appearance of a land/seascape (A1)

The activity will also allow candidates the opportunity to further their ability to describe solar power in terms of efficiency, predictability, intermittency and energy density.

Risk Assessment

It is the responsibility of the centre to ensure that a risk assessment is carried out.

The Practical Work

For this part of the investigation candidates may work individually or in groups.

A suggested outline is given, but centres may adapt this to suit their own needs.

The teacher should complete the ISA Explanation Sheet. This should be included with the sample of candidates’ work that is sent to the moderator.

Instructions of a general nature may be given to the candidates, but these must not be so prescriptive as to preclude candidates from making their own decisions.

It is recommended that this investigation is put into an applied context such as the possibility of householders using solar panels on roofs as a way of reducing their carbon footprint.

Candidates should be given the opportunity to carry out an investigation concerning solar cells. They may use any commercially available cells or panels.

A simple method would be to obtain a small piece of solar cell (eg from RS Components or Maplins), connect the terminals to a voltmeter and use a bench lamp for illumination.

Candidates should investigate how the **area** of the cell exposed affects the output voltage. They may do this by covering over sections of the cell with thick cardboard.

Candidates should carry out a number of repeats in order to be able to calculate a mean.

Candidates need to produce a table for the results, and to draw a graph or bar chart to show their results. They will need to have collected sufficient data to display in such a format.

The Data Processing

For this part of the investigation candidates must work individually under direct supervision.

Each candidate must draw up his or her own table of results and should process the data in an appropriate way, eg charts, graphs, diagrams, line of best fit.

The candidates' work should be collected by the teacher at the end of this session and only returned to the candidates when they undertake the subsequent ISA.

Candidates' work must **not** be annotated with additional information, either by the teacher or the candidate, which would give them an unfair advantage during the ISA, eg the use of the terms independent/dependent variable.