Year 11 > 12 Applied Science Bridging Work Summer Term 2025

Subject	**Applied Science**
Course	**Extended Certificate Cambridge Advanced National**
Awarding Body	**OCR**

Contents:

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 – Fundamentals of Science – assessed externally – 25% of grade
- Unit 3 – Investigating Science – assessed internally – 25% of grade

Year 2:

- Unit 2 – Science in Society – assessed externally – 17% of grade
- Unit 4 – Analytical Techniques in Chemistry – assessed internally – 17% of grade
- Unit 6 – Medical Physics – assessed internally – 17% of grade

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

Internal assessments will be student responses to case studies, which are completed in controlled conditions, with 1 opportunity for feedback before submission.

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 Sciences, 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.
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.
4. **Organisation:**
   a. You will be given a book for each of the 3 specialisms you will learn, these need to be brought to lessons, and kept in good condition.
5. **Attendance and Punctuality**
   a. You cannot miss practical lessons in particular as they are a required part of one of your coursework units.
6. **Meeting deadlines:**
   a. You must have a pencil case with pens, pencils, ruler, rubber, sharpener and a calculator.
   b. 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=NgD9yHSJ29I

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=Yqioa8Njhhk

University

- https://www.youtube.com/watch?v=GgXwega3UeM

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.
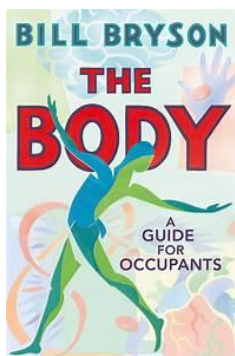
Growing New Organs
Available at:
http://www.ted.com/talks/anthony_atala_growing_organs_engineering_tissue?language=en
Anthony Atalla's state-of-the-art lab grows human organs — from muscles to blood vessels to bladders, and more.

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
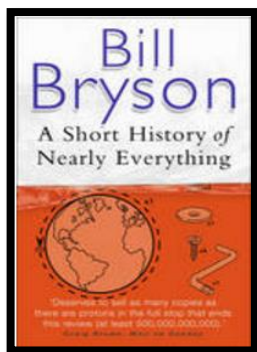
A Short History of Nearly Everything

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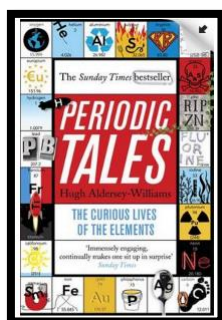
Periodic Tales: The Curious Lives of the Elements (Paperback) Hugh Aldersey-Williams

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
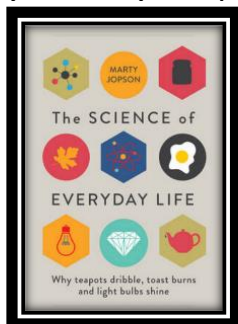
The title says it all really, lots of interesting stuff about the things around you home!
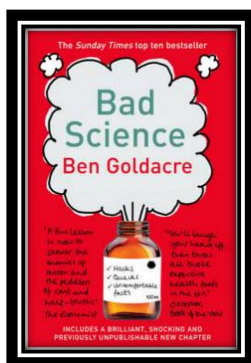
Bad Science (Paperback) Ben Goldacre

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 make Cornell notes on the 3 topics below.

Introduction to Cells – The Grand Cell Tour by the Amoeba sisters
Available at: https://www.youtube.com/watch?v=8IlzKri08kk

Whole of Atomic Structure by Primrose Kitten
Available at: https://www.youtube.com/watch?v=bgyuXU97jaI

All of AQA electricity by Physics Online
Available at: https://www.youtube.com/watch?v=EmCGF49Uils

Complete

In this section to complete there are three main parts:

(Section A)

Complete the 3 research activities (in the research section on page 9)

(Section B)

-Chemistry, Biochemistry, and Electricity Questions for you to answer

-Due the first week in September

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:

(i) NH_3

(ii) O^{2-}

(iii) SO_4^{2-}

(iv) F_2

(v) O

(vi) O_2

(vii) NO_3^-

(viii) H_2O

(ix) Cl^-

(xi) H^+
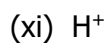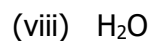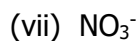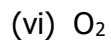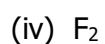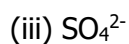
(10)

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:

(i) $Ca(OH)_2$ ii) $MgCO_3$

iii) $SrSO_4$ iv) MgI_2

v) NH_4Cl vi) $Ca(NO_3)_2$

vii) $CaCO_3$ viii) $Mg(OH)_2$

ix) $FeBr_3$ x) Br_2

xi) $CaSO_4$ xii) $BaCl_2$

xiii) $AgCl$ xiv) $AgNO_3$

(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).

(i) Fe_2O_3 ii) C_5H_{10}

(iii) $(NH_4)_2CO_3$ iv) $Fe_2(SO_4)_3$

(4)

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

   a)   Fe + H_2O → Fe_3O_4 + H_2 (1)

   b) PCl_3 + H_2O → $P(OH)_3$ + HCl   (1)

   c) ammonia + oxygen → nitrogen + water

   _____

                                                                                                                                          (2)

   d) ethane + oxygen → carbon dioxide + water
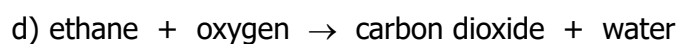
      _____ (2)

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					
$^{35}Cl^-$					
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 (NH_3)

(b) methane (CH_4)

(c) water

(d) nitrogen

(e) carbon dioxide

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   ☐

Electricity

a) What is electric current?

    a. State the definition

    b. State the equation and units

    c. If 0.05 C of charge is transferred in 10 s what is the current?

b) What is the potential difference (voltage) between two points in an electric circuit?

    a. State the definition

    b. State the equation and units

    c. If 0.05 C of charge transfers in 10 J what is the potential difference?

c) Draw and label the symbols for:

    a. Switch (open and closed)

    b. Cell

    c. Battery

    d. Diode

    e. Resistor

    f. Variable Resistor

    g. Thermistor

h. LDR

i. LED

j. Lamp

k. Fuse

l. Voltmeter

m. Ammeter

d) What does a current–potential difference graph show?

e) What is the current–potential difference graph for a resistor at constant temperature?

f) How can you use a current-potential difference graph to calculate resistance?

g) *The current through a resistor (at a constant temperature) is directly proportional to the potential

difference across the resistor.* What does this mean?

h) Show how you could calculate current, potential difference or resistance using the equation: V=IR

i) What does the current through a component depend on?

j) For components connected in series: (use a labelled diagram to help)

a. How would you calculate the total resistance?

b. What happens to the current?

c. What happens to the voltage?

k) For components connected in parallel: (use a labelled diagram to help)

a. What happens to the current?

b. What happens to the voltage?

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

P1 Electricity	
Charge = current × time	$Q = It$
Potential difference = current × resistance	$V = IR$
Power = current × potential difference	$P = IV$
Power = (current)² × resistance	$P = I^2 R$
Power = $\dfrac{(\text{potential difference})^2}{\text{resistance}}$	$P = \dfrac{V^2}{R}$
Work done = potential difference × current × time	$W = VIt$
Work done = potential difference × charge	$W = VQ$
Total resistance in series = resistance of resistor 1 + resistance of resistor 2 + …	$R_T = R_1 + R_2 + \cdots$
$\dfrac{1}{\text{Total resistance in parallel}} = \dfrac{1}{\text{Resistance of resistor 1}} + \dfrac{1}{\text{Resistance of resistor 2}} + \cdots$	$\dfrac{1}{R_T} = \dfrac{1}{R_1} + \dfrac{1}{R_2} + \cdots$

The Periodic Table of the Elements

Key
atomic number
Symbol
name
relative atomic mass

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(0)
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 H hydrogen 1.0																	2 He helium 4.0
3 Li lithium 6.9	4 Be beryllium 9.0											5 B boron 10.8	6 C carbon 12.0	7 N nitrogen 14.0	8 O oxygen 16.0	9 F fluorine 19.0	10 Ne neon 20.2
11 Na sodium 23.0	12 Mg magnesium 24.3											13 Al aluminium 27.0	14 Si silicon 28.1	15 P phosphorus 31.0	16 S sulfur 32.1	17 Cl chlorine 35.5	18 Ar argon 39.9
19 K potassium 39.1	20 Ca calcium 40.1	21 Sc scandium 45.0	22 Ti titanium 47.9	23 V vanadium 50.9	24 Cr chromium 52.0	25 Mn manganese 54.9	26 Fe iron 55.8	27 Co cobalt 58.9	28 Ni nickel 58.7	29 Cu copper 63.5	30 Zn zinc 65.4	31 Ga gallium 69.7	32 Ge germanium 72.6	33 As arsenic 74.9	34 Se selenium 79.0	35 Br bromine 79.9	36 Kr krypton 83.8
37 Rb rubidium 85.5	38 Sr strontium 87.6	39 Y yttrium 88.9	40 Zr zirconium 91.2	41 Nb niobium 92.9	42 Mo molybdenum 95.9	43 Tc technetium	44 Ru ruthenium 101.1	45 Rh rhodium 102.9	46 Pd palladium 106.4	47 Ag silver 107.9	48 Cd cadmium 112.4	49 In indium 114.8	50 Sn tin 118.7	51 Sb antimony 121.8	52 Te tellurium 127.6	53 I iodine 126.9	54 Xe xenon 131.3
55 Cs caesium 132.9	56 Ba barium 137.3	57–71 lanthanoids	72 Hf hafnium 178.5	73 Ta tantalum 180.9	74 W tungsten 183.8	75 Re rhenium 186.2	76 Os osmium 190.2	77 Ir iridium 192.2	78 Pt platinum 195.1	79 Au gold 197.0	80 Hg mercury 200.6	81 Tl thallium 204.4	82 Pb lead 207.2	83 Bi bismuth 209.0	84 Po polonium	85 At astatine	86 Rn radon
87 Fr francium	88 Ra radium	89–103 actinoids	104 Rf rutherfordium	105 Db dubnium	106 Sg seaborgium	107 Bh bohrium	108 Hs hassium	109 Mt meitnerium	110 Ds darmstadtium	111 Rg roentgenium	112 Cn copernicium		114 Fl flerovium		116 Lv livermorium		