

the **PiXL** club
partners in excellence

Transition Pack for Level 3 Applied Science

Get ready for Science!

**A guide to help you get ready for Level 3 Applied
Science, including everything from topic guides to
online learning courses.**

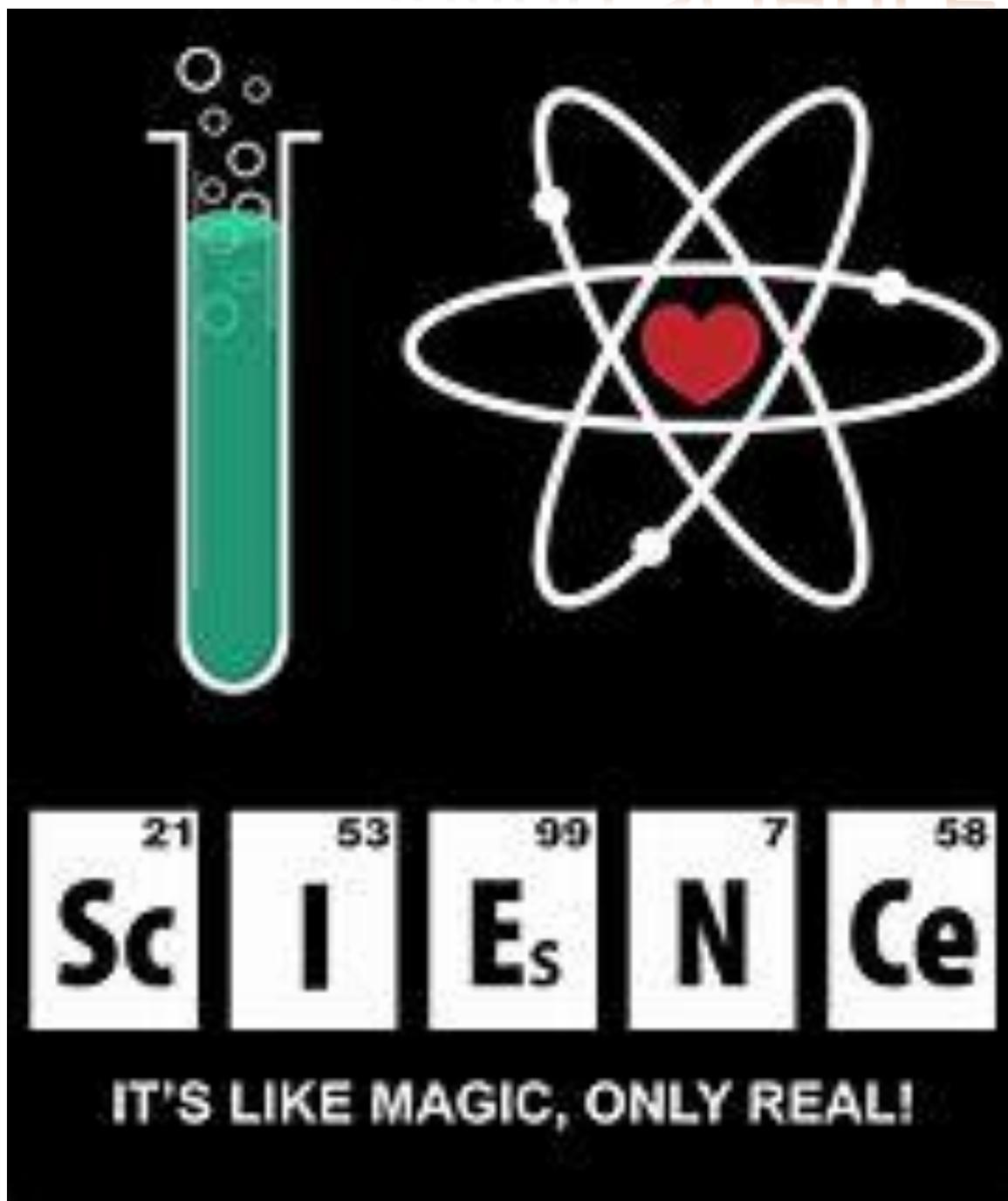
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Preparing to study Level 3 Applied Science



This pack contains activities and resources to prepare you to start Applied Science. It is designed for you to complete throughout the remainder of the summer term to help you prepare for your course in September.

Deadline 22nd June 2020.

BTEC LEVEL 3 NATIONAL EXTENDED CERTIFICATE IN APPLIED SCIENCE

TEACHERS OF APPLIED SCIENCE – DR DERRY AND MRS K FOX

This course covers all three science specialisms of Biology, Chemistry and Physics, focussing on their application in the real world. Science is everywhere and developing an appreciation and understanding of science along with the skill base that this course develops is a highly desirable quality that employers and Higher Education appreciate.

Studying this course will help you develop the transferable and higher order skills which are valued by higher education providers and employers. Students will develop skills including how to plan investigations, collecting, analysing, and presenting data and communicating results which support some of the skills learners need to progress to higher education, employment, self-employment or training. Students develop into resilient learners who are able to manage their time and workload, meet deadlines and think for themselves.

COURSE OUTLINE

The course content is split into four units of work:

- Unit 1 – Principles and Applications of Science 1 (External Assessment through examination)
- Unit 2 – Practical Scientific Procedures and Techniques (Internal assessment – portfolio assignments)
- Unit 3 – Science Investigation Skills (External assessment through examination and synoptic internal assessment)
- Unit 4 – Physiology of Human Body Systems (Internal assessment – portfolio assignments)

HOW AM I ASSESSED?

There are three mandatory units (Unit 1,2 and 3), one internal and two externally assessed. Students must complete and achieve at Near Pass grade or above in all mandatory external units and achieve a Pass or above in all mandatory internal units.

Section title:

Key ideas identified:

Where can this topic be found in your textbook?

Useful diagrams/tables etc..

Key word definitions:

What previous topics does this link to?

Questions I need to ask in the lesson

Pre-Knowledge Topics- All must be completed

You have come across most of these concepts to some degree at GCSE but it is really important you understand them as they are fundamental ideas in Applied Science. For each of the following topics, you need to use the resources suggested to produce one page of notes. If you find topics you are still unsure about, please use other websites to aid your understanding. Some of the research questions are followed with questions to check your knowledge. You could always email me (Dr Derry) if you get really stuck. To complete this task, use the flipped learning sheet on the previous page to help you lay out your notes; we use it for pre-reading tasks at A-level so you can get some practise at using it as you work through the tasks. If you can't print it out at home, you can just copy out the format onto your paper.

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. This explores 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: The Immune System

Available at: <http://bigpictureeducation.com/immune>

The immune system is what keeps us healthy in spite of the many organisms and substances that can do us harm. Explore how our bodies are designed to prevent potentially harmful objects from getting inside, and what happens when bacteria, viruses, fungi or other foreign organisms or substances breach these barriers.

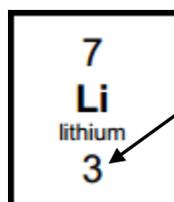


Topic 3: Electronic structure in atoms

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>

Make sure you make some notes.

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.

Q 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

Topic 4 - Chemical equations

Balancing chemical equations is the stepping stone to calculate masses in chemistry. There are loads of websites that give ways of balancing equations and lots of exercises in balancing.



<http://bit.ly/pixlchem7>

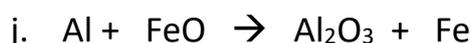
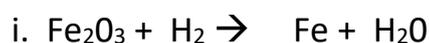
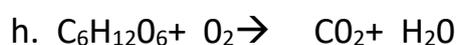
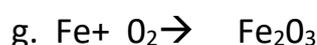
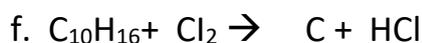
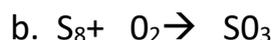
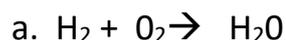
<http://www.chemteam.info/Equations/Balance-Equation.html>

<http://bit.ly/pixlchem8>

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



Q1 Balance the following equations



Topic 5 - Symbols and Prefixes

In Science we use a few symbols and prefixes to save us time writing lots of 0000. Some of these you will already be familiar with. Try and memorise the ones you do not know.

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	$\times 10^9$

Q1 Solve the following:

- How many metres in 2.4 km?
- How many joules in 8.1 MJ?
- Convert 326 GW into W.
- Convert 54 600 mm into m.
- How many grams in 240 kg?
- Convert 0.18 nm into m.
- Convert 632 nm into m.
- How many m in 11 km?

Topic 6 - Waves

At GCSE you have studied different types of waves and used the wave equation to calculate speed, frequency and wavelength. You will also have studied reflection and refraction.

Use the following links to review this topic **and make notes**.

<http://www.bbc.co.uk/education/clips/zb7gkqt>

<https://www.khanacademy.org/science/physics/mechanical-waves-and-sound/mechanical-waves/v/introduction-to-waves>

Topic 7 – Refraction

1) Draw a diagram showing the refraction of a wave through a rectangular glass block. Explain why the ray of light takes this path.

2) Describe the difference between a longitudinal and transverse waves and give an example of each

3) Draw a wave and label the wavelength and amplitude

Careers- Complete all tasks

You may already have an idea about what you want to do beyond GCSE and A levels or you may have chosen your A level courses based on the topics you enjoy either way investigating the types of careers that a Chemistry course can lead you into might surprise you and inspire you.

Visit the following websites: -

<https://www.indeed.co.uk/Applied-Science-jobs>

<https://www.healthcareers.nhs.uk/explore-roles>

<https://careertrend.com/info-7806751-bachelor-applied-science-jobs.html>



1) Create a wordle of the jobs titles that you come across, try to get a good range of different job types.

<http://www.wordlecreator.com/>

4)

2) Pick two of the jobs that you find most interesting and write a job description for each in the style of a job advert you might see online or in a newspaper. Include salary, qualifications and skills needed and what the job entails in terms of day to day tasks and activities (see example below). Note: -If you are doing more than one Science topic and these jobs overlap e.g. Pharmacist (involves Chemistry and biology) you need not do this task twice! Submit the same advert to both your teachers.

3) Write down your current thoughts on what **you** might like to do beyond A levels (it doesn't have to be one of the jobs you have researched), has it changed in light of your research?

Example job description

Specialist Quality Assurance Technician

Bradford Teaching Hospitals 

NHS Foundation Trust

Department: Pharmacy

Salary: Band 6 - £31,365 - £37,890 per annum

Hours: 37.5 HOURS PER WEEK

Brief Description of the Role:

We are looking for a pro-active, self-motivated individual with strong problem solving skills who shows a passion for improving and developing services to work in our small, dedicated team in pharmacy QA. This established role will suit an individual with good critical thinking skills, who has a background in the life sciences, microbiology, chemistry, pharmacy or engineering. The role is open to pharmacy technicians, however, this is not a pre-requisite, and individuals with relevant qualifications outside of pharmacy are also invited to apply.

The role involves providing a technical pharmacy service to both internal and external customers – primarily NHS Trusts. This will involve occasionally visiting other trusts (sometimes staying overnight) and undertaking physical and environmental monitoring tasks in pharmacy cleanrooms and radiopharmacies, therefore a good understanding of GMP and clean room behaviours is required. This role also involves a significant amount of manual handling.

On site, the role requires the management and processing of non-pathogenic microbiological samples, and therefore the individual will also need to demonstrate a clear understanding of GLP. This role also involves providing advice and support to customers, clinical hospital teams, and occasionally patients. The QA team advise on the use and safety of unlicensed medicines, the stability of medicines made in the licensed aseptic unit (and radiopharmacy), medicines defects, safe storage of medicines (GDP) and aspects of COSHH. The successful candidate will be expected to support all of these aspects as a primary part of their role. All necessary training will be provided. The post is also likely to include line management at a future stage.

Summary of Qualifications and Skills required:

- NVQ3 in Pharmacy Services or BTEC equivalent level qualification or MSc in Clinical Pharmaceutical Sciences or A suitable degree in associated science disciplines of chemistry or biology
- Diploma in Pharmacy Technology and Quality Assurance would be desirable, if the candidate does not hold this qualification they would be expected to undertake it during the first three years of work
- Knowledge of Good Manufacturing Practice, Good Distribution Practice and Good Laboratory Practice, including clean room behaviour
- Good verbal and written command of English and ability to follow written and verbal instructions
- Ability to work effectively under pressure
- Good communication/interpersonal skills
- Ability to manage staff and team workload
- Demonstrates a caring, compassionate and empathetic approach to work
- Ability to plan own time, use own initiative and act independently within the bounds of existing knowledge and skills
- Capable of working within a multidisciplinary team
- Computer literate

Movie Recommendations

For the following films please watch one of the selected titles and write a review on this.

These are great presentations (and free!) from world leading scientists and researchers on a variety of topics. They provide some interesting answers and ask some thought-provoking questions. Use the link or scan the QR code to view:

A New Superweapon in the Fight Against Cancer

Available at :

http://www.ted.com/talks/paula_hammond_a_new_superweapon_in_the_fight_against_cancer?language=en

Cancer is a very clever, adaptable disease. To defeat it, says medical researcher and educator Paula Hammond, we need a new and powerful mode of attack.



Why Bees are Disappearing

Available at :

http://www.ted.com/talks/marla_spivak_why_bees_are_disappearing?language=en

Honeybees have thrived for 50 million years, each colony 40 to 50,000 individuals coordinated in amazing harmony. So why, seven years ago, did colonies start dying en-masse?

Why Doctors Don't Know About the Drugs They Prescribe

Available at :

http://www.ted.com/talks/ben_goldacre_what_doctors_dont_know_about_the_drugs_they_prescribe?language=en

When a new drug gets tested, the results of the trials should be published for the rest of the medical world — except much of the time, negative or inconclusive findings go unreported, leaving doctors and researchers in the dark.



Growing New Organs

Available at :

http://www.ted.com/talks/anthony_atalla_growing_organs_engineering_tissue?language=en

Anthony Atalla's state-of-the-art lab grows human organs — from muscles to blood vessels to bladders, and more.

Movie / Video Clip Recommendations (optional)

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.

Dantes Peak 1997: Volcano disaster movie.

Use the link to look at the Science of acids and how this links to the movie. <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 4 2005 & 2015: Superhero movie

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>

Online Clips / Series

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.

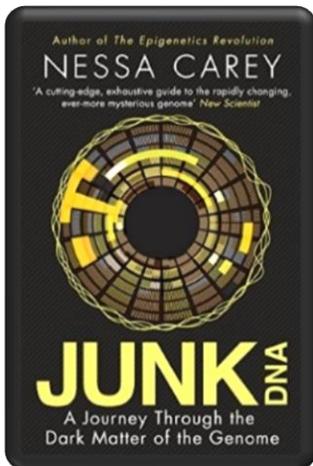
<http://www.nasa.gov/multimedia/nasatv/>

Science Fictions Films

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

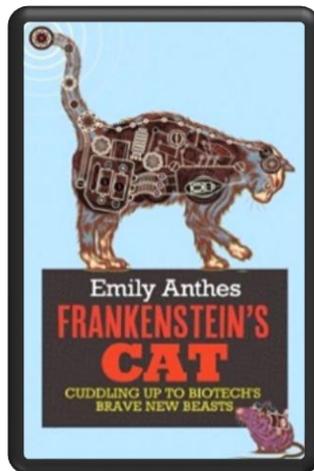
Book Recommendations (optional)

Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of Science. You can choose your own book if you prefer!



Junk DNA

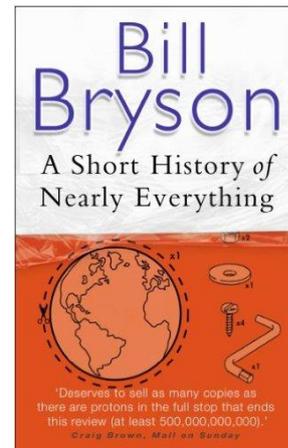
Our DNA is so much more complex than you probably realize, this book will really deepen your understanding of all the work you will do on Genetics.



An easy read..

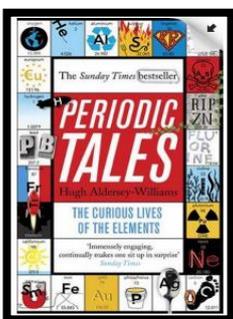
Frankenstein's cat

Discover how glow in the dark fish are made and more great Biotechnology breakthroughs.



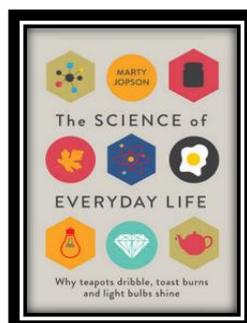
A Short History of Nearly Everything

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!



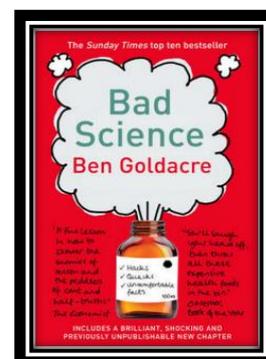
Periodic Tales: The Curious Lives of the Elements

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

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



Bad Science

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'.