OXFORD OPEN LEARNING

GCSE
Science

Introduction

GCSE Science

Introduction

Welcome to your GCSE Science course. This introduction will serve as a guide to what you can expect from the course, and it will show you how to plan your study of this course effectively. Take your time to read this introduction thoroughly before you start the lessons.

The course is designed to prepare students for the **AQA GCSE Science A specification and the GCSE Science B specification.**

AQA subject codes:

GCSE Science A (4461)
GCSE Science B (4462)

Please note that this course has four examined components;

- A Biology examination paper
- A Chemistry examination paper
- A Physics examination paper, plus

An ISA (see below), which consists of

- An item of practical coursework, *and*
- An examination paper based on the practical work

Full details of these components are given below and during the course.

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The Course

The course is different from GCSE science courses of the past in that it attempts to look at the way science affects your everyday life and how you can evaluate the scientific material that you come across in newspapers, magazines and on the television. The course in itself is not sufficient to prepare you to study the sciences at A-level. For that you will also need AQA Additional Science at GCSE.

If you have some background in science, then you will find some of the lessons will touch upon things that you have met before, but the course is designed to be fully understandable with those who have little or no previous background in science.

Arrangement of Lessons

The lessons are planned so that the three strands of biology, chemistry and physics are covered fully throughout the course. It is recommended that you study them in this order. The lessons relating to science in general and the coursework component can be studied at any point after starting the course.

Lesson Contents and Textbook References

Module	**Lesson Title**	**Lesson Number**	**Text book reference**
Science 1	What is Science all about?	1	H1, pp. 2-3
	Can we Trust Scientists?	2 **TMA A**	H8-9, pp. 16-19
Biology 1	Responding to Change	3	B1a1, pp. 22-37
	Keeping Healthy	4	B1a2, pp. 38-45
	Use and Abuse of Drugs	5 **TMA B**	B1a3, pp. 48-59
Chemistry 1	What the World is Made Of	6	C1a, pp. 136-49
	Using Metals	7	C1a2, pp. 164-65
	Getting Metals from the Earth	8 **TMA C**	C1a2, pp. 152-63

Physics 1	Moving Heat	9	P1a, pp. 226-39
	Efficient Energy	10	P1a2, pp. 242-51
Biology 2	Cause and Prevention of Disease	11	B1a4, pp. 62-75
	Survival in the Environment	12 **TMA D**	B1b, pp. 80-91
Chemistry 2	Oils and Fuels	13	C1a3, pp. 168-77
	Making Things from Oil	14	C1b4, pp. 182-93
	Making Things from Plants	15 **TMA E**	C1b5, pp. 196-207
Physics 2	Electrical Devices	16	P1a3, pp. 254-63
	Generating Electricity	17 **TMA F**	P1a4, pp. 266-75
Science 2	Investigating and Observing	18	H4, H5, pp. 8-11
	Gathering and Using Data	19	H6, H7, pp. 12-15
	Coursework	20 **TMA G**	-
Biology 3	Genes and Genetic Engineering	21	B1b6, pp. 94-105
	Evolution and Darwin	22 **TMA H**	B1b7, pp. 110-17
Physics 3	Using Waves	23	P1b, pp. 280-95
	The Uses and Dangers of Radioactivity	24 **TMA I**	P1b6, pp. 298-307
Science Issues	Changes in the Earth and Atmosphere	25	P1b7, pp. 310-15; C1b6, pp. 210-19
	Humans and the Environment	26 **TMA J**	B1b8, pp. 120-31
	Your Practice ISA Test	27	-
Appendices	Glossary/ More on ISAs		-

Textbook

The textbook that is referred to throughout this course is *AQA GCSE Science* by Jim Breithaupt, Ann Fullick and Patrick Fullick. It is published by Nelson Thornes (ISBN 978-0748796342).

You will need a copy of *AQA GCSE Science* throughout the course; you can buy a copy through the Oxford Open Learning website. It is referred to in almost every lesson and provides excellent coverage of the material. By using the textbook and the course you will have very full coverage of all the material

You should not need other books throughout the course but you may like to look in other science books from time to time. If you feel that you would like to use a revision guide before the examination you should ask your tutor which one they recommend.

Internet Resources

In each lesson of the course, internet sites are given which have been carefully selected to illustrate points in the course and to provide additional activities. These are an important tool in your understanding of your science course and you should make every effort to view them and use the activities that they contain. If you do not have an internet connection at home, consider building in regular trips to a library or internet café as part of your study schedule.

The structure within each lesson: how to study

Front Page

The front page of each lesson shows:

- The title.
- **Aim(s)** for the lesson. These set out the position that you should reach after working through the lesson; keep these in mind while reading the lesson material.
- **Context**. This gives a very brief summary and shows how the lesson fits in with the rest of the course.
- **Reading**. The individual references for each lesson.

Lesson Notes

There then follow the notes; these are an outline of the subject material to be studied in the lesson. Read the notes carefully several times until you feel that you have understood the broad outline of the theory involved, and

then tackle the reading references. The textbook may deal with the subjects in greater detail, and, as with the notes, you will probably need to read the passages several times.

Activities

Most activities in the course are placed in the notes at the relevant point. Activities are indicated as follows:

Activity 7	Investigate how a nucleus is held together, particularly how the binding energy of the nucleus relates to Einstein's equation, $E = mc^2$.
	

The pencil symbol indicates that you should make your own notes in the space provided. If the space is insufficient, continue with the activity on a separate piece of paper which may be added to your notes.

Self-Assessment Tests

When you feel that you have mastered the topics and completed the activities, tackle the practice tests, which are at the end of every lesson that does not contain a tutor-marked assessment.

Tutor-marked Assignments

After every two or three lessons there is a tutor-marked assignment. Most of these are in GCSE examination style. Some students may opt to tackle them under timed conditions as examination practice. These tests will thoroughly check your understanding of the previous few topics. You should send your answers to these tests to your tutor, who will return your marked script, together with a set of suggested answers.

Revision

Do **not** leave all your revision until the end of the course. You will need to revise thoroughly for your examination, but frequent revision throughout the course is **essential**. Plan your revision sensibly, and re-read as you feel necessary, if your knowledge is beginning to fade.

Coursework

You will need to discuss the coursework with your tutor once you have made a start on the course. AQA will specify the topic that you will be working on. Do not start the coursework before discussing it with you tutor.

You should not need too much in the way of specialist equipment for your coursework – mainly items that you can find in the kitchen.

Checking the Syllabus

As you know, this course has been written to cover the contents of the **AQA syllabus 4462** which is available to download (you will need an Adobe Acrobat reader on your computer) at:

http://www.aqa.org.uk

You should read the syllabus throughout the course, so either keep a copy on your computer or print it out. If you do not have access to the internet, the syllabus is available from:

AQA Logistics Centre (Manchester)
Unit 2, Wheel Forge Way,
Ashburton Park, Trafford Park,
Manchester
M17 1EH

The Scheme of Assessment comprises four units: Biology 1, Chemistry 1, Physics 1, and the Science 1 unit (normally centre-assessed).

Biology 1	Written Paper	45 minutes
	25% of the marks	45 marks

Entry Code: BLY1F or BLY1H

The unit comprises a written paper with short answer questions. The questions assess the subject content in Sections 10 (up to 9 marks) and 11 (at least 36 marks). The paper is available at Foundation and Higher Tier. All questions are compulsory.

Chemistry 1 Written Paper 45 minutes
25% of the marks 45 marks
Entry Code: CHY1F or CHY1H

The unit comprises a written paper with short answer questions. The questions assess the subject content in Sections 10 (up to 9 marks) and 12 (at least 36 marks). The paper is available at Foundation and Higher Tier. All questions are compulsory.

Physics 1 Written Paper 45 minutes
25% of the marks 45 marks
Entry Code: PHY1F or PHY1H

The unit comprises a written paper with short answer questions. The questions assess the subject content in Sections 10 (up to 9 marks) and 13 (at least 36 marks). The paper is available at Foundation and Higher Tier. All questions are compulsory.

Science 1 25% of the marks 40 marks
Entry Code: SCYC

The unit comprises an Investigative Skills Assignment, which (for school-based students) is normal class practical work followed by an externally-set, internally-assessed test taking 45 minutes, and a Practical Skills Assessment which is a holistic practical skills assessment. The unit assesses parts of the content in Section 10. Different arrangements apply to external candidates, including most distance learners.

Candidates take *either* Foundation Tier (G-C grades possible) *or* Higher Tier (D-A* grades possible) alternatives for the first three papers. It is not necessary to decide at the outset which tier you are going for – tutors will advise in due course.

The last normal exam sitting for the main science specifications is **2012** (there is a theoretical possibility of re-taking in January 2013 but it may be hard to find an exam centre holding such exams). Changes to the GCSE Science specifications (i.e. the introduction of controlled assessment) mean that it is unlikely to be possible to take GCSE Science

exams after 2012 as a distance learner. If you wish to take exams in 2013 or 2014, you'll need to take (or transfer to) an **I**GCSE course. Please see our website for the latest details.

Science A or Science B?

Candidates taking AQA Combined Science may choose between two different syllabuses: **Science A (4461)** and **Science B (4462)**. Candidates may take *either* a series of multiple choice question-papers, often referred to as 'Objective Tests' for Science A (4461) *OR* they can take the series of written papers for Science B (4462).

Science A (4461)
If you choose to do the Objective Tests option, you will sit 6 papers, each worth 36 marks (or 12.5%) and each lasting 30 minutes long.

If you choose this specification, you also have the option of choosing to do the Objective Tests **on-screen**, instead of on paper. On-screen tests are undertaken by candidates sitting at a computer and keying in their responses.

That is to say, you may *either* do the multiple-choice tests on paper *or* on-screen. You may do (or re-do) them in November, March *and* June. For more information on the Science A (4461) option, see the AQA website.

Science B (4462)
We strongly recommend that candidates stick to the 45-minute written papers, i.e. Science B. These can be taken in either January or June, although coursework can only be marked in June.

Past Papers

AQA now makes all (but the very last set) of past papers available online for free download at: http://www.aqa.org.uk
You should discuss how to approach these with your tutor.

Your Tutor

You have a lot of resources to help you in your studies; your course file, textbook, internet resources and your tutor. You should make good use of your tutor to help you with any difficulties that you may have during the course.

And finally…very good luck with your studies.

GCSE Science

Your Coursework Practical (ISA)

Aims

By the end of this lesson you should be able to:

- understand how to work effectively on the coursework component for your GCSE qualification

Context

This section is designed to give you a preliminary understanding of how the coursework element of your GCSE course is carried out and marked. It is important that you read through it carefully, as many of the procedures for the ISA are different for Private Candidates. More detailed information is given in an Appendix at the back of the pack but this does not need to be studied at the outset.

To prepare for your ISA you should read carefully through the appropriate part of the syllabus. You can view or download this at www.aqa.org.uk.

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Introduction

Your coursework instructions are included in the following pages. Please read them carefully and talk to your tutor about what you intend to do.

What is an ISA?

An 'ISA' ('Investigative Skills Assessment') is the practical element of your GCSE Science course. It is made-up of two parts;

Part 1: A Practical Experiment

This is carried out by you, the student. Because you are a private candidate, you should do this practical part of the ISA at home. You should then record the results of your experiment in a table and use them to produce a graph or a chart.

Part 2: A 45-minute written test

You must take this at an exam centre of your choice. You will need to contact your chosen centre well in advance to arrange a time when you can take Part 2 of your ISA (the written test) under exam conditions.

This test will be based on the experiment you did in Part 1 (see above). It will contain a section with questions related to your own experiment and results and a second section related to a similar experiment which you will not have seen before. The data obtained from Part 1 (the practical experiment) will be taken into the related written examination with you. You will need to use your data to answer questions (more about the written examination later).

You must *not* take any written explanations, write-ups or methodology into the written test part of your ISA. This is not allowed.

When you have completed both parts of the ISA, your test paper, along with the results from your experiment and any graphs or charts you might have produced, will be sent off to a moderator to be marked.

Risk Assessment

All experiments are undertaken at the student's own risk, so it is essential that you should be aware of (and minimise) the risks associated with your chosen experiment(s). You should therefore read and consider the Risk Assessment sections that precede each experiment.

Drawing up a Table of Results

Before you carry out your practical investigation, you should draw up a table you can use to record your results. You should design your table based on the requirements of the investigation. Guidelines on drawing up a table can be found in Lesson 19 'Gathering and Using Data'.

Labelling your tables, graphs and charts

There are strict rules about what you can and cannot take into the written exam for your ISA. You should label the axes on your graph with the appropriate titles, but the only other writing you may have on your graphs or charts is that of the ISA title (e.g. 'Chemistry ISA 1.5: Investigating Plastics'). There must be **no other writing** on tables, graphs or charts, including that which identifies dependent or independent variables.

Writing up your Practical (Optional)

For both the practice ISA and the final ISA, we would advise you to write up your chosen experiment(s) using the lessons on practical work (in particular Lessons 18-20 and 27, plus the Appendices) to help you. Your tutor will talk to you about what they expect from a write-up.

You *cannot* take your write-up into the written exam part of the ISA. It is to help you understand your experiment, but does not form part of the final assessment.

Practice ISAs (Part 1: Practical Experiment)

You should complete at least one of the practice ISAs (e.g. 'Viscosity of Oils' before you attempt your final ISA. There is a practice ISA for each of Physics, Chemistry and Biology. If you only do one, it would make sense to do it in the same subject as your final ISA.

The instructions for the practice ISA are outlined in the pages that follow. It is very important that you carry out a practice ISA in order to familiarise yourself with the processes involved in carrying out a practical scientific experiment. Doing a practice ISA should mean you are better equipped with the skills of planning, observation arid evaluation which you will be tested on in the actual ISA.

Practice ISAs (Part 2: Written Test)

Past papers relating to your practice ISAs are included at the end of this course. Once you have completed your practical experiment and written it up (Part 1), you should complete the past paper under test conditions, as if it were the real thing. You should refer only to your table of results and the graph(s) or chart(s) you produced when you take the practice written test. Look carefully at the mark scheme for the written test (see lesson 27) to see how marks are allocated for each question.

Which ISA should I take?

AQA releases a number of ISA options at regular intervals during the course of the year, which are valid for a certain period only. It is important that you understand which ISAs you can choose from, so that you do not end up submitting an ISA which is no longer accepted.

The tables below show the ISA options for the years 2011 and 2012.

If you are taking your exams in June **2011**, you should choose **one** ISA from **Table 1** to carry out for your coursework.

If you are taking your exams in June **2012**, you should choose the ISA from **Table 2** to carry out for your coursework. A further set of options will be released by AQA in due course, and OOL will update you of any developments. You should also make sure that your student advisor at OOL knows which year you have decided to sit your exams.

Final ISA (Part 1: Practical Experiment)

Table 1 (2011)

Option	June 2011 GCSE Science Final ISA Options
Option 1	Chemistry 1.6 Investigating the properties of oils, Set 4
Option 2	Biology 1.6 Distribution of Plants, Set 5

Table 2 (2012)

Option	June 2012 GCSE Science Final ISA Options
Option 1	Biology 1.6 Distribution of Plants, Set 5

Where there is a choice, you should discuss which ISA you will choose with your tutor. The instructions for these options are outlined in the pages that follow, and each is labelled as a 'Final ISA'.

Experiments should be all your own work and AQA ask schools not to announce the experiments until they are actually to be attempted (to prevent students from accessing model answers on the internet). Your tutor and the exam board will be on the look out for work that has been copied from elsewhere.

Final ISA (Part 2: Written Test)

This will be sat at an Exam Centre of your choice. It is the student's responsibility to find a centre. For more information, see the 'Oxford Open Learning Guide to finding a Centre'.

Not sure about anything?

You should find further useful information about ISAs in an Appendix at the back of this course. But that is as much as you need to know at the outset.

Biology *Practice* ISA

Reaction Times

Risk Assessment

It is the responsibility of the candidate (and any relevant parent or guardian) to ensure that a risk assessment is carried out. This ISA has been chosen, in part, because the risks are small.

This experiment has no particular risks involved but;

- When dropping sticks care should be taken that toes are protected.
- Keep young children out of the way while doing this experiment.
- Take care of your eyes and of the eyes of your partner when performing this experiment.
- This experiment is best performed on a carpeted area or out of doors.

Area of investigation

This work relates to the section of your course which investigates:

How do human bodies respond to changes inside them and to their environment?

Related Lessons

You should re-visit **Lesson 1 on 'Responding to Change'** in your course pack before you carry out this ISA, to refresh your memory of the topic.

Background

When an event occurs, the brain takes a certain time to react to it. For example, when driving along a road, a driver can take roughly two thirds of a second to react to the car in front beginning to brake. This time is called the *reaction time*. How

far would a car travelling at, for example, 50 mph go in this two thirds of a second?

It is important for drivers to allow for the time they take to react when driving, and to be aware of the fact that they may have a reaction time that is slower than average. A simple experiment to measure reaction times can be carried out using a metre ruler. A friend holds the metre ruler vertically and drops it, while you try to catch it as soon as possible after it is released.

Equipment

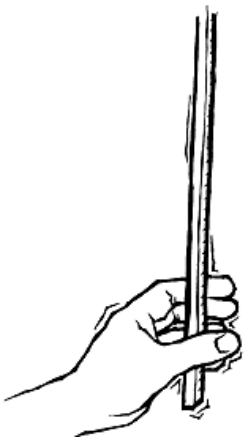
- a piece of lightweight, sanded wood of about one metre in length (available from your local DIY supplier).
- an accurate tape measure or steel rule that measures in millimetres.

The Practical Work

You should aim to carry out an investigation concerning how changes in your external environment can affect your reaction time.

Method

You will need a helper for this experiment.



1. Place a mark on a smooth, even stick of light wood close to one end.

2. Sit with your forearm on a table surface so that your hand extends over the edge.
3. Have your partner hold the stick with the mark between, but not touching, your thumb and fingers.
4. Ask your partner to release the stick without warning.
5. Catch the stick as quickly as you can between your thumb and fingers.
6. Mark where you caught the stick.
7. Measure the distance between the original mark and point where the stick was caught as accurately as you can.
8. Repeat the experiment a number of times.
9. Change places with your partner and repeat the experiment

Part Two: the Data Processing

You should draw up a table of results and process the data in an appropriate way, e.g. charts, graphs, diagrams or line of best fit.

Remember:

You must decide:

1. How you will make this investigation a 'fair test'.
2. Which variable will be your independent variable.
3 The number of tests. (Each test with a different value for the independent variable.)
4. How many repeats of each test you should carry out so that you can calculate the average value of the dependent variable for each test.
5 The type of graph/chart to plot.

Before you start the practical work you must draw up a table ready to record your results.

When you have finished your investigation:

1. Make sure that you have produced a clear table of results as close to the standard table layout as possible.

2. Process your results to produce what you think is the most appropriate **graph** or **chart**.

The written ISA Test which matches this Practice ISA can be found in Lesson 27.

Chemistry Practice ISA
Viscosity of Oils

Risk Assessment

The risks involved with this practical are minimal, but as with all practical work you should be careful.

- Do not use nut oil in this experiment if you or any of your household has a nut allergy.
- Oil spilt on surfaces can be slippery – take care.
- Oil is flammable so do not do the experiment in any place where this presents a danger.
- Oil will stain carpets, upholstery and clothing if spilt.
- Tiles have sharp edges if dropped – dispose of them safely
- Do not dispose of oil by putting it down the drain.
- Keep small children out of the way when performing this experiment.

Area of investigation

This work relates to the section of your course which investigates:

How do we get fuels from Crude Oil?

Related Lessons

You should re-visit Lesson 13: 'Getting Fuel from Oil' in your course pack before you carry out this ISA, to refresh your memory of the topic.

Viscosity is a measure of how 'thick' a liquid is. In this experiment you will be testing the viscosity of three oils at three different temperatures. You may like to refer to the material in Lessons Five and Six before starting this work.

Equipment

You can use three of the following oils; all are readily available and you may be able to find them in your kitchen or your local supermarket.

- Groundnut oil
- Corn oil
- Rape oil
- Olive oil
- Almond oil
- Walnut oil
- Grape seed oil
- Baby oil

It is best not to use oils marked as 'cooking oil' or 'vegetable oil' as they are often blended and may give confusing results.

You can obtain bathroom tiles from any DIY store.

You can use the stopwatch facility on your wristwatch.

A free stopwatch that works on your computer screen can be downloaded (at the time of going to press) from:

www.download.com/XNote-Stopwatch/3000-2350_4-10332723.html

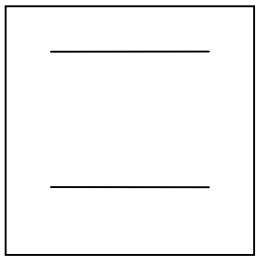
You can buy a very cheap sports stopwatch at:

www.astopwatch.co.uk/products/fastimerange.asp

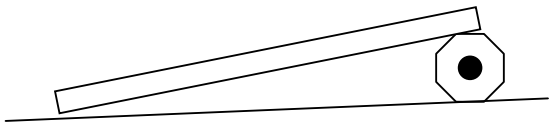
Part 1: The Practical Work

You should aim to carry out an investigation concerning the viscosity of oils.

1. Using a flat glazed bathroom tile, mark two lines at least 10 cm apart with a permanent felt tip pen. If your tile is large then you can use a greater distance.



2. On a newspaper-covered surface, place one end of the tile on a pencil so that one edge is slightly raised.



3. With a dropper put one drop of oil on your tile at the top line and time how long it takes to reach the bottom line.
4. Each time you need to clean the tile with a dry paper towel - do not use detergent (this may affect your experiment)
5. Repeat the experiment with two other oils; it is a good idea to take repeat readings.
6. Repeat the experiment at a lower temperature by keeping the oil, the tile and the dropper in the refrigerator for one hour.

Part 2: The Data Processing

You should draw up a table of results and process the data in an appropriate way, e.g. charts, graphs, diagrams, and line of best fit if appropriate.

You need to have collected sufficient data to display in such a format. For more information on this, see the *GCSE Sciences Coursework (ISA) Guide for Students* in your course-pack.

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

Remember:

You must decide:

1. How you will make this investigation a 'fair test'.
2. Which variable will be your independent variable.
3 The number of tests. (Each test with a different value for the independent variable.)
4. How many repeats of each test you should carry out so that you can calculate the average value of the dependent variable for each test.
5 The type of graph/chart to plot.

Before you start the practical work you must draw up a table ready to record your results.

When you have finished your investigation:

1. Make sure that you have produced a clear table of results as close to the standard table layout as possible.

2. Process your results to produce what you think is the most appropriate **graph** or **chart**.

FINAL ISA

Option 1 (Valid for June 2011)

Chemistry 1, ISA 1.6: Investigating the Properties of Oils

(N.b. You must use this **exact wording** in your ISA title.)

This ISA relates to Unit C1: Science A (4461), Science B (4462) Section 12.3,

Chemistry (4421) Section 11.3.

Risk Assessment

It is the responsibility of the candidate (and any relevant parent or guardian) to ensure that a risk assessment is carried out. This ISA has been chosen, in part, because the risks are small.

Your attention is drawn in particular to the dangers associated with the following:

- Do not use a nut oil in this experiment if you or any member of your household has a nut allergy.
- Oil spilt on surfaces can be slippery – take care.
- Oil is flammable so do not do the experiment in any place where this presents a danger.
- Oil will stain carpets, upholstery and clothing if spilt.
- Do not dispose of oil by putting it down the drain.

Area of investigation

This work relates to the section of your course which investigates:

How do we get fuels from Crude Oil?

Related Lessons

You should re-visit Lesson 4: '**Getting Fuel from Oil**' in your course pack before you carry out this ISA, to refresh your memory of the topic. Viscosity is a measure of how 'thick' a liquid is. In this experiment you will be testing the viscosity of 3 different oils at different temperatures using a **Cup Viscometer**. A Cup Viscometer is a cup with a hole in the base. Oil flows out of the cup through the hole at a rate determined by the oil's viscosity.

Equipment

Choose three of the following oils; all are readily available and you may be able to find them in your kitchen or local supermarket.

Corn oil	Groundnut oil
Rapeseed oil	Walnut oil
Olive oil	Almond oil
Grape seed oil	Baby oil

It is best not to use oils marked as 'cooking oil' or 'vegetable oil' as they are often blended and may give confusing results.

Alternatively you could investigate the viscosity of washing up liquid or shower gel at different dilutions, to see how the viscosity changes.

You will also need,

- Disposable plastic drinks cups
- A compass point or skewer to make a hole in the cup
- A measuring cylinder or measuring jug

You will need a stopwatch facility, which could be on your wristwatch. You can buy cheap stopwatches at

www.astopwatch.co.uk/products/fastimerange.asp

The Practical Work

A suggested method is described below, but you may adapt this method to suit your own situation.

You should aim to carry out an investigation concerning the properties of oils.

Candidates can investigate how the viscosity of different oils varies. The investigation can also include how the viscosity of different oils varies when the oils have been subjected to a lower temperature.

Candidates can make a cup viscometer using a plastic drinks cup. A compass point or skewer can be used to punch a hole in the centre of the bottom of the cup. This should be about 1mm in diameter. (Heating the compass point in a gas flame for a few seconds will make the job easier, but take care if you use this method).

Candidates need to suspend the cup so that oil can drain out of the hole into another container. In the absence of a clamp, a piece of card can be used with a hole cut out big enough to hold the cup without it falling through. The card can then be positioned across two supports. Another cup may be placed underneath to catch the oil.

Candidates should be aware of the need accurately to measure suitable quantities of oil and accurately to time the flow of oil through the cup viscometer. Place one finger underneath the cup blocking the hole. Then pour the oil into the cup. Start the stopwatch and remove your finger. Time how long it takes for the oil to run out of the cup. You need to think carefully about the exact point when you are going to stop timing. You should carry out a preliminary investigation to determine the quantity of oil you want to use, and the point a which you will stop timing.

It is a good idea to take repeat readings. Clean the cup thoroughly before testing the next oil.

Repeat the experiment at a lower temperature by keeping the oils, the cup and the measuring jug in the refrigerator for one hour.

Candidates need to produce a table for the results and draw a graph or bar chart to show their results.

You need to have collected sufficient data to display in such a format. For more information on this, see the *GCSE Sciences Coursework (ISA) Guide for Students* in your course-pack.

The Data Processing

Each candidate must draw up his or her own table for the results and should process the data in an appropriate way, e.g. charts, graphs, diagrams, line of best fit.
Candidates' work must **not** be annotated with additional information, by either the tutor or the candidate, which would give them an unfair advantage during the ISA, e.g. the use of the terms independent/dependent variable.

Remember:

You must decide:

1. How you will make this investigation a 'fair test'.
2. Which variable will be your independent variable.
3 The number of tests. (Each test with a different value for the independent variable.)
4. How many repeats of each test you should carry out so that you can calculate the average value of the dependent variable for each test.
5 The type of graph/chart to plot.

Before you start the practical work you must draw up a table ready to record your results.

When you have finished your investigation:

1. Make sure that you have produced a clear table of results as close to the standard table layout as possible.

2. Process your results to produce what you think is the most appropriate **graph** or **chart**.

FINAL ISA

Option 2 (Valid for June 2011 and June 2012)

Biology ISA 1.6 Distribution of Plants

This ISA relates to Unit B1: Science A (4461) Science B (4462) Biology (4411) Section 11.5.

Risk Assessment

This is a low risk activity but you should be aware of the following:

- Take care if you are working near water.
- Take into account any allergies that you have and how these will be affected by working in your chosen environment.
- Fieldwork can bring you close to stinging plants and insects.
- Always let someone know where you are working.
- Keep a close eye on young children if they accompany you.

It is the responsibility of the candidates (and any relevant parent or guardian) to ensure that a risk assessment is carried out.

In addition to the normal risk assessment, please read the ecologists' code of conduct which is reproduced in the **Appendix: Fieldwork,** page 15.

Many areas, including certain parks and forestry commission land, require written permission to conduct fieldwork within them. You will need to apply for this in advance.

Area of investigation

This work relates to the section of your course which investigates:

What determines where particular species live and how many of them are there?

- To suggest reasons for the distribution of plants in a particular habitat.

Related Lessons

You should re-visit **Lesson 5** on **'Surviving in the Environment'** in your course pack as well as the **Appendix: Fieldwork** before you carry out this ISA, to refresh your memory of the topic, and also **Section B1b, pages 80 – 91 in the AQA Science GCSE Biology Textbook** by Ann Fullick.

Equipment

- Quadrat (see below)
- Metric tape measure

You should find that the wood necessary to build a quadrat is readily available from your local DIY store. A metric tape measure will be necessary for the transect (see below). If you decide to use other equipment - light meters, thermometers, etc, you should build your plan around the equipment readily available to you.

Inexpensive digital read-out thermometers are available from:

www.toolstation.com/search.html?searchstr=thermometer

The Practical Work

You should aim to carry out an investigation concerning the distribution (by percentage cover) of one plant species in a changing habitat, using a transect.

A suggested method is described below, but you may adapt this method to suit your own situation.

A simple method would be to extend a tape measure or string from the goal line of a football or hockey pitch to the edge of the goal area. Half metre quadrats could be placed on this at suitable intervals and the percentage cover of one species, e.g. grass, dandelions or plantain plants, in each quadrat could be estimated. It may be helpful to candidates to use quadrats that are internally divided into 100 squares. (Plastic fencing bought from a garden centre and cut into 50 cm x 50 cm squares makes a cheap alternative to commercially produced quadrats; there are one hundred 50 cm x 50 cm squares in this size quadrat.)

It is not necessary to measure the environmental factor that is changing, although it should be clear to candidates what that factor might be.

The Data Processing

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

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

Remember:

You must decide:

1. How you will make this investigation a 'fair test'.
2. The species that you will investigate.
2. Which variable will be your independent variable.
3 The number of tests. (Each test with a different value for the independent variable.)
4. How many repeats of each test you should carry out so that you can calculate the average value of the dependent variable for each test.
5 The type of graph/chart to plot.

Before you start the practical work you must draw up a table ready to record your results.

When you have finished your investigation:

1. Make sure that you have produced a clear table of results as close to the standard table layout as possible.

2. Process your results to produce what you think is the most appropriate **graph** or **chart**.

OXFORD OPEN LEARNING

GCSE
Science

Module 1: Science 1

Lesson One

What is Science all about?

Aims

By the end of this lesson you should be able to:

- understand the difference between science and technology
- appreciate the differences between biology, chemistry and physics
- understand that despite their differences, the sciences are united in their methods and aims
- understand the importance of measurement to science
- know about SI units

Context

This lesson introduces some basic ideas for all the sciences and relates to all other lessons in the course and to the Investigating Skills examination paper.

AQA GCSE Science – section H1, pages 2 to 3.

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