

Introduction to Applied Science

This pack contains a programme of activities and resources to help prepare you to start BTEC Applied Science. It is aimed to help consolidate your GCSE knowledge and give you a head start with A-level Physics. Please note we do not expect you to do all this work, just choose the bits that interest you the most and leave anything that you find too challenging at this point. We know some of you have more time than other to dedicate to studying at this time, just do what you can and look after yourselves.

We do not expect you to buy any books or materials at this time, you will be provided with a textbook in September.

We do not expect you to hand any of this work in, but we will be happy to look at anything you produce in September

Take care and stay safe

As part of your BTEC Applied Science qualification you will be completing coursework and also sitting an external exam assessing you on some of the key concepts in biology, chemistry and physics. Each science subject will build on knowledge from your GCSE work and develop these concepts further relating them to use in industry and everyday life.

In order to best prepare you for September we would like you to undertake some work on some of the topics we will cover in Unit 1 (Principles and Applications of Science) and Unit 2 (Practical Scientific Procedures and Techniques). It is up to you whether this work is handwritten, done electronically or a mixture of both.

- For unit 1 you will be producing 3 reports, 1 for each of biology, chemistry and physics, to cover criteria set out below.
- For the unit 2 work you will be producing a course work assignment of the practical skills that you have acquired during your GCSE science studies.

Unit 1: Biology assignment

Cells are the building blocks of life and any biologist must have a sound understanding of the organelles and structures which make them up. You will have already studied the cell as the fundamental building block of organisms at GCSE. Scientists who work with living things need to be able to predict the outcome of substances on different organisms at a cellular level. Whether this is in drug development, pioneering research into the use of therapeutic STEM cells or genetic engineering, an in-depth knowledge of cell workings is essential.

To prepare you for your first unit in your level 3 BTEC, you must revisit your knowledge of Eukaryotic cells from GCSE and produce a report. This research task will help you review these organelles, gain an insight into the relative sizes of cells and organelles and provided an introduction to the equipment we use to study them.

Criteria

- Introduce Eukaryotic cells
- Investigate the different types of Eukaryotic cell (including specialised cells such as palisade cells, sperm cells and white blood cells)
- List cell organelles stating structure and functions
- Diagrams to illustrate
- Relative sizes of organelles
- Ways in which organelles can be viewed

Unit 1: Chemistry assignment

One of the key concepts you will be examined on in chemistry is atomic structure and bonding. Scientists and technicians working in the chemical industry need to have an understanding of atoms and electronic structure. This allows them to predict how chemical substances will react in the production of a wide range of products – anything from fertilisers in the farming industry to fragrances in the perfume industry.

To prepare you for your first unit in your BTEC, you must revisit your knowledge on atomic structure and bonding from GCSE and produce a report on the 3 different types of bonding; ionic, covalent and metallic.

Criteria

- Introduce bonding by considering the structure of an atom and why atoms form bonds
- A diagram to show each type of bonding
- State when each type of bonding occurs
- Examples of substances with each type of bonding
- Properties of each type of structure

Unit 1: Physics assignment

One of the key concepts you will be examined on in Physics is waves. Knowledge of waves is essential in a wide range of industries and organisations. In the communication industry, scientists and technicians apply their knowledge of the electromagnetic spectrum when designing mobile phone and satellite communication, and fibre optics are used to transmit telephone and television signals. Fibre optics are also used in diagnostic tools in medicine.

To prepare you for your first unit in your level 3 BTEC, you must revisit your knowledge on the electromagnetic spectrum produce a report on the different parts of the spectrum, their dangers and their uses.

Criteria

- A diagram showing the electromagnetic spectrum and the typical wavelengths and frequencies for each region of the spectrum.
- Describe some general properties of the waves, such as their speed.
- Ways that each part of the spectrum can be used (e.g. microwaves are used for cooking, and also in mobile phones)
- Explain the possible dangers to the human body for each region of the spectrum

Unit 2: Coursework assignment

One of the coursework assignments in Unit 2 is "Review personal development of scientific skills for laboratory work". As part of your analysis and evaluation of the skills that you will develop as part of the BTEC Applied Science course you will need to consider the skills that you have already gained from your science education so far. You will need to produce a report summarising your skill development across all the practical work in your science GCSE. You should include equipment from all 3 sciences, for example, measuring cylinders, stopwatches, Bunsen burners, balances, microscopes, quadrats, electrical circuits and lenses. This list isn't complete and you should include all the skills that you have learnt not just those listed.

Criteria

For each skill you should include

- A description of what the skill is used for eg. measuring cylinder is used for accurately measuring out volumes of liquids
- A method on how to carry out the skill, including technical considerations eg. the meniscus when using a measuring cylinder
- How you can make sure you are working as accurately as possible
- Any safety requirements that need to be considered.

Introduction to applied science project – writing a scientific report

Overview

As part of the applied science course you will need to be confident in writing in a scientific style. This will help you with your coursework, remember the applied science course is mostly written assignments.

Scientific reports are written slightly differently to essays you might write in history, for example. Reports might be write ups of experimental findings or you might be summarising knowledge on a particular topic in a literature review. You will also need to be able to reference work properly, you can't just copy someone else's research and not mention them in your report.

This project is designed to introduce you to scientific report writing and give you more confidence when writing up your BTEC assignments.

You are going to write your own report so first you need to choose a title, either choose the biology or chemistry topic from the titles below:

**How important are shapes in biology or
Discuss the importance of intermolecular forces**

Report structure

Paragraph 1 – Abstract

Paragraph 2 – Introduction

Paragraphs 3-8 – Main body

Paragraph 9 – Conclusion

Bibliography

Abstract

- You should write this when you have finished your report.
- The aim of the abstract is to summarise the content of the report. A bit like a blurb on the back cover of a book
- You should introduce your topic and summarise your main findings and conclusions
- Abstracts are usually typed in bold under the title to capture the reader's attention

Introduction

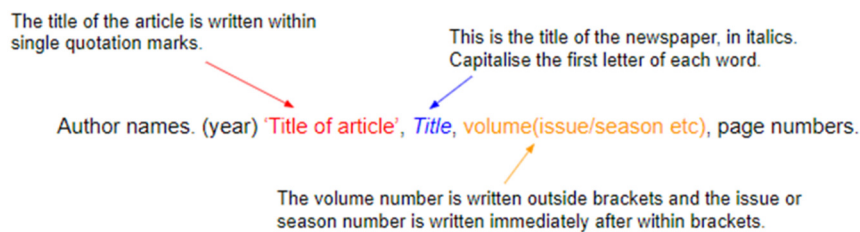
Your introduction should introduce your chosen topic and layout some of the content you will discuss in the main body.

- focus the reader's attention on the exact subject of the report;
- provide background information on the topic of the report;
- engage the reader's interest in the topic;

- familiarise the reader with the structure and purpose of what they are about to read.

Main

- This is the main section of your essay
- It should be split into paragraphs for each point you make
- You might find it easier to use point, example, explanation
- Each point you make must have an example and must link back to the essay title. All examples need to be referenced
- Each paragraph must include at least 1 reference. You can use the Harvard referencing system. Try not to reference web pages like Wikipedia, instead use the journal or book that Wikipedia got its reference from. You need to reference in the text and at the end in your bibliography



Conclusion

- A conclusion is what you will leave with your reader
- It "wraps up" your essay
- It demonstrates to the reader that you accomplished what you set out to do
- It shows how you have proved your question
- It provides the reader with a sense of closure on the topic
- Remember to address the report title in the conclusion

Bibliography

In your bibliography you need to list all the references you have used in alphabetical order

How do I research my chosen subject?

1. Start with a basic google search. Can you find 5 points you could talk about for your topic? These could be 5 paragraphs for your main writeup
2. Once you've found your five topics google each topic individually – for any information you want to include in your report, make sure you write down the reference. This will save you time at the end
3. An easy way to find references is to use the ones on Wikipedia. When you read some information on a wiki article you've probably noticed there's little numbers dotted about everywhere in the article. If you press on the number this will link you to the reference the author used. (Using Wikipedia is a bit of a cheat, if you continue your studies at university, you'll be expected to find the original articles yourself)

Some links to get you started

Shapes in biology

<https://en.wikipedia.org/wiki/Antibody>

<https://en.wikipedia.org/wiki/Enzyme>

<https://en.wikipedia.org/wiki/Insulin>

[https://en.wikipedia.org/wiki/Complementarity_\(molecular_biology\)](https://en.wikipedia.org/wiki/Complementarity_(molecular_biology))

Intermolecular forces

In https://en.wikipedia.org/wiki/Intermolecular_force

https://en.wikipedia.org/wiki/Hydrogen_bond

https://en.wikipedia.org/wiki/Van_der_Waals_force

<https://www.sciencedirect.com/topics/immunology-and-microbiology/intermolecular-interaction>

https://en.wikipedia.org/wiki/Intermolecular_forces