**Enrichment in Physics at A-level**

**There is no compulsory background reading for the start of the year. However reading Physics articles/ books other than your textbook will enhance your background knowledge/interest and give you an advantage when applying for University, as you can include the ones you have read in your personal statement and have more to talk about in your University interview.**

**Excellent websites**

**Institute of Physics** ([www.physics.org](http://www.physics.org)) . (You can also join the IOP free membership for 16-19 year olds)

* Links to latest Physics news feeds and discoveries
* Massive data base of articles on all topics. You can search by age and also by experience in the subject as well.
* Find advice and information about studying physics at school or university.
* Also has careers information.

**Physics World** (www.physicsworld.com)

This is the member magazine of the Institute of Physics. A vast amount of latest Physics and technology discoveries. If you have joined the IOP 16-19 membership (for free), you can access all articles.

**Sixty Symbols** www.sixtysymbols.com

This excellent website has all physics symbols. You just click on it and they have a video explaining each symbol and science involved. e.g. Ω Ohms or ω angular velocity.

**New Scientist**: [www.newscientist.com](http://www.newscientist.com)

This website keeps you up to date with all the latest advances and discoveries in Science. You can access many articles with a free subscription, section on Physics and technology. For full access it is quite costly.

**Future learn:** futurelearn.com

* **Free high quality online courses** from some of the world’s leading universities and other outstanding cultural institutions.
* **Improve your background knowledge in your A-level subjects.**
* **Give yourself the edge in UCAS applications and University interviews.**
* **Log onto “futurelearn.com”, register and go!**

**Some optional wider** *A Short History of Nearly Everything* - Bill Bryson:

A really interesting read that tells the story of science, right back from the beginning when the philosophers were thinking about the stars, to the latest theories on unifying quantum mechanics with general relativity. It is filled with all sorts of anecdotes and really makes you interested in how all these discoveries came about!

* *Why don’t penguins’; feet freeze? –* New Scientist

A vast collection of New Scientists readers questions, many seemingly simple questions turn out to have complex answers and some that seem difficult have a very simple explanation. *New Scientist's* 'Last Word' is regularly voted the magazine's most popular section as it celebrates all questions - the trivial, idiosyncratic, baffling and strange. This new selection of the best is popular science at its most entertaining and enlightening.

* *Why does E = mc2* – Brian Cox and Jeff Forshaw

This is an engaging and accessible explanation of Einstein's equation that explores the principles of physics through everyday life. Professor Brian Cox and Professor Jeff Forshaw go on a journey to the frontier of 21st century science to consider the real meaning behind the iconic sequence of symbols that make up Einstein's most famous equation. Breaking down the symbols themselves, they pose a series of questions: What is energy? What is mass? What has the speed of light got to do with energy and mass? In answering these questions, they take us to the site of one of the largest scientific experiments ever conducted. Lying beneath the city of Geneva, straddling the Franco-Swiss boarder, is a 27 km particle accelerator, known as the Large Hadron Collider. Using this gigantic machine - which can recreate conditions in the early Universe fractions of a second after the Big Bang - Cox and Forshaw will describe the current theory behind the origin of mass. Alongside questions of energy and mass, they will consider the third, and perhaps, most intriguing element of the equation: 'c' - or the speed of light. Why is it that the speed of light is the exchange rate? Answering this question is at the heart of the investigation as the authors demonstrate how, in order to truly understand why E=mc2, we first must understand why we must move forward in time and not backwards and how objects in our 3-dimensional world actually move in 4-dimensional space-time. In other words, how the very fabric of our world is constructed. A collaboration between two of the youngest professors in the UK, "Why Does E=MC2?" promises to be one of the most exciting and accessible explanations of the theory of relativity in recent years.

* *The Grand Design –* Stephen Hawkins and Leonard Mjodinow

When and how did the universe begin? Why are we here? Is the apparent 'grand design' of our universe evidence for a benevolent creator who set things in motion? Or does science offer another explanation? In *The Grand Design*, the most recent scientific thinking about the mysteries of the universe is presented in language marked by both brilliance and simplicity. Model dependent realism, the multiverse, the top-down theory of cosmology, and the unified M-theory - all are revealed here.

This is the first major work in nearly a decade by one of the world's greatest thinkers. A succinct, startling and lavishly illustrated guide to discoveries that are altering our understanding and threatening some of our most cherished belief systems, *The Grand Design* is a book that will inform - and provoke - like no other.

* *The Quantum Universe: Everything that can happen does happen –* Brian Cox and Jeff Forshaw

From the bestselling authors of *Why does E=mc2?* comes *The Quantum Universe*, in which Brian Cox, presenter of the BBC's *Wonders of the Solar System* and *Wonders of the Universe,* and Jeff Forshaw go on a brilliantly ambitious mission to show that everyone can understand the deepest questions of science.

But just what is quantum physics? How does it help us understand our amazing world? Where does it leave Newton and Einstein? And why, above all, can we be sure that the theory is good?

Here, Brian Cox and Jeff Forshaw give us the real science behind the bizarre behaviour of the atoms and energy that make up the universe, and reveal exactly how everything that can happen, does happen.

* *A* ***Briefer*** *History of Time –* Stephen Hawkins

Stephen Hawking's worldwide bestseller, *A Brief History of Time,* has been a landmark volume in scientific writing. Its author's engaging voice is one reason, and the compelling subjects he addresses is another: the nature of space and time, the role of God in creation, the history and future of the universe. But it is also true that in the years since its publication, readers have repeatedly told Professor Hawking of their great difficulty in understanding some of the book's most important concepts. This is the origin of and the reason for *A Briefer History of Time:* its author's wish to make its content accessible to readers - as well as to bring it up-to-date with the latest scientific observations and findings. Although this book is literally somewhat 'briefer', it actually expands on the great subjects of the original. Purely technical concepts, such as the mathematics of chaotic boundary conditions, are gone. Conversely, subjects of wide interest that were difficult to follow because they were interspersed throughout the book have now been given entire chapters of their own, including relativity, curved space, and quantum theory.

* *Newton -*  Peter Ackroyd

When Newton was not yet twenty-five years old, he formulated calculus, hit upon the idea of gravity, and discovered that white light was made up of all the colours of the spectrum. By 1678, Newton designed a telescope to study the movement of the planets and published *Principia*, a milestone in the history of science, which set forth his famous laws of motion and universal gravitation. Newton’s long-time research on calculus, finally made public in 1704, triggered a heated controversy as European scientists accused him of plagiarizing the work of the German scientist Gottfried Leibniz.
In this third volume in the acclaimed Ackroyd’s Brief Lives series, bestselling author Peter Ackroyd provides an engaging portrait of Isaac Newton, illuminating what we think we know about him and describing his seminal contributions to science and mathematics.

* *From Greek Atoms to Quarks –* Sally Morgan (on LHC)

Who discovered electrons, protons, and neutrons? What is antimatter? Could atomic research help scientists cure cancer? This book tells the amazing story of the discovery of the atom and the particles that exist inside it, and explains how scientists have used these discoveries in incredible ways.