OXFORD OPEN LEARNING

GCSE
Additional Science

Introduction

Additional Science GCSE

Introduction

Welcome to your GCSE Additional 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 Additional Science specification (syllabus).**

The AQA subject code is **4463 GCSE Additional Science.**

Please note that this course has four examined components (assuming you have already done Combined Science):

Examination paper Biology 2
Examination paper Chemistry 2
Examination paper Physics 2, 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 follows on from the GCSE Science course. You should have studied this course (or an equivalent) before starting work on Additional Science. If you have not studied the GCSE Science course with Oxford Open Learning then you will need to have a copy of that course or a textbook for GCSE science to pick up on the topics which are explored in more detail in this course.

Arrangement of Lessons

The lessons are provided in seven modules;

- Physics 1
- Biology 1
- Chemistry 1
- Physics 2
- Biology 2
- Chemistry 2
- Science Skills

You should note that the seventh module is common to the examination for GCSE Science. If you have recently completed the GCSE Science course then you will have studied these lessons before. TMA J, however, which is based on this material, is different from the one that appears in the GCSE Science course. If you have not taken your GCSE Science course with Oxford Open Learning then you will need to study these lessons carefully.

You should do the modules in order, but the Science Skills module can be completed whenever you like; this *must* be before you start on your practical assessment (see below).

Textbook

The textbook that is referred to throughout this course is

AQA GCSE Additional Science
Jim Breithaupt – Ann Fullick – Patrick Fullick – Nelson Thornes - ISBN 978-0748796380.

You will need a copy of *AQA GCSE Additional Science* throughout the course; you can buy a copy through the Oxford Open Learning website. It is referred to in almost

every lesson. By using the textbook and the course you will have an excellent coverage of all the material.

You should not need to use other books during 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.

Lesson Contents and Textbook References

Physics Module 1		
Lesson	*Title*	*Book Reference*
1	Movement 1	P2.1/2
2	Movement 2 / **TMA A**	P2. 3
3	Static Electricity	P2.4

Biology Module 1		
Lesson	*Title*	*Book Reference*
4	Cells	B2.1
5	Movement of Substances/ **TMA B**	B2.1
6	Green Plants	B2.2

Chemistry Module 1		
Lesson	*Title*	*Book Reference*
7	Chemical Bonding	C2.1
8	Chemical Structures /**TMA C**	C2.2
9	Chemical Calculations 1	C2.3
10	Chemical Calculations 2	C2.3

Physics Module 2		
Lesson	*Title*	*Book Reference*
11	Electrical Circuits	P2.5
12	Electrical Appliances **/ TMA D**	P2.6
13	Atoms and radioactivity	P2.7
14	Nuclear Power / **TMA E**	P2.7

Biology Module 2		
Lesson	*Title*	*Book Reference*
15	Energy and Food in the Ecosystem / **TMA F**	B2.3
16	Enzymes	B2.4
17	Homeostasis	B2.5
18	Inheritance / **TMA G**	B2.6

Chemistry Module 2		
Lesson	*Title*	*Book Reference*
19	Rate of Reaction / **TMA H**	C2.4
20	Energy and Chemical Reactions	C2.5
21	Ions in Solution / **TMA I**	C2.6/7

Science Skills		
Lesson	*Title*	*Book Reference*
22	What is Science all about?	-
23	Can we believe Scientists?	-
24	Investigating and Observing	-
25	Gathering and using Data	-
26	Coursework / **TMA J**	-

Appendices		
	Fieldwork	-
	Chemistry Data	-
	More on ISAs	-

Internet Resources

In most lessons 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 the understanding of your Additional 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 making 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.

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. Some suitable experiments suggested by AQA are given in the section after

this Introduction. Do not start the coursework before discussing it with your tutor.

You should not need too much in the way of specialist equipment for your coursework; you can use mainly items that you can find in the kitchen. Specific details for equipment used for coursework will be found in the coursework notes.

Checking the Syllabus

As you know, this course has been written to cover the contents of the **AQA syllabus 4463**, which is available to download (you will need an Adobe Acrobat® reader on your computer) at **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 2, Chemistry 2, Physics 2, and the Science 2 unit (normally centre-assessed).

Biology 2 Written Paper 45 minutes
25% of the marks 45 marks
Entry Code: BLY2F or BLY2H

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 2 Written Paper 45 minutes
25% of the marks 45 marks
Entry Code: CHY2F or CHY2H

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 2 Written Paper 45 minutes
25% of the marks 45 marks
Entry Code: PHY2F or PHY2H

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 2 25% of the marks 40 marks
Entry Code: ASCC

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**. 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 later years), you will need to take (or transfer to) an **I**GCSE course. Please see our website for the latest details.

Past Papers

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

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.

Additional Science GCSE ISA

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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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 25 '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. 'Biology ISA 2.4 'Staying Cool'). 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 24-26, 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.

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 Additional Science Final ISA Options**
Option 1	Biology 2.4 Staying Cool, Set 4
Option 2	Physics 2.5 Crumple Zones, Set 5

Table 2 (2012)

Option	**June 2012 GCSE Additional Science Final ISA Options**
Option 1	Physics 2.5 Crumple Zones, 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.

ISA Option 1 (Valid for June 2011)

Biology ISA 2.4 Staying Cool

This ISA relates to Unit B2: Additional Science (4463) Section 11.7, Biology (4411) Section 12.7.

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 using hot water.

Area of investigation

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

How do human bodies keep internal conditions constant?

Related Lessons

You should re-visit Lesson 14 on 'Homeostasis' in your course pack before you carry out this ISA, to refresh your memory of the topic, and also Section B2 5.2, pages 194 – 195 in the AQA Science GCSE Biology Textbook by Ann Fullick.

Equipment

- Two boiling tubes (or small pyrex jugs)
- Hot water
- A thermometer
- A stopwatch

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 how evaporation of sweat affects the loss of heat from the body.

One approach would be to wrap newspaper round two boiling tubes. Fill each tube with hot water and then wet the paper of one tube with more hot water. Record the temperature of the water in the two tubes at suitable intervals. It may be necessary to add further hot water to the paper of the one tube every few minutes (perhaps using a paint brush). Carry out the temperature recording for up to 15 minutes.

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

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**.

ISA Option 2 (Valid for June 2011 and June 2012)

Physics ISA 2.5 - Crumple Zones

This ISA relates to Unit P2: Additional Science (4463) and to Physics (4451) Section 12.3.

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.

Area of investigation

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

When a force causes a body to move through a distance, energy is transferred and work is done.

Related Lessons

Lesson 8 on Movement in the Physics (4451) course pack and Section P2 3.5 in the recommended textbook.

Equipment

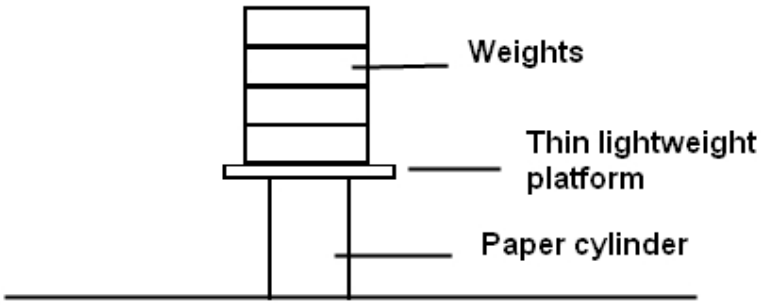
- Paper cylinders
- Weights
- A platform

The Practical Work

You will need your table of results and graph/chart to answer questions in your ISA written exam. Therefore keep as close as possible to the task that follows.

You are to put loads (weights) onto paper cylinders until the cylinders crumple.

Make each paper cylinder by cutting a rectangle out of paper and rolling it into a cylinder and then gluing or taping the two edges together. Use the minimum amount of tape otherwise the cylinder will be given artificial strength. A small platform of, for example hardboard, is then placed on top of the cylinder and weights added until the cylinder is crushed. A suitable size for the platform is about 10cm by 10cm.



Choose <u>only one</u> of the following to investigate:

How the height of the cylinder affects the load (weight) needed to crumple the cylinder.

Or how the diameter of the of the cylinder affects the load needed to crumple the cylinder.

Or how the thickness of the paper affects the load needed to crumple the cylinder.

Practical suggestions:

The paper cylinder: If you use sticky tape to hold the edges of your cylinder, trim off as much tape as you can before attaching the second edge. Try to attach edge to edge rather than overlapping.

The platform: You can use a square 'coaster' (small mat used to protect table top) instead of cutting a piece of hardboard.
The weights: If you do not have a suitable 'set of weights' you can use a container, for example a plastic milk bottle, and pour in sand (or similar). Find the weight of the sand using kitchen scales. Most kitchen scales give a measurement in grams. The weight of 100grams of material is 1newton.

If you do not have kitchen scales you could use water in the container instead of sand. The water may spill when the cylinder crumples – so work on a tray. You measure the volume of water used to crumple the cylinder and work out the weight of the water. 100cc of water has a mass of 100g and a weight of 1newton.

If you use other objects to provide the load, for example a number of nails, then make sure they are evenly distributed on the platform.

The paper: Paper cylinders can be very strong. Find a type of paper that will crumple reasonably easily for a suitable range of your independent variable.

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 with line of best fit.

Candidates' work must not be annotated with additional information, by either the tutor or the candidate, which would give an unfair advantage during the written ISA exam, e.g. do not write the words independent variable or dependent variable on your results table or graph/chart.

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**.

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Physics Module One