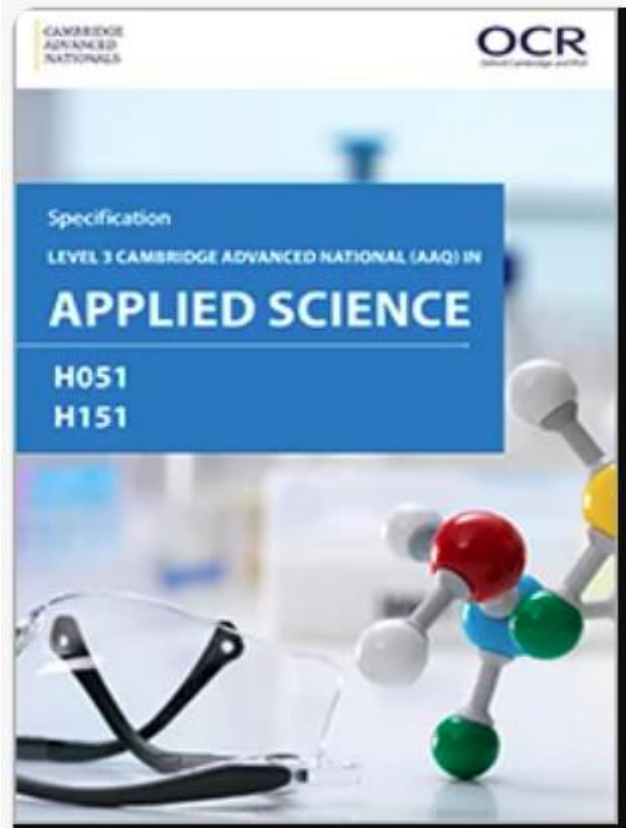
Wigston College

Level 3 AAQ Cambridge Advanced National Extended Certificate in Applied Science



Transition Pack 2025/26

Welcome

We are glad that you have chosen to study AAQ Level 3 National Extended Certificate in Applied Science at Wigston College.

You will be completing the Certificate in year 12 which includes two mandatory units, one externally assessed exam and one internally assessed unit of assignments. Learners must complete and achieve at pass grade or above for both these units to gain a qualification.

These units are:

Year 12 Content:

F180 Fundamentals of science (Exam)

F182: Investigating science (NEA)

Year 13 Content:

F181: Science in society (Exam)

F183: Analytical techniques in chemistry : (NEA)

F184: Environmental studies (NEA) tbc

Your work will be assessed to one of five levels:

U- Unclassified (no qualification awarded)

P - Pass (equivalent to E at AS-level)

M - Merit (equivalent to C at AS-level)

D - Distinction (equivalent to A at AS-level)

D*- Distinction*(equivalent to A* at AS-level)

You will receive regular feedback and support from your teachers during the NEA work. The exam will be taken in January 2026.

How do I succeed in AAQ Applied Science?

Workload

At first, you will notice the difference in work load compared to year 11. You will need to take notes in class and read around the subject in your own time to support your learning. Make sure you ask for help if you feel you need it. Many people leave it too long before asking for help. At the start you need to recognise that Year 12 will take some getting used to.

Planning

You will be given deadlines for assignments and tasks. You have to meet deadlines so make sure you plan for them in your study schedule. For each hour you have in class, you should spend at least another hour in personal study time, completing notes and writing up experiments. Your teacher will tell you what is coming up and you need to complete tasks for lessons so you maximise your time in the lab.

Practical work

As this is a vocational and practically based course, you will be completing a substantial amount of practical work in all areas. Most of this will be as part of your assignments or exam. Therefore, any tasks that are completed should be written up as notes.

Resources

A folder, lined paper, stationary and a USB stick are essential to back up and keep your digital work safe.

Research activities

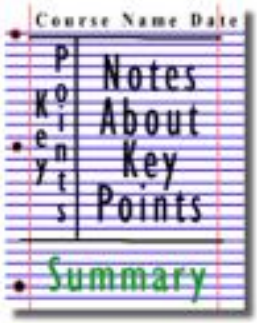
Research, reading and note making are essential skills for BTEC Applied Science study. For the following task you are going to produce 'Cornell Notes' to summarise your reading.

1. Divide your page into three sections like this

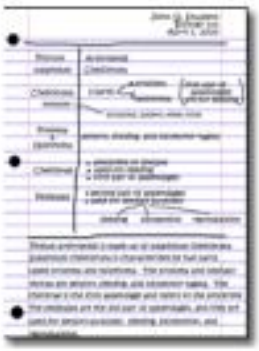
2. Write the name, date and topic at the top of the page

3. Use the large box to make notes. Leave a space between separate idea. Abbreviate where possible.

4. Review and identify the key points in the left hand box



5. Write a summary of the main ideas in the bottom space



Images taken from http://coe.jmu.edu/learningtoolbox/cornellnotes.html

Research activities

For each of the following topics, you are going to use the resources to produce one page of Cornell style notes. Use the links or scan the QR code to take you to the resources.

Topic 1: The Cell
Available at: http://bigpictureeducation.com/cell
The cell is the building block of life. Each of us starts from a single cell, a zygote, and grows into a complex organism made of trillions of cells. In this issue, we explore what we know – and what we don't yet know – about the cells that are the basis of us all and how they reproduce, grow, move, communicate and die.

Topic 2: Exercise, Energy and Movement
Available at:
http://bigpictureeducation.com/exercise-energy-and-movement
All living things move. Whether it's a plant growing towards the sun, bacteria swimming away from a toxin or you walking home, anything alive must move to survive. For humans though, movement is more than just survival – we move for fun, to compete and to be healthy. In this issue we look at the biological systems that keep us moving and consider some of the psychological, social and ethical aspects of exercise and sport.

Topic 3: 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.

Pre-Knowledge Topics

Applied Science will use your knowledge from GCSE and build on this to help you understand new and more demanding ideas. Complete the following tasks to make sure your knowledge is up to date and you are ready to start studying:

Chemistry topic 1 – Isotopes and mass

You will remember that an isotopes are elements that have differing numbers of neutrons.

Hydrogen has 3 isotopes; H_1^1 H_1^2 H_1^3

Isotopes occur naturally, so in a sample of an element you will have a mixture of these isotopes. We can accurately measure the amount of an isotope using a mass spectrometer. You will need to understand what a mass spectrometer is and how it works at A level. You can read about a mass spectrometer here:

http://bit.ly/pixlchem3
http://www.kore.co.uk/tutorial.htm
http://bit.ly/pixlchem4
http://filestore.aqa.org.uk/resources/chemistry/AQA-7404-7405-TN-MASS-SPECTROMETRY.PDF

Q1.1 What must happen to the atoms before they are accelerated in the mass spectrometer?

Q1.2 Explain why the different isotopes travel at different speeds in a mass spectrometer.

A mass spectrum for the element chlorine will give a spectrum like this:

75% of the sample consist of chlorine-35, and 25% of the sample is chlorine-37.

Given a sample of naturally occurring chlorine ¾ of it will be Cl-35 and ¼ of it is Cl-37. We can calculate what the mean mass of the sample will be:

$$\text{Mean mass} = \frac{75 \times 35}{100} + \frac{25 \times 37}{100} = 35.5$$

If you look at a periodic table this is why chlorine has an atomic mass of 35.5.

http://www.avogadro.co.uk/definitions/ar.htm

An A level periodic table has the masses of elements recorded much more accurately than at GCSE. Most elements have isotopes and these have been recorded using mass spectrometers.

GCSE

11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9
27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17

A level

10.8 **B** 5 boron	12.0 **C** 6 carbon	14.0 **N** 7 nitrogen	16.0 **O** 8 oxygen	19.0 **F** 9 fluorine
27.0 **Al** 13 aluminium	28.1 **Si** 14 silicon	31.0 **P** 15 phosphorus	32.1 **S** 16 sulphur	35.5 **Cl** 17 chlorine

Given the percentage of each isotope you can calculate the mean mass which is the accurate atomic mass for that element.

Q1.3 Use the percentages of each isotope to calculate the accurate atomic mass of the following elements.

a) Antimony has 2 isotopes: Sb-121 57.25% and Sb-123 42.75%

b) Gallium has 2 isotopes: Ga-69 60.2% and Ga-71 39.8%

c) Silver has 2 isotopes: Ag-107 51.35% and Ag-109 48.65%

d) Thallium has 2 isotopes: Tl-203 29.5% and Tl-205 70.5%

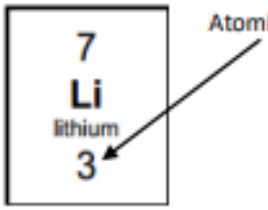
e) Strontium has 4 isotopes: Sr-84 0.56%, Sr-86 9.86%, Sr-87 7.02% and Sr-88 82.56%

Chemistry topic 2 – 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

At A level 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

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+}

Biology Topic 1: Exchange and Transport

Organisms need to exchange substances selectively with their environment and this takes place at exchange surfaces. Factors such as size or metabolic rate affect the requirements of organisms and this gives rise to adaptations such as specialised exchange surfaces and mass transport systems. Substances are exchanged by passive or active transport across exchange surfaces. The structure of the plasma membrane enables control of the passage of substances into and out of cells

Read the information on these websites (you could make more Cornell notes if you wish):

http://www.s-cool.co.uk/a-level/biology/gas-exchange

http://www.s-cool.co.uk/a-level/biology/nutrition-and-digestion/revise-it/human-digestive-system

And take a look at these videos:

http://ed.ted.com/lessons/insights-into-cell-membranes-via-dish-detergent-ethan-perlstein

http://ed.ted.com/lessons/what-do-the-lungs-do-emma-bryce

Task:

Create a poster or display to go in your classroom in September. Your poster should either: compare exchange surfaces in mammals and fish or compare exchange surfaces in the lungs and the intestines. You could use a Venn diagram to do this. Your poster should:

Describe diffusion, osmosis and active transport

Explain why oxygen and glucose need to be absorbed and waste products removed

Compare and contrast your chosen focus

Physics Topic 1: Standard Form

At A level quantity will be written in standard form, and it is expected that your answers will be too.
This means answers should be written as ....x 10^{y}. E.g. for an answer of 1200kg we would write 1.2 x 10^{3}kg. For more information visit: www.bbc.co.uk/education/guides/zc2hsbk/revision

1. Write 2530 in standard form.
2. Write 280 in standard form.
3. Write 0.77 in standard form.
4. Write 0.0091 in standard form.
5. Write 1 872 000 in standard form.
6. Write 12.2 in standard form.
7. Write 2.4 x 10^{2} as a normal number.
8. Write 3.505 x 10^{1} as a normal number.
9. Write 8.31 x 10^{6} as a normal number.
10. Write 6.002 x 10^{2} as a normal number.
11. Write 1.5 x 10^{-4} as a normal number.
12. Write 4.3 x 10^{3} as a normal number.

Physics Topic 2: Symbols and Prefixes

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	$\times 10^{9}$

At AAQ level, unlike GCSE, you need to remember all symbols, units and prefixes. Below is a list of quantities you may have already come across and will be using during your BTEC course.

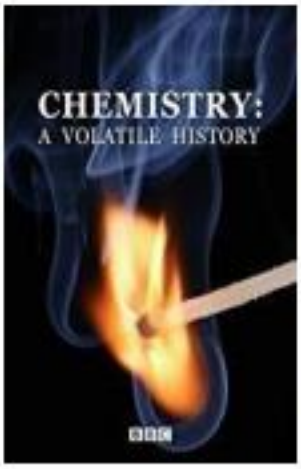
Quantity	Symbol	Unit
Velocity	v	ms^{-1}
Acceleration	a	ms^{-2}
Time	t	S
Force	F	N
Resistance	R	Ω
Potential difference	V	V
Current	I	A
Energy	E or W	J
Pressure	P	Pa
Momentum	p	$kgms^{-1}$
Power	P	W
Density	ρ	kgm^{-3}
Charge	Q	C

Solve the following:

1. How many metres in 2.4 km?
2. How many joules in 8.1 MJ?
3. Convert 326 GW into W.
4. Convert 54 600 mm into m.
5. How many grams in 240 kg?
6. Convert 0.18 nm into m.
7. Convert 632 nm into m. Express in standard form.
8. Convert 1002 mV into V. Express in standard form.
9. How many eV in 0.511 MeV? Express in standard form.
10. How many m in 11 km? Express in standard form.

Everyone loves a good story and everyone loves some great science. Here are some of the picks of the best films and TV based on real life scientists and discoveries. You wont find Jurassic Park on this list, but they are all great watching for a rainy day; so perfect for the British summer then.

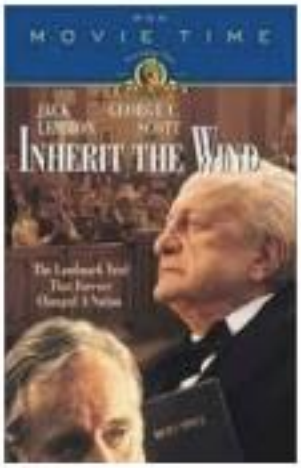
Cosmos: A Spacetime Odyssey (Series TV)
An excellent Science documentary which tries to cover a huge chunk of our Scientific discoveries throughout history. It's presented by Neil deGrasse Tyson, produced by Seth MacFarlane (Yes, from Family Guy fame) and it's on Netflix; Watch this now!



Chemistry: A volatile History (Series 2010)
a fascinating three-part series by theoretical physicist Jim Al-Khalili, exploring everything from the history of the elements to the rivalries and controversies that bedevilled scientific progress to the latest bleeding-edge attempts to split matter.

Crash course Chemistry/Biology/Physics
https://www.youtube.com/user/crashcourse
Excellent YouTube channel with playlists covering Chemistry, Biology and Physics A-level content.
Check out Chemistry Episode 1
https://www.youtube.com/watch?v=FSyAehMdpyI&list=PL8dPuuaLjXtPHzzYuWy6fYEaX9mQQ8oGr&index=2
and if you like, subscribe.

The Martian (2015)
Great to watch or read; it depicts an astronaut's lone struggle to survive on Mars after being left behind, and efforts to rescue him, and bring him home to Earth

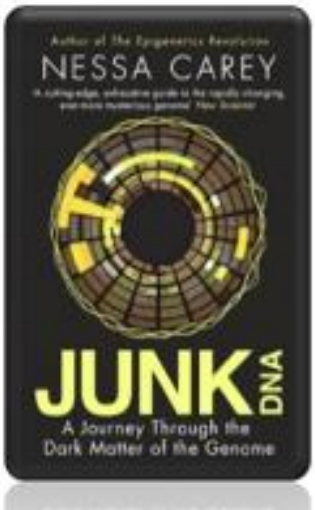


Inherit The Wind (1960)
Great if you can find it. Based on a real life trial of a teacher accused of the crime of teaching Darwinian evolution in school in America. Does the debate rumble on today?

Gorillas in the Mist (1988)
An absolute classic that retells the true story of the life and work of Dian Fossey and her work studying and protecting mountain gorillas from poachers and habitat loss. A tear jerker.

Book Recommendations

Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of Biology

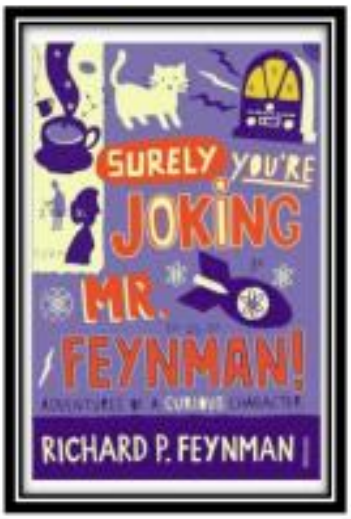


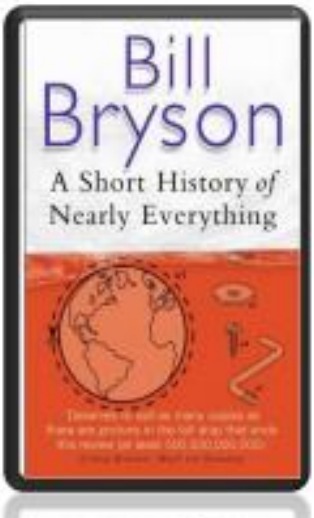
Junk DNA
Our DNA is so much more complex than you probably realize, this book will really deepen your understanding of all the work you will do on Genetics. Available at amazon.co.uk

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

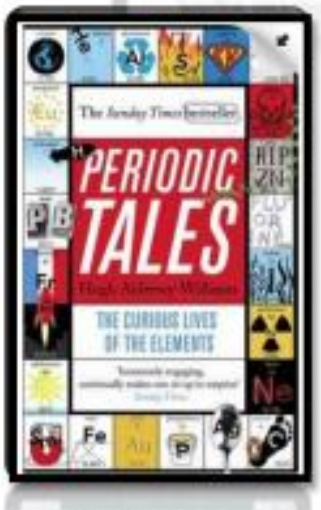
ISBN - 009917331X - Richard Feynman was a Nobel Prize winning Physicist. In my opinion he epitomises what a Physicist is. By reading this books you will get insight into his life's work including the creation of the first atomic bomb and his bongo playing adventures and his work in the field of particle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

(Also available on Audio book).





A Short History of Nearly Everything
A whistle-stop tour through many aspects of history from the Big Bang to now. This is a really accessible read that will re-familiarise you with common concepts and introduce you to some of the more colourful characters from the history of science! Available at amazon.co.uk



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.

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'.

Checklist for August

- A ring binder folder with dividers
- A USB stick (or be confident in using the cloud for online storage)
- Cornell style notes on the 3 QR code topics
- Pre-topic questions attempted
- Poster

Hand in all your tasks during the first lessons with your teacher. Completion of these tasks is required over the Summer holidays to show a commitment to your place on the AAQ Applied science Level 3 course.

We look forward to seeing you in August.