IGCSE Combined Science

Introduction

Welcome to your IGCSE Combined 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 examination in the **Edexcel IGCSE Combined Award Science specification (4SD0)**, which was examined for the first time in May/June 2019.

Contents of the Introduction

Oxford Open Learning

The Biology Course and Practical Work

The lessons in this Biology section are planned so that all the material and preparation required for the final examination papers is in the following five course modules:

Module 1: Cells and Organisms
Module 2: Plant and Animal Physiology A
Module 3: Plant and Animal Physiology B
Module 4: Inheritance
Module 5: Ecology and Food Production

Physics and Chemistry are arranged in similar fashion. It is advisable that you do the modules in order, as the content has been written to enable you to develop your knowledge and skills as you progress through the lessons.

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.

In combination with other suitable IGCSE entry subjects the course is an ideal preparation for those who wish to go on to study scientific subjects at A-level.

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 scientific subjects, 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 places in this course is to help to develop your skills for the practical-based components of the theory exams. You should try to carry out this work yourself; 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 Appendix at the back of the Biology textbook (pages 303 - 307) to help you further. The exam will include written questions on practical-based study, so you should make sure that you have studied these lessons carefully and have carried out some of the experiments yourself.

Lesson Contents and Textbook References

Biology section **Module 1: Cells and Organisms**		
Lesson	*Title*	*Textbook Reference: page numbers*
1	Cells, Organisms, and the Variety of Life	2-6, 18-22, 25-30
2	Movement of Substances in and out of Cells **TMA A**	16-18, 152-158
3	Investigative Skills A: Design	303, 305-307
4	Respiration and Enzymes **TMA B**	6-15
5	Investigative Skills B: Carrying Out	303-304

Module 2: Plant and Animal Physiology A		
Lesson	*Title*	*Textbook Reference: page numbers*
6	Human Nutrition **TMA C**	52-66
7	Investigative Skills C: Interpreting	304-305
8	Photosynthesis **TMA D**	135-147
9	Transport in Plants and Animals	70-80, 158-163
10	Gas Exchange in Humans	39-49, 139-142

Module 3: Plant and Animal Physiology B		
Lesson	*Title*	*Textbook Reference: page numbers*
11	Homeostasis and Excretion	104-115
12	The Human Nervous System **TMA E**	84-94
13	Hormones in Plants and Animals	98-102, 168-172
14	Human Reproduction **TMA F**	118-126
15	Reproduction in Plants	174-179

Module 4: Inheritance		
Lesson	*Title*	*Textbook Reference: page numbers*
16	Chromosomes and Genes	226-237
17	Cell Division	240-246
18	Genes and Inheritance **TMA G**	249-257
19	Natural and Artificial Selection	261-266, 268-272
20	Genetic Engineering and Cloning **TMA H**	272-274, 285-286, 289-298

Module 5: Ecology and Food Production		
Lesson	*Title*	*Textbook Reference: page numbers*
21	Ecosystems	187-200
22	Human Impact on the Environment **TMA I**	204-206, 211-218
23	Food Production **TMA J: Mock Exam (Biology)**	206-211, 281-286

Chemistry Section **Module 1: Introducing Chemistry**		
Lesson	*Title*	*Textbook pages*
Intro	Using Numbers in Chemistry	
1	Substances, Particles and Solutions	3-8
2	Atomic Structure	24-28, 30-33
3	Chemical Bonds **TMA A**	75-80, 85-91
4	Structures and Properties	81-83, 92-96
5	Formulae and Equations	38-41
6	Rates of Reaction **TMA B**	227-237

Module 2: Chemistry Investigations		
Lesson	*Title*	*Textbook pages*
7	Investigative Skills A: Design	322-324
8	Investigative Skills B: Carrying out	322-323
9	Investigative Skills C: Interpreting **TMA C**	324-327

Module 3: Chemical Patterns		
Lesson	*Title*	*Textbook pages*
10	Oxygen and Oxides	137-143, 191, 270-273, 279
11	The Reactivity Series	145-157
12	Acids, Bases and Salts	167-170, 173-181, 185-187
13	The Periodic Table **TMA D**	30-36, 123-128, 130-133, 135

Module 4: Chemistry in Practice		
Lesson	*Title*	*Textbook pages*
14	Separating and Analysing	15-21, 190-196
15	Energy Changes during Reactions	207-210, 219-220
16	Reversible Reactions	240-241

Module 5: Organic Chemistry		
Lesson	*Title*	*Textbook pages*
17	Organic Molecules	255-263
18	Alkanes and Alkenes **TMA E**	264-265, 277-280, 282-285
19	Crude Oil and Addition Polymers	268-275, 302-308

Module 6: Chemistry Calculations		
Lesson	*Title*	*Textbook pages*
20	Moles	25-27, 39-53
21	Equations and Calculations **TMA F**	53-59
22	Energy Calculations	207-219

	Mock Exam Paper (TMA G)	
	Appendix A: The Periodic Table	
	Appendix B: The Reactivity Series and Formulae of Ions	

Physics section **Module 1 – Forces and Motion**		
Lesson	*Title*	*Textbook pages*
1	Speed, Distance and Time	3-15
2	Forces **TMA A**	18-21, 28-32, 34, 246-247
3	Friction	21-22, 32-33, 35-36
4	Investigative Skills A: Experimental Design	280-281
5	Stretching	23-25
6	The Solar System **TMA B**	259-266

Module 2 – Electricity		
Lesson	*Title*	*Textbook pages*
7	Mains Electricity	59 - 65
8	Electrical Circuits 1: Current and Voltage	67-73
9	Electrical Circuits 2: Resistance	75-82
10	Investigative Skills B: Interpretation **TMA C**	281-283

Module 3 – Waves		
Lesson	*Title*	*Textbook pages*
11	Properties of Waves	96-104
12	The Electromagnetic Spectrum	106-111
13	Light	113-121
14	Sound	123-126
15	Investigative Skills C: Taking a Reading **TMA D**	281-282

Module 4 – Energy		
Lesson	*Title*	*Textbook pages*
16	Energy Transfers	132-137
17	Thermal Energy	139-148
18	Work and Power **TMA E**	150-156

Module 5 – Solids, Liquids and Gases		
Lesson	*Title*	*Textbook pages*
19	Density and Pressure	172-179
20	Gases **TMA F**	187-191

Module 6 – Magnetism and Electromagnetism		
Lesson	*Title*	*Textbook pages*
21	Magnetism	196-201
22	Electric Motors and Electromagnetic Induction	206-212

Module 7 – Radioactivity, Particles and Astrophysics		
Lesson	*Title*	*Textbook pages*
23	Atoms and Radioactivity **TMA G**	220-230
24	Radiation and Half-life	233-239
25	Applications of Radioactivity	241-248
26	Fission and Fusion	250-254

Textbook

You will need three accompanying textbooks. The textbook that is referred to throughout the Biology section is:

Philip Bradfield and Steve Potter, *Edexcel International GCSE (9-1) Biology Student Book* (2017, Pearson Education, ISBN: 978 0 435185 08 4)

The textbook that is referred to throughout the Chemistry section is:

Jim Clark, *Edexcel International GCSE (9-1) Chemistry Student Book* (2017, Pearson Education; ISBN: 978-0435185169

The textbook that is referred to throughout the Physics section is:

Brian Arnold, Steve Woolley and Penny Johnson, *Edexcel Edexcel International GCSE (9-1) Physics Student Book* (2017, Pearson Education, ISBN: 978-0435185275)

You will need to use a copy of these three textbooks during the course; you can buy copies through the Oxford Open Learning website. There are references to these books in every lesson and they provide excellent supplementary coverage of the material. By using the textbooks and the course you will have very full coverage of all the material. The books have accompanying CD-ROMs which contain useful extra questions with answers.

Please note that reading *not* required for Combined Science is clearly marked in red as “Biology Only” (or “Chemistry only”, etc) in each textbook.

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.

Twig Resources

We hope that students of this course will also take the opportunity to learn from the wealth of Twig resources to which this course is linked. Twig have produced more than a thousand educational films, particularly for science, maths and geography and these complement the lesson materials here to enhance the learning experience.

To view the films, you will need an e-mail account, internet access and a password, supplied to you on enrolment. As you work through the lessons, you will come across Twig-links quite regularly, looking like this:

Log on to Twig and look at the film titled: **Deforestation**

www.ool.co.uk/1257ud

Discover how the destruction of the rainforest impacts ecosystems, and begins a cycle that contributes to global warming.

To reach the film, you would either type the URL into your web-browser (here www.ool.co.uk/1257ud) or search the Twig site (www.twig-world.co.uk) for 'Deforestation'. Having watched it, you return to the lesson.

Access to these resources is offered on the following terms:

1. OOL is not responsible for the content of the Twig films or for the technology which transmits them.

2. The films may not be accessible at certain times.

3. OOL cannot be responsible for any technical difficulties students may have in viewing the films and cannot advise on any software or hardware issues.

4. Access is limited in any case to the period until the student's expected exam date.

5. Students are responsible for remembering their own usernames and passwords. Please note: once assigned, a username *cannot* be changed. Passwords can be.

6. Passwords are supplied for the use of the named student only and should not be passed on to any third parties under any circumstances – because each password is unique it will be apparent if it is used on numerous machines.

7. The films are of greater or lesser relevance and it is probable that some parts of many of the films will be too "advanced" for your needs, include ideas you have not yet covered, or introduce information that is not required for the Edexcel specification.

8. If you find that a film is not helpful or interesting, stop watching it! It is possible to study the course successfully without watching *any* of the films. Remember that this is bonus material only, adding depth and context to the course, and this pack forms the spine of the learning material. But each film we have selected should make studying that little bit easier and more enjoyable.

9. Alongside each film, the Twig site offers various additional resources. You can download a transcript of the film, take a quiz or even an advanced quiz. These are optional extras if you have time and inclination.

Other Internet Resources

In most lessons of the course other internet sites are also given which 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 Combined 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.

Please bear in mind that internet addresses change regularly so we cannot guarantee that all addresses listed in the course will remain current.

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.
- **Context**. This shows how the lesson relates to the Specification. Again, the numbering refers to the new specification (4SD0), which differs slightly from the old (4SC0) numbering.
- **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, SATs and TMAs

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.

Towards the end of each lesson, you will find **Key Words**, a **Summary** and **What You Need to Know** sections. It is vital that you revise these sections before you attempt each assignment and they will form a big part of your revision at the end of the course.

Self-Assessment Tests

Every lesson is concluded with either a Self-Assessment Question 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 Question, 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 two lessons there is a Tutor-Marked Assignment (TMA). These are in IGCSE examination style and will thoroughly check your understanding of the previous two lessons. You should send your answers to your tutor, who will return your marked script, together with a set of

suggested answers.

Revision and Examination Planning

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 TMA in each section of the course is a mock exam, following closely the format of the Edexcel 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 4SD0** which is available to download at www.ool/co.uk/0010sci.

To see this you will need Adobe Acrobat reader on your computer which you can download freely at:

http://get.adobe.com/uk/reader

In the specification, you should look in particular at:

- The Qualification Content
- The Assessment Objectives

You should check your specification periodically throughout the course, so bookmark the Edexcel IGCSE Combined Science homepage.

The Edexcel International General Certificate of Secondary Education (IGCSE) in Combined 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.

Key Features and Benefits of the Edexcel Specification

The IGCSE in Combined 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 A-level science examinations

The Edexcel IGCSE Combined Science homepage can be accessed by following the Combined Science link from www.ool.co.uk/0010sci.

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 both of the theory papers. It is likely that you will need to give written answers to practical-based questions.

The Edexcel Specification (4SD0)

Biology **Paper code: 4SD0/1B**

This is a two-hour examination paper. The total number of marks is 110, one third of the overall total. The paper examines all of the Specification content *except* those items printed in **bold**, and all of the assessment objectives.

Chemistry **Paper code: 4SD0/1C**

This is a two-hour examination paper. The total number of marks is again 110, one third of the overall total.

Physics **Paper code: 4SD0/1P (and 4SD0/1P**

This is also a two-hour examination paper. The total number of marks is 110, one third of the overall total.

Grading

The IGCSE qualification is graded on a nine-grade scale from 9-1. 9 is best and 1 is lowest. Students whose level of achievement is below the minimum standard for Grade 1 receive an unclassified U. Where 'unclassified' is awarded, it is not recorded on the certificate.

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 biological phenomena.

Calculators may be used in all of these papers.

Past Papers

At the time of writing, past exam papers for the old 4SC0 specification are available for download from the Edexcel website. You may also use these as exam practice.

Your Tutor

You have a lot of resources to help you in your studies; your course 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