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| **PHYSICS 2024/2025** |
| **Academic Education** |

A black sky with many stars

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| **Start Date** | 9th September |
| **End Date** | 4th July 2025 (Year 1)  End of June 2026 (Year 2) |
| **Level of course** | Level 3 |
| **Awarding Body** | OCR A |
| **Specification** | [OCR A Level Physics A (H556) Specification](https://www.ocr.org.uk/Images/171726-specification-accredited-a-level-gce-physics-a-h556.pdf) |

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| YOUR SUBJECT TEACHERS |

The teachers here to support you

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| **Physics teaching staff** | **Which days are we**  **in college?** | **Email contact:** |
| Katherine Willis (coordinator) | Tuesdays, Wednesday and Fridays | [katherine.willis@derby-college.ac.uk](mailto:katherine.willis@derby-college.ac.uk) |
| Emad Mostafa | All week | [emad.mostafa@derby-college.ac.uk](mailto:emad.mostafa@derby-college.ac.uk) |

Welcome from your Curriculum manager Patrick Ring who is also a Geology A Level teacher:

A picture containing outdoor, person, stone

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I’m based in G19 by the student services and will be popping into classes from time to time. I’ll be driving your minibus on trips such as visiting universities and many other extracurricular activities. I’m sure you’ll have a great experience at the Joseph Wright Centre but if you have any problems then come see me and I’ll be able to signpost you to rapid assistance.

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| INTRODUCTION & AIMS OF THE COURSE |

**Aim of the course**

The aim of the Biology A-Level is to provide students with the knowledge of key physical concepts underpinned by their ability to show proficiency in laboratory techniques. We will encourage you to develop:

* An essential knowledge and understanding of different areas of the subject and how they relate to each other
* A deep appreciation of the skills, knowledge and understanding of scientific methods
* Your competence and confidence in a variety of practical, mathematical and problem-solving skills
* Your interest in and enthusiasm for the subject, including developing an interest in further study and careers associated with the subject
* Your understanding of how society makes decisions about scientific issues and how the sciences contribute to the success of the economy and society

Physics combines particularly well with A-level maths, chemistry, biology, geology and computer science.

Studying Physics is a route to a wide variety of rewarding careers. As well as learning about how the universe works, you will gain skills that all employers value – an ability to grasp concepts quickly and a determination to search for answers, not to mention problem-solving, analytical, mathematical and practical skills.

Even if you don’t end up in a physics career, these skills are still highly regarded. Studying Physics is an excellent way of keeping your options open and earning a good salary.

Physics is essential for many science and engineering courses.

Find out more about progression opportunities and the benefits of studying physics on the Institute of Physics website here: [Careers with physics | Institute of Physics (iop.org)](https://www.iop.org/careers-physics)

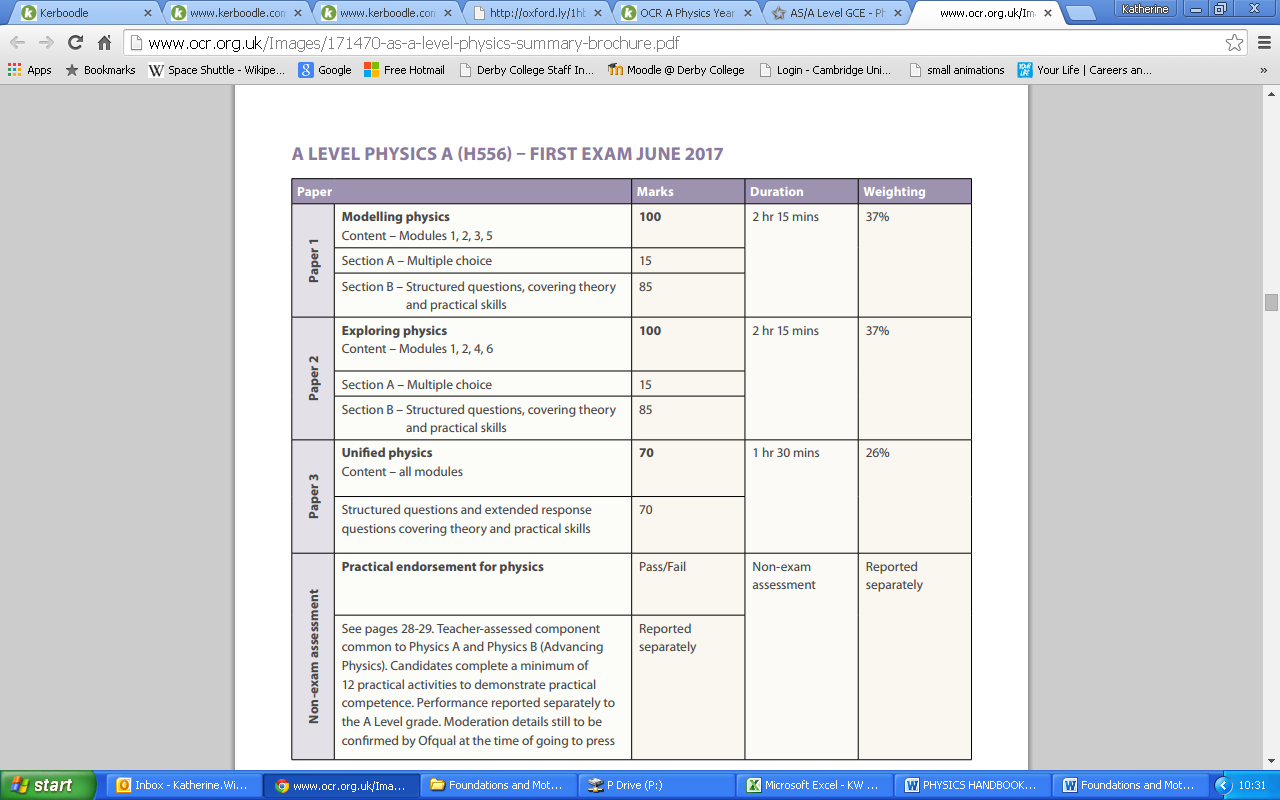
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| COURSE STRUCTURE |

We will be studying the **OCR Physics A** (from 2015) specification. An outline is given below.

**Specification Overview**



All practical activities completed form the evidence for this assessment element.

**A-level Exam Details: Year 2**

**Exam Information**

|  |  |  |  |
| --- | --- | --- | --- |
| Year | Module | Title | Outline Content |
| Year 1 | Module 1  AS & A-level | Development of practical skills in physics | Skills of planning, implementing, analysis and evaluation |
| Module 2  AS & A-level | Foundations of Physics | • Physical quantities and units  • Making measurements and analysing data  • Nature of quantities |
| Module 3  AS & A-level | Forces and Motion | • Motion  • Forces in action  • Work, energy and power  • Materials  • Newton’s laws of motion and momentum |
| Module 4  AS & A-level | Electrons, Waves and Photons | • Charge and current  • Energy, power and resistance  • Electrical circuits  • Waves  • Quantum physics |
| Year 2 | Module 5  A-level | Newtonian World and Astrophysics | • Thermal physics  • Circular motion  • Oscillations  • Gravitational fields  • Astrophysics |
| Module 6  A-level | Particles and Medical Physics | • Capacitors  • Electric fields  • Electromagnetism  • Nuclear and particle physics  • Medical imaging |

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| KEY COURSE INFORMATION |

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| Length of Study | 5 hours weekly |
| Your classrooms | Most classes will be held in the third-floor laboratories |
| Key skills you will be developing during the course to be successful | Problem solving, mathematical and graphical skills, comprehension, scientific writing, research techniques, practical and analysis skills |
| What will lessons look like? | Your lessons in Physics will be varied and incorporate a wide range of activities depending on the topic taught. These will include lecture style lessons, group work, practical work and a variety of learning activities. |
| Informal Assessment Methods | You will be assessed using a wide variety of methods including verbal questions, Isaac physics tasks, MS Teams assignments, quizzes, multiple choice topic tests and observations of your practical skills. |
| Essential Equipment/ Resources | Image result for casio calculator<http://www.tts-group.co.uk/_rmvirtual/media/tts/images/legacy/TTS/MWRULER30.jpg>Equipment - as well as the obvious pens, pencils and paper you will also need a clear 30 cm ruler and a protractor. It is recommended that you use a ring binder to file your notes neatly so you can refer to previous work easily both in and out of lessons. You will also be expected to bring a scientific calculator to every physics lesson. Make sure you are familiar with how your calculator works. |
| Health and Safety | You will be expected to wear appropriate safety equipment during practical lessons and read the safety information on each of your PAG sheets before conducting practical’s.  Inform your teacher if an accident occurs and ask for clarification if you are unsure of what to do.  Further details can be found on the next page. |

**Health and Safety - Code of Practice for Students in Science Laboratories**

All persons entering or using laboratories are governed by the HEALTH AND SAFETY AT WORK ACT 1974 and THE CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH (COSHH) REGULATIONS 1989

1. **Protective clothing**

When working with chemicals, microbiological material and radioactive substances all students must wear a lab coat.

1. **Eye protection**

Safety glasses are provided and must be worn when a practical involves a risk to the eyes.

1. **Hair**

Long hair must be tied back and fastened securely for all practical work.

1. **Coats and bags**

The floor must be kept clear at all times.

1. **General laboratory procedures**

* Instructions from staff must be followed. If in doubt – **ASK**.
* Apparatus and equipment should be returned to the appropriate place after use.
* All used glassware should be placed in the containers provided. DO NOT put used glassware

back in the store.

* Faulty or damaged equipment should be reported.
* Place broken glass in the special bin provided and NOT into the general waste bin. Report any breakages to a member of staff.
* Solids and rubbish should not be placed in the sinks.
* Follow any special instructions for the disposal of solid or hazardous waste that should not go

into the drains.

* Benches should be left clear and clean at the end of the session.
* Wash hands after practical work.
* Eating and drinking in a science laboratory is strictly forbidden (even water).

1. **Injuries** All injuries should be reported to a member of staff immediately.
2. **Emergency procedures** In the event of an emergency or fire drill please follow the college guidelines or the instructions given by a member of staff

**You should wash your hands before and after practical work.**

**Respect the laboratory and the equipment.**

**Help to keep things safe, usable, and tidy for yourself and others.**

You will be asked to sign to say that you have read and understood this code of practice.

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| YEAR PLAN OF STUDY |

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|  | **Year 1** | **Year 2** |
| **Teacher** | **Katherine Willis/Emad Mostafa**  **3 lessons per week** | **Katherine Willis**  **3 lessons per week** |
| **Autumn Term Topics** | Motion  Forces in action  Work, energy and power  Materials  Practical Skills  Waves | Nuclear Physics  Radioactivity  Gamma Camera and PET Scanning  Particle Physics  Circular Motion  Gravitational Fields  Simple Harmonic Motion  Thermal Physics and Ideal Gases |
| **Formal Assessment** | **There are two formal assessments in the Autumn term to assess progress (these do not count towards your final exam grade)** | |
| **Spring Term Topics** | Newton’s laws of motion  Momentum  Electricity  Waves  Quantum Physics | Electric Fields  Capacitors  Magnetic Fields  Electromagnetism  X-rays  Ultrasound |
| **Formal Assessment** | **There are two formal assessments in the Spring term to assess progress, including a Modelling Physics mock exam in Year 2.**  **(these do not count towards your final exam grade)** | |
| **Summer Term Topics** | Quantum Physics  Exam skills  Preparation and essential skills for Year 2 | Unified Physics  Exam skills and preparation |
| **Formal Assessment and Year 2 Final Exams** | **Formal assessment and Year 1 Progression exam** | **Exploring Physics Mock**  **Unified Physics Mock Date**  **Modelling Physics OCR Final Exam**  **Exploring Physics OCR Final Exam**  **Unified Physics OCR Final Exam** |

**Practical work and practical skills are embedded throughout the course. Practical work you complete will count towards your practical endorsement mark.**

**For more details and to keep up to date on teaching week by week please use Teams where you will find lesson information, resources and assignments.**

**Our Big Plan for Physics can be found pinned on the Physics team – see for more detailed information**

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| ASSESSMENT AND FEEDBACK |

**Assessments**

You will have half termly assessments as shown on the year plan of study. Each assessment will include a variety of topics previously taught that year and include a mix of knowledge recall, multiple choice, practical and evaluation style questions.

The progression exam will be a formal paper of 90 minutes covering all topics from year 1.

**Referrals Procedures and Resubmissions Procedures**

You will have a clear plan of what to expect, what assessments will take place during the year and when you can expect these assessments to happen. You can expect your work to be marked and quality assured where appropriate and returned within 15 working days of submission.

Once you have submitted your work, it will be marked and potentially be quality assured by the Internal Quality Assurance team. This is particularly key where the learning outcomes have not been met and a resubmission opportunity has been given.

Where a referral has been given, by the teacher or assessor will provide you with an opportunity to resubmit. However, you must read the feedback carefully to ensure you are clear of what you need to do and where a graded qualification and assessment is in place what you can attempt. This will be time bound and you will be given a re-submission date by your trainer/assessor/lecturer, and you must meet this deadline.

**Academic Malpractice**

DCG is keen to support students and avoid any cases of Academic malpractice. Awarding Organisations take matters of academic malpractice very seriously and require all schools and colleges to have specific policies and procedures in place to both educate staff and students about malpractice, thus deterring them from committing it, whether intentional or not, and report and investigate any suspected malpractice where it may occur.

While we don’t want to see anyone jeopardise their grades or marks, we must ensure the validity of all qualifications and we must investigate any suspected breaches fully. It is your responsibility to ensure you understand the rules and boundaries:

* You must not copy from someone else or give opportunities to another student to copy from you.
* Any wording taken from a published source must be correctly referenced for example:

(Morrison, 2000, p29).

* Where computer-generated content has been used (AI tools such as ChatGPT) you must reference these correctly for example: ChatGPT 3.0 (<https://openai.com/blog/chatgpt/>), 25/01/2024.
* You may also be required to include a bibliography to support referencing.
* You must also avoid working collaboratively with other students beyond what is permitted as this may be deemed to be collusion.

**Academic Malpractice continued:**

Other examples include:

* Falsification or fabrication of results,
* Deliberate destruction of other student’s work
* Any other act that will give you an unfair advantage. This also relates to not following clear guidance in examinations or assessments where examination conditions exist.

You will be required to complete an Authentication Form on submission of any and all assignments/NEA projects. This will confirm that the work is your own, and that it is referenced appropriately, including the use of AI. Where academic malpractice is suspected, this will be reported to your Team Manager who will conduct an investigation and, where relevant, the Awarding Organisation may also be informed and investigate further. Where malpractice is discovered to have occurred, sanctions may be imposed which could include:

* Zero marks for the work or exam.
* Disqualification from the qualification.
* Disqualification from taking any qualification with that Awarding Organisation often over a set period of time.
* Warnings which can last several years.

For further details and to fully familiarise yourself with JCQ guidance please see the Joint Councils for Qualifications (JCQ) website:

[Information for candidates documents - JCQ Joint Council for Qualifications](https://www.jcq.org.uk/exams-office/information-for-candidates-documents)

Further information can be found on the DCG website:

[**Examination Information - DCG (derby-college.ac.uk)**](https://www.derby-college.ac.uk/student-support/examination-information/)

**Appeals Procedures**

Each Awarding Organisation will have slightly different processes for appealing decisions. Appeals can be made where:

* You believe that the awarding body policies and procedures have not been followed correctly in respect of external quality assurance/standards verification (policies and procedures can be found on the relevant awarding body website).
* You believe that the awarding body policies and procedures have not been followed correctly in respect of qualification decisions (policies and procedures can be found on the relevant awarding body website).
* You disagree with the outcome of your internal appeals procedure (for example, a decision in relation to reasonable adjustments or assessment outcomes).

However, should you, as a student wish to appeal, firstly:

* Contact your teacher and discuss your concerns.

If you are still not satisfied with the outcome, the College would usually make an appeals application on your behalf. This would require your consent. It is possible to apply directly to the Awarding Organisation but only once the College’s internal processes have been followed. At this point you would be informed of the next stages and Awarding Organisation communication link. This is time bound and this will also be communicated to you once the internal appeals process has taken place.

Note: you must be aware that through this process the initial grade can go up, stay the same, or go down.

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| ENRICHMENT AND VISITS |

**Isaac Physics**

Keep an eye on notifications from Isaac Physics for workshops/lectures and revision programmes run my Isaac Physics. <https://isaacphysics.org/>

**British Physics Olympiad** - <https://www.bpho.org.uk/>

We run the following BPHO competitions in year 1 and year 2 of the Physics A-level course:

* Senior Physics Challenge
* Physics Challenge
* BPHO Round 1
* Experimental Project
* Computational Challenge

**Institute of Physics Lectures (Deby IOP)**

A series of public lectures by Derby IOP – these usually take place at Derby University so keep an eye on your e-mails/Teams for dates.

**Cern Zone**  - Chat with scientists at Cern

**University Open Days/Experience Days** – as advertised as part of the Physics course

**Electronics Everywhere** [Electronics Everywhere | UK Electronics Skills Foundation (ukesf.org)](https://www.ukesf.org/what-we-do/electronics-everywhere/)

**Insight into Electronics** [Insight into Electronics | UK Electronics Skills Foundation (ukesf.org)](https://www.ukesf.org/what-we-do/insight-into-electronics/)

**STEMSmart** [STEM SMART | Undergraduate Study (cam.ac.uk)](https://www.undergraduate.study.cam.ac.uk/stem-smart)

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| SUCCESSFUL LEARNER HABITS |

To do well you will need to practice, practice, practice.

At the end of each lesson, read the relevant pages in the textbook and add to your class notes – this does not mean copy it! Read and condense the information. Create a set of flash cards/memory aid of your choice.

At the end of each chapter in the textbook is a double page spread of exam questions – do these and MARK them.

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Description automatically generated**How to succeed in A-level Physics**

Have a read through this page about the attitudes and methods you can use to be successful in A-level Physics – ignore paid for content

**Expectations**

1. A-levels give you the chance to become independent learners but with that must come responsibility for you own learning and that of other people.

You will be required to abide by the laboratory code of conduct. You will sign a document to say that you agree to this and breaking this code of conduct will not only result in disciplinary procedures but could also be putting yourself and others at risk.

1. You are expected to complete 5 hours of independent study for this subject every week. You will need to complete independent study and go through topics in order to ensure you have a full understanding. Each week you will be given independent study tasks and it is expected that you will meet the deadlines given.

**You will complete the questions in the Module Booklets, Exam Booklets, Lesson Preparation, Practical Write-Ups and Isaac Physics Tasks as guided by your teacher.**

1. If you are absent or miss any lessons you are expected to catch up on any work you have missed. All homework details will be available online with relevant resources for independent study. You will also be expected to contact your teacher in person, by e-mail or phone call.
2. You are responsible for the organisation of your learning materials. Notes should be kept neatly and be easily accessible for revision. You will record all practical work; **this is evidence for the practical endorsement and must be kept safe.**
3. Ask! If you do not understand something or need any help you must ask.

**How to solve numerical physics problems – quick guide**

1. Read the question
2. Identify the topic area
3. Highlight key words, data or graph axes
4. Where relevant draw a diagram or annotate the one given (especially useful with forces or circuit questions)
5. If told to use ‘Figure 1’ you must use the information provided in Figure 1 (for example a graph)
6. Write down the key relationships/equations from the datasheet
7. Take any known constants from the data sheet
8. Check for prefixes/units and any conversions needed for the data provided
9. Rearrange equations before you put the numbers in (exception to this is if you know a value is zero)
10. Show your working – often marks are given for rearranging and putting the numbers in
11. Don’t round up too much in the middle of calculations.
12. Give answers to a suitable number of significant figures (more than 1 sig fig in general)
13. Check to see if your answer is realistic.

**How to answer written questions – quick guide**

1. Read the question
2. Identify the topic area
3. Highlight key words, data or graph axes
4. Where relevant draw a diagram – e.g. sketch a
5. If told to use ‘Figure 1’ you must use the information provided in Figure 1
6. Write down the key relationships/equations from the datasheet
7. Take any known constants from the data sheet

**What to do if you get stuck**

* Re-read the question – you may notice something you missed the first time; an object may be in equilibrium for example
* Find examples for that topic in the textbook or use your notes/booklet
* Use the retrieval lists in the booklets to jog your memory
* If you have completely forgotten use A-level physics online videos
* Ask – other students, your teacher
* If you don’t have a clue then work backwards from the mark scheme and see how they arrived at the answer – warning, if you do this then find yourself another similar question to have another go

Isaac Physics has a number of hints you can work through for each question – you should work through all of these if you get stuck – and of course do ask if you still can get the correct answer!

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| YOUR NEXT STEPS OPPORTUNITIES |

Complete (with team and in liaison with the Careers Team). Add your progression diagrams here.

Your next steps opportunities when you successfully achieve your chosen study program / course.

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| SUBJECT RESOURCES FOR STUDENTS |

**Get the help you need!** Come into the Library or use the resources online and ask any one of the friendly team members for help.  All the Libraries for Learning Team are skilled researchers willing to help you find the information you need and guide you to resources you might not have considered to help you finish those assignments.  On the rare occasions that the library does not have exactly what you want, they will do their best to borrow it through another library.  They can also give you advice on study skills and digital skills via the Skills Hubs too (see Study Skills and Digital Skills on the [Libraries for Learning Pod Page](https://pod.derby-college.ac.uk/course/view.php?id=36)).

Specific resources and recommended reading lists to support your learning can be found below:

**Textbook**: Available from the library; you are not expected to bring this to every lesson.

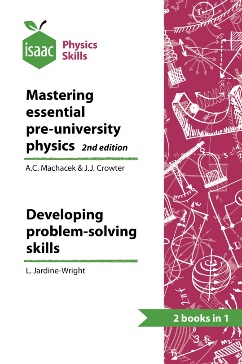
A book cover with text

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# OCR AS/A level Physics A Student Book 1  (Year 1)

Pearson 2015 ISBN: 9781447990826

**OCR AS/A level Physics A Student Book 2 (Year 2)**

**Homework Book**: Available from the library

**Mastering essential pre-university physics and Developing problem solving skills**

Periphyseos Press, Cambridge 2015 ISBN: 9780957287334

This book will be used in conjunction with Isaac Physics at isaacphysics.org

You can find more physics books in the library. You will find Physics textbooks categorised as 530 and in subdivisions of 1 for particular topics. (Maths you will find in the 510s and Astronomy in the 520s)

**Electronic Resources**

As well as our Microsoft Team we will regularly use the following resources:

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alevelphysicsonline.com

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Graphical user interface, application

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flippedaroundphysics.com isaacphysics.org

A screenshot of a computer

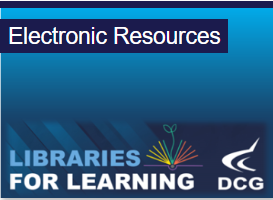
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https://phet.colorado.edu/

.Search for more resources using the library catalogue: [Library Catalogue](https://broomx.cirqahosting.com/cirqa-web-app/)



Take full advantage of more resources available under the Electronic Resources tile resources,



these include:

* [**Philip Allan Reviews**](https://nam04.safelinks.protection.outlook.com/?url=http%3A%2F%2Fwww.hoddereducationmagazines.com%2F&data=05%7C01%7Cfrances.booth%40derby-college.ac.uk%7C8d4eb70f07c14c7ca37b08db8134364f%7C7584d7479421477d8345bedc5d73bc46%7C0%7C0%7C638245833467240334%7CUnknown%7CTWFpbGZsb3d8eyJWIjoiMC4wLjAwMDAiLCJQIjoiV2luMzIiLCJBTiI6Ik1haWwiLCJXVCI6Mn0%3D%7C3000%7C%7C%7C&sdata=cD3LSFxSgBclifsFrK4bpF0KbZAkh%2FVp%2FZvKZGdPhCs%3D&reserved=0) **- an archive of A-level magazine reviews, which include, biological sciences,**[**business**](https://pod.derby-college.ac.uk/mod/book/view.php?id=451)**,**[**chemistry**](https://pod.derby-college.ac.uk/mod/book/view.php?id=452)**,**[**economics**](https://pod.derby-college.ac.uk/mod/book/view.php?id=458)**,**[**geography**](https://pod.derby-college.ac.uk/mod/book/view.php?id=470)**, international baccalaureate, modern**[**history**](https://pod.derby-college.ac.uk/mod/book/view.php?id=475)**, PE,**[**physics**](https://pod.derby-college.ac.uk/mod/book/view.php?id=489)**, politics,**[**psychology**](https://pod.derby-college.ac.uk/mod/book/view.php?id=491)**, religious studies, and** [**sociology**](https://pod.derby-college.ac.uk/mod/book/view.php?id=493)**.**
* [Gale](https://infotrac.gale.com/itweb/dtc_jisc) – an extensive collection of newspaper and journal articles. The collection includes full-text articles from a selection of UK and international newspapers.
* [Britannica Academic](https://academic.eb.com/) - Britannica Academic provides thousands of academic, credible and citable resources to use in essays.

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| GLOSSARY OF TERMS |

The following list is a brief glossary of scientific terms you will learn or be exposed to during your learning.

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| **Term** | **Definition** |
| **Accuracy** | A measurement result is considered accurate if it is judged to be close to the true value. |
| **Calibration** | Marking a scale on a measuring instrument. This involves establishing the relationship between indications of a measuring instrument and standard or reference quantity values, which must be applied. For example, placing a thermometer in melting ice to see whether it reads 0 °C, in order to check if it has been calibrated correctly. |
| **Data** | Information, either qualitative or quantitative, that has been collected. |
| **Errors** | See also uncertainties. |
| **Measurement error** | The difference between a measured value and the true value. |
| **Anomalies** | These are values in a set of results which are judged not to be part of the variation caused by random uncertainty. |
| **Random error** | These cause readings to be spread about the true value, due to results varying in an unpredictable way from one measurement to the next. Random errors are present when any measurement is made, and cannot be corrected. The effect of random errors can be reduced by making more measurements and calculating a new mean. |
| **Systematic error** | These cause readings to differ from the true value by a consistent amount each time a measurement is made. Sources of systematic error can include the environment, methods of observation or instruments used. Systematic errors cannot be dealt with by simple repeats. If a systematic error is suspected, the data collection should be repeated using a different technique or a different set of equipment, and the results compared. |
| **Zero error** | Any indication that a measuring system gives a false reading when the true value of a measured quantity is zero, e.g. the needle on an ammeter failing to return to zero when no current flows. A zero error may result in a systematic uncertainty. |
| **Evidence** | Data which has been shown to be valid. |
| **Hypothesis** | A proposal intended to explain certain facts or observations. |
| **Interval** | The quantity between readings, e.g a set of 11 readings equally spaced over a distance of 1 metre would give an interval of 10 centimetres. |
| **Precision** | Precise measurements are ones in which there is very little spread about the mean value. Precision depends only on the extent of random errors – it gives no indication of how close results are to the true value. |
| **Prediction** | A prediction is a statement suggesting what will happen in the future, based on observation, experience or a hypothesis. |
| **Range** | The maximum and minimum values of the independent or dependent variables; important in ensuring that any pattern is detected. For example a range of distances may be quoted as either: 'From 10 cm to 50 cm'or 'From 50 cm to 10 cm' |
| **Repeatable** | A measurement is repeatable if the original experimenter repeats the investigation using same method and equipment and obtains the same results. |
| **Reproducible** | A measurement is reproducible if the investigation is repeated by another person, or by using different equipment or techniques, and the same results are obtained. |
| **Resolution** | This is the smallest change in the quantity being measured (input) of a measuring instrument that gives a perceptible change in the reading. |
| **True value** | This is the value that would be obtained in an ideal measurement. |
| **Uncertainty** | The interval within which the true value can be expected to lie, with a given level of confidence or probability, e.g. “the temperature is 20 °C ± 2 °C, at a level of confidence of 95%. |
| **Validity** | Suitability of the investigative procedure to answer the question being asked. For example, an investigation to find out if the rate of a chemical reaction depended upon the concentration of one of the reactants would not be a valid procedure if the temperature of the reactants was not controlled. |
| **Valid conclusion** | A conclusion supported by valid data, obtained from an appropriate experimental design and based on sound reasoning. |
| **Variables** | These are physical, chemical or biological quantities or characteristics. |
| **categorical variables** | Categoric variables have values that are labels. e.g.names of plants or types of material. |
| **Continuous variables** | Continuous variables can have values (called a quantity) that can be given a magnitude either by counting (as in the case of the number of shrimp) or by measurement (eg light intensity, flow rate etc). |
| **Control variables** | A control variable is one which may, in addition to the independent variable, affect the outcome of the investigation and therefore has to be kept constant or at least monitored. |
| **Dependent variables** | The dependent variable is the variable of which the value is measured for each and every change in the independent variable. |
| **Independent variables** | The independent variable is the variable for which values are changed or selected by the investigator |

We will meet many scientific terms as we journey through the Physics course – these will all be included in your module booklets and in your Quizlet class.

**At the start of the course it is useful to discuss the differences between scientific use of terminology and everyday use. Some of these common words are listed below for comparison.**

Acceleration

Everyday: In everyday use “acceleration” occurs when an object speeds up. The less time that an object takes to speed up by a particular amount, the greater the acceleration. This understanding of acceleration is correct but incomplete.

Science: Acceleration occurs when an object speeds up, slows down or changes direction: “Acceleration” is defined as the rate of change of velocity of an object (m/s2 or m s-2). Because velocity is speed in a particular direction; if a moving object’s direction changes, its velocity also changes and it is therefore accelerating. If its velocity decreases because it slows down this also constitutes a change in velocity and is also acceleration.

Act

Everyday: To do something (past, present or future). Students may be familiar with the word “act” being used to describe people’s behaviour (For example “don’t act in that way”). “Act” is also used to describe the process of performing as a particular character (in a drama, film, series….etc…) An act is also a major part of a play.

Science: When the word “act” is used in science students may think of it as one thing having an influence on another thing. If ‘A acts on B’ then A has an influence on B. (For example, “The force of gravity acts on an object” means “the force of gravity has an influence on the object”- i.e. it has an effect on the object)

Balance

Everyday: A person’s sense of balance is their ability to remain upright without falling over. In general objects may be described as balanced if; they are steady and stable and their weight is equally distributed. The word “balance” can be used to describe an equal distribution of something (For example, “A well balanced student” has an equal distribution of skills and strengths)

Science: The word balance could be used to describe balancing an object so it is steady and stable in a practical task.

In Physics students will often refer to balanced forces to describe equilibrium but this is to be avoided and zero resultant force should be used instead.

The word “balance” is sometimes used as an abbreviation of “mass balance”; an instrument used to determine the mass of an object or sample. In chemistry “balancing equations” refers to the process of putting numbers (called stoichiometric coefficients) in front of the formulae in a symbol equation, in order to make the number of each type of atom at the start of the reaction equal to the number of each type of atom at the end of the reaction.

Body

Everyday: The word “body” is also used to describe a distinct mass of material (For example “An ocean is a large body of water”). The word body may also refer to the largest part of something (For example “the main body of the text”)

Science: In Science “body” is a general word used to describe any object (For example, “A body accelerates…”). A body also refers to the physical substance that makes up an organism.

Constant

The word “constant” describes something that remains the same / unchanging. This can also be the meaning in science, the speed remains constant, for example.

Physical constants in Science have a related but more specific meaning. Constants are fundamental values, which often appear in a number of different equations, are found by experimentation and can be regarded as unchanging. An example of a physical constant is the speed of light, values for physical constants can be found on the exam data sheet.

Drag

Everyday: To pull something, usually against resistance (For example; “drag the table across the room”). Something tedious and boring can be described as being a “drag”. (For example; “That lesson was a real drag!”)

Science: A general word used in Physics for frictional forces. Particularly used when describing water resistance.

Energy

Everyday: The ability to do something vigorous, active and challenging (For Example, “I have a lot of energy for a run” or if someone is tired they may claim “I have no energy!”) Dictionary definitions of “energy” may use words like “power” or “force”; this is misleading as these words have their own specific meanings in Science.

Science: Energy is defined in Physics as the capacity to do work (see definition below). Energy is measured in Joules (J). Energy can exist in a variety of forms which are interchangeable (examples include; light energy, thermal energy, chemical potential energy…)

Force

Everyday: To impose something against some ones will (For example “Her mum forced her to do her homework”). Many dictionaries definitions of “force” include words like “strength”, “energy” and “power”. This is misleading because each of these words have their own specific meaning in Science.

Science: An introductory definition of the word “force” is a “push pull or twist”. Force is also defined as something which causes an object to change its speed, direction or its shape. Forces are measured in Newtons (N)

Formula

Everyday: A particular way of making something (For example “Our new formula of skin care cream”)

Science: The word “formula” is sometimes used interchangeably with the word “equation” (i.e. a mathematical expression of the relationship between variables that is used to solve problems). Chemical formula is the ration of atoms or ions in a particular compound or element.

Friction

Everyday: “Friction” may be used to describe a disagreement or dispute between two individuals or two groups of people. (For example: “There is a lot of friction between the football fans”).

Science: In Physics “Friction” is a force that acts at the surface when two objects are in contact with each other. It can be divided into static friction and dynamic friction: Dynamic friction is a force that opposes/resists relative motion of the objects. Static friction occurs when there is no relative motion between the two objects. Static friction prevents objects from accelerating when a force (up to a certain amount) is applied to the object.

Hard

Everyday: Something which is challenging and difficult to accomplish may be described as “hard”. A person may be described as “hard” is they are ruthless or unemotional. Alternatively a strong, tough or determined person may be described as “hard”. The word “hard” may also be used to describe a rigid object which does not easily change shape (For example “That mattress is very hard”).

Science: “Hardness” is a property of materials which is measured by the ability of a material to scratch other materials. Materials are ranked on the Moh’s scale according to their ability to scratch other materials. In Chemistry, “hardness” of water is a property which results from the presence of dissolved magnesium or calcium ions.

Impact

Everyday: To impact means to have an effect or influence on something or someone (For example, “That book had a great impact on me”).

Science: In Physics the word impact is used to refer to the forceful collision of two bodies.

Impulse

Everyday: Do something as a result of a sudden and spontaneous desire.

Science: In Biology the word “impulse” refers to an electrical signal which travels along a nerve. In Physics impulse is the product of Force and Time (Measured in Ns)

Initial

Everyday: The word “initials” means an abbreviation using the first letters of someone’s name(s).

Science: The word can also mean at the beginning or start. This beginning point is chosen for convenience depending on the change we are concerned with. For example if we are required to calculate the deceleration of a car; the initial velocity is the car’s velocity prior to slowing down, rather than the car’s velocity at the beginning of its journey.

Material

Everyday: The word material may be used to refer to fabric.

Science: Material is the substance that makes something up. The informal word “stuff” may help some students understand the word “material”. The word is used interchangeably with “matter”.

Moment

Everyday: A brief period of time (For example “Please wait for a moment”)

Science: A turning force (torque) measured in Nm (where force is measured perpendicular to the distance from a pivot)

Power

Everyday: Power is the ability to do something. To have authority over an individual or group of people or is in control of a situation. The word “power” is sometimes used interchangeably with “strength” or “force” (For example, “The boxer has a powerful punch” or “The wrestler has powerful arms”). Something can be said to be “powered” whatever makes it operate (For example, “This is a petrol powered car”).

Science: In Science it is acceptable to talk about things being “powered” by whatever makes them operate. However, “power” in Science should not be used interchangeably with “strength” or “force”. Power is the rate at which physical work (J) is performed. Measured in Watts, where 1Watt = 1Joule per second. Power may be used to describe many different systems, however the underlying meaning is always the same (For example, “A kettle operates at 2000Watts means it transfers 2000Joules of energy to the water every second and a light bulb that operates at 40Watts produces 40Joules of light energy per second).

Pressure

Everyday: People are said to be under pressure when they have to carry out a task urgently. The word “pressure” can also be used to describe the process of persuading or forcing someone to do something.

Science: Force acting on an area (N/m2 or Pa). Pressure can arise as a result of a solid object resting on another object. It can also result from liquids or gases.

Property

Everyday: A word used for houses or apartments, particularly in the context of buying and selling

Science: A property is a characteristic or attribute. For example, metals tend to have the property of being good conductors of electrical current.

Relationship

Everyday: This word is often used to refer to a connection or link between two people; often on friendly or romantic terms with each other.

Science: When two variables are mathematically linked we can say that there is a relationship between them. Student’s are likely to encounter this word in experimental Science where research questions are often stated in the form “what is the relationship between X and Y?”

Rest

Everyday: To rest means to stop working. Certain activities may be considered “rest” such as sleeping, watching TV or reading a book. This is subjective as it varies from person to person. The word “rest” also means “remainder” (For example, “The rest of you should keep working on your projects”)

Science: In Physics the term “at rest” is applied to stationary objects (this which are not moving).

Strain

Everyday: A strain is an injury that resulting from over exertion of the body (For example “I have strained a muscle in my back”). Straining can also mean striving for something (For example “The boy strained to reach the cookie jar”).

Science: In Physics, physical strain is a measure of the deformation of an object that results from the physical stress applied to it. Strain is a unit-less (dimensionless) number which takes the original size and/or shape into account.

Stress

Everyday: To stress something is to emphasize the importance or significance of that thing (For example, “The teacher stressed the importance of completing homework on time”). A person can be said to be “under stress”, if they are doing high responsibility, high paced or challenging work. “Stress” is also the psychological anxiety induced by this type of work.

Science: In Physics the word “stress” refers to the physical force that act on an area (measured in N/m2) resulting in the physical deformation (change in shape) of an object.

Tension

Everyday: Psychological or emotional strain; may also manifest itself physically. Tension can refer to muscles; when someone contracts their muscles (For example; “Tense your muscles!”). Tension may be said to exist between individuals or groups of people who disagree.

Science: In Physics an object is said to be under tension when two forces pull an object in opposite directions; tending to stretch or elongate the object.

Uniform

Everyday: A uniform is a set of clothes worn to identify members of a particular organization. Because all members of the organization will wear identical or similar uniforms, the meaning of the word “uniform” can be linked to the adjective form of the word- where “uniform” means the same throughout.

Science: In Science the word “uniform” can be taken to mean ‘the same throughout’ or ‘constant’. A solution may be described as “uniform” as the particles of solute may be assumed to be equally distributed; whereas a mixture may be non-uniform since different parts may vary in composition. The word “homogeneous” may be used interchangeably with “uniform”. The word “homogenous” means composed of identical parts or something which has a common property throughout.

Unit

Everyday: Unit may refer to a small group; for example “a unit of soldiers”. A unit in mathematics is also single number 1-9.

Science: A unit in Science is the scale used to measure things. The most widely used standard scientific units are those belonging to the System International (S.I. units).

Velocity

Everyday: A measure of how fast an object is moving; used interchangeably with “speed”.

Science: A measure of how fast an object is moving (speed) in a particular direction. Velocity changes when a moving object changes its direction and/or speed. Sometimes velocities will be quoted and a direction is not stated. In these cases velocity is generally assumed to be measured in the same direction as the object travels.

Weight

Everyday: How heavy something is. Used interchangeably with “mass”. It may also be used metaphorically to describe the emotional experience of stress or depression “He is weighed down with responsibility”.

Science: Weight is the force of gravity acting on an object (Measured in Newtons, N). A person’s weight depends on where they are. In space the force of gravity is negligible so a person will be weightless.

Work

Everyday: The word “work” is used to describe a task that requires effort to complete. It is also used to refer to someone’s career / occupation / study “I am doing school work”.

Science: The product of force and distance measured in the direction that force is applied (Nm or J)

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| NOTES |