Transition to BTEC Level 3 National Certificate in Applied Science

Contents:

Useful Resources:

Course details

https://qualifications.pearson.com/en/qualifications/btec-nationals/applied-science-2016.html

BTEC Applied Science Revision Guide

http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa/

Biology

I. Reading List

The books below are all popular science books and great for extending your understanding of Science.

Lewis Thomas:
The Lives of a Cell: Notes of a Biology Watcher.
The Medusa and the Snail: More Notes of a Biology Watcher
Barry Gibb: *The Rough Guide to the Brain* (Rough Guides Reference Titles)
Charles Darwin: *The Origin of Species*
Armand Marie Leroi: *Mutants: On the Form, Varieties and Errors of the Human Body*
David S. Goodsell: *The Machinery of Life*
Ernst Mayr: *This Is Biology: The Science of the Living World*
George C. Williams: *Plan and Purpose in Nature*
Steve Pinker: *The Language Instinct*
Edward O Wilson: *The Diversity of Life*
Richard Leaky: *The Origin of Humankind*
Bill Bryson: *A Short History of Nearly Everything*
Matt Ridley:
Genome: The Autobiography of a Species in 23 Chapters
The Red Queen: Sex and the Evolution of Human Nature
The Language of Genes
Francis Crick: *Discoverer of the Genetic Code*
Nature Via Nurture: Genes, Experience and What Makes Us Human

Websites

1. http://www.ibiblio.org/virtualcell/index.htm–Aninteractivecellbiologysite
2. http://www.accessexcellence.org/RC/VL/GG A website showing illustrations of many processes of biotechnology
3. http://www.uq.oz.au/nanoworld–Visit the world of electron-microscopy
4. http://www.dnai.org/a/index.html–Explore the genetic code
5. http://nobelprize.org–Details of the history of the best scientific discoveries
6. http://nature.com–The site of the scientific journal
7. http://royalsociety.org Podcasts, news and interviews with scientists about recent scientific developments
8. http://www.nhm.ac.uk – The London Natural History Museum's website with lots of interesting educational material
9. http://www.bmj.com– The website of the British Medical Journal
10. http://www.bbc.co.uk/news/science_and_environment - The BBC news page for Science and the Environment

There are various documentaries you can watch including:

Secret universe: the hidden life of the cell (BBC Iplayer) 2012

Planet Earth I and II, Icarus, Blackfish, The Ascent of Man, Catastrophe, Frozen Planet, Life Story, The Hunt and Monsoon.

II. Tasks

Cells

The cell is a unifying concept in biology, you will come across it many times during your two years of BTEC. Prokaryotic and eukaryotic cells can be distinguished on the basis of their structure and ultrastructure.
In complex multicellular organisms, cells are organised into tissues, tissues into organs and organs into systems

Read the information on these websites:
http://www.s-cool.co.uk/a-level/biology/cells-and-organelles
http://www.bbc.co.uk/education/guides/zvjycdm/revision

And take a look at these videos:
https://www.youtube.com/watch?v=Pxujitlv8wc
https://www.youtube.com/watch?v=ORB866QSGv8
https://www.youtube.com/watch?v=wNe6RuK0FfA&t=25s

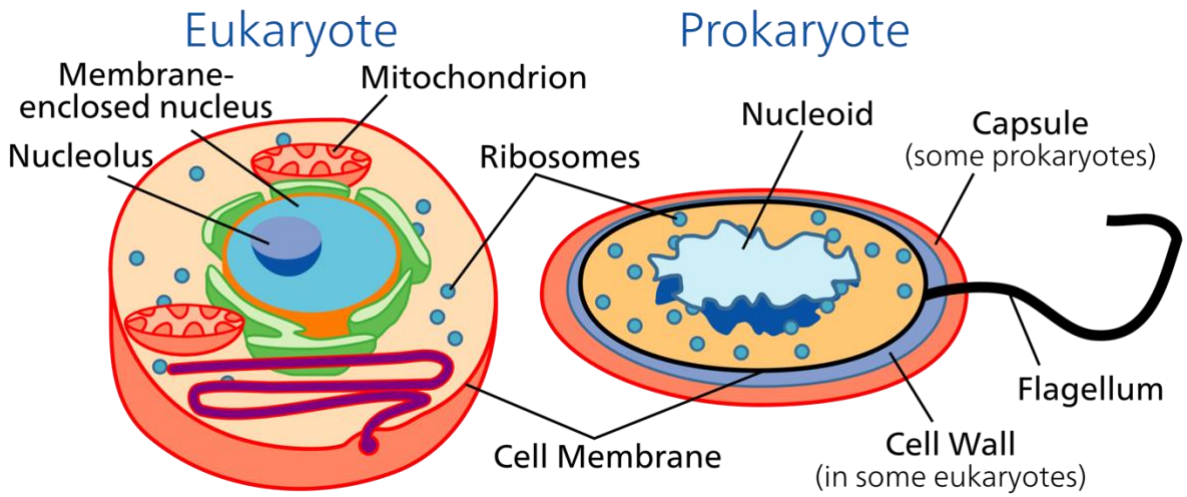
1. **Produce an A3 Poster diagram of an animal cell, with the organelles labelled on it clearly.**

2. **Produce a one page revision guide to share with your class in September summarising one of the following topics: Cells and Cell Ultrastructure, Prokaryotes and Eukaryotes, specialised cells**

Whichever topic you choose, your revision guide should include:

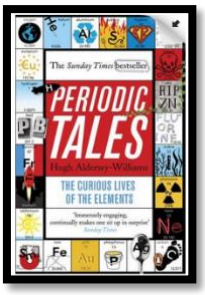
- Key words and definitions
- Clearly labelled diagrams
- Short explanations of key ideas or processes.

3. **Research on COPD (chronic obstructive pulmonary disease) in smokers and how it affects gas exchange in individuals. Particularly looking at the function and structure of epithelial tissue. Make sure to write this down with diagrams to aid you explanation.**
    - You need to look at the structure of epithelial cells and how they are specialised for their role.
    - Define and explain gas exchange in humans
    - Look at how smoking effects the epithelial cells/tissue
    - And subsequently effects gas exchange



Chemistry

Reading list



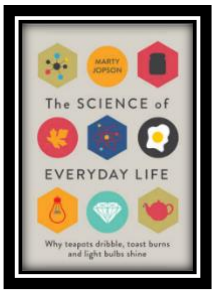
Periodic Tales: The Curious Lives of the Elements (Paperback) Hugh Aldersey-Williams

ISBN-10: 0141041455

http://bit.ly/pixlchembook1

This book covers the chemical elements, where they come from and how they are used. There are loads of fascinating insights into uses for chemicals you would have never even thought about.

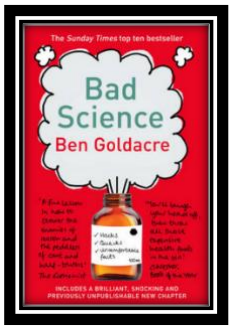
The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Shine (Hardback) Marty Jopson



ISBN-10: 1782434186

http://bit.ly/pixlchembook2

The title says it all really, lots of interesting stuff about the things around you home!



Bad Science (Paperback) Ben Goldacre

ISBN-10: 000728487X

http://bit.ly/pixlchembook3

Here Ben Goldacre takes apart anyone who published bad / misleading or dodgy science – this book will make you think about everything the advertising industry tries to sell you by making it sound 'sciency'.

Videos to watch online

Rough Science – the Open University – 34 episodes available

Real scientists are 'stranded' on an island and are given scientific problems to solve using only what they can find on the island.

Great fun if you like to see how science is used in solving problems.

There are six series in total

http://bit.ly/pixlchemvid1a

http://www.dailymotion.com/playlist/x2igjq_Rough-Science_rough-science-full-series/1#video=xxw6pr

or

http://bit.ly/pixlchemvid1b

https://www.youtube.com/watch?v=lUoDWAt259I

10 weird and wonderful chemical reactions

10 good demonstration reactions, can you work out the chemistry of …. any… of them?

http://bit.ly/pixlchemvid3

https://www.youtube.com/watch?v=0Bt6RPP2ANI

Chemistry in film

Dantes Peak 1997: Volcano disaster film.

Use the link to look at the Science of acids and how this links to the film.
http://www.open.edu/openlearn/science-maths-technology/science/chemistry/dantes-peak

http://www.flickclip.com/flicks/dantespeak1.html

http://www.flickclip.com/flicks/dantespeak5.html

Fantastic Four 2005 &2015: Superhero film

Michio Kaku explains the "real" science behind fantastic four http://nerdist.com/michio-kaku-explains-the-real-science-behind-fantastic-four/

http://www.flickclip.com/flicks/fantastic4.html

Research activities

TASK 1

Use your online searching abilities to see if you can find out as much about the topic as you can. Remember, you should aim to push **your** knowledge.

A: The chemistry of fireworks

What are the component parts of fireworks? What chemical compounds cause fireworks to explode? What chemical compounds are responsible for the colour of fireworks?

B: Aspirin

What was the history of the discovery of aspirin, how do we manufacture aspirin in a modern chemical process?

C: The hole in the ozone layer

Why did we get a hole in the ozone layer? What chemicals were responsible for it? Why were we producing so many of these chemicals? What is the chemistry behind the ozone destruction?

TASK 2

Scientific and Investigative Skills

As a part of your BTEC course, you will complete practical assessment. This will require you to carry out a series of practical activities as well as planning how to do them, analysing the results and evaluating the methods. This will require you to use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature. Length and current), use appropriate instrumentation to record quantitative measurements such as a colorimeter or photometer, use apparatus for a variety of experimental techniques to include micrometres.

Produce a glossary for the following key words:

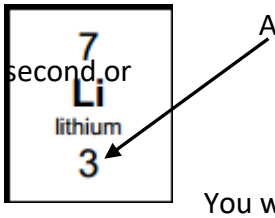
Accuracy, anomaly, calibration, control experiment, control group, control variable, correlation, dependent variable, errors, evidence, valid test, hypothesis, independent variable, null hypothesis, precision, probability. Protocol, random distribution, random error, raw data. Reliability, systematic error, true value, validity, zero error.

TASK 3: Electronic structure, how electrons are arranged around the nucleus

A periodic table can give you the proton / atomic number of an element; this also tells you how many electrons are in the ***atom***.

You will have used the rule of electrons shell filling, where:

The first shell holds up to 2 electrons, the second up to 8, the third up to 8 and the fourth up to 18 (or you may have been told 8).



Atomic number =3, electrons = 3, arrangement 2 in the first shell and 1 in the second or

Li = 2,1

You will learn that the electron structure is more complex than this, and can be used to explain a lot of the chemical properties of elements.

The 'shells' can be broken down into 'orbitals', which are given letters:'s' orbitals, 'p' orbitals and 'd' orbitals.

You can read about orbitals here:

http://bit.ly/pixlchem1

http://www.chemguide.co.uk/atoms/properties/atomorbs.html#top

Now that you are familiar with s, p and d orbitals, try these problems; write your answer in the format:

$1s^2$, $2s^2$, $2p^6$ etc.

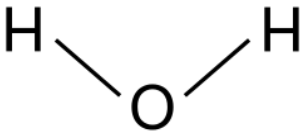
Q1.1 Write out the electron configuration of:

a) Ca b) Al c) S d) Cl e) Ar f) Fe g) V h) Ni i) Cu j) Zn k) As

Q1.2 Extension question, can you write out the electron arrangement of the following *ions*:

a) K^+ b) O^{2-} c) Zn^{2+} d) V^{5+} e) Co^{2+}

Task 4: The shapes of molecules and bonding



Have you ever wondered why your teacher drew a water molecule like this?

The lines represent a covalent bond, but why draw them at an unusual angle?

If you are unsure about covalent bonding, read about it here:

http://bit.ly/pixlchem5

http://www.chemguide.co.uk/atoms/bonding/covalent.html#top

You are also expected to know how molecules have certain shapes and why they are the shape they are.

You can read about shapes of molecules here:

http://bit.ly/pixlchem6

http://www.chemguide.co.uk/atoms/bonding/shapes.html#top

Q2.1 Draw a dot and cross diagram to show the bonding in a molecule of aluminium chloride ($AlCl_3$)

Q2.2 Draw a dot and cross diagram to show the bonding in a molecule of ammonia (NH_3)

Q2.3 What is the shape and the bond angles in a molecule of methane (CH_4)?

TASK 5: Chemical equations

Balancing chemical equations is the stepping-stone to using equations to calculate masses in chemistry.

There are loads of websites that give ways of balancing equations and many exercises in balancing.

Some of the equations to balance may involve strange chemical, do not worry about that, the key idea is to get balancing right.

http://bit.ly/pixlchem7

http://www.chemteam.info/Equations/Balance-Equation.html

This website has a download; it is safe to do so:

http://bit.ly/pixlchem8

https://phet.colorado.edu/en/simulation/balancing-chemical-equations

Balance the following equations

a. $H_2 + 0_2 \rightarrow H_20$

b. $S_8 + 02 \rightarrow S0_3$

c. $HgO \rightarrow Hg + 0_2$

d. $Zn + HCl \rightarrow ZnCl_2 + H_2$

e. $Na + H_20 \rightarrow NaOH + H_2$

f. $C_{10}H_{16} + Cl_2 \rightarrow C + HCl$

g. $Fe + 0_2 \rightarrow Fe_20_3$

h. $C_6H_{12}0_6 + 0_2 \rightarrow C0_2 + H_20$

i. $Fe_20_3 + H_2 \rightarrow Fe + H_20$

j. $Al + FeO \rightarrow Al_2O_3 + Fe$

TASK 6: Amount of substance

From this point on you need to be using an A Level standard periodic table, not a GCSE one you can view one here:

http://bit.ly/pixlpertab

https://secondaryscience4all.files.wordpress.com/2014/08/filestore_aqa_org_uk_subjects_aqa-2420-w-trb-ptds_pdf.png

Now that we have our chemical equations balanced, we need to be able to use them in order to work out masses of chemicals we need or we can produce.

The ***mole*** is the chemists equivalent of a dozen, atoms are so small that we cannot count them out individually, we weigh out chemicals.

For example: magnesium + sulfur → magnesium sulfide

$$Mg + S \rightarrow MgS$$

We can see that one atom of magnesium will react with one atom of sulfur, if we had to weigh out the atoms we need to know how heavy each atom is.

From the periodic table: Mg = 24.3 and S = 32.1

If I weigh out exactly 24.3 g of magnesium this will be 1 mole of magnesium, if we counted how many atoms were present in this mass it would be a huge number (6.02×10^{23}!!!!), if I weigh out 32.1g of sulfur then I would have 1 mole of sulfur atoms.

So 24.3g of Mg will react precisely with 32.1g of sulfur, and will make 56.4g of magnesium sulfide.

Here is a comprehensive page on measuring moles; there are a number of descriptions, videos and practice problems.

You will find the first 6 tutorials of most use here, and problem sets 1 to 3.

http://bit.ly/pixlchem9

http://www.chemteam.info/Mole/Mole.html

Answer the following questions on moles.

a) How many moles of phosphorus pentoxide (P_4O_{10}) are in 85.2g?
b) How many moles of potassium in 73.56g of potassium chlorate (V) ($KClO_3$)?
c) How many moles of water are in 249.6g of hydrated copper sulfate(VI) ($CuSO_4.5H_2O$)? For this one, you need to be aware the dot followed by $5H_2O$ means that the molecule comes with 5 water molecules so these have to be counted in as part of the molecules mass.
d) What is the mass of 0.125 moles of tin sulfate ($SnSO_4$)?
e) If I have 2.4g of magnesium, how many g of oxygen (O_2) will I need to react completely with the magnesium? $2Mg + O_2 \rightarrow 2MgO$

TASK 7: Solutions and concentrations

In chemistry, many of the reactions we carry out involve mixing solutions rather than solids, gases or liquids.

You will have used bottles of acids in science that have labels saying 'Hydrochloric acid 1M'; this is a solution of hydrochloric acid where 1 mole of HCl, hydrogen chloride (a gas) has been dissolved in 1dm^3 of water.

The dm^3 is a cubic decimetre, it is actually 1 litre, but from this point on as a BTEC scientist you will use the dm^3 as your volume measurement.

http://bit.ly/pixlchem10

http://www.docbrown.info/page04/4_73calcs11msc.htm

Questions:

a) What is the concentration (in mol dm^{-3}) of 9.53g of magnesium chloride ($MgCl_2$) dissolved in 100cm^3 of water?
b) What is the concentration (in mol dm^{-3}) of 13.248g of lead nitrate ($Pb(NO_3)_2$) dissolved in 2dm^3 of water?
c) If I add 100cm^3 of 1.00 mol dm^3 HCl to 1.9dm^3 of water, what is the molarity of the new solution?
d) What mass of silver is present in 100cm^3 of 1moldm^{-3} silver nitrate ($AgNO_3$)?
e) The Dead Sea, between Jordan and Israel, contains 0.0526 moldm^{-3} of Bromide ions (Br^-), what mass of bromine is in 1dm^3 of Dead Sea water?

TASK 8: Titrations

One key skill in BTEC Applied Science is the ability to carry out accurate titrations, **and** be able to describe in detail how to carry out a titration - there will be questions on the exam paper about how to carry out practical procedures.

You can read about how to carry out a titration here; the next page in the series (page 5) describes how to work out the concentration of the unknown.

http://bit.ly/pixlchem11

http://www.bbc.co.uk/schools/gcsebitesize/science/triple_aqa/further_analysis/analysing_substances/revision/4/

Remember that for any titration calculation you need to have a balanced symbol equation; this will tell you the ratio in which the chemicals react.

E.g. a titration of an unknown sample of sulfuric acid with sodium hydroxide.

A 25.00 cm^3 sample of the unknown sulfuric acid was titrated with 0.100 $moldm^{-3}$ sodium hydroxide and required exactly 27.40 cm^3 for neutralisation. What is the concentration of the sulfuric acid?

Step 1: the equation $2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$

Step 2; the ratios 2 : 1

Step 3: how many moles of sodium hydroxide $27.40cm^3 = 0.0274dm^3$

number of moles = c x v = 0.100 x 0.0274 = 0.00274 moles

step 4: Using the ratio, how many moles of sulfuric acid

for every 2 NaOH there are 1 H_2SO_4 so, we must have 0.00274/2 =0.00137 moles of H_2SO_4

Step 5: Calculate concentration. Concentration = moles / volume ←in dm^3 = 0.00137/0.025 = ***0.0548 moldm^{-3}***

Here are some additional problems, which are harder, ignore the questions about colour changes of indicators.

http://bit.ly/pixlchem12

http://www.docbrown.info/page06/Mtestsnotes/ExtraVolCalcs1.htm

Use the steps on the last page to help you

A solution of barium nitrate will react with a solution of sodium sulfate to produce a precipitate of barium sulfate.

$Ba(NO_3)_2(aq) + Na_2SO_4(aq) \rightarrow BaSO_4(s) + 2NaNO_3(aq)$

What volume of 0.25$moldm^{-3}$sodium sulfate solution would be needed to precipitate all of the barium from 12.5cm^3 of 0.15 $moldm^{-3}$ barium nitrate?

Answers to problems

Q1.1a) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6 4s^2$ b) $1s^2\ 2s^2\ 2p^6 3s^2 3p^1$ c) $1s^2\ 2s^2\ 2p^6 3s^2 3p^4$ d) $1s^2\ 2s^2\ 2p^6 3s^2 3p^5$

e) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6$ f) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^6 4s^2$ g) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^3 4s^2$

h) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^8 4s^2$ i) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^{10}\ 4s^1$ j) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^{10}\ 4s^2$

k) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 4s^2\ 3d^{10}\ 4p^3$

Q1.2a) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6$ b) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6$ c) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^{10}$

d) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6$ e) $1s^2\ 2s^2\ 2p^6 3s^2 3p^6\ 3d^7$

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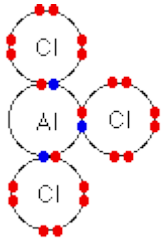
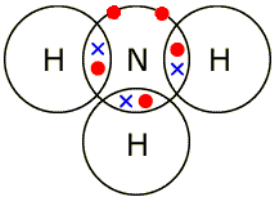
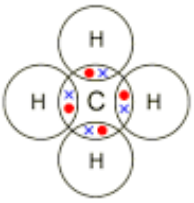
Q2.1

a) 

120°

b) 

107°

c) 

109.5°

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Q3 a. $2H_2 + 0_2 \rightarrow 2\ H_20$

b. $S_8 + 1202 \rightarrow 8S0_3$

c. $2HgO \rightarrow 2Hg + 0_2$

d. $Zn + 2HCl \rightarrow ZnCl_2 + H_2$

e. $2Na + 2H_20 \rightarrow 2NaOH + H_2$

f. $C_{10}H_{16} + 8Cl_2 \rightarrow 10C + 16HCl$

g. $2Fe + 30_2 \rightarrow 2Fe_20_3$

h. $C_6H_{12}0_6 + 60_2 \rightarrow 6\ C0_2 + 6\ H_20$

i. $Fe_20_3 + 3H_2 \rightarrow 2Fe + 3H_20$

j. $2Al + 3\ FeO \rightarrow Al_2O_3 + 3Fe$

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Q4.1 a) 85.2/284 = 0.3 moles b) 73.56/122.6 = 0.6 moles c) 249.5/249.5 = 1.0 moles

d) 0.125 x 212.8 = 26.6g e) 2Mg : O_2 or 1:2 ratio 2.4g of Mg = 0.1moles so we need 0.05 moles of oxygen (O_2): 0.05 x 32 = 1.6 g

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Q5.1 a) 9.53g/95.3 = 0.1 moles, in 100cm^3 or 0.1dm^3 in 1dm^3 0.1moles/0.1dm^3 = 1.0 mol dm^{-3}

b) 13.284g/331.2 = 0.04 moles, in 2dm^3 in 1dm^3 0.04moles /2dm^3 = 0.02 mol dm^{-3}

c) 100cm^3 of 0.1 mol dm^{-3} = 0.01 moles added to a total volume of 2 dm^3 = 0.01moles/2dm^3 = 0.005 mol dm^{-3}

d) in 1dm^3 of 1 mol dm^{-3} silver nitrate, 1 mole of Ag = 107.9g in 0.1dm^3 = 107.9 x 0.1 = 10.79g

e) 0.0526 x 79.7 = 42.0274g

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Q6.1

$Ba(NO_3)_2$: Na_2SO_4

1 : 1 ratio

12.5cm^3 of $Ba(NO_3)_2$ = 0.0125dm^3

0.15 moldm^{-3} x 0.0125dm^3 = 0.001875 moles

same number of moles of sodium sulfate needed, which has a concentration of 0.25 mol dm^{-3}

0.001875 moles / 0.25 mol dm^{-3} = 0.0075 dm^3 or 7.5cm^3

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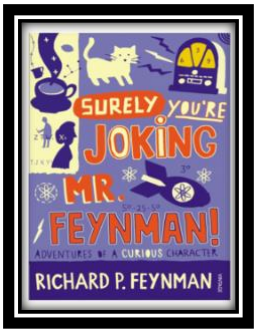
Physics

Reading list

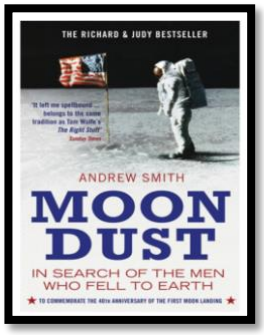
Below is a selection of books that should appeal to a physicist – someone with an enquiring mind who wants to understand the universe around us.



Surely You're Joking Mr Feynman: Adventures of a Curious Character

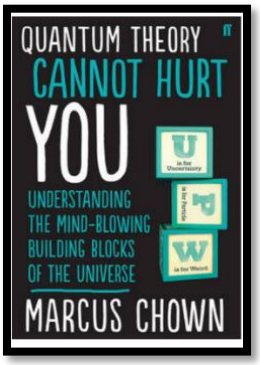
ISBN - 009917331X - Richard Feynman was a Nobel Prize winning Physicist. In my opinion he epitomises what a Physicist is. By reading this books you will get insight into his life's work including the creation of the first atomic bomb and his bongo playing adventures and his work in the field of particle physics.

(Also available on Audio book).



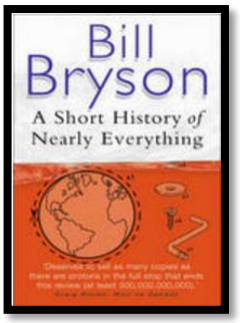
Moondust: In Search of the Men Who Fell to Earth

ISBN – 1408802384 - One of the greatest scientific achievements of all time was putting mankind on the surface of the moon. Only 12 men made the trip to the surface, at the time of writing the book only 9 are still with us. The book does an excellent job of using the personal accounts of the 9 remaining astronauts and many others involved in the space program at looking at the whole space-race era, with hopefully a new era of space flight about to begin as we push on to put mankind on Mars in the next couple of decades.



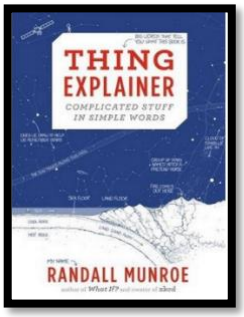
Quantum Theory Cannot Hurt You: Understanding the Mind-Blowing Building Blocks of the Universe

ISBN - 057131502X - Any Physics book by Marcus Chown is an excellent insight into some of the more exotic areas of Physics that require no prior knowledge. In your first year of A-Level study you will meet the quantum world for the first time. This book will fill you with interesting facts and handy analogies to whip out to impress your peers!



A Short History of Nearly Everything

ISBN – 0552997048 - A modern classic. Popular science writing at its best. A Short History of Nearly Everything Bill Bryson's quest to find out everything that has happened from the Big Bang to the rise of civilization - how we got from there, being nothing at all, to here, being us. Hopefully by reading it you will gain an awe-inspiring feeling of how everything in the universe is connected by some fundamental laws.



Thing Explainer: Complicated Stuff in Simple Words

ISBN – 1408802384 - This final recommendation is a bit of a wild-card – a book of illustrated cartoon diagrams that should appeal to the scientific side of everyone. Written by the creator of online comic XTCD (a great source of science humour) is a book of blueprints from everyday objects such as a biro to the Saturn V rocket and an atom bomb, each one meticulously explained BUT only with the most common 1000 words in the English Language. This would be an excellent coffee table book in the home of every scientist.

Film/ Video Clip Recommendations

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 Fictions Films:

1. Moon (2009)
2. Gravity (2013)
3. Interstellar (2014)
4. The Imitation Game (2015)
5. The Prestige (2006)

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 particular favourite of mine is "Why is the Sky Dark at Night?"
   https://www.youtube.com/user/minutephysics
2. *Wonders of the Universe* / *Wonders of the Solar System* – Both available of Netflix as of 17/4/16 – Brian Cox explains the Cosmos using some excellent analogies and wonderful imagery.
3. *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. Don't forget

to boo when you see Edison. (alternatively watch any Horizon documentary – loads of choice on Netflix and the I-Player)

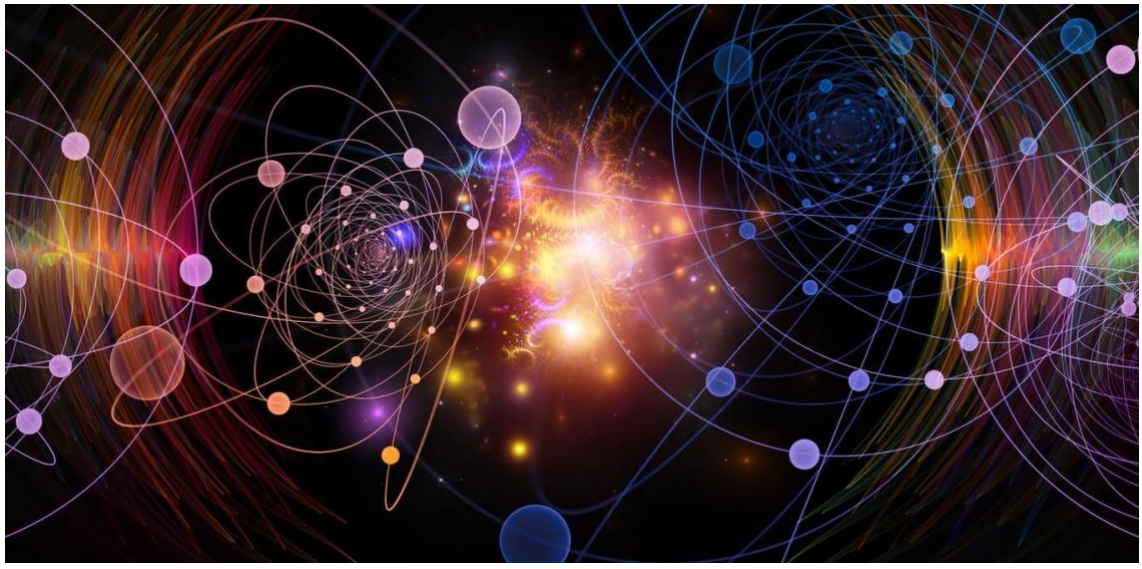
https://www.youtube.com/watch?v=Gtp51eZkwoI

4. *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/

5. *The Fantastic Mr. Feynman* – I recommended the book earlier, I also cannot recommend this 1 hour documentary highly enough. 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



Revision

Below are prefixes, quantities and their units that you need to be familiar with

Prefix	Symbol	Power of ten
Nano	n	$\times 10^{-9}$
Micro	μ	$\times 10^{-6}$
Milli	m	$\times 10^{-3}$
Centi	c	$\times 10^{-2}$
Kilo	k	$\times 10^{3}$
Mega	M	$\times 10^{6}$
Giga	G	$\times 10^{9}$

Quantity	Symbol	Unit
Velocity	v	ms^{-1}
Acceleration	a	ms^{-2}
Time	t	S
Force	F	N
Resistance	R	Ω
Potential difference	V	V
Current	I	A
Energy	E or W	J
Pressure	P	Pa
Momentum	p	$kgms^{-1}$
Power	P	W
Density	ρ	kgm^{-3}
Charge	Q	C

Revision and Research - General

You need to be able to:

AO1 Demonstrate knowledge of scientific facts, terms, definitions and scientific formulae

TASK: Define the command words: give, label, name, state

You need to be able to:

AO2 Demonstrate understanding of scientific concepts, procedures, processes and techniques and their application.

TASK: Define the command words: calculate, compare, discuss, draw, explain, state, write

You need to be able to:

AO3 Analyse, interpret and evaluate scientific information to make judgements and reach conclusions

TASK: Define the command words: calculate, comment, compare, complete, describe, discuss, explain, state

You need to be able to:

AO4 Make connections, use and integrate different scientific concepts, procedures, processes or techniques

TASK: Define the command words: comment, compare, complete, discuss, explain

Revision and Research - Waves

Course content & task to create a glossary

Waves in communication - C1 Working with waves

Understand the features common to all waves and use the following terms as applied to waves:

TASK: Define the following KEY TERMS

- periodic time
- speed
- wavelength
- frequency
- amplitude
- oscillation.

Graphical representation of wave features

Understand the difference between the two main types of wave:

TASK: Define, draw and label a transverse & a longitudinal wave

Independent research tasks

1. **Produce a wall display** (poster or PowerPoint) for your classroom that explains how **electromagnetic radiation** is used in communications.

   Your display should include images, keywords and simple explanations to link frequencies to uses, including mobile phones, Wi-Fi, IR, Bluetooth and satellite communications.

2. **Produce a wall display** (poster or PowerPoint) for your classroom about the **solar system.**

Your display should include images, keywords and simple explanations to describe the structure of the solar system, how it was formed and how it is changing.

3. **Investigate climate change and climate engineering/geoengineering**, make notes of key points. **Compose a letter** to an MP or company proposing an engineering solution to climate change.

   Your letter should explain what is meant by climate change and climate engineering. It should include at least three ways to reduce climate change and evaluate the carbon capture in addition to reducing carbon emissions.

   Possible links to help

Communications

a. http://physicsnet.co.uk/gcse-physics/communication/

Solar system
https://www.youtube.com/watch?v=Uhy1fucSRQI&feature=youtu.be

Climate change
https://www.youtube.com/watch?v=LV1DQK7tJbo&feature=youtu.be