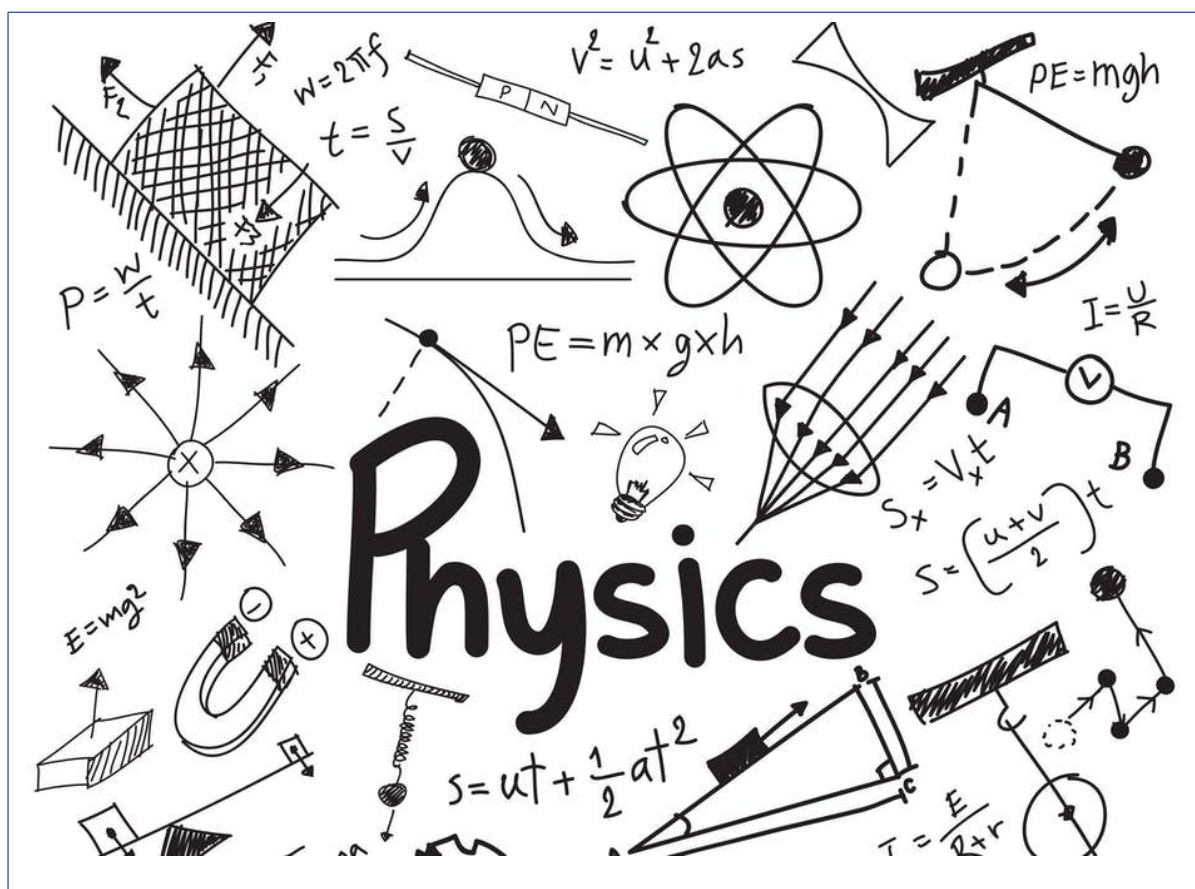













Year 11 > 12 Bridging Work Summer Term 2023



Subject	Physics
Course	A-Level
Awarding Body	OCR (Specification A)

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Course/specification overview

Content Overview	Assessment Overview	
<p>Content is split into six teaching modules:</p> <ul style="list-style-type: none">• Module 1 – Development of practical skills in physics• Module 2 – Foundations of physics• Module 3 – Forces and motion• Module 4 – Electrons, waves and photons• Module 5 – Newtonian world and astrophysics• Module 6 – Particles and medical physics <p>Component 01 assesses content from modules 1, 2, 3 and 5.</p> <p>Component 02 assesses content from modules 1, 2, 4 and 6.</p> <p>Component 03 assesses content from all modules (1 to 6).</p>	<p>Modelling physics (01)</p> <p>100 marks</p> <p>2 hours 15 minutes</p> <p>written paper</p>	<p>37%</p> <p>of total</p> <p>A level</p>
	<p>Exploring physics (02)</p> <p>100 marks</p> <p>2 hours 15 minutes</p> <p>written paper</p>	<p>37%</p> <p>of total</p> <p>A level</p>
	<p>Unified physics (03)</p> <p>70 marks</p> <p>1 hour 30 minutes</p> <p>written paper</p>	<p>26%</p> <p>of total</p> <p>A level</p>
	<p>Practical Endorsement in physics (04)</p> <p>(non exam assessment)</p>	<p>Reported separately</p> <p>(see Section 5g)</p>

In year 12 you are taught Modules 1, 2, 3, and 4

In year 13 you are taught Modules 5 and 6.

The practical endorsement is covered throughout the 2 years, with the practical tasks being taught where they fit into the content being taught.

Module 1 – Development of practical skills in physics

- 1.1 Practical skills assessed in a written examination
- 1.2 Practical skills assessed in the practical endorsement

Module 2 – Foundations of physics

- 2.1 Physical quantities and units
- 2.2 Making measurements and analysing data
- 2.3 Nature of quantities

Module 3 – Forces and motion

- 3.1 Motion
- 3.2 Forces in action
- 3.3 Work, energy and power
- 3.4 Materials
- 3.5 Newton's laws of motion and momentum

Module 4 – Electrons, waves and photons

- 4.1 Charge and current
- 4.2 Energy, power and resistance
- 4.3 Electrical circuits
- 4.4 Waves
- 4.5 Quantum physics

Module 5 – Newtonian world and astrophysics

- 5.1 Thermal physics
- 5.2 Circular motion
- 5.3 Oscillations
- 5.4 Gravitational fields
- 5.5 Astrophysics and cosmology

Module 6 – Particles and medical physics

- 6.1 Capacitors
- 6.2 Electric fields
- 6.3 Electromagnetism
- 6.4 Nuclear and particle physics
- 6.5 Medical imaging



Our department expectations

Lesson expectations and preparation

- Bring an A4 folder with dividers to lesson to organise your work.
- Print the relevant information to put in your folders. This includes
 - o The formula booklet
 - o The practical handbook
 - o Personalised Learning Checklists (PLCs) for the modules they are learning
- Purchase a textbook so they can practice questions (if you receive a bursary use this to purchase the textbook)
- Use the textbook to complete the pre-reading tasks before the lesson.

Required Practicals ('PAGs')

- Complete practical preparation work (using checklist), including:
 - o Write up practical / PAG plan before coming to the lessons (method can then be amended from experience of the practical)
 - o Include risk assessment
 - o Include labelled apparatus diagrams (where appropriate)
 - o Identified potential sources of error and uncertainty (where appropriate)
- Complete the method amendments, analysis and evaluation of practical tasks in PAG books after the lesson.

Independent study

- Review the topic covered in class and make a set of condensed class notes.
- Practice questions on the topics they have covered using the textbook and the practise in physics book.
- Check SMHW and emails regularly and complete tasks set.
- Attend Physics problem solving sessions if stuck or advised to.

Assessments

- Develop effective study habits and revise efficiently for your assessments, so you show your true capability in the assessment
- Evaluate their performance on tests and use this to identify areas of improvement.
- **You will have a bridging unit assessment in September. Part of the assessment will be a GCSE paper (you are expected to achieve a grade 6 or above on this paper).**

Working as a scientist

- Log ins and subscriptions – Isaac Physics and Physics Review
- Reading around subjects and topics / having a wider interest in your field of study
- Read / research about possible careers



Review/revise

GCSE topics covered in more depth in year 12 (from the AQA GCSE Specification)

topics for Separate GCSE Physics shown in red

- Energy
 - o Energy Stores and Transfers
 - o Kinetic, Gravitational Potential, and Elastic Potential Energy
 - o Power
 - o Efficiency
- Electricity
 - o Current (in series and parallel circuits)
 - o Potential Difference (in series and parallel circuits)
 - o Resistance (in series and parallel circuits) LDRs and thermistors
 - o Power and energy transfer
- Particle Model of Matter
 - o Density
- Forces
 - o Weight, Mass and Gravity
 - o Resultant Forces
 - o Work Done
 - o Forces and Elasticity
 - o **Moments**
 - o **Fluid Pressure**
 - o **Upthrust**
 - o Scalars and Vectors
 - o Acceleration
 - o Motion Graphs
 - o Newton's Laws of Motion
 - o Momentum (**including changes in momentum and momentum calculations**)
- Waves
 - o Transverse and Longitudinal Waves
 - o Features of a Wave
 - o Wave Speed
 - o Refraction
 - o Electromagnetic Waves

GCSE topics covered in more depth in year 13 (from the AQA GCSE Specification)

topics for Separate GCSE Physics shown in red

Energy

- Specific Heat Capacity
- Electricity
 - ***Electric Fields***
- Particle Model of Matter
 - Internal Energy
 - Specific Latent Heat
 - Particle Motion in Gases
- Waves
 - ***Black Body Radiation***
 - ***Ultrasound***
- Atomic Structure
 - Radioactivity
 - Activity and Half-life
 - ***Nuclear Fission and Fusion***
- Magnetism and Electromagnetism
 - Magnetic Fields
 - Electromagnetism
 - The Motor Effect
 - ***The Generator Effect***
 - ***Transformers***
- ***Space Physics***
 - ***Life Cycles of Stars***
 - ***The Solar System and Orbits***
 - ***Red-shift and the Big Bang***



Watch

Hopefully you'll get the opportunity to soak up some of the Sun's rays over the summer – synthesising some important Vitamin-D – but if you do get a few rainy days where you're stuck indoors here are some ideas for films to watch or clips to find online.

Science fiction and other science genre films

1. Moon (2009)
2. Gravity (2013)
3. Interstellar (2014)
4. The Imitation Game (2015)
5. The Prestige (2006)
6. 2001: A Space Odyssey (1969)
7. The Martian (2015)
8. Apollo 13 (1995)
9. Hidden Figures (2016)
10. The Theory of Everything (2014)
11. Primer (2004)
12. Contact (1997)
13. The Day After Tomorrow (2004)
14. Sunshine (2007)
15. Arrival (2016)
16. Copenhagen (BBC production, 2002)
17. Einstein and Eddington (HBO production, 2008)
18. Radioactive (2019)
19. Chernobyl (HBO series, 2019)
20. Don't Look Up (2021)
21. WALL-E (2008)

Online Clips / Series

1. Minute Physics – Variety of Physics questions explained simply (in felt tip) in a couple of minutes. Addictive viewing that will have you watching clip after clip – a good one is “Why is the Sky Dark at Night?” <https://www.youtube.com/user/minutephysics>
2. The Universe – Available on Netflix as of 19/04/20. Documentary series featuring computer-generated imagery and computer graphics of astronomical objects in the universe plus interviews with experts who study in the fields of cosmology, astronomy, and astrophysics.
3. The Most Unknown – Available on Netflix as of 19/04/20. Documentary that sends nine scientists to extraordinary parts of the world to uncover unexpected answers to some of humanity's biggest questions. How did life begin? What is time? What is consciousness? How much do we really know?
4. The Sky at Night - Available on BBC iPlayer from April 2020. Monthly episodes on space and astronomy, discussing what you can see in the sky, astrophysics and cosmology. <https://www.bbc.co.uk/programmes/b006mk7h>

5. Shock and Awe, The Story of Electricity – A 3 part BBC documentary that is essential viewing if you want to see how our lives have been transformed by the ideas of a few great scientists a little over 100 years ago. The link below takes you to a stream of all three parts joined together but it is best watched in hourly instalments. (alternatively watch any Horizon documentary – look for on Netflix and the I-Player)

<https://www.youtube.com/watch?v=Gtp51eZkwoI>

6. NASA TV – Online coverage of launches, missions, testing and the ISS. Plenty of clips and links to explore to find out more about applications of Physics in Space technology.

<http://www.nasa.gov/multimedia/nasatv/>

7. The Fantastic Mr. Feynman – I also recommend the book. See the life's work of the "great explainer", a fantastic mind that created mischief in all areas of modern Physics.

<https://www.youtube.com/watch?v=LyqleIxXTpw>

8. Light and Dark – the programme shows how light has been used to uncover the secrets of the universe. <https://www.youtube.com/watch?v=yNntDhr2n4g>

9. Sci-Show – General science on a range of very interesting topics

<https://www.youtube.com/user/scishow>

10. Sixty symbols – A whole range of interesting numbers based phenomena explained.

<https://www.youtube.com/user/sixtysymbols>

11. The world according to physics – Lecture that attempts to explain how physics plays a role in everything we do <https://www.youtube.com/watch?v=gKrjOD3Ze00>

12. Why dark matter matters! – An attempt to explain why we cannot see the majority of our Universe <https://www.youtube.com/watch?v=gE9aFOF-Od8>

13. The "WOW" signal – The best evidence that intelligent life exists outside of Planet Earth.

<https://www.youtube.com/watch?v=x67K-Vq1KWk>

14. The secrets of Quantum Physics – the programme investigates the most accurate and yet perplexing scientific theory – quantum physics.

<https://www.youtube.com/watch?v=voUi8RtmVRw&list=PLL4WDrq7vmPFyJKVgIfYL9ZRNhsvNZwFQ&index=11>



Listen to

Podcast list Royal Institution science podcasts: <https://soundcloud.com/royal-institution/sets/ri-science-podcast>

Mars Exploration: Curiosity and Beyond, with aerospace engineer Anita Sengupta <https://soundcloud.com/royal-institution/mars-exploration-curiosity-and-beyond-with-anita-sengupta-ri-science-podcast-2>

Catching Gravitational Waves <https://soundcloud.com/royal-institution/catching-gravitational-waves> o How does science actually work? <https://soundcloud.com/royal-institution/how-does-science-actually-work-ri-science-podcast-xx>

Moon, Mars and beyond <https://soundcloud.com/royal-institution/moon-mars-and-beyond>

The Order of Time, with Carlo Rovelli <https://soundcloud.com/royal-institution/the-order-of-time-ri-science-podcast-x>

Naked Scientists Astronomy podcasts: <https://www.thenakedscientists.com/podcasts/astronomy-podcasts>

Remarkable Women: A hidden history <https://www.thenakedscientists.com/podcasts/astronomy-podcasts/space-boffins/remarkable-women-hidden-history>

Magnificent Mercury: <https://www.thenakedscientists.com/podcasts/astronomy-podcasts/space-boffins/magnificent-mercury-bepicolombo>

Nature podcasts (from the premier science journal): <https://www.nature.com/nature/articles?type=nature-podcast>

BBC Science & Nature podcasts: <https://www.bbc.co.uk/podcasts/category/scienceandnature>

BBC The Life Scientific: <https://www.bbc.co.uk/programmes/b015sqc7/episodes/downloads>

BBC Inside Science: <https://www.bbc.co.uk/programmes/b036f7w2/episodes/downloads>

Donna Strickland (the first woman to win a Physics Nobel Prize): <https://www.bbc.co.uk/programmes/m0002z2z>

Clive Oppenheimer on volcanoes: <https://www.bbc.co.uk/programmes/m0001hvs>

Caroline Hargrove (Formula One engineer): <https://www.bbc.co.uk/programmes/m00017s6>

Carlo Rovelli on why time is not what it seems: <https://www.bbc.co.uk/programmes/b0b1r1cw>

Eben Upton about designing the Raspberry Pi: <https://www.bbc.co.uk/programmes/b09ly60f>

Physics Central: www.physicscentral.com/explore/multimedia/podcasts.cfm

Star-chaology: the Next Stellar Generation

<https://www.physicscentral.com/explore/multimedia/podcast.cfm?uid=20160428010716>

The Physics behind the Silver Screen

<https://www.physicscentral.com/explore/multimedia/podcast.cfm?uid=20150225072329>

New Scientist (weekly science magazine) podcasts: <https://www.newscientist.com/podcasts/>

Scientific American (premier science journal) 60-second science podcasts:

<https://www.scientificamerican.com/podcast/60-second-science/>

Talk Nerdy with Cara Santa Maria (US-based science interviewer):

<https://www.carasantamaria.com/podcast/>

Story Collider (explores everyday experiences of science):

<https://www.storycollider.org/podcasts>



Read (*GCSE level/A-level*)

A Short History of Nearly Everything - Bill Bryson

Storm in a Teacup - Helen Czerski

What If - Randall Munroe

Thing Explainer - Randall Munroe

Forces of Nature - Brian Cox

How to Teach Quantum Physics to your Dog - Chad Orzel

Seven Brief Lessons on Physics - Carlo Rovelli

6 Easy Pieces - Richard Feynman

A Brief History of Time - Stephen Hawking

Physics of the Impossible - Michio Kaku

In Search of Schrodinger's Cat - John Gribbin

Relativity Made Relatively Easy - Andrew M. Sterne

Alex's Adventures in Numberland - Alex Bellos

Why do Buildings Fall Down - Mattys Levy and Marto Salvadori

Paradox - Jim Al-Khalili

The Joy of Science - Jim Al-Khalili

The Matter of Everything – Suzie Sheehy

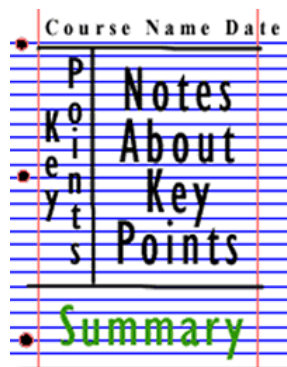


Research

To get the best grades in A Level Physics you will have to get good at completing independent research and making your own notes on difficult topics. Below are links to 7 websites that cover some interesting Physics topics.

Using the Cornell notes system: <http://coe.jmu.edu/learningtoolbox/cornellnotes.html> make 1 page of notes for **3 of the sites below** covering topics of your choice.

- a) <http://home.cern/about>
CERN encompasses the Large Hadron Collider (LHC) and is the largest collaborative science experiment ever undertaken. Find out about it here and make a page of suitable notes on the accelerator.
- b) http://joshworth.com/dev/pixelspace/pixelspace_solarsystem.html
The solar system is massive and its scale is hard to comprehend. Have a look at this award winning website and make a page of suitable notes.
- c) <https://phet.colorado.edu/en/simulations/category/html>
PhET create online Physics simulations when you can complete some simple experiments online. Open up the resistance of a wire html5 simulation. Conduct a simple experiment and make a one page summary of the experiment and your findings.
- d) <http://climate.nasa.gov/>
NASA's Jet Propulsion Laboratory has lots of information on Climate Change and Engineering Solutions to combat it. Have a look and make notes on an article of your choice.
- e) <http://www.livescience.com/46558-laws-of-motion.html>
Newton's Laws of Motion are fundamental laws for the motion of all the object we can see around us. Use this website and the suggested further reading links on the webpage to make your own 1 page of notes on the topics.
- f) <https://physicsworld.com/> The Institute of Physics online magazine, with the most up to date research and articles on Physics. Make notes on one article.
- g) https://www.sciencedaily.com/news/matter_energy/physics/ Science Daily – a website that keeps you up to date with developments in the physics world.





Complete

Task 1: Isaac Physics

Use the link below to sign up to Isaac Physics and join

the class. <https://isaacphysics.org/account?authToken=ZLTFCZ>

Complete all the questions set for you in this class. You need to complete 5 tasks per week. They are on the following topics

GCSE Revision Topics

- Mechanics (Forces)
 - o Speed, distance, and time
 - o Motion graphs
 - o Acceleration
 - o Resultant Force
 - o Terminal Velocity
 - o Moments
 - o Pressure in fluids
 - o Momentum
 - o Circular Motion
- Electricity
 - o Current and charge
 - o Potential difference
 - o Resistance
 - o I-V Characteristics
 - o Power
 - o Transformers
- Energy
 - o Thermal Energy
 - o Work, gravitational potential energy, and power
 - o Kinetic energy
 - o Efficiency
 - o Elastic potential energy
- Waves
 - o Wave properties
 - o Reflection
 - o Refraction

Maths Revision Topics

- Using and Re-arranging equations
- Standard Form and Prefixes
- Gradients and Intercepts of Graphs
- Equations of Graphs
- Area Under a Line Graph
- Factor and Percentage Changes
- Proportionality

This part is not compulsory, but I also highly recommend that you sign up to the year 12 mentor scheme (https://isaacphysics.org/pages/isaac_mentor). Sign up and you'll get the following:

- work set each week, relevant to your level;
- fortnightly tutorials covering this work with an online tutor from the University of Cambridge.
- the chance to ask our tutors to cover a specific problem you've been having;
- a certificate at the end of the course if you've attempted at least 60% of the problems set;
- all work for Year 12s can go towards your application for the [Senior Physics Challenge](#).

Task 2: Book Review

Pick one of the books from the reading list, read it, and write a book review for the book. This should include the following points and be between 1 and 3 paragraphs long.

- why you enjoyed reading this book
- any interesting facts/insights you have learned/gained from this book
- the people you would recommend this book to e.g. this would be a good book for you if you like...

Task 3: Cornell Notes

Using the Cornell notes system: <http://coe.jmu.edu/learningtoolbox/cornellnotes.html> make 1 page of notes **3 of the sites in the research section** covering topics of your choice.

Task 4: Careers in Physics

Using the careers sites (<https://nationalcareers.service.gov.uk/job-categories/engineering-and-maintenance> , <https://nationalcareers.service.gov.uk/job-categories/science-and-research> ,and other reliable sources) to find a in physics career option that interests you, and fill in the Careers Research Template (found in the resources/appendices section) for your chosen career.



Appendices/resources

Good places for resources are:

Headstart to A-level Physics: Useful transition book introducing one of the content for the A-level

<https://www.amazon.co.uk/Head-Start-level-Physics-Level/dp/1782942815>

Revision Guides and textbooks:

https://www.amazon.co.uk/level-Physics-Student-ActiveBook-Science/dp/144799082X/ref=sr_1_5?dchild=1&keywords=a+level+physics+ocr+a&qid=1587585661&sr=8-5

https://www.amazon.co.uk/New-Level-Physics-2018-Complete/dp/1789080398/ref=sr_1_3?dchild=1&keywords=ocr+a+revision+guide+physics+a+level&qid=1587585746&sr=8-3

A-Level Physics Online: <https://www.alevelphysicsonline.com/ocr-spec-a>

This site has videos on all the A-level topics for our specification (OCR A), and the year 12 content (Modules 1-4) is free.

Physics and Maths Tutor: <https://www.physicsandmathstutor.com/> and <https://www.physicsandmathstutor.com/physics-revision/a-level-ocr-a/>

This site has GCSE and A-level sections with revision notes on topics, and practice questions. You can pick GCSE topics you need to brush up on, or try some of the A-level questions using the revision notes to help you.

Careers Research Template

Name:

Career of Interest:

Explanation of the Career: *What do these people do as their day to day role.*

Qualifications for this career:

e.g. Degree in

For this degree I need A-levels in ... and ...

If I study this degree at ... University I will need to achieve the grades XXX.

Skills for this career:

What attributes would make you good at this career?

Why does this career interest you?