GCSE Science to Level 3
BTEC Extended Certificate in Applied Science
Bridging Project

Summer 2023

Important information and key skills activities to support your move from GCSE to level 3.

BTEC

Science @ chaseterrace academy

Aim of the booklet

This booklet will support your transition from GCSE science to level 3 Applied Science. At first, you may find the jump in demand a little daunting, but if you follow the tips and advice in this guide, you'll soon adapt. As you follow the course you will see how the skills and content you learnt at GCSE will be developed and your knowledge and understanding of all these elements will progress.

We have organised the guide into two sections:

1. Understanding the specification and the assessments
2. Transition activities to bridge the move from GCSE to the start of the level 3 course.

Understanding the specification and the assessments

Specification at a glance

The specification is a useful reference document for you.
You can download a copy from the Pearson website:
https://qualifications.pearson.com/content/dam/pdf/BTEC-Nationals/Applied-Science/2016/specification-and-sample-assessments/BTEC-L3-Nat-Cert-in-Applied-Science-Spec.pdf

The subject content is split between 4 units of work; 3 mandatory units and 1 final optional unit.

Pearson BTEC Level 3 National Extended Certificate in Applied Science				
Unit number	**Unit title**	**GLH**	**Type**	**How assessed**
	Mandatory units – learners complete and achieve all units			
1	Principles and Applications of Science I	**90**	**Mandatory**	External
2	Practical Scientific Procedures and Techniques	**90**	**Mandatory**	Internal
3	Science Investigation Skills	**120**	**Mandatory and Synoptic**	External
	Optional units – learners complete 1 unit			
8	Physiology of Human Body Systems	**60**	**Optional**	Internal
9	Human Regulation and Reproduction	**60**	**Optional**	Internal
10	Biological Molecules and Metabolic Pathways	**60**	**Optional**	Internal
11	Genetics and Genetic Engineering	**60**	**Optional**	Internal
12	Diseases and Infections	**60**	**Optional**	Internal
13	Applications of Inorganic Chemistry	**60**	**Optional**	Internal
14	Applications of Organic Chemistry	**60**	**Optional**	Internal
15	Electrical Circuits and their Application	**60**	**Optional**	Internal
16	Astronomy and Space Science	**60**	**Optional**	Internal

Mandatory units are:

1. **Principles and Applications of Science** – an in-depth study of fundamental scientific concepts encompassing biology, chemistry and physics applications that are crucial to our modern day lives. Topic areas include:
    a. Animal and plant cells
    b. Tissues
    c. Atomic structure and bonding
    d. Chemical and physical properties of substances related to their uses
    e. Waves and their application in communications.

2. **Practical Scientific Procedures and Techniques** – a hands on introduction to standard laboratory equipment and techniques:
    a. Titration
    b. Colorimetry
    c. Calorimetry
    d. Chromatography
    e. Calibration procedures
    f. Laboratory safety

3. **Science Investigation Skills** – a practical based unit refining the skills needed in planning a scientific investigation, recording and interpreting data, drawing scientific conclusions and making sound evaluations:
    a. Demonstrating knowledge and understanding of scientific concepts, procedures, processes and techniques and their application in a practical investigative context
    b. Interpreting and analysing qualitative and quantitative scientific information to make reasoned judgements and draw conclusions based on evidence in a practical investigative context
    c. Evaluating practical investigative procedures used and their effect on the qualitative and quantitative scientific information obtained to make reasoned judgements
    d. Making connections between different scientific concepts, procedures, processes and techniques to make a hypothesis and write a plan for a practical investigation

The optional unit we will be studying is:

4. **Genetics and Genetic Engineering**
    In this unit you will:
        A. Understand the structure and function of nucleic acids in order to describe gene expression and the process of protein synthesis
        B. Explore how the process of cell division in eukaryotic cells contributes to genetic variation
        C. Explore the principles of inheritance and their application in predicting genetic traits
        D. Explore basic DNA techniques and the use of genetic engineering technologies.

Assessment structure

A combination of assessment styles will give you confidence that you can apply your knowledge to succeed in the workplace.

- Unit 1 – an externally assessed written 2hr exam worth 90 marks
- Unit 2 – a series of practical tasks assessed internally by your teaching staff
- Unit 3 – an externally set task worth 60 marks, completed under supervised conditions over an assessment period of 9 days
- Unit 4 – an internally assessed portfolio of research, practical evidence and coursework

Assessment outcomes

The Unit 1 exam questions are written to address the Assessment outcomes (AOs). It is important you understand what these AOs are, so you are well prepared. In Applied Science there are four AOs.

- ✓ **AO1** Demonstrate knowledge of scientific facts, terms, definitions and scientific formulae Command words: give, label, name, state
- ✓ **AO2** Demonstrate understanding of scientific concepts, procedures, processes and techniques and their application Command words: calculate, compare, discuss, draw, explain, state, write
- ✓ **AO3** Analyse, interpret and evaluate scientific information to make judgements and reach conclusions Command words: calculate, comment, compare, complete, describe, discuss, explain, state
- ✓ **AO4** Make connections, use and integrate different scientific concepts, procedures, processes or techniques Command words: comment, compare, complete, discuss, explain

Command words

Command words are used in questions to tell you what is required when answering the question. The following table shows the key terms that will be used consistently by Pearson in your assessments to ensure you are rewarded for demonstrating the necessary skills.

Please note: the list below will not necessarily be used in every paper/session and is provided for guidance only. Only a single command word will be used per item.

Command or term	Definition
Add/label	Learners label or add to a stimulus material given in the question, for example labelling a diagram or adding units to a table.
Assess	Learners give careful consideration to all the factors or events that apply and identify which are the most important or relevant. Make a judgement on the importance of something and come to a conclusion where needed.
Calculate	Learners obtain a numerical answer, showing relevant working. If the answer has a unit, this must be included.
Comment on	Learners synthesise a number of variables from data/ information to form a judgement. More than two factors need to be synthesised.
Compare	Learners look for the similarities and differences of two (or more) things. Should not require the drawing of a conclusion. Answer must relate to both (or all) things mentioned in the question. The answer must include at least one similarity and one difference.
Complete	Learners complete a table/diagram.
Criticise	Learners inspect a set of data, an experimental plan or a scientific statement and consider the elements. Look at the merits and/or faults of the information presented and back up judgements made.
Deduce	Learners draw/reach conclusion(s) from the information provided.

Command or term	Definition
Derive	Learners combine two or more equations or principles to develop a new equation.
Describe	Learners give an account of something. Statements in the response need to be developed as they are often linked but do not need to include a justification or reason.
Determine	Learners' answers must have an element that is quantitative from the stimulus provided, or must show how the answer can be reached quantitatively. To gain maximum marks there must be a quantitative element to the answer.
Devise	Learners plan or invent a procedure from existing principles/ideas.
Discuss	Learners identify the issue/situation/problem/argument that is being assessed in the question. Explore all aspects of an issue/situation/problem/argument. Investigate the issue/situation, etc. by reasoning or argument.
Draw	Learners produce a diagram, either using a ruler or using freehand.
Evaluate	Learners review information then bring it together to form a conclusion, drawing on evidence, including strengths, weaknesses, alternative actions, relevant data or information. Come to a supported judgement of a subject's qualities and relation to its context.
Explain	Learners' explanations require a justification/ exemplification of a point. The answer must contain some element of reasoning/justification – this can include mathematical explanations.
Give/state/name	These generally require recall of one or more pieces of information.
Give a reason why	When a statement has been made and the requirement is only to give the reasons why.
Identify	Usually requires some key information to be selected from a given stimulus/resource.
Plot	Learners produce a graph by marking points accurately on a grid from data that is provided and then drawing a line of best fit through these points. A suitable scale and appropriately labelled axes must be included if these are not provided in the question.
Predict	Learners give an expected result.
Show that	Learners prove that a numerical figure is as stated in the question. The answer must be to at least one more significant figure than the numerical figure in the question.
Sketch	Learners produce a freehand drawing. For a graph this would need a line and labelled axes with important features indicated. The axes are not scaled.

Command or term	Definition
State and justify/identify and justify	When a selection is made and a justification has to be given for the selection.
State what is meant by	When the meaning of a term is expected but there are different ways in which this meaning can be described.
Write	When the question asks for an equation.

Transition activities

The following activities cover some of the key skills from GCSE science that will be relevant at level 3. They include the vocabulary used when working scientifically and some maths and practical skills.

You are to do these activities in preparation for the start of your level 3 course. Work through booklet electronically or print it out and do the activities on paper. You will need to bring your completed copy of the booklet to your first physics lesson where your baseline knowledge and understanding will be assessed.

The activities are **not a test**. Try the activities first and see what you remember and then use textbooks or other resources to answer the questions.

Don't just go to Google for the answers, as actively engaging with your notes and resources from GCSE will make this learning experience much more worthwhile.

Understanding and using scientific vocabulary

Understanding and applying the correct terms are key for practical science. Much of the vocabulary you have used at GCSE for practical work will not change but some terms are dealt with in more detail in sixth form so are more complex.

Activity 1 Scientific vocabulary: Designing an investigation

Link each term on the left to the correct definition on the right.

Hypothesis	The maximum and minimum values of the independent or dependent variable
Dependent variable	A variable that is kept constant during an experiment
Independent variable	The quantity between readings, eg a set of 11 readings equally spaced over a distance of 1 metre would give an interval of 10 centimetres
Control variable	A proposal intended to explain certain facts or observations
Range	A variable that is measured as the outcome of an experiment
Interval	A variable selected by the investigator and whose values are changed during the investigation

Activity 2 Scientific vocabulary: Making measurements

Link each term on the left to the correct definition on the right.

True value	The range within which you would expect the true value to lie
Accurate	A measurement that is close to the true value
Resolution	Repeated measurements that are very similar to the calculated mean value
Precise	The value that would be obtained in an ideal measurement where there were no errors of any kind
Uncertainty	The smallest change that can be measured using the measuring instrument that gives a readable change in the reading

Activity 3 Scientific vocabulary: Errors

Link each term on the left to the correct definition on the right.

Random error	Causes readings to differ from the true value by a consistent amount each time a measurement is made
Systematic error	When there is an indication that a measuring system gives a false reading when the true value of a measured quantity is zero
Zero error	Causes readings to be spread about the true value, due to results varying in an unpredictable way from one measurement to the next

Understanding and using SI units

All measurements have a size (eg 2.7) and a unit (eg metres or kilograms).
Sometimes, there are different units available for the same type of measurement. For example, milligram, gram, kilogram and tonne are all units used for mass. Some values like strain and refractive index are not followed by a unit.

To reduce confusion, and to help with conversion between different units, there is a standard system of units called the SI units which are used for most scientific purposes.

These units have all been defined by experiment so that the size of, say, a metre in the UK is the same as a metre in China.

There are seven SI base units, which are given in the table.

Physical quantity	Unit	Abbreviation
Mass	kilogram	kg
Length	metre	m
Time	second	s
Electric current	ampere	A
Temperature	kelvin	K
Amount of substance	mole	mol
luminous intensity	candela	cd

Using prefixes and powers of ten

Very large and very small numbers can be complicated to work with if written out in full with their SI unit. For example, measuring the width of a hair or the distance from Manchester to London in metres (the SI unit for length) would give numbers with a lot of zeros before or after the decimal point, which would be difficult to work with.

So, we use prefixes that multiply or divide the numbers by different powers of ten to give numbers that are easier to work with. You will be familiar with the prefixes milli (meaning 1/1000), centi (1/100), and kilo (1 × 1000) from millimetres, centimetres and kilometres.

There is a wide range of prefixes. Most of the quantities in scientific contexts will be quoted using the prefixes that are multiples of 1000. For example, we would quote a distance of 33 000 m as 33 km.

Kg is the only base unit with a prefix.

The most common prefixes you will encounter are given in the table.

Prefix	Symbol	Power of 10	Multiplication factor	
Tera	T	10^{12}	1 000 000 000 000	
Giga	G	10^{9}	1 000 000 000	
Mega	M	10^{6}	1 000 000	
kilo	k	10^{3}	1000	
deci	d	10^{-1}	0.1	1/10
centi	c	10^{-2}	0.01	1/100
milli	m	10^{-3}	0.001	1/1000
micro	μ	10^{-6}	0.000 001	1/1 000 000
nano	n	10^{-9}	0.000 000 001	1/1 000 000 000
pico	p	10^{-12}	0.000 000 000 001	1/1 000 000 000 000
femto	f	10^{-15}	0.000 000 000 000 001	1/1 000 000 000 000 000

Greek letters

Greek letters are used often in science. They can be used:

- as symbols for numbers (such as π = 3.14…)
- as prefixes for units to make them smaller (eg μm = 0.000 000 001 m)
- as symbols for particular quantities.

Capital letter	Lower case letter	Name
Α	α	alpha
Β	β	beta
Γ	γ	gamma
Δ	δ	delta
Ε	ε	epsilon
Ζ	ζ	zeta
Η	η	eta
Θ	θ	theta

Capital letter	Lower case letter	Name
Ι	ι	iota
Κ	κ	kappa
Λ	λ	lambda
Μ	μ	mu
Ν	ν	nu
Ξ	ξ	ksi
Ο	ο	omicron
Π	π	pi

Capital letter	Lower case letter	Name
Ρ	ρ	rho
Σ	ς or σ	sigma
Τ	τ	tau
Υ	υ	upsilon
Φ	φ	phi
Χ	χ	chi
Ψ	ψ	psi
Ω	ω	omega

Activity 4 SI units and prefixes

1. Re-write the following quantities using the correct SI units.
    a. 1 minute
    b. 1 milliamp
    c. 1 tonne
2. What would be the most appropriate unit to use for the following measurements?
    a. The wavelength of a wave in a ripple tank
    b. The temperature of a thermistor used in hair straighteners
    c. The half-life of a source of radiation used as a tracer in medical imaging
    d. The diameter of an atom
    e. The mass of a metal block used to determine its specific heat capacity
    f. The current in a simple circuit using a 1.5 V battery and bulb

Activity 5 Converting data

Re-write the following quantities.

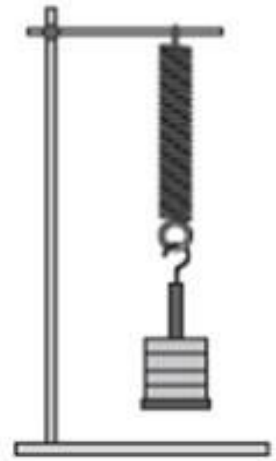
1. 1.5 kilometres in metres
2. 450 milligrams in kilograms
3. 96.7 megahertz in hertz
4. 5 nanometers in metres
5. 3.9 gigawatts in watts

Practical skills

The practical skills you learnt at GCSE will be further developed through the practicals you undertake at level 3. You need to ensure you revise and are familiar with the scientific method, writing conclusions and evaluating your data.

Activity 6 Investigating springs

A group of students investigated how the extension of a spring varied with the force applied. They did this by hanging different weights from the end of the spring and measuring the extension of the spring for each weight.



The results are below.

Weight added to the spring / N	Extension of spring / cm			
	Trial 1	Trial 2	Trial 3	Mean
2	3.0	3.1	3.2	
4	6.0	5.9	5.8	
6	9.1	7.9	9.2	
8	12.0	11.9	12.1	
10	15.0	15.1	15.12	

1. What do you predict the result of this investigation will be?
2. What are the independent, dependent and control variables in this investigation?
3. What is the difference between repeatable and reproducible?
4. What would be the most likely resolution of the ruler you would use in this investigation?
5. Suggest how the student could reduce parallax errors when taking her readings.
6. Random errors cause readings to be spread about the true value. What else has the student done in order to reduce the effect of random errors and make the results more precise?
7. Another student tries the experiment but uses a ruler which has worn away at the end by 0.5 cm. What type of error would this lead to in his results?
8. Calculate the mean extension for each weight.
9. A graph is plotted with force on the *y* axis and extension on the *x* axis. What quantity does the gradient of the graph represent?

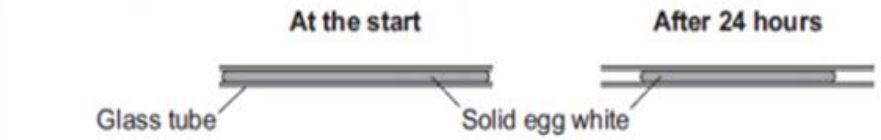
Activity 7 Investigating how temperature and pH affect enzymes

Egg white is made of protein. The students were investigating how temperature and pH affect the digestion of protein

The students carried out the following procedure:

- Filled six narrow glass tubes with fresh egg white
- Boiled the tubes so the egg white became solid
- Placed each tube into a different beaker containing human protease enzyme at different pH values at room temperature and 3 in neutral pH but at different temperatures for 24 hours
- Measured the length of solid egg white in each tube after 24 hours

The diagram shows the investigation.



The results were recorded in the tables below:

pH	Original length of solid egg white (cm)	Final length of solid egg white (cm)	% change
4	6.0	5.6	
7	6.0	3.8	
9	6.0	5.8	

Temperature (°C)	Original length of solid egg white (cm)	Final length of solid egg white (cm)	% change
15	6.0	5.7	
35	6.0	3.8	
55	6.0	5.3	

1. State a hypothesis for this investigation.
2. The students predicted that the enzyme would be most effective in conditions similar to those found in the human body. Was their prediction correct?
3. Identify the independent and dependent variables in this investigation.
4. Suggest the control variables for this investigation.

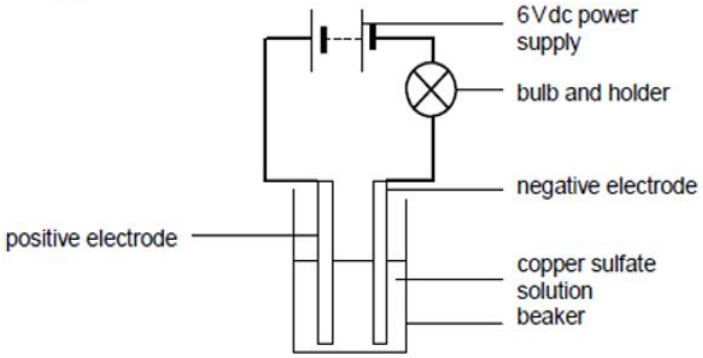
5. Describe the difference between repeatable and reproducible.
6. What would be the most likely resolution of the ruler you would use in this investigation.
7. Suggest how repeating the investigation would be an improvement.
8. Calculate the % change for each result in this investigation. Show your answers to 3 significant figures.

Activity 8 Practical skills: Electrolysis

Students were investigating if the time the current flows through an electrolyte affects the amount of copper deposited on the negative electrode.

Equipment:

Measuring cylinder
Balance
Two suitable electrodes eg carbon rods
6V bulb and holder
0.5 moles per dm^3 copper sulfate solution
Stopwatch
Wires
Power supply
100 cm^3 beaker



Method:

1. Measure 50 cm^3 of the copper sulfate solution into the beaker.
2. Measure and record the mass of the negative electrode.
3. Set up the circuit, setting the power pack at 6V dc.
4. Turn on the power supply for the time you have been given, then turn the power pack off.
5. Remove and carefully dry the negative electrode.
6. Measure and record the mass of the negative electrode.

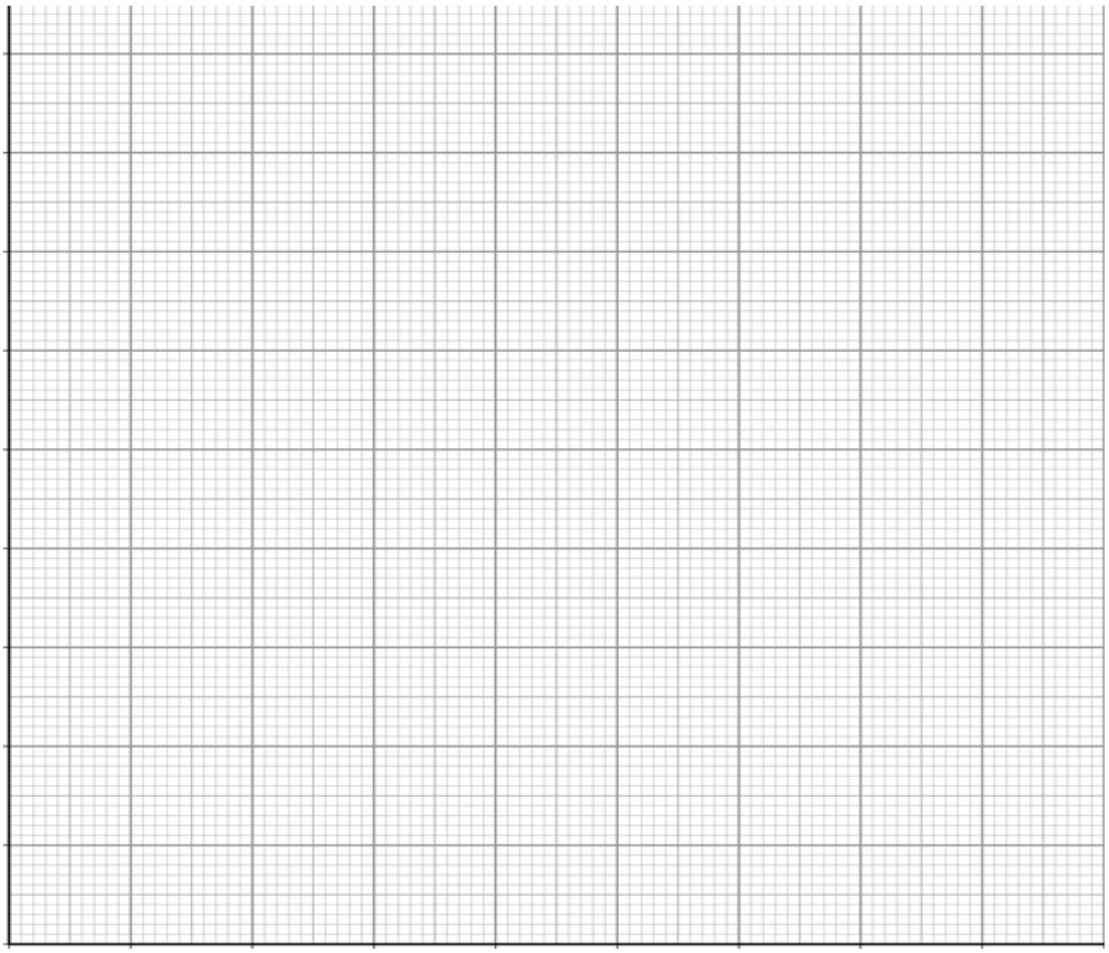
1. Write a hypothesis for this investigation.
2. What do you predict will be the result of this investigation?
3. For this investigation, give:
   a. the independent variable
   b. the dependent variable
   c. a control variable.
4. What is the difference between repeatable and reproducible results?
5. What would be the most likely resolution of the balance you use in a school lab?
6. How could you make the reading more precise?
7. Random errors cause readings to be spread about the true value.
   How could you reduce the effect of random errors and make the results more accurate?

8. The results the student recorded are given in the table.

Time / minutes	Increase in mass / g			Mean
2	0.62	0.64	0.45	
4	0.87	0.83	0.86	
6	0.99	1.02	0.97	
8	1.06	1.05	1.08	
10	1.10	1.12	1.10	

Calculate the mean increase in mass for each time measurement.

9. Plot a graph of your results



Using math skills

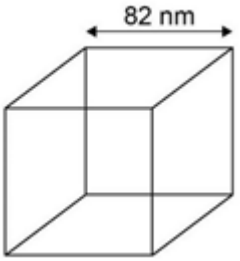
Science uses the language of mathematics as a tool to make sense of the world. It is important that you are able to apply math skills in Science. The maths skills you learnt and applied at GCSE are used and developed further at level 3.

Activity 9 Math skills

1. Write the following numbers in standard form:

   a. 4000
   b. 1 000 000

2. Zinc oxide can be produced as nanoparticles.
   A nanoparticle of zinc oxide is a cube of side 82nm.

   Calculate the surface area of a nanoparticle of zinc oxide. Give your answer in standard form

3. Express the following numbers to 3 significant figures:

   a. 57 658
   b. 0.045346

4. Toothpaste may contain sodium fluoride (NaF). The concentration of sodium fluoride can be expressed in parts per million (ppm). 1 ppm represents a concentration of 1 mg in every 1 kg of toothpaste.
   A 1.00 g sample of toothpaste was found to contain 2.88×10^{-5} mol of sodium fluoride.

   Calculate the concentration of sodium fluoride, in ppm, for the sample of toothpaste.

   Give your answer to 3 significant figures.

   Use the following information to help you

   To convert moles to grams use *g* = *moles* × *relative formula mass*

   Relative formula mass of NaF = 42

5. A rocket can hold 7 tonnes of material. Calculate how many rockets would be needed to deliver 30 tonnes of material to a space station.

6. A power station has an output of 3.5 MW. The coal used had a potential output of 9.8 MW. Calculate the efficiency of the power station. Give your answer as a percentage to an appropriate number of significant figures.

7. A radioactive source produces 17 804 beta particles in 1 hour. Calculate the mean number of beta particles produced in 1 minute. Give your answer to one significant figure.

8. The mean mass of 9 people is 79 kg. A 10th person is such that the mean mass increases by 1 kg What is the mass of the 10th person?

9. A pendulum completes 12 swings in 150 s. Calculate the mean swing time.

Activity 9 Math skills

1. The ratio of turns of wire on a transformer is 350 : 7000 (input : output)
   What fraction of the turns are on the input side?

2. A bag of electrical components contains resistors, capacitors and diodes.
   $^2/_5$ of the components are resistors. The ratio of capacitors to diodes in a bag is 1 : 5. There are 100 components in total.
   How many components are diodes?

3. The number of coins in two piles are in the ratio 5 : 3. The coins in the first pile are all 50p coins. The coins in the second pile are all £1 coins.
   Which pile has the most money?

4. A rectangle measures 3.2 cm by 6.8 cm. It is cut into four equal sized smaller rectangles.
   Work out the area of a small rectangle.

5. Small cubes of edge length 1 cm are put into a box. The box is a cuboid of length 5 cm, width 4 cm and height 2 cm.
   How many cubes are in the box if it is half full?

6. In a circuit there are 600 resistors and 50 capacitors. 1.5% of the resistors are faulty. 2% of the capacitors are faulty.
   How many faulty components are there altogether?

7. How far would you have to drill in order to drill down 2% of the radius of the Earth?

8. Power station A was online 94% of the 7500 days it worked for. Power station B was online $^8/_9$ of the 9720 days it worked for. Which power station was offline for longer?

Activity 10 Biology assignment

Cells are the building blocks of life and any Biologist must have a firm grasp 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.

In order to study organisms in more detail we need to ensure our knowledge of the functions of different organelles within cells is spot on. 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 an **information poster**.
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.

Success Criteria:

- ✓ Introduce Eukaryotic cells
- ✓ Investigate the different types of Eukaryotic cell
- ✓ List cell organelles stating structure and functions
- ✓ Diagrams to illustrate
- ✓ Relative sizes of organelles
- ✓ Ways in which organelles can be viewed

Activity 11 Chemistry assignment

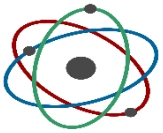
One of the key concepts you will be examined on in Chemistry is atomic structure and bonding. Scientists and technicians working in the chemical industry need to have an understanding of atoms and electronic structure. This allows them to predict how chemical substances will react in the production of a wide range of products – anything from fertilisers in the farming industry to fragrances in the perfume industry. Metals play an important role in the construction industry, in providing structure to building, as well as in electrical wiring. So understanding the chemical and physical properties of metals is essential when selecting building materials.

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

Success 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
- ✓ Explain the different properties

Activity 12 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 an **information poster** on the different parts of the spectrum, their dangers and their uses.

Success Criteria:

- ✓ A diagram showing the electromagnetic spectrum and the typical wavelengths and frequencies for each region of the spectrum. You may also want to describe some general properties of these waves, such as their speed.
- ✓ You need to mention at least two ways that each part of the spectrum can be used (e.g. microwaves are used for cooking, and also in mobile phones).
- ✓ With the exception of radio waves, explain the possible dangers to the human body for each region of the spectrum

Activity 13 Scientific skills assignment

Learning aim D of unit 2 is a "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. It is up to you to choose whether it is handwritten or typed up on a computer.

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.

Success Criteria:

For each skill you should include

- ✓ A description of what the equipment/technique 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.

Suggested Reading

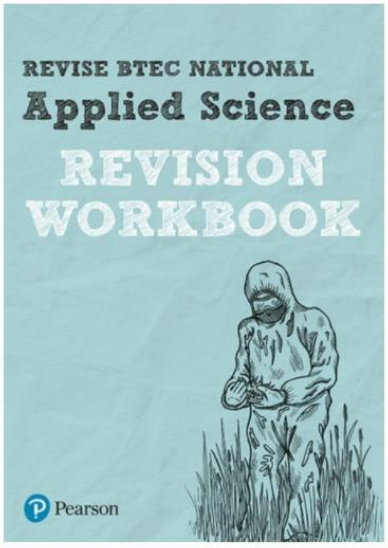
At level 3 it becomes increasingly important to read around your subject to not only improve your breadth of knowledge and depth of understanding, but also to allow you to contribute to discussions in class and share ideas. To get the most out of your studies, you should take an active interest in the subject. This would require you to use additional resources, both print and online to read around the subject and familiarise yourself with the most recent developments in the field.

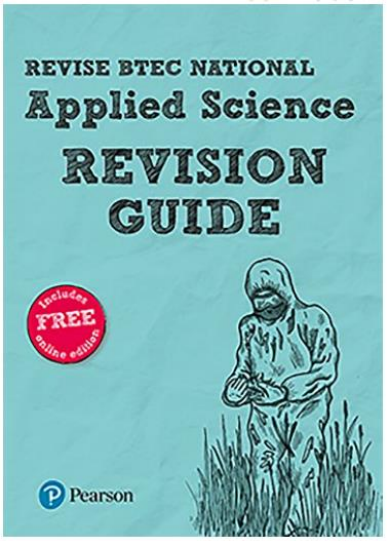
Recommended further reading:

- A Short History of Nearly Everything by Bill Bryson
- This Book Will Blow Your Mind. New Scientist
- The Science Book: Big Ideas Simply Explained

- Royal Society of Biology www.rsb.org.uk/
- Royal Society of Chemistry www.rsc.org/
- Institute of Physics (IOP) www.iop.org
- Free Science Lessons www.youtube.com/channel/UCqbOeHaAUXw9Il7sBVG3_bw
- BBC Bitesize www.bbc.com/bitesize/levels/z98jmp3

Recommended support materials:





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