

## GCSE to A-level Bridging Work: Physics

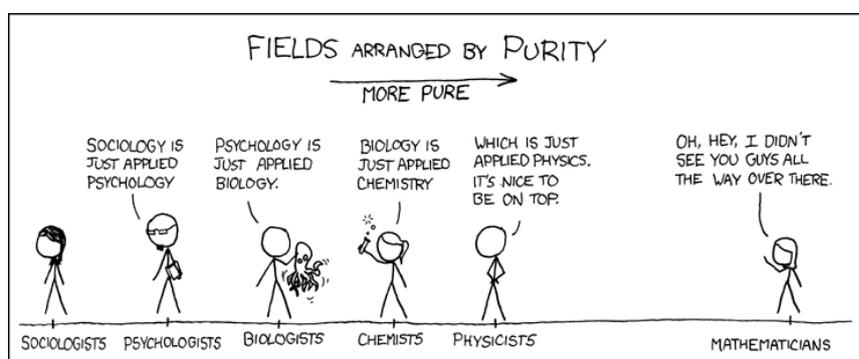
Congratulations on deciding to prepare for taking A-level Physics!

You can also download this document as a PDF, that may make it easier to view.

### Introduction.

Physics is a very rewarding subject because the principles of physics are the principles by which **everything in the universe** works, at the deepest level. From supermassive black holes, to subatomic virtual particles that pop in and out of existence, to a sleepy sloth hanging off a vine in the Amazon jungle: every object you can think of is made of **matter**, stores and transfers **energy** and interacts through **forces**. The physics of fundamental particles and forces underpins all of chemistry (atoms and chemical reactions), which in turn underpin all biological processes that occur within cells, and therefore all life.

It turns out that the universe seems to work in simple, elegant and mathematical ways. This means that mathematical patterns underpin physics. In mathematics, there are an infinity of *logically possible* mathematical patterns and relationships; the job of physics to identify which mathematical patterns **actually** relate to **the universe we see and live in**. The cartoon below shows this nicely! Then, with physics knowledge, comes the possibility of technology that is crucial to the modern world: smartphones, ever better Wi-Fi and communications, cleaner and more efficient transport and electricity generation, and medical treatments and procedures and equipment.



<https://xkcd.com/435/>

**What to do to get ready for A-level Physics.** Below, I have described three 'Tasks' you could do, but I have also included lots of possible extensions. Physics is interesting and often goes off in unexpected directions, and there is **loads** of fantastic stuff that you could look at. So feel free to do this, but after a bit of exploring make sure you return to whichever of the three tasks you're actually supposed to be doing!

### **Task 1. Introducing Physics as a subject.**

Watch the following videos and then **make a summary or concept map** about what is studied in physics, what physics is about (in a general sense) and what are the key questions that physics tries to answer.

[Video 1](#) – note: this is the first video in [a completely free online Physics course](#). Working through or dipping into a few sections of this course would be great preparation for A-level Physics.

[Video 2](#) – I think the 2<sup>nd</sup> half of this one is better than the first half, see if you agree. (also at one point the video uses gendered language unnecessarily, its a real shame they do this).

[Video 3](#) – this is a great video showing a ‘map’ of all the different topics in physics, and also a bit about the history of physics as a subject

[Videos 4, 5](#) and [6](#) – some of these are a bit over dramatic but they give some nice examples!

#### Extension reading on this:

A man called Richard Feynmann was an American lecturer in Physics in the 1960s. He wrote a very famous and influential series of lectures for the courses on physics that he taught. These are now know as “the Feynmann Lectures”. They are free to read online, in their entirety, [here](#).

**Chapters 1, 2 and 3** are excellent introductory reading to the study of physics at A-level.

Try and summarise each chapter in just 10 bullet points (so max. of 10 points for chapter 1, then max. 10 points for chapter 2, and again for chapter 3). So you have to be ruthless and only include Feynmann’s most important points in your summaries.

## Task 2 – brush up on your maths skills using Isaac Physics

'[Isaac Physics](#)' is a fantastic website where you can practice *doing* physics, and also practice *doing* maths. You will probably use it throughout the A-level as extra practice.

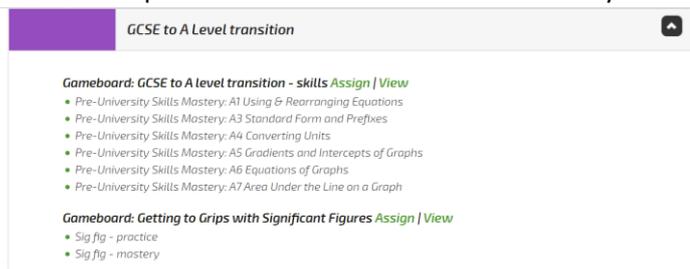
When you do work on Isaac Physics, the idea is to **do the work first on paper**. It often helps to draw a diagram of stuff in the question first, and you should use your calculator if necessary. You then type in your answer, or click on the hints if needed.

### How to do this:

1. Make yourself an account on the website – then the website will track your progress.
2. On the homepage, click on 'Learn – GCSE'. This should take you to this page



3. Click on 'Preparation for A-level'. That should take you to this page:



4. Click on 'View' and work through as much of these two 'gameboards' as you can.

### **Extension tasks on Isaac Physics** (do skip to TASK 3 if you like)

There is *loads* of other brilliant stuff you can work through on this website.

Most of the questions on Isaac physics are *mathematical* physics questions/problems, so they need you to apply an equation and do a calculation. So **it would be useful to have your list of GCSE Physics equations out in front of you**, to choose from, as well as a pen and paper to do your working out on.

It is worth reading [this page](#) first, which gives tips for *how* to go about doing the questions/problems on the site.

### **So – what else *could* you do on Isaac Physics:**

1. On the 'GCSE resources' page, you could work through the 'Quick Quizzes':



2. On the 'GCSE resources' page, you could click on 'preparation for A-level' and work through some of the other topics listed. **You don't have to do every question!**

Mechanics	▼
Materials	▼
Waves and Light	▼
Circuits	▼
Further Mechanics	▼
Fields	▼

**The questions are rated by difficulty, and some of the harder ones are very challenging, so there is nothing wrong with just trying a few of the easy ones from each section.**

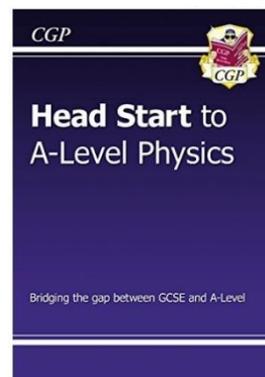
3. On the 'GCSE resources' page, you could click on 'problem solving' and choose topics to create a custom 'game board' to work through – but be prepared that some will be quite difficult.
4. On the Isaac Physics home page, you could click on 'Concepts' in the top right. This will give you a menu of *loads* of different physics subtopics to try some questions on. Choose any subtopic you like – maybe start with something you half-recognise from GCSE. Start with the lowest difficulty level and work through that subtopic as far as you like.

**Task 3 – use this free book from CGP to look over some topics from GCSE that will help for A-level**

You can download an electronic copy of this book FREE [here](#) from Amazon (you may need to install the free Kindle app too).

Alternatively, you can buy a hard copy if you like.

- 1. Start by reading and summarising page 1, this is a good introduction.**
- 2. Go back to the contents pages and do a ‘red-amber-green’ confidence rating of ALL the different topics.**
- 3. Aim to work through all of your ‘red’ (lowest confidence from GCSE) topics first. Make a schedule, perhaps aiming for 1 or 2 topics each week. You should do this by:**
  - (a) reading the topic page carefully and make a half-page summary of the key ideas on that page****THEN**
  - (b) try the questions at the bottom of that page****THEN**
  - (c) check your answers (answers are in the back of the book), adding corrections and going back to check for errors if needed.**
- 4. Then you could work through your ‘amber’ topics, and then you could review any other topics in the book that you like the look of too 😊**



I'm happy for you to email me (from your school email address) with any questions you might have about any of this work. [t.norris@huntington-ed.org.uk](mailto:t.norris@huntington-ed.org.uk)

**Other extra extension tasks that you might find interesting** for A-level Physics.

Having a look at some of these will be interesting but these **won't** be as good preparation for A-level Physics as doing tasks 1, 2 or 3 above.

You could do any of these you like the look of. Try as many or as little as you like.

1. This [youtube channel](#) has summaries of all the key parts of GCSE Physics, and even a single 2-hour video summarising ALL of the GCSE Physics! It might be a good place to go for a refresher of some topics.
2. [A completely free online Physics course](#) from Khan Academy. Working through or dipping into a few sections of this course would be great preparation for A-level Physics.
3. Khan academy also do a short course on cosmology and astronomy if you're particularly interested in space: <https://www.khanacademy.org/science/cosmology-and-astronomy>
4. Spend some time playing with this: <http://www.htwins.net/scale/> or the updated version: <http://www.htwins.net/scale2/> ... and google anything you don't understand. [This video](#) and [this website](#) also complement this in terms of 'scale'.
5. Here is [another free e-book](#) you can download as preparation for A-level physics. This one is maybe a bit more challenging.
6. Read the opening chapter of this book about the physics of climate change and sustainable energy.  
The whole book is freely available online. <https://www.withouthotair.com/>
7. Watch [this video](#) of real experiments. Take screenshots of the video at different points and try to write an explanation of the physics behind each screenshot.
8. These youtube channels are great for interesting physics things  
<https://www.youtube.com/user/1veritasium>  
<https://www.youtube.com/user/physicswoman>  
<https://www.youtube.com/user/steventhebrave>  
<https://www.youtube.com/user/minutephysics>
9. Find out what a 'quark' is, and what 'the standard model of particle physics' is.
10. Read chapters 1-3 of the Feynmann Lectures (if not done already) [here](#).