



Year 11 > 12 Applied Science Bridging Work Summer Term 2023



Subject	Applied Science
Course	Extended Certificate Cambridge Technical
Awarding Body	OCR

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Course/specification overview

Aims

To develop and broaden interest and skills in Applied Science via a fundamentally learner-centred approach to the curriculum, with a flexible, unit-based structure and knowledge applied in project-based assessments. We will focus on the holistic development of the practical, interpersonal and thinking skills required to be able to succeed in employment and higher education.

Course Structure

This is a two year A Level equivalent course.

Year 1:

- Unit 1 – Science Fundamentals – assessed Externally
- Unit 2 - Laboratory Techniques – assessed Externally

Year 2:

- Unit 6 – Control of hazards in the laboratory – assessed Internally
- Unit 18 - Microbiology – assessed Internally
- Unit 21 – Product testing techniques – assessed Internally

External assessments will be formal examinations taken together in controlled conditions and marked and moderated by OCR.

Internal assessments will be portfolios developed by students and facilitated and marked by Science staff.

Applied Science Entry requirements

1. **Combined Science** Grades **4-4** minimum—higher recommended or **Separate Science** Grades **4-4-4**
2. **Maths** Grade **5**
3. **English** Grade **5**

Who is this qualification for?

This qualification is designed with the workplace in mind to provide an alternative to A Level Science, without compromising on the quality of its content. Applied science is all about using our current scientific knowledge to exhibit how our scientific curiosities can be applied to create new technologies and interesting inventions. This course is suitable for students with different learning styles and academic abilities, but hard work and determination is required. Students will be expected to strive for Distinction level.



Our department expectations

1. Adherence to Deadlines:

- a. All work must be handed in on time as a hard copy – late work is NOT eligible for re-submission.

2. Communication:

- a. Communicate with the teachers before deadlines to ensure any uncertainties are cleared up – office hours will be organised.
- b. You must have a working Hayes school email - you will be expected act on instructions.

3. Safety:

- a. All practical work is conducted safely. We will be using expensive equipment and dangerous chemicals.
- b. A lab coat is REQUIRED – please purchase one before school starts.

4. Organisation:

- a. You must purchase an A4 ring binder with dividers in it.

5. Attendance and Punctuality

- a. You cannot miss practical lessons in particular or you will not have the information needed to complete the assignments to a pass level.

6. Meeting deadlines:

- a. Key documents from pupil handbook must be in your folders – these will be handed out by teachers.
- b. You must have a lab book – this will be provided – all practical work is to be neatly recorded in this book.
- c. You must have a pencil case with pens, pencils, ruler, rubber, sharpener and a calculator.
- d. Printing credit –you need to ensure you have enough to print before the assignment deadline. You will not have to buy a textbook.

7. Assignment paperwork:

- a. All assignments must have the correct paperwork with them when you hand it in. We will explain when lessons start.

8. Effort:

- a. There is no point in doing this course without putting effort into it. You will fail if you do not try hard and follow the above advice. Please do not waste your time and ours
 - i. Pass grade = Equivalent to an E for UCAS
 - ii. Merit grade = Equivalent to a C for UCAS
 - iii. Distinction = equivalent to an A for UCAS
- b. Start this course with the intention of getting the grade you need for your next steps. A distinction.



Review / revise

Cells-

- <https://www.bbc.co.uk/bitesize/topics/z2mttv4>
- <https://www.youtube.com/watch?v=URUJD5NEXC8>

Atomic structure and number

- <https://www.bbc.co.uk/bitesize/guides/z3sg2nb/revision/1>
- <https://www.youtube.com/watch?v=fN8kH9Vvqo0>
- <https://www.bbc.co.uk/bitesize/guides/z3sg2nb/revision/4>
- <https://www.youtube.com/watch?v=jNmNyy2BX4g>

How atoms bond - George Zaidan and Charles Morton

- <https://www.youtube.com/watch?v=NqD9yHSJ29I>

Electricity

- <https://www.bbc.co.uk/bitesize/topics/zq8wxnb>
- <https://www.youtube.com/watch?v=3YSH-RRoNWI>
- <https://spark.iop.org/using-electric-motor-raise-load>
- <https://spark.iop.org/measuring-power-motor>

Practical skills

- <https://www.bbc.co.uk/bitesize/topics/z2j22nb>
- <https://www.youtube.com/watch?v=LezXeEssD4g>
- <https://www.youtube.com/watch?v=tAlGzcClgOs>
- <https://www.youtube.com/watch?v=Yqioa8Njhkh>

University

- <https://www.youtube.com/watch?v=GqXwega3UeM>



Watch

If you have 30 minutes to spare, here are some 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.

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_don_t_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

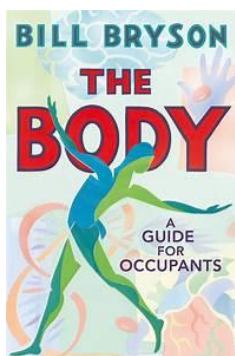
Available at:

http://www.ted.com/talks/anthony_atala_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.



Read

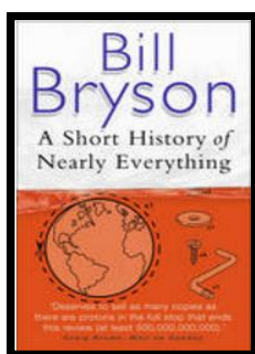


The Body **ISBN-13:** 978-0857522405

'We spend our whole lives in one body and yet most of us have practically no idea how it works and what goes on inside it. The idea of the book is simply to try to understand the extraordinary contraption that is us.' Bill Bryson sets off to explore the human body, how it functions and its remarkable ability to heal itself. Bill Bryson sets off to explore the human body, how it functions and its remarkable ability to heal itself. Full of extraordinary facts and astonishing stories The Body: A Guide for Occupants is a brilliant, often very funny attempt to understand the miracle of our physical and neurological make up. A wonderful successor to A Short

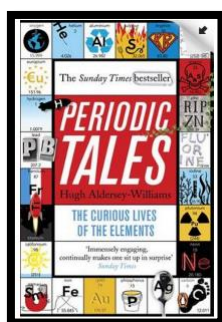
History of Nearly Everything, this new book is an instant classic. It will have you marvelling at the form you occupy, and celebrating the genius of your existence, time and time again. 'What I learned is that we are infinitely more complex and wondrous, and often more mysterious, than I had ever suspected. There really is no story more amazing than the story of us.' Bill Bryson

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.

<https://www.waterstones.com/books/search/term/a+short+history+of+nearly+everything>



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

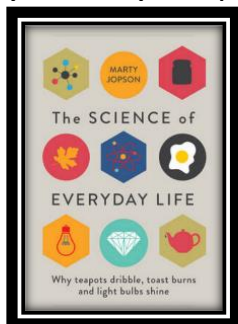
ISBN-10: 0141041455

<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

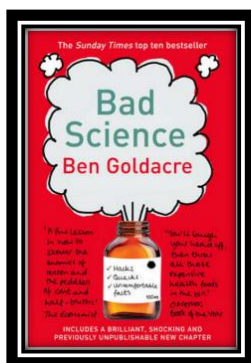
<http://bit.ly/pixlchembook2>

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'.



Research

Research activities

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

<https://hayestl.com/students/>

Choose the Cornell method and video watch it (its down at the bottom)

The Big Picture is an excellent publication from the Wellcome Trust. Along with the magazine, the company produces posters, videos and other resources aimed at students studying for GCSEs and A level. For each of the following topics, you are going to use the resources to produce one page of Cornell style notes.



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.



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 are 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.



Populations

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

What's the first thing that pops into your mind when you read the word population? Most likely it's the ever-increasing human population on earth. You're a member of that population, which is the term for all the members of a single species living together in the same location. The term population isn't just used to describe humans; it includes other animals, plants and microbes too. In this issue, we learn more about how populations grow, change and move, and why understanding them is so important.





Complete

In this section to complete there are three main parts:

(Section A)

- Chemistry and Biochemistry Questions for you to answer
- Due the first week in September

(Section B)

Complete Levels of Organisation of the Human Body Assessment

Due 16th September 2022

SECTION A

This section needs to be completed and brought to school for your first Applied Science lesson of Year 12.

1) Explain the following in words:

a) The difference between an element and a compound?

(2)

b) An atom:

(1)

c) A molecule:

(1)

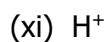
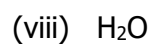
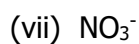
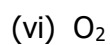
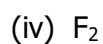
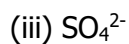
d) An ion:

(1)

e) A mole (the chemical quantity not the burrowing mammal kind):

(1)

2) Identify each of the following particles as an atom, molecule or ion AND name them:



(10)

3) a) Write the formula of the following substances:

i) lithium oxide

ii) ammonia

iii) calcium nitrate

iv) nitrogen

v) methane

vi) argon

vii) ammonium sulphate

viii) iron (III) hydroxide

ix) calcium oxide

x) magnesium hydroxide

xi) barium nitrate

xii) magnesium carbonate

xiii) calcium sulphate

xiv) barium chloride

xv) sodium bromide

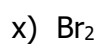
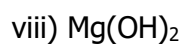
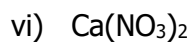
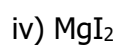
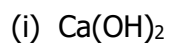
xvi) iron (III) chloride

xvii) iodine monochloride

xviii) strontium iodide

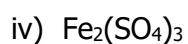
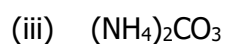
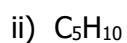
(18)

b) Give the name of the following substances from their formula:



(14)

4) Give the name and relative formula mass (M_r) of each of the following substances. You will need to use the Periodic Table (see appendices).



(4)

5) Balance the following equations. For (c) and (d) you will need to find the chemical formulae for the reactants and products first.



c) ammonia + oxygen \rightarrow nitrogen + water

(2)

d) ethane + oxygen \rightarrow carbon dioxide + water

(2)

Large numbers, Significant Figures and Rounding up and down

When quoting a result, it should contain the same number of significant figures (sig figs) as the measurement with the smallest number of significant figures.

If the last figure is between 5 and 9 inclusive, round up

If the last figure is between 0 and 4 inclusive, round down

Significant figures and rounding up and down should ***only be done at the end*** of a calculation, otherwise it causes rounding errors.

Use standard form for large numbers and very small numbers.

6) a) Give the following numbers to 3 sig figs:

i) 50.67 _____ ii) 506789 _____

iii) 0.5067 _____ iv) 0.0005067 _____

b) Give the following numbers to standard form and 2 sig figs

i) 5067 _____ ii) 0.0005067 _____

(2)

7) Complete the following:

	Sub atomic particles		
	Electron	Proton	Neutron
Charge			
Relative mass			1
Where are they found in an atom			
How to work out how many of them are there in an atom of an element			

(3)

8) Complete the following table. You will need the Periodic Table (see appendices):

	Atomic Number	Mass Number	Number of...		
			Electrons	Protons	Neutrons
^{35}Cl					
^{37}Cl					
$^{35}\text{Cl}^-$					
Ca					
Ca^{2+}					

(5)

9) Draw the electron configurations and write its electron arrangement. Use • or x to represent the electrons. Put the symbol of the element in the centre.

- (a) magnesium (b) oxygen (c) chlorine (d) potassium

(4)

10) Draw dot cross diagrams to show the ions in ionic bonding of the following compounds. Only show outer electrons and put the element's symbol in the centre.

(a) Magnesium oxide

(b) Calcium chloride

(c) Sodium oxide

(9)

11) Draw dot cross diagrams to show the covalent bonding in the following molecules. Only show outer electrons and put the element's symbol in the centre.

(a) ammonia (NH₃)

(b) methane (CH₄)

(c) water

(d) nitrogen

(e) carbon dioxide

(10)

19) Complete the following table:

Compound	Type of bonding	Type of structure	Melting point & Boiling point
Silver			
Chlorine			
Magnesium chloride			
Diamond			
Graphite			
Silicon dioxide			
Carbon dioxide			
Aluminium oxide			

(8)

Biochemistry

Use the following web pages, or find answers using a search engine, to help you answer the questions:

<https://alevelbiology.co.uk/>

<https://www.physicsandmathstutor.com/biology-revision/>

<https://ib.bioninja.com.au/>

<https://www.savemyexams.co.uk/a-level/biology/aqa/17/revision-notes/>

<https://www.revisely.co.uk/alevel/biology/aqa>

1 – Draw the molecular structure of alpha glucose in the space below

2 – Draw the molecular structure of beta glucose in the space below and describe how it is different from alpha glucose

Beta glucose and alpha glucose differ in that:

3 – Complete the sentences:

Glucose molecules bond together through a _____ reaction. They can be split apart by a _____ reaction. Bonds between simple sugar molecules are called _____ bonds.

4 – Draw the molecular structure of a triglyceride below. Draw a ring around each ester bond

5 – Draw the molecular structure of a phospholipid below. What is the difference between a triglyceride and a phospholipid?

Triglycerides and phospholipids differ in that:

6 – Complete the sentences:

When a fatty acid bonds to a glycerol molecule the reaction that happens is called a _____ reaction. The bond is called an _____ bond. When a fatty acid splits from a glycerol molecule and the bond is broken we call this a _____ reaction.

7 – Draw the general structure of an amino acid. Label the R group, the amine group and the carboxyl group.

8 – Complete the sentences:

Amino acids bond together through a _____ reaction. They can be split apart by a _____ reaction. Bonds between amino acids are called _____ bonds.

9 – Draw a carboxyl group below. Tick which from the list have a carboxyl group.

Glucose

Glycerol

Fatty acids

Amino acids

SECTION B

This assignment is very similar to some of the assignments you will face in this course. It is important that you are able to follow instructions and carefully read the criteria of the assignment. If you do not include all the criteria in your write –up, then you will not achieve the standard expected.

**You are expected to reference your work. All writing must be in your own words and sources referenced. This includes any diagrams, photos, or drawings.

Student Name			
Course	Cambridge Technical Level 3 Extended Certificate in Applied Science		
Unit Title	Bridging Unit		
Assessment Title	Levels of Organisation of the Human Body		
		Final Deadline Date	Friday, Sept 16th 2022
Learning outcomes covered by this assignment			
Know the levels of organisation within the human body			
Scenario and Task			
You are a first year nursing student preparing for your first placement which will be at Pinderfields General Infirmary. As part of your assessment, you are required to demonstrate your understanding of the levels of organisation of the human body.			
Criteria			
P1: Describe the organisation of the eukaryotic cell in terms of the <u>functions</u> of the organelles (plasma membrane; cytoplasm; nucleus; nucleolus; endoplasmic reticulum; Golgi apparatus; vesicles; lysosomes; ribosomes; mitochondria; centrioles) P2: Describe the four different tissue types (epithelial, muscular, nervous and connective) M1: Use diagrams or micrographs to compare and contrast the four tissue types and explain how differentiation would have led to this process. D1: Explain the relationship between organelles, cells, tissues, organs and organ systems in the organisation of the human body			

Tasks
<u>Task 1.1 – Cells (P1)</u> Create a <u>leaflet</u> on human cells. Sketch a diagram of a eukaryotic animal cell. Describe the structure and explain the function of the following organelle and add their labels to the diagram you have drawn: Plasma membrane, cytoplasm, nucleus, nucleolus, endoplasmic reticulum, Golgi apparatus, vesicles, lysosomes, ribosomes, mitochondria and centrioles. <u>Task 1.2 – Tissue Types (P2)</u> Create a <u>report</u> describing the four different tissue types in the human body (epithelial, muscular, nervous and connective). For each type include: <ul style="list-style-type: none">• A diagram of the tissue• The different sub types of each tissue• Where is it found

- What type(s) of cells are present
- What their function is

Task 1.3 – Electron Micrographs (Part of M1)

Create a fact file by finding an electron micrograph for each tissue type and **explain** how the relative presence of cell components influences the function of the cell. (for example, muscular tissue has a lot of mitochondria, why?)

Task 1.4 – Compare and Contrast (Part of M1)

Add to Task 1.4 by **comparing** and **contrasting** the four different tissue types. Include the following:

- An explanation of what cell differentiation is.
- Similarities in the different tissue types (maybe a table?)
- Differences between the different tissue types (maybe a table?)
- Link the structure of the tissue to its function.

Task 1.5 – Organisation (D1)

Create a report **explaining** the levels of organisation in the human body from eukaryotic cell organelles to cells, tissues, organs and organ systems.

Name 3 main organ systems of the human body.

For each one:

- Name the organs in the system
- The role of the system in the body
- A brief description of what each organ does in the system
- A brief description of which tissue types are found in each organ
- A brief description of how the system is connected to other systems in the human body

Referencing:

Whenever a piece of information that has been retrieved from a source is provided in a text- and in text citation should be included that links to the full original source in the reference list.

2 ways to do this:

1. Harvard - The author(s) and date of the work are included in brackets at the appropriate point in the text. A full list of references at the end of the document is ordered alphabetically and the references are not numbered. For multi author works, the full list of names is not given in text references. The first name is given followed by et al.
2. Vancouver -The reference is numbered at the appropriate point in the text. The references are ordered in the sequence in which they are first cited in the text. The numbers are repeated in the in text citation as required (so the same number is always used to cite a given reference)

Sources must be listed at the end as shown below:

- Books: Authors (year) Title, edition (if relevant), publisher's location, publisher
- Journal articles: Authors (year) Article title, Journal title, vol. no., issue no, pp xxx-xxx
- Websites: Authors (year), Title (online) last accessed date, URL If no name- give the name of the organisation



Appendices/resources

- BBC Bitesize for review of key GCSE material
- GCSE revision guides and workbooks
- Specification -
- <https://www.ocr.org.uk/qualifications/cambridge-technicals/applied-science/units/>
- The Body by Bill Bryson

UNIT 1 Science Fundamentals Resource list

- <https://www.ocr.org.uk/Images/327886-science-fundamentals.pdf>

UNIT 2 Laboratory Techniques Resource list

- <https://www.ocr.org.uk/Images/314484-laboratory-techniques.pdf>

The Periodic Table of the Elements

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
1	2	13	14	15	16	17	18
1	2	5	6	7	8	9	10
H hydrogen 1.0	He helium 4.0	B boron 10.8	C carbon 12.0	N nitrogen 14.0	O oxygen 16.0	F fluorine 19.0	Ne neon 20.2
3	4	13	14	15	16	17	18
Li lithium 6.9	Be beryllium 9.0	Al aluminum 27.0	Si silicon 28.1	P phosphorus 31.0	S sulfur 32.1	Cl chlorine 35.5	Ar argon 39.9
11	12	19	20	21	22	23	24
Na sodium 23.0	Mg magnesium 24.3	K potassium 39.1	Ca calcium 40.1	Sc scandium 45.0	Ti titanium 47.9	V vanadium 50.9	Cr chromium 52.0
19	20	27	28	29	30	31	32
K potassium 39.1	Ca calcium 40.1	Co cobalt 58.9	Ni nickel 58.7	Cu copper 63.5	Zn zinc 65.4	Ga gallium 69.7	Ge germanium 72.6
37	38	45	46	47	48	49	50
Rb rubidium 85.5	Sr strontium 87.6	Rh rhodium 102.9	Pd palladium 106.4	Ag silver 107.9	Cd cadmium 112.4	In indium 114.8	Sn tin 118.7
55	56	77	78	79	80	81	82
Cs cesium 132.9	Ba barium 137.3	Ir iridium 192.2	Pt platinum 195.1	Au gold 197.0	Hg mercury 200.6	Tl thallium 204.4	Pb lead 207.2
87	88	107	108	109	110	111	112
Fr francium	Ra radium	Bh bohrium	Hs hassium	Mt meitnerium	Ds darmstadtium	Rg roentgenium	Cn copernicium
		104	105	106	107	108	109
		Rf rutherfordium	Db dubnium	Sg seaborgium	Bh bohrium	Hs hassium	Mt meitnerium
		114	115	116	117	118	119
		Fl flerovium	Mc moscovium	Lv livermorium	Ts tennessine	Og oganesson	

Key atomic number Symbol name relative atomic mass
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