

BTEC Applied Science Extended Certificate

**Welcome!**

We are looking forward to welcoming you to college in September. This booklet will outline the course and give you activities to try reinforce key areas of your GCSE knowledge and prepare you for the applied science course

**Assessment**

The content is of the same standard as A level Sciences, but is assessed differently. Assessment is a mixture of coursework and exam (roughly 50/50) - these exams are both written and practical. Exams are on specific units and are modular in nature, those sat in year 1 and early in year 2 can be resat.

Our exam board is Pearson.

*“It is the function of science to discover the existence of a general reign of order in nature and to find the causes governing this order. And this refers in equal measure to the relations of man (social and political) and to the entire universe as a whole…”*

**DMITRI MENDELEEV: CHEMIST**

1901

**Extended Certificate**

This is a full time Level 3 science qualification equivalent to 1 A level.

You will study 5 units over the 2 years:

1. Principles and Applications of Biology
2. Principles and Applications of Chemistry
3. Principles and Applications of Physics
4. Practical Scientific Procedures and Techniques
5. Contemporary Issues in Science

**Year 1**

**Assessment**

The content is of the same standard as A level Sciences but is assessed differently. The assessment is equally split between coursework and exams

The first year is focused on scientific theory and is assessed through external exams, whilst the second year is assessed via coursework focused on practical skills and topical issues within science. Each exam is available to retake in year 2 if desired as well.

**Year 2**

**Headstart tasks**

On the following pages you will find tasks associated the content you covered at GCSE and will build on in unit 1,2 & 3 in your first year in Applied Science. The sections are split into biology, chemistry and physics and should all be completed before starting the course. On some of the chemistry pages below there are videos links to help remind you how to approach the questions.

Although these examples are for rates of reaction, the same principle applies for estimating the rate of growth from a population curve.

1. Estimate the rate of population growth at three different points by taking tangents at three different points on the curve. Show the tangents used on your graph (GC3)[4]
2. Using data to support your answer describe **and**explain how the growth rate of the population changes with time. The following sources may help you answer this question. (GC4)[4]

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

<http://www.wales.nhs.uk/sitesplus/documents/888/Microbiology%20Presentation11.pdf>

### **Biology**

### Activity 1 – Structure and function of cell organelles

Complete the table for the parts of Cells

|  |  |
| --- | --- |
| Structure | Function |
| Cell membrane |  |
| Chloroplast |  |
| Cell vacuole |  |
| Mitochondria |  |
| Nucleus |  |
| Cell wall |  |
| Chromosomes |  |
| Ribosomes |  |

### Activity 2 – label the organs

A diagram of a human body

AI-generated content may be incorrect.

### Activity 3

Complete the table to show which organ that carries out each function.

|  |  |
| --- | --- |
| **Organ** | **Function** |
|  | takes oxygen into the bloodstream |
|  | breaks down (digests) food |
|  | make sperm cells |
|  | make egg cells |
|  | controls the body’s functions |
|  | absorbs nutrients from food |
|  | produce urine |
|  | sense light |

## Chemistry section

### Activity 1

Relative atomic mass (Ar)

RAM – relative atomic mass is the mass number of the element – the mass is made up of the protons and neutrons in the nucleus. The atomic number of the element is the number of protons in the nucleus. For each of these elements write down their number of protons, electrons and neutrons using the information on the periodic table:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Element | Mass number | Number of: | | |
| protons | neutrons | electrons |
| Oxygen |  |  |  |  |
| Carbon |  |  |  |  |
| Iodine |  |  |  |  |
| Argon |  |  |  |  |
| Fluorine |  |  |  |  |
| Magnesium |  |  |  |  |
| Aluminium |  |  |  |  |
| Boron |  |  |  |  |

<https://www.youtube.com/watch?v=KPXuP67KWyk>

Activity 2

Isotopes: If there are several isotopes of an element, the relative atomic mass will take into account the proportion of atoms in a sample of each isotope. For example, chlorine gas is made up of 75% of chlorine-35 and 25% of chlorine-37. The relative atomic mass of chlorine is therefore the mean atomic mass of the atoms in a sample, and is calculated by:

𝐴𝑟 = (75.0/100 × 35) + (25.0/100 × 37) = 26.25 + 9.25 = 35.5

A questionnaire with text

AI-generated content may be incorrect.

<https://www.youtube.com/watch?v=yOsMN89wIQc>

Activity 3

A math equations on a white background

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A list of chemical formulas

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Activity 4 – Moles Calculations:

**You will need the use the following.**

**Number of moles (n) = mass (m) Concentration (mol dm-3) = number of moles (n)**

**Mr Volume (dm-3)**

**Mr = Relative formulae mass**

**To convert from cm3 to dm3 you must divide the volume by 1000**

**1 mole of any gas takes up 24 dm3 at standard condition (25 °C and 1 bar).**

**Number of moles = Gas volume (dm3)**

**24**

1. How many moles are there in 44 g of CO2 ?
2. What is the mass of 2.5 moles of Na2O?
3. What is mass of 2.34 moles of Platinum?
4. How many moles are there in 132 g of CO2? How many dm3 would this be?
5. 58.5 g of sodium chloride are dissolved in 1 dm3. What concentration would this be?
6. How many moles would needed to be dissolved in 1 dm3 to get a 3 mol dm-3 solution? How many would be needed if only 0.1 dm3 were used?
7. 92 dm3 of a gas dissolved in a solvent. How many moles is this? What is the concentration of the resulting solution?
8. 48 dm3 of a gas has a mass of 262 grams. How many moles is this? What is the Mr? What must this element be?

Calculating moles of a compound: <https://www.youtube.com/watch?v=Md4BQL91U6>w

Calculating concentration of a solution: <https://www.youtube.com/watch?v=xsma3KjKPx8&t=51s>

Using Molar gas volume: <https://www.youtube.com/watch?v=tYE-1nywlFs>

Activity 5

Covalent bonding

Draw a dot and cross diagram to show how the electrons are arranged in the following small molecules.

|  |  |  |
| --- | --- | --- |
| A. Hydrogen gas |  | B. Water |
|  |  |  |
| C. Carbon dioxide |  | D. Hydrogen chloride |

<https://www.youtube.com/watch?v=IV404giwIE0>

### Activity 6

Balance the equations below by adding numbers in front of the formulae –

however, you must not change the formulae themselves! Be careful as some may already be balanced.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| e.g. **2** H2 + O2 **2** H2 O | | | | | | |
| **1** | HCl + Mg MgCl2 + H2 | |  |  |  |  |
| **2** | Na + O2 Na2O | |  |  |  |  |
| **3** | Si + HCl SiCl4 + H2 | |  |  |  |  |
| **4** | TiCl4 + Mg Ti + MgCl2 | |  |  |  |  |
| **5** | Al + O2 Al2O3 | |  |  |  |  |
| **6** | HCl + | Na2S2O3 S + SO2 | + | NaCl | + | H2O |
| **7** | C6H12O6 + O2 H2O + CO2 | | |  |  |  |
| **8** | HNO3 + NaOH NaNO3 + H2O | | |  |  |  |

|  |  |
| --- | --- |
| **9** | K + H2O KOH + H2 |
| **10** | Pb(NO3)2 PbO + NO2 + O2 |
| **11** | NaOH + H3PO4 Na3PO4 + H2O |
| **12** | Pb(NO3)2 + AlCl3 PbCl2 + Al(NO3)3 |

<https://www.youtube.com/watch?v=qquOFYOpdl0>



## Physics

### Activity 1

### SI units

A screenshot of a computer

AI-generated content may be incorrect.

### A white background with black text AI-generated content may be incorrect.

### Activity 2A white background with black text AI-generated content may be incorrect.

Activity 3

Rearranging equations – do as many as you can – they get trickier:

A screenshot of a math test

AI-generated content may be incorrect.

Activity 4

A table with numbers and text

AI-generated content may be incorrect.

You can use your own graph paper or the space below –

A graph paper with a grid

AI-generated content may be incorrect.

Activity 5 – Electrical Circuit Components

Complete the table below:

|  |  |  |
| --- | --- | --- |
| Component | Symbol | Function |
| Lamp |  |  |
| Cell |  |  |
| Resistor |  |  |
| Diode |  |  |
| Fuse |  |  |
| Ammeter |  |  |
| Voltmeter |  |  |
| LED |  |  |

### A diagram of a circuit AI-generated content may be incorrect.