General Certificate of Secondary Education
June 2012

Environmental Science 44402/TN

Unit 2 Investigations in Environmental Science

Teachers' Notes

Investigative Skills Assignments (ISAs)

- **ISA 1 – Fieldwork Investigation**
- **ISA 2 – Laboratory Investigation**

Valid for Moderation in June 2012

For immediate release to the teacher(s) responsible for GCSE Environmental Science

All controlled assessment marks to be returned to AQA by 7 May 2012

Open on receipt

Introduction

1 The Investigative Skills Assignments (ISAs) will be available to Examinations Officers (EO) in April 2011. The EO may print out **one** copy of the ISAs for the use of the Head of Environmental Science but this copy **must** be kept under secure conditions.

2 The ISA papers should **not** be downloaded on to the centre's intranet, neither should any electronic copies be made.

3 Teachers' Notes are sent out in advance of the ISA papers so that teachers can incorporate the ISAs into their schemes of work.

4 Candidates may attempt one or both of the ISAs supplied by AQA, and submit the best mark to AQA. Candidates may **not** attempt an ISA more than once. **ISAs are re-issued each year and are valid for one year only**.

5 **Do not use the 'live' ISAs for practice purposes**. These ISAs may be used for practice from September 2012.

6 Candidates should be entered in February for controlled assessment moderation in the following June.
A mark is not needed at the time of entry but should be submitted to AQA and the moderator by 7 May. The marks must be submitted on the Centre Mark Form (CMF). The centre should also circle the highest and lowest non-zero mark for each subject on the CMFs.

7 The teacher should ensure that the PSA mark has been added to the ISA mark to make a total controlled assessment mark.

8 The entry code for Unit 2 (controlled assessment) is **44402**.

9 The entry code for certification in Environmental Science is **4442**.

10 ISAs require candidates to use information from their own experiment to answer some of the questions in Section 2. Consequently, as far as possible, centres should use tasks **very similar** to the ones detailed in the Teachers' Notes.

11 Further information about conducting the ISA can be found in the 'Guidance Notes for Controlled Assessment' accessed through the Teacher Resource bank for GCSE Environmental Science.
http://web.aqa.org.uk/qual/newgcses/science/new/env_science_materials.php?id=03&prev=03

GCSE Environmental Science ISA

ISA 1 – Fieldwork Investigation – Teachers' Notes

Valid for submission in June 2012

This ISA relates to Section A: Population and Sustainability

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

A2.2: How can energy consumption be reduced?

Candidates should know and understand that domestic energy consumption can be reduced by:
- improved efficiency of energy-consuming devices
- improved insulation
- lifestyle decisions
- innovations in the design and construction of houses.

The practical activity based on this topic should enable candidates to show their ability to:
- interpret data on domestic use of fossil fuel resources
- estimate possible energy savings
- demonstrate that housing design affects energy use
- show that differences in lifestyle and individual values and attitudes affect energy use
- sample variables related to energy use in the local environment using a random or systematic method.

Section 2 of the ISA will relate to planners working within the energy sustainability department of a Local Authority in Britain, and will give candidates the opportunity to demonstrate their understanding of the need for such departments to:
- identify differences in energy consumption of buildings
- demonstrate ways in which carbon dioxide production can be minimised
- find ways of educating people to encourage better use of fuel and energy resources
- evaluate housing designs and lifestyles to help them to develop future energy strategies.

Risk Assessment
It is the responsibility of the centre to ensure that a risk assessment is carried out before students commence any fieldwork.

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

A suggested outline is given and, as far as possible, centres should use a task very similar to that detailed in the Teachers' Notes.

The teacher should complete the ISA Explanation Sheet for each different method used in an ISA. This should be included with the outline of work suggested to students and the sample of candidates' work which is sent to the moderator.

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

Candidates should plan and carry out a fieldwork investigation related to the differences in energy use linked to production of carbon dioxide gas by different households or in different types of houses. A survey should be carried out to find out how and why the energy consumption of individual households varies. This could include the use of different fuels, energy conservation methods and the number and ages of residents.

Individual candidates need to collect sufficient data to allow them to produce at least one relevant graph or chart, but they may share and use data produced by other members of a class.

It is recommended that this investigation is put into an applied context such as the work of local house builders or planners who are involved in developing new housing in the region and expect to increase the amount of renewable energy used. There might be opportunities for candidates to receive talks from, or do work experience with, officers in local planning departments or local companies involved with house construction.

As part of their work students will identify variations and patterns found, and will include quantitative and qualitative analysis. They will seek causes for these, which might include details of housing construction, characteristics of the residents, relative energy costs, environmental variables such as weather and local planning influences.

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.

The candidates' work should be collected by the teacher at the end of the 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.

GCSE Environmental Science ISA

ISA 2 – Laboratory Investigation – Teachers' Notes

Valid for submission in June 2012

This ISA relates to Section B: Environmental Management Issues

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

B1.2 How is wildlife conserved?

Candidates should know and understand that nature and countryside wardens are employed in many reserves and national parks. They use scientific knowledge and skills to manage the wildlife and their habitats. The management includes:

- surveying the species and habitat to identify needs eg clear water surface for plant growth
- removal of competition: weed plants, animal pests
- halting natural succession eg coppicing, scrub clearance, flooding, dredging
- creating new habitats eg shallow ponds for water fowl
- excluding people by fencing, zoning and use of permits
- advisory and statutory control of neighbouring land-users eg polluters
- providing education and access: visitor centres, work experience, interpretation boards, guided walks, nature trails, hides etc.

The practical activity devised by the teacher should enable candidates to show their ability to:

- set up an experiment to investigate the production of oxygen in photosynthesis
- select a suitable continuous variable for study eg light intensity, temperature, carbon dioxide concentration
- select information through sampling and replication of measurements
- show awareness of different variables which might influence the rates of photosynthesis
- use data to predict how to control environmental variables to manage a habitat
- demonstrate the value to conservators of an understanding of biotic and abiotic variables.

The laboratory activity should give candidates an opportunity to gain knowledge of ways in which habitats can be managed. There may be an opportunity, in preparatory work, to liaise with local council conservation staff or wardens at a nearby nature reserve, who may be involved in a habitat control project.

Section 2 of the ISA will relate to the management of weeds in ponds at a Country Park. This will allow candidates to demonstrate their understanding of the need for researchers to give clients accurate information to:

- identify variables which influence the growth of weeds in ponds
- relate the effects of these variables to growth rates and hence to the problems caused by weeds
- understand how the variables might be controlled in the real environment to manage a habitat in a better way
- demonstrate an awareness of how to apply sustainable conservation policies.

Risk assessment
It is the responsibility of the centre to ensure that a risk assessment is carried out before candidates commence any laboratory work.

The practical work
For this investigation candidates may work individually or in groups. Individual candidates need to collect sufficient data to allow them to produce at least one relevant graph or chart, but they may share and use data produced by other members of a class.

Some suggestions are given and, as far as possible, centres should use a task very similar to that detailed in the Teachers' Notes.

The teacher should complete the ISA Explanation Sheet for each different method used in the ISA. This should be included with the outline of work suggested to candidates and the sample of candidates' work which 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 suggested that candidates use *Elodea canadensis* or *cabomba* (usually more reliable and readily obtainable from 'aquatic' suppliers) as the basis for their work. They should place samples of the plant in suitable containers, from which they can collect or measure the amount of oxygen produced (possibly as number of bubbles formed). Candidates can select a suitable continuous variable eg light intensity, temperature, carbon dioxide concentration. Virtual simulations of this work are not recommended since they may not provide a high level of insight into some of the issues involved. Candidates should investigate how changes in their selected variable affect the production of oxygen. Work must be focused on the selected variable, but candidates should be aware that other factors may influence photosynthesis.

Candidates need to generate sufficient data to produce a table to show their individual results and draw a graph and/or chart to demonstrate their results. **At least three repeat readings should be made for each measurement of the variable, and means calculated from these.**

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, diagrams, graphs. They must also demonstrate the use of numerical calculations.

The candidates' work should be collected by the teacher at the end of the session and only returned to 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.

GCSE Environmental Science (44402)
ISA Explanation Sheet

to accompany each ISA
(You will need to fill in more than one of these sheets if different students have carried out different methods)

Centre Number						Year of submission

ISA Title

Name of Teacher

Independent variable	Dependent variable

Did you make any changes to the suggested method?

YES / NO

If YES give details of any changes you made to the suggested method, the equipment, chemicals etc. for this investigation.

Any other Information:

Teacher Signature:

Please attach any experimental worksheet or outline used by the candidates to carry out the investigation if available.

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