

IGCSE
Physics

Introduction

Welcome to your IGCSE Physics 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 effectively. Take the time to read this Introduction thoroughly before you start the lessons.

The course is designed to prepare students for examination in the **Edexcel IGCSE Physics specification (4PHO)**. Please make sure you refer to the current issue of the specification.

The Course

In combination with other suitable IGCSE entry subjects, the course is an ideal preparation for those who wish to go on to study Physics at AS and A2 level.

If you have some background in Physics then you will find that some of the lessons touch upon things that you have encountered before, but the course is designed to be fully understandable by those who have little or no previous background in science. There is some overlap with our Year 9 Physics course, for instance.

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



Practical Work

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 textbook (pages 218-226), and the course pack to help you further.

NB. 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.

Textbook

The textbook that is referred to throughout this course is

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

You will need a copy of *Edexcel IGCSE Physics* throughout the course; you can buy a copy through the Oxford Open Learning website. The textbook is referred to in almost every lesson and provides excellent coverage of the material. By using the textbook and the course together you will be fully prepared for the examinations at the end.

You should not need 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.

Arrangement of Lessons

The lessons are planned so that all the material and preparation required for both examination papers, Physics Paper 1 and Physics Paper 2, is covered by the seven modules of the course. Topics that will be examined only in Paper 2 are given in **bold type** in the lesson aims at the beginning of each lesson.

The seven course modules are:

- Module 1: Forces and Motion
- Module 2: Electricity
- Module 3: Waves
- Module 4: Energy Resources and Energy Transfer
- Module 5: Solids, Liquids and Gases
- Module 6: Magnetism and Electromagnetism
- Module 7: Radioactivity and Particles

You are advised to 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.

Lesson Contents and Textbook References

Introductory Lesson: Using Numbers in Physics

Module 1 – Forces and Motion		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
1	Speed, Distance and Time	1 - 10
2	Forces TMA A	12-16, 23-26, 28-29, 39-40
3	Friction and Momentum	16-18, 26-31, 34-39
4	Investigative Skills A: Experimental Design	234 - 236
5	Turning and Stretching	18-20, 42-58
6	Astronomy TMA B	49-56

Module 2 – Electricity		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
7	Electrical Appliances	59 - 65
8	Static Electricity TMA C	66 - 72
9	Electrical Circuits 1: Current and Voltage	74 - 80
10	Electrical Circuits 2: Resistance	82 - 88
11	Investigative Skills B: Interpretation TMA D	236 - 241

Module 3 – Waves		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
12	Properties of Waves	91 - 98
13	The Electromagnetic Spectrum	99 - 106
14	Light	107 - 116
15	Sound	118 - 125
16	Investigative Skills C: Taking a Reading TMA E	235

Module 4 – Energy Resources and Energy Transfer		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
17	Energy Transfers	127 - 132
18	Thermal Energy	133 - 141
19	Work and Power TMA F	142 - 149
20	Energy Resources and Electricity Generation	150 - 159

Module 5 – Solids, Liquids and Gases		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
21	Density and Pressure TMA G	162 - 168
22	Solids, Liquids and Gases	169 - 176

Module 6 – Magnetism and Electromagnetism		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
23	Magnetism TMA H	179 - 186
24	Electric Motors and Electromagnetic Induction	187 - 195

Module 7 – Radioactivity and Particles		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
25	Atoms and Radioactivity TMA I	199 - 207
26	Radiation and Half-life	209 - 215
27	Applications of Radioactivity	216 - 224
28	Atomic Theory and Nuclear Fission TMA J TMA K – Mock Exam paper 1 TMA L – Mock Exam paper 2	226 - 231

Appendices		
	A: Electrical circuit symbols	242
	B: Physical Quantities and Units	245
	C: Formulae and Relationships	243 - 244

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: **Speed, Velocity, Acceleration**

www.ool.co.uk/1491qt

Discover how speed, velocity and acceleration are interlinked but very different measurements of motion.

To reach the film, you would either type the URL into your web-browser (here www.ool.co.uk/1491qt) or search the Twig site (www.twig-world.co.uk) for 'Speed' (or one of the other terms). 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. These are an important tool in your understanding of your Physics 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.

There are two ways of finding the correct webpage:

- type in the full webpage address given in the text
- search using the search phrase given in the text.

When you type in either the address or the search phrase, it is important that you do not make typing errors, or miss out words. The search phrases have been carefully tested to bring the required website to the top of the list of sites returned by the search engine. If you cannot see the site you need on the first page of websites listed, you should try retyping the phrase and searching again. If you still have a problem, ask your tutor for help. But it is inevitable that some webpages will disappear altogether without warning!

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 what you should know, and be able to do, after working through the lesson. Keep these aims in mind while reading the lesson material. Aims printed in **bold** will not be examined in Paper 1, but will appear in Paper 2.
- **Context**. This tells you which sections of Edexcel course specification are covered by the lesson.
- **Reading**. This tells you which pages of your textbook cover the same ground as the lesson. Reading them will help to reinforce what you have learned from the course notes.

Lesson Notes

The body of the lesson, from the heading “Introduction” onwards, contains the subject material to be mastered. Read these notes carefully several times until you feel that you have thoroughly understood the theory involved.

Then tackle the reading from the textbook. This will deal with some of the topics in greater detail than the notes. As with the notes, you will probably need to read some of the passages in the textbook several times.

The Textbook CD and Answers Download

Textbook CD

When you acquire your textbook it will either have a CD attached, or will have instructions about how you can obtain the CD. The CD contains a copy of the textbook with additional resources for most pages. You may need your invoice number for the textbook in order to obtain the CD. If you do not understand how to use the CD you should ask your tutor.

If you are taking the IGCSE exam in one year, you may find it better to leave the interactive pages on the CD until you start your revision. If you are taking your exam over two years, then you might spend time on the interactive

resources as you progress through this course, or leave them for revision.

Textbook questions

After each chapter in the textbook there are questions. You are recommended to try these as part of your study of the chapter. So that you have some questions to practise when you revise, you might like to work on alternate questions when you first study the chapter, e.g. try odd-numbered questions, leaving even-numbered questions for revision. You will get a spread of topics if you tackle odd and even questions, rather than only those at the start of the set of questions. Organise your answers so they are easy to refer back to; for example, use a separate notebook and write down the textbook page number as well as the question number next to your answer.

Textbook answers

These are available for downloading at

<http://www.edexcel.com/resources/pages/viewItem.aspx?item=320>

If you have difficulty finding the download on www.edexcel.com please ask your tutor to help you.

Activities

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

Activity 7	Make a list giving examples of situations in which friction operates. Record the effect friction has and state whether it is an advantage or a disadvantage.
	

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 all of the topics in the lesson, and have completed the activities, tackle the Self-Assessment test (SAT). This is to be found at the end of the lesson, unless it concludes with a TMA (see below). The answers to the SAT are found right at the end of the lesson.

Ask your tutor if there is a question in the SAT you do not understand, but do *not* send your self-assessment answers to your tutor.

Tutor-marked Assignments

After every two or three lessons there is a Tutor-Marked Assignment (TMA). Most of these are in IGCSE examination style. These tests will thoroughly test your understanding of the previous few lessons. You should send your answers to each TMA to your tutor, and you will then receive a marked script together with a set of suggested answers.

Some students may opt to tackle TMAs under timed conditions as examination practice. However, they are intended to check your understanding, so it can be helpful also to look back at the lessons.

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 helpful. Plan your revision sensibly and re-read as much as you feel necessary if your knowledge is beginning to fade.

If you intend to revise all the work after studying the lessons, you should allow at least two months of concentrated study for revision and past papers. You can find past exam papers on the Edexcel website (see below).

Coursework

The IGCSE Physics course does not contain coursework. However the skills involved in designing, carrying out and interpreting scientific investigations are tested in both of the written exam papers, and account for 20-25% of the overall

mark. These skills are addressed directly in Lessons 4, 11 and 16, but you will also practise them throughout the course. Read any experimental detail covered in the notes or textbook carefully, and think about how you would do any practical work mentioned.

Checking the Specification/Syllabus

This course has been written to cover the contents of the **Edexcel Physics 4PH0** syllabus, which is available to download at

<http://www.edexcel.com/quals/igcse/int-gcse11/physics/Pages/default.aspx>

Click on “Specification” and then download “Specification and Sample assessment Material: First Examination May/June 2013”. Make sure you do **not** download “Specification – Issue 3” by mistake. You will need an Adobe Acrobat® reader on your computer to download this material. This can be downloaded for free at:

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

In the specification, you should look in particular at:

- The Qualification Content on pages 3 -22
- The Assessment Objectives on page 24-25

NB. Please make sure that you look at the current issue of the specification.

You should check the specification throughout the course, so either keep a copy on your computer or print it out.

The Examination

The examination you will sit consists of two papers. There is no separate practical exam and no practical coursework component; testing of practical skills is built into both of the

theory papers. You will be asked practical-based questions as part of your written exam.

Physics Paper 1 Paper code: 4PH0/1P

This is a two-hour examination paper. The total number of marks is 120, two thirds of the overall total. The paper examines all of the Specification content *except* those items printed in **bold** (see also in the lesson Aims and Context), and all of the assessment objectives.

Physics Paper 2 Paper code: 4PH0/2P

This is a one-hour examination paper. The total number of marks is 60, one third of the overall total. This paper examines all of the Specification content, *including* those items printed in **bold** (see also in the lesson Aims and Context), and all of the assessment objectives.

You can see an example of both papers, and the mark-schemes used in marking them, at the end of the file which contains the specification.

In both papers there will be a range of compulsory short-answer, structured questions, which gradually increase in difficulty to ensure accessibility for less-able students, as well as to stretch more-able students.

In both papers, students may be required to perform calculations, draw graphs and describe, explain and interpret physical phenomena. Some of the question content will be deliberately unfamiliar to students: these questions are designed to assess data-handling skills and the ability to apply physical principles in unfamiliar situations.

The IGCSE qualification is graded on an eight-point 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 IGCSE certificate.

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

Edexcel Publications
Adamsway
Mansfield
Notts NG18 4FN

Tel: 01623 467 467
Fax: 01623 450 481
Email: publication.orders@edexcel.com

Past Papers

At the time of writing, some past exam papers for the previous issue of the specification are available for download from the Edexcel website at:

<http://www.edexcel.com/quals/igcse/int-gcse11/physics/Pages/default.aspx>

Follow the link “Question paper”. You may use these for exam practice, but please do not send them to your tutor for marking.

A pair of mock examinations, marked by your tutor, are provided at the end of this course.

Tiering and Assessment

The Edexcel IGCSE Physics examination is not tiered. This means that all abilities are tested in the same examination.

Your Tutor

You have a lot of resources to help you in your studies: your course file, your textbook, the interactive CD, 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 ... good luck with your studies!

Marian Green and Philip West

© Oxford Open Learning 2014