OXFORD OPEN LEARNING

IGCSE Science (Double Award)
Biology

OXFORD OPEN LEARNING

IGCSE

Science (Double Award)

Introduction

IGCSE Science

Introduction

Welcome to your IGCSE 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 **Edexcel IGCSE Science (Double Award) specification (syllabus).**

The Edexcel subject code is **4SC0 IGCSE Science**.

The 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 advisable that you do the modules in the order suggested below, as the content has been written to enable you to develop your knowledge and skills as you progress through the lessons.

Oxford Open Learning

The Course

The course is designed to develop (1) a broad understanding of scientific facts, concepts and principles, (2) skills in scientific investigation, and (3) an ability to evaluate the benefits and drawbacks of modern scientific developments.

This qualification supports progression to:

- GCE Advanced Subsidiary and Advanced Level in Biology
- GCE Advanced Subsidiary and Advanced Level in Chemistry
- GCE Advanced Subsidiary and Advanced Level in Physics

Students entering for the Edexcel IGCSE in Science (Double Award) (4SC0) may not enter the following specifications in the same exam series:

- Edexcel IGCSE in Biology (4BI0)
- Edexcel IGCSE in Chemistry (4CH0)
- Edexcel IGCSE in Physics (4PH0)

The course is designed to be accessible to students who may have only a limited previous background in science. If you have some background in Science then you should find that some of the lessons build upon things that you have met before in your earlier studies.

The practical work described at various points in this course is to help to develop your skills for the practical-based components of the theory exams. It is not essential to carry out this work yourself, but if you can undertake some of it at home, or have the opportunity to perform supervised laboratory work in the course of your studies, this will be a great help. Three of the lessons are devoted to the development of practical skills, and there is a very useful guide to practical skills in the Appendix at the back of each textbook to help you further.

Textbooks

The textbooks referred to throughout this course are:

1. Phil Bradfield and Steve Potter, *Edexcel IGCSE Biology* (2009;

   Pearson Education ISBN: 978 0 435966 88 1)

2. Jim Clark, *Edexcel IGCSE Chemistry* (2009; Pearson Education ISBN 978 0 435966 89 8)

3. Brian Arnold, Steve Woolley and Penny Johnson, *Edexcel IGCSE Physics* (2009; Pearson Educational Ltd ISBN 978 0 435966 90 4)

You will need to use these textbooks throughout the course; you can buy copies through the Oxford Open Learning website. They are referred to in many lessons and provide excellent coverage of the material. By using the textbooks and the course you will have very full coverage of all the material. The books each have an accompanying CD-ROM containing useful extra questions with answers.

The *Edexcel IGCSE Science Double Award Student Guide* (Pearson, 2011, ISBN 9780435046774) by Cliff Curtis, Steve Woolley, and Phil Bradfield is also available. This textbook would also form a useful accompaniment to the course; however, the page references given in this course are to the single science textbooks listed above.

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.

Tiering and IGCSE Examination Entry

Science IGCSE examinations are *not* divided into different entry tiers.

Arrangement of Lessons and Textbook References

Paper 1 Biology **Module 1: Cells and Organisms**		
Lesson	*Title*	*Textbook Reference*
1	Cells, Organisms, and the Variety of Life	Chapter 1 pages 1-3, 12-13, and Chapter 2 pages 16-21.
2	Movement of Substances into and out of Cells **TMA A**	Chapter 1 pages 9-11 and Chapter 11 pages 122-123 123-126.
3	Investigative Skills A: Design	Appendix A, pages 247, 252-254.
4	Respiration and Enzymes	Chapter 1, pages 3-9.
5	Investigative Skills B: Carrying Out	Appendix A, pages 247-250.

Module 2: Plant and Animal Physiology A		
Lesson	*Title*	*Textbook Reference*
6	Human Nutrition **TMA B**	Chapter 4 pages 37-51.
7	Investigative Skills C: Interpreting	Appendix A, pages 249-251.
8	Photosynthesis	Chapter 10 pages 109-120.
9	Transport in Plants and Animals	Chapter 5 pages 53-63 and Chapter 11 pages 127-133.
10	Gas Exchange in Plants and Animals **TMA C**	Chapter 3 pages 26-35 and Chapter 10 pages 114-115.

Module 3: Plant and Animal Physiology B		
Lesson	*Title*	*Textbook Reference*
11	Homeostasis and Excretion	Chapter 8 pages 83-94.
12	The Human Nervous System	Chapter 6 pages 65-76.
13	Hormones in Plants and Animals	Chapter 7 pages 78-82 and Chapter 12 pages 135-142.
14	Human Reproduction **TMA D**	Chapter 9 pages 96-105.
15	Reproduction in Plants	Chapter 13 pages 143-148.

Module 4: Inheritance

Lesson	*Title*	*Textbook Reference*
16	Chromosomes, Genes and DNA	Chapter 16, pages 181-188.
17	Cell Division	Chapter 17, pages 190-195.
18	Genes and Inheritance **TMA E**	Chapter 18, pages 197-206.
19	Natural and Artificial Selection	Chapter 19 pages 208-217 and Chapter 20 pages 218-221.
20	Genetic Engineering and Cloning	Chapter 20 pages 221-224 and Chapter 22 pages 235-244.

Module 5: Ecology and Food Production		
Lesson	*Title*	*Textbook Reference*
21	Ecosystems	Chapter 14 pages 152-162.
22	Human Impact on the Environment **TMA F**	Chapter 15 pages 170-175.
23	Food Production **TMA G**: Mock Exam	Chapter 15 pages 165-170 and Chapter 21 pages 228-233.

Chemistry IGCSE **Module 1: Principles of Chemistry**		
Lesson	*Title*	*Textbook Reference*
1	States of Matter and Atoms	pages 1-6, and 89-91.
2	Atomic Structure	pages 6-12.
3	Relative Formula Masses	pages 176-185, 190-192.
4	Chemical Formulae and Chemical Equations **TMA A**	pages 33-40.
5	Ionic Compounds	pages 17-22, 25-27.
6	Covalent Substances	pages 13-18; 20-21; 27-29.
7	Metallic Crystals	pages 20, 24-25.
8	Electrolysis **TMA B**	pages 112-119.

Module 2: Chemistry of the Elements		
Lesson	*Title*	*Textbook Reference*
9	The Periodic Table	pages 6-12, 99-101, Appendix B.
10	Group 1 and Group 7 Elements	pages 102-111.
11	Oxygen and Oxides	pages 54-59.
12	Hydrogen and Water	pages 66, 93, 106, 123, 125.

13	Reactivity Series	pages 55, 60-69, 109,139-140; 144-145.
14	Tests for Ions and Gases **TMA C**	pages 93-95 (ions), 55, 58, 73, 92, 93, 95, (gases).

Module 3: Organic Chemistry		
Lesson	*Title*	*Textbook Reference*
15	Alkanes	pages 149-160.
16	Alkenes **TMA D**	pages 156-62.

Module 4: Physical Chemistry		
Lesson	*Title*	*Textbook Reference*
17	Acids, Alkalis and Salts	pages 70-88.
18	Energetics	pages 120-123, 202-208.
19	Rates of Reaction	pages 41-50.
20	Equilibria **TMA E**	pages 126-129.

Module 5: Chemistry in Society		
Lesson	*Title*	*Textbook Reference*
21	Extraction and Uses of Metals	pages 139-145.
22	Crude Oil	pages 163-168.
23	Synthetic Polymers	pages 169-173.
24	The Industrial Manufacture of Chemicals **TMA F**	pages 133-138.

Module 6: Investigative Skills		
Lesson	*Title*	*Textbook Reference*
25	Designing and Carrying Out a Scientific Experiment	pages 218-225.
26	Interpreting the Results of an Experiment	as above.
	TMA G: Mock Exam, Paper 1	
	Appendix: Data	
	Glossary	

Physics Paper 1 **Module 1 – Forces and Motion**		
Lesson	*Title*	*Textbook pages*
1	Movement 1	1 -10
2	Movement 2 **TMA A**	12-17, 23-25, 34-37
3	Movement 3	26-31, 38-40
4	Turning Effects and Stretching Effects	18-20, 42-48
5	Astronomy **TMA B**	49-56

Module 2 – Electricity		
Lesson	*Title*	*Textbook pages*
6	Electrical Appliances	59-65
7	Static Electricity **TMA C**	66-69
8	Electrical Circuits 1	70-72
9	Electrical Circuits 2	74-80
10	Electrical Circuits 3 **TMA D**	82-88

Module 3 – Waves		
Lesson	*Title*	*Textbook pages*
11	-	91-98
12	The Electromagnetic Spectrum	99-103, 136
13	Light: Reflection and Refraction	107-115
14	Sound	104-105, 118-126
15	Investigative Skills A: Taking a Reading **TMA E**	235

Module 4 – Energy Resources and Energy Transfer		
Lesson	*Title*	*Textbook pages*
16	Energy Transfers	127-132
17	Thermal Energy	133-141
18	Work and Power **TMA F**	142-149
19	Energy Resources and Electricity Generation	150-159
20	Investigative Skills B: Experimental Design	234-236

Module 5 – Solids, Liquids and Gases		
Lesson	*Title*	*Textbook pages*
21	Density and Pressure **TMA G**	162-168

22	Solids, Liquids and Gases	169-176
23	Investigative Skills C: Interpreting Investigations	236-241

Module 6 – Magnetism and Electromagnetism		
Lesson	*Title*	*Textbook pages*
24	Magnetism **TMA H**	179-186
25	Electric Motors and Electromagnetic Induction	187-195

Module 7 – Radioactivity and Particles		
Lesson	*Title*	*Textbook pages*
26	Atoms and Radioactivity **TMA I**	199-207
27	Radiation and Half-life	209-214
28	Applications of Radioactivity	216-224
29	Atomic Theory and Nuclear Fission **TMA J** **TMA K – Mock Exam**	226-231

Appendices		*Textbook pages*
	A: Electrical circuit symbols B: Physical Quantities and Units	242 245

Internet Resources

In most lessons of the course internet sites are referenced. These have been carefully selected to provide additional activities. Some of these have been designated as "Extension" activities.

These internet sites are an important tool to help your understanding of your Science course, and you should make every effort to view at least the ones not designated as Extension.

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 Course Structure: How to use the Course

The course comprises three strands: Biology, Chemistry and Physics. These are arranged separately in three course folders. The course modules correspond to the numbered sections of the Edexcel Science specification. We strongly recommend that you follow an **integrated** approach to the course by studying firstly Module 1 of Biology, secondly Module 1 of Chemistry, and thirdly Module 1 of Physics, and then return to Module 2 of Biology, and so forth. This integrated approach will enable you to build on your knowledge in a consistent way across all three sciences.

Make sure you complete the Tutor-marked Assignments (TMAs) for each module before you proceed to the next module of study.

NB. In some instances the lesson content of a large module may be covered by two TMAs. Sometimes the second TMA comes at the end of a lesson in the following module; see for example, TMA B (Biology) which comes at the end of Lesson Six in Module 2. You need to look ahead and make sure you have completed the relevant TMAs before proceeding to a new module in a different subject. If in doubt, please ask your tutor for advice.

The Structure within each Lesson: How to Study

Front Page

The front page of each lesson shows:

- The **Title**.
- **Aims** 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. Paper 2 examines all of these aims, but Paper 1 does not examine the aims picked out in **bold** print.
- **Context**. This shows how the lesson relates to the Specification.
- **Reading**. The individual textbook references for each lesson. This is additional reading to accompany this course.

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 and carry out the activities 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. The textbook and accompanying CD-ROM also contain relevant questions, and at revision time you may want to return to these to further test your knowledge.

At the end of each lesson there is a list of new technical words whose meanings you should know. There is also a summary to which you can add your own comments.

Activities

Activities are placed in the notes at the relevant point. They are indicated as follows:

Activity 7	Find out your own breathing rate per minute. How does this compare to the results shown above.
	

The pencil symbol indicates that you should make your own notes in the space provided.

Self-Assessment Tests

Most lessons conclude with either a Self-Assessment Test or a Tutor-Marked Assignment. Only tackle these when you feel that you have fully mastered the material in the lesson.

If it is a Self-Assessment Test, first try to check your answers by referring back to the lesson, and then compare your answers with those given right at the end of the lesson.

Tutor-Marked Assignments

After every few lessons there is a Tutor-Marked Assignment (TMA). Many of these are in IGCSE examination style and will thoroughly check your understanding of the previous lessons. You should send your answers to your tutor, who will return your marked script, together with a set of suggested answers.

You should note that each series of TMAs for each science subject includes the name of the science within the TMA name, e.g. TMA A (Biology). When you send your TMA to your tutor, make sure that you include the subject detail in brackets so that your tutor can see at a glance which subject you are currently working on. If you are, for example, sending in TMA B for Chemistry, the TMA should be headed 'TMA B (Chemistry)', not just 'TMA B' as there are three TMA Bs within the course.

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.

The last TMAs in the course are mock exams of one paper, following closely the format of the exam itself. You are recommended to study the online practice exam and mark scheme (see the section Past Papers below) before attempting this TMA and sending it to your tutor. It is also a good idea to restrict yourself to the time specified for the exam, so you have practice writing under time pressure.

Checking the Specification

As you know, this course has been written to cover the contents of the **Edexcel Specification 4SC0** which is available to download at the Edexcel website. You should look particularly at:

- The Qualification Content on pages 3-38;

- The Assessment Objectives on pages 40-41.

The Edexcel International General Certificate of Secondary Education (IGCSE) in Science is designed for use in schools and colleges. It is part of a suite of IGCSEs in Science offered by Edexcel. The course gives students the opportunity to experience science within the context of their general education.

The Edexcel IGCSE in Science enables students to:

- acquire a systematic body of scientific knowledge and facts, and an understanding of scientific concepts, principles, themes and patterns
- appreciate the practical nature of science, acquiring experimental skills based on correct and safe laboratory techniques
- appreciate the importance of accurate experimental work to scientific method and reporting
- form hypotheses and design experiments to test them
- sustain and develop an enjoyment of, and interest in, the scientific world
- appreciate the significance of science in wider personal, social, environmental, economic and technological contexts, and consider ethical issues
- select, organise and present information clearly and logically, using appropriate scientific terms and conventions
- prepare for more advanced courses in each of the three scientific disciplines which comprise this specification.

Key Features and Benefits of the Edexcel Specification

The IGCSE in Science:

- includes aspects of science appropriate for the 21st century
- has straightforward linear assessment
- assesses investigative skills through examination.
- provides a sound foundation for progression to AS and A2 examinations in scientific disciplines

The precise web address for the IGCSE Science specification is:

http://www.edexcel.com/quals/igcse/igcse09/science/Pages/default.aspx

NB: Please note the forbidden combinations listed in the specification.

The Examination

The examination you will sit consists of three papers. There is no separate practical exam and no practical coursework component; testing of practical skills is built into all three written papers.

Biology Paper 1 Paper code: 4SC0/1B

This is a two-hour examination paper. The total number of marks is 120, one third of the overall total. The paper examines all of the Specification content and all of the assessment objectives.

Chemistry Paper 1 Paper code: 4CH0/1C

This is a two-hour examination paper. The total number of marks is 120, one third of the overall total. The paper examines all of the Specification content and all of the assessment objectives.

Physics Paper 1 Paper code: 4PH0/1P

This is a two-hour examination paper. The total number of marks is 120, one third of the overall total. The paper examines all of the Specification content and all of the assessment objectives.

In all papers there will be a range of compulsory short-answer, structured questions, which are ramped to ensure accessibility for less able students, as well as to stretch more able students.

In all papers, students may be required to perform calculations, draw graphs and describe, explain and interpret scientific phenomena. Some of the question content will be unfamiliar to students; these questions are designed to assess data-handling skills and the ability to apply scientific principles to unfamiliar information. Questions targeted at grades A* – B will include questions designed to test knowledge, understanding and skills at a higher level, including some questions requiring longer prose answers.

The IGCSE qualification will be graded and certificated on an eight-grade scale from A* to G. Students whose level of achievement is below the minimum standard for Grade G will receive an unclassified U. Where a candidate is unclassified, this will not be recorded on the certificate.

You should read the Specification throughout the course, and more especially when you are revising to check you have covered everything. Keep a copy on your computer or print it out.

If you do not have access to the Internet, it is possible to buy a paper copy from Edexcel. The contact details are:

Edexcel Publications	Tel: 01623 467 467
Adamsway	Tel: 01623 467 467 Fax: 01623 450 481
Mansfield	Email: publication.orders@edexcel.com
Notts NG18 4FN	

Past Papers

At the time of writing, a sample set of exam papers and mark schemes is available for download from the Edexcel website at:

http://www.edexcel.com/quals/igcse/igcse09/science/Pages/default.aspx

With examinations set for the first time in 2011 on this specification, there is currently a shortage of past papers, but a mock examination is provided as part of this course.

Please liaise with your tutor concerning news of the availability and use of past papers.

Your Tutor

You have a lot of resources to help you in your studies; your course blue file, your 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, especially at the start.

And finally... very good luck with your studies!

Philip West
Michael Jones
Marian Green