



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 (4PH1)**.

Contents of the Introduction

	Page
The Course	2
Practical Work	2
Textbook	2
Modules and Tiering	3
Arrangement of Lessons and Textbook References	4
Twig Resources	5
Other Internet Resources	7
The Structure within each Lesson: How to Study	8
Using the Textbook	8
Activities, SATs and TMAs	9
Revision and Examination Planning	10
Checking the Specification/Syllabus	11
The Examination	11
Past Papers	13
Your Tutor	13



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 A 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 280-283), 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, Penny Johnson and Steve Woolley, *Edexcel International GCSE (9-1) Physics Student Book* (2017, Pearson Education Ltd, ISBN 978 0 435 18527 5),

You will need a copy of this textbook throughout the course; you can buy a copy through the Oxford Open Learning

website. The textbook is referred to in 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 and Textbook References

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, Particles and Astrophysics

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

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	3-15
2	Forces TMA A	18-21, 28-32, 34, 246-247
3	Friction and Momentum	21-22, 32-33, 35-36, 40-45
4	Investigative Skills A: Experimental Design	280-281
5	Turning and Stretching	23-25, 48-53
6	The Solar System TMA B	259-266

Module 2 – Electricity		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
7	Mains Electricity	59 - 65
8	Static Electricity TMA C	84-92
9	Electrical Circuits 1: Current and Voltage	67-73
10	Electrical Circuits 2: Resistance	75-82
11	Investigative Skills B: Interpretation TMA D	281-283

Module 3 – Waves		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
12	Properties of Waves	96-104
13	The Electromagnetic Spectrum	106-111
14	Light	113-121
15	Sound	123-129
16	Investigative Skills C: Taking a Reading TMA E	281-282

Module 4 – Energy		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
17	Energy Transfers	132-137
18	Thermal Energy	139-148
19	Work and Power TMA F	150-156
20	Energy Resources and Electricity Generation	158-167

Module 5 – Solids, Liquids and Gases		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
21	Density and Pressure TMA G	172-179
22	Heating and Change of State	181-187
23	Gases	187-191

Module 6 – Magnetism and Electromagnetism		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
24	Magnetism TMA H	196-204
25	Electric Motors and Electromagnetic Induction	206-215

Module 7 – Radioactivity, Particles and Astrophysics		
<i>Lesson</i>	<i>Title</i>	<i>Textbook pages</i>
26	Atoms and Radioactivity TMA I	220-230
27	Radiation and Half-life	233-239
28	Applications of Radioactivity	241-248
29	Fission and Fusion TMA J	250-254
30	Astrophysics TMA K – Mock Exam paper 1 TMA L – Mock Exam paper 2	265-274

Appendices		
	A: Electrical circuit symbols	-
	B: Physical Quantities and Units	279
	C: Formulae and Relationships	278

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.
- **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. Often the Paper 2 material is integrated with Paper 1 material in the same lesson section and cannot be separately identified in the course notes. You should refer to the lesson aims in **bold** to identify the Paper 2 content.
- **Context**. This shows how the lesson relates to the Specification.
- **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.

Using the Textbook

Instructions on how to use the textbook most effectively are found on pages vi-vii of the book itself. You should read these instructions carefully before carrying out the first set of textbook reading in Lesson One.

Online textbook

Provided that you buy a new copy of the textbook, you will be able to access an online version of the book for three years. Instructions on how to do this are found on the inside front cover of the textbook.

The online version has answers to the questions found at the end of each chapter and section of the textbook. These answers are not in the print version.


Textbook questions

After each chapter and section 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.

Answers to these questions are found at the back of the online version of the textbook, on pages 297 onwards.

Activities, SATs and TMAs

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

Activity 1	Look at Appendix A. How many of the elements did you know already?
	

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

Each lesson concludes with either a Self-Assessment Test (SAT) or a Tutor-Marked Assignment (TMA). 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). These will thoroughly check your understanding of the preceding few lessons. You should send your answers to your tutor, who will return your marked script, together with a set of suggested answers.

Revision and Exam 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 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).

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

As you know, this course has been written to cover the contents of the **Edexcel Specification 4PH1** which is available to download from the Edexcel site at www.eepl.co.uk/0011pi.

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 Physics homepage.

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: 4PH1/1P

This is a two-hour examination paper. The total number of marks is 110, 61% of the overall total. The paper examines all of the Specification content *except* those items printed in **bold**, and all of the assessment objectives.

Physics Paper 2 Paper code: 4PH1/2P

This is a 75-minute examination paper. The total number of marks is 70, 39% of the overall total. This paper examines all of the Specification content, including those items printed in **bold** and all of the assessment objectives.

The IGCSE qualification is graded on a nine-grade scale from 9-1. Students whose level of achievement is below the minimum standard for Grade 1 will receive an unclassified U. Where unclassified is received it will not be recorded on the certificate.

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

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 unfamiliar to students; these questions are designed to assess data-handling skills and the ability to apply physical principles to unfamiliar information. Questions targeted at grades highest grades will include questions designed to test knowledge, understanding and skills at a higher level, including some questions requiring longer prose answers.

Calculators can be used in all of these papers. You are expected to provide your own calculator for the exams. However, note carefully that **you will not be allowed to use a calculator on a mobile phone**, or on any other device that can connect to the Internet.

You will find some sample assessment materials on the Edexcel website. These show you what to expect in your exam, so make sure you look at them and work through the sample questions. You can find this material at www.ool.co.uk/0015pi.

(Click on the link “Physics”, and then follow the link to your specification and the materials associated with it.)

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
Adamsway
Mansfield
Notts NG18 4FN
Tel: 01623 467 467

Email: publication.orders@edexcel.com

Past Papers

At the time of writing, past exam papers only for the old 4PH0 specification are available for download from the Edexcel website at www.ool.co.uk/0016pi.

You can also use these as exam practice. You may send up to two past papers to your tutor for marking, but only after you have successfully completed all the other assignments in your course.

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

Your Tutor

You have a lot of resources to help you in your studies: your course file, Twig, your textbook, the additional online resources that come with it, other 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

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