The Friary Sixth Form

Pearson Level 3 Alternative Academic Qualification

BTEC National Extended Certificate in Applied Science

Bridging Pack 2025

Course Expectations

This pack has been designed to help you bridge the gap from GCSE to Level 3 BTEC to ensure that you understand what you've let yourself in for and that you are ready for your new course.

What do I need?

Required Equipment
Pen, pencil, sharpener, rubber, highlighters, protractor, 30cm ruler, scientific calculator, A4 lever-arch folder with dividers.

How will I learn?

Over the course you will have around five hours of lessons a week that will cover all the theory and practical skills you will need.
You will be given homework questions every week and these will be expected to be completed by the next lesson in most cases.

You are expected to be spending six hours per week out of class completing homework, reviewing your work and reading around the subject.

In addition to the lessons you will receive, there is plenty of support available:

- Teachers: Your teacher is your first point of call as they are the experts – you will have two experienced teachers who will always offer their time when they are available to help you in and out of lessons.

- Notes: You will be expected to organise these in a folder and add any extra notes that you write in or out of lessons and bring these along to lessons where we will check these regularly.

- Textbook: You will be given access to a textbook. These have notes, questions and revision tips and quizzes.

  Specification and past papers: Download a BTEC specification from the website:

Staff

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Course Overview

The Level 3 AAQ BTEC National Applied Science Extended Certificate is completed in Year 13 with a total of 360 guided learning hours across four units. You will complete three externally assessed units and exams in Y12 and two internally assessed units in Y13.

Year 12

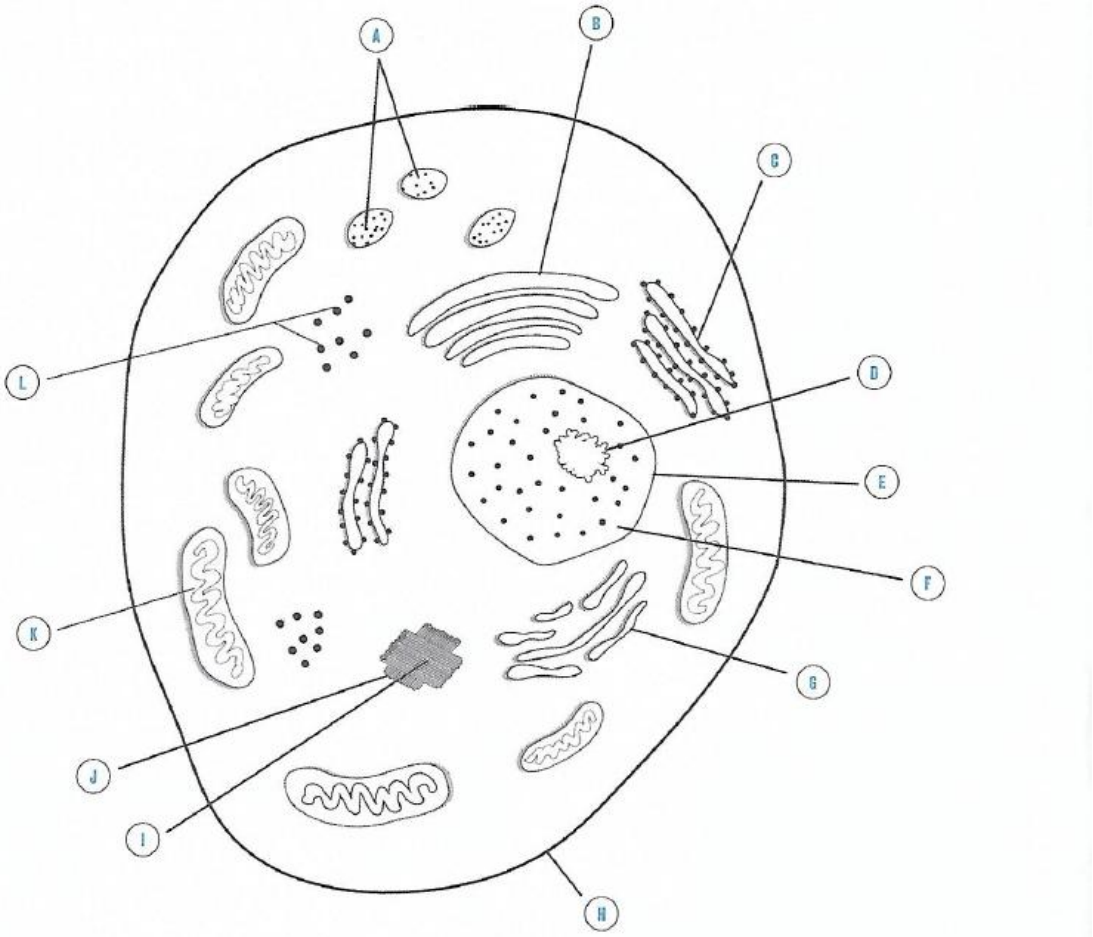
Unit	Title	Learning hours	Brief description	Assessment
1	**Principles and Applications of Biology**	60	Cell biology, tissues and biological molecules	External
2	**Principles and Applications of Chemistry**	60	Atomic structure and bonding, periodicity and chemical energetics	External
3	**Principles and Applications of Physics**	60	Waves, optics, communication and forces	External

Year 13

Unit	Title	Learning hours	Brief description	Assessment
4	**Practical Scientific Procedures and Techniques**	90	Practical techniques commonly used in chemistry, biology and physics laboratories	Internal assessment
5	**Science Investigation Skills**	90	Research project	Internal assessment

Tasks: Biology

1. a) Research the organelles present in an animal cell using internet resources and the textbook. Colour the different parts and label them using the key below.



https://www.s-cool.co.uk/a-level/biology/cells-and-organelles/revise-it/organelles

Identify and label the following

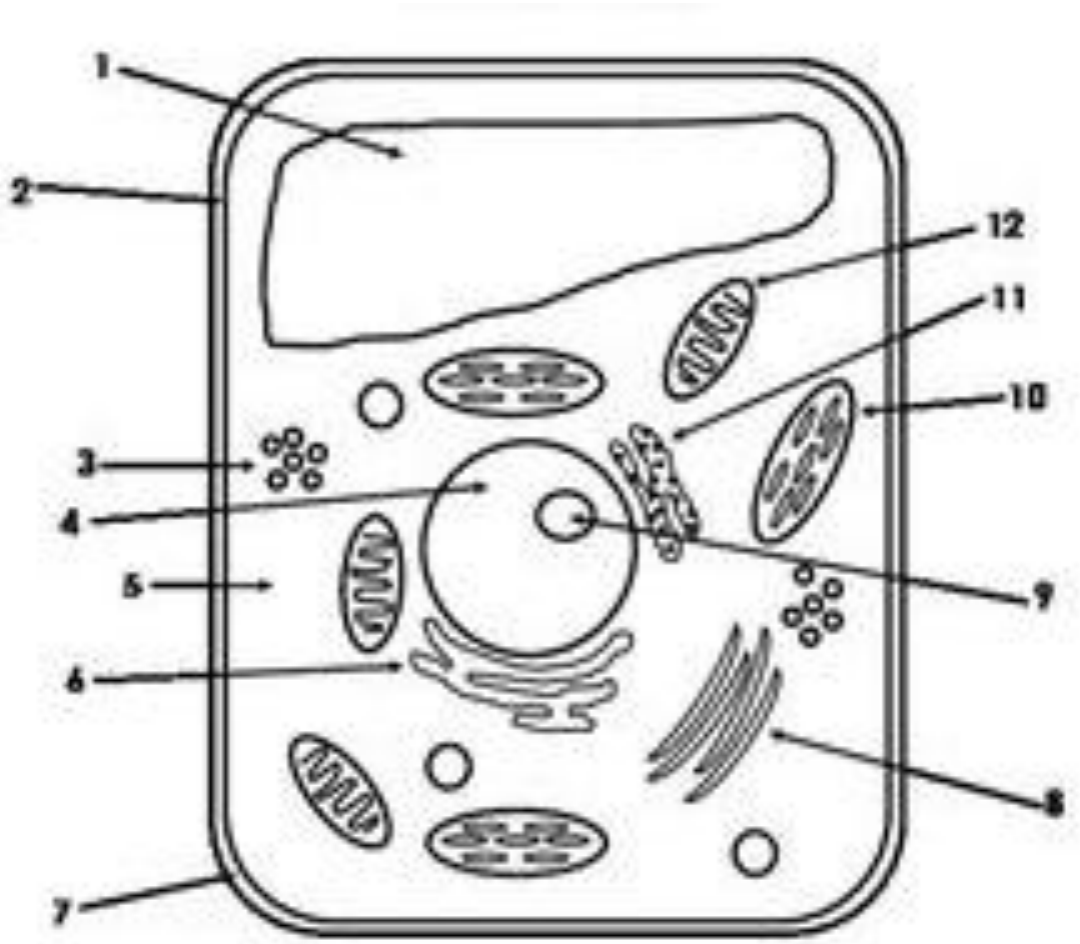
- ☐ Nucleus
- ☐ Nucleolus
- ☐ Smooth endoplasmic reticulum
- ☐ Rough endoplasmic reticulum
- ☐ Golgi apparatus
- ☐ Mitochondrion
- ☐ Cell membrane
- ☐ Ribosomes
- ☐ Centrioles
- ☐ Centrosomes
- ☐ Nuclear membrane
- ☐ Secretory granules

- Colour the nucleolus black
- Colour the cytoplasm of the nucleus yellow
- Colour the cytoplasm of the cell light blue
- Colour the Golgi apparatus pink
- Colour the mitochondria green
- Colour the smooth endoplasmic reticulum red
- Colour the rough endoplasmic reticulum brown
- Colour the secretory granules orange

b) Research the structure and function of each part listed below

Organelle	Structure	Function
Plasma membrane		
Cytoplasm		
Nucleus		
Nucleolus		
Rough endoplasmic reticulum		
Smooth endoplasmic reticulum		
Golgi apparatus		
Vesicle		
Lysosome		
Ribosome		
Mitochondria		
Centrioles		

2. a) Research the organelles present in a plant cell using internet resources and the textbook. Colour the different parts and label them using the key below.



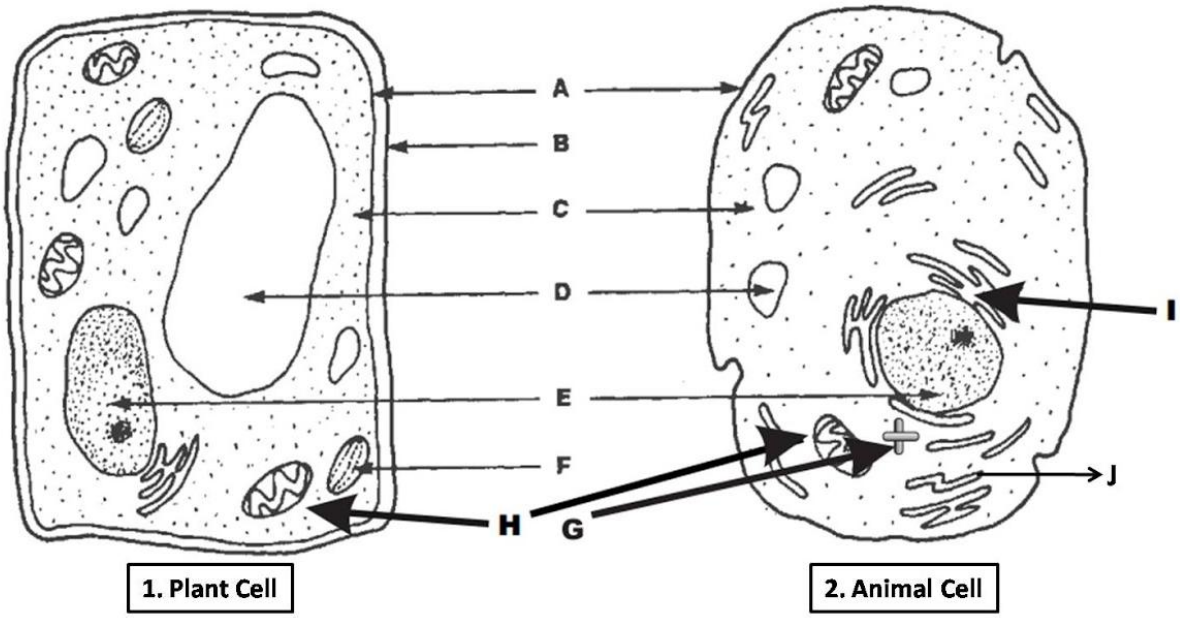
- Nucleus
- Nucleolus
- Smooth endoplasmic reticulum
- Rough endoplasmic reticulum
- Golgi apparatus
- Mitochondrion
- Chloroplast
- Cell membrane
- Cell wall
- Vacuole
- Ribosomes
- Centrioles
- Centrosomes
- Nuclear membrane
- Amyloplast

- Colour the nucleolus black
- Colour the cytoplasm of the nucleus yellow
- Colour the cytoplasm of the cell light blue
- Colour the Golgi apparatus pink
- Colour the mitochondria green
- Colour the chloroplasts purple
- Colour the smooth endoplasmic reticulum red
- Colour the rough endoplasmic reticulum brown
- Colour the vacuole orange
- Colour the amyloplasts grey

b) Research the structure and function of each part listed below

Organelle	Structure	Function
Plasma membrane		
Cytoplasm		
Nucleus		
Nucleolus		
Rough endoplasmic reticulum		
Smooth endoplasmic reticulum		
Golgi apparatus		
Vesicle		
Lysosome		
Ribosome		
Mitochondria		
Centrioles		
Cell wall		
Chloroplast		
Vacuole		
Tonoplast		
Amyloplast		
Plasmodesmata		
Pit		

3. Use the diagram to compare plant and animal cells.



Complete the table below to show similarities and differences between them

A _____ F _____

B_____ G _____

C_____ H _____

D_____ I _____

E_____ J _____

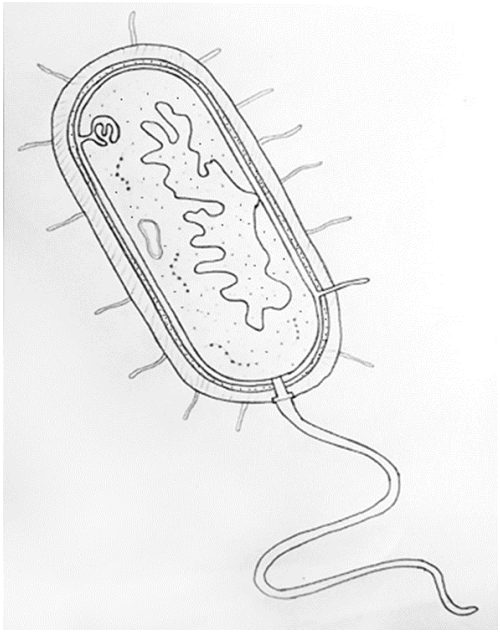
Similarities	
Differences	
Animal cells	Plant cells

4. Find out about prokaryotic cells

http://astarbiology.com/ib/1-2-prokaryotic-cells/

a) Label this diagram

.

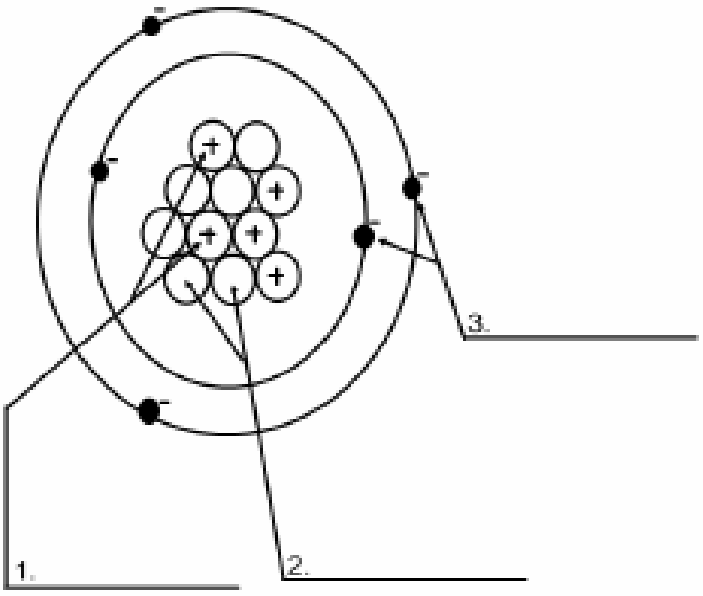


b) Research the structure and function of each part listed below

Organelle	Structure	Function
Cell wall		
Capsule		
Ribosomes		
Nucleoid		
Plasmid		
Cell wall		

Tasks: Chemistry

Label the parts of an atom below and answers the questions



4. What type of charge does a proton have?

5. What type of charge does a neutron have?

6. What type of charge does an electron have?

7. Which two subatomic particles are located in the nucleus of an atom?

8. If an atom has 35 protons in the nucleus, how many electrons will it have orbiting the nucleus?

9. What is the atomic number of the atom in the diagram above?

10. What is the atomic mass/mass number of the atom in the diagram above?

11. How many protons are in the nucleus of an atom with an atomic number of 15?

12. How many electrons are in the nucleus of an atom with an atomic number of 20?

13. How many neutrons are in the nucleus of an atom with an atomic number of 25? (use Periodic Table for mass)

14. What is the mass number of an atom with 3 protons, 4 neutrons, and 3 electrons?

15. How many neutrons are in the nucleus of an atom that has an atomic mass of 36 and an atomic number of 25?

2. Describe the difference between the plum pudding model of the atom and the nuclear model of the atom developed by Rutherford and Marsden. Include a diagram of each model.

Plum pudding model of the atom

Nuclear model of the atom

3. Electron arrangements of atoms

Using the periodic table to help you, complete the electron configurations of the first 20 elements

n	Shell	Number of electrons
1	1st shell	2
2	2nd shell	8
3	3rd shell	18
4	4th shell	32

You can find the total number of electrons in an atom by using the **atomic number**. This is defined as the **number of protons** in an atom, but for a neutral atom also equals the number of electrons.

Hydrogen H	Helium He	Lithium Li	Beryllium
Boron B	Carbon C	Nitrogen N	Oxygen O
Fluorine F	Neon Ne	Sodium Na	Magnesium Mg
Aluminium Al	Silicon Si	Phosphorus P	Sulphur S
Chlorine Cl	Argon Ar	Potassium K	Calcium

4. Bonding

Ionic bonding . https://www.bbc.co.uk/bitesize/guides/zyydng8/revision/1

1. What is an ion? How are they formed?

2. Describe in words the bonding between magnesium and oxygen and the charge on the ions formed.

Covalent bonding https://www.bbc.co.uk/bitesize/guides/zcpjfcw/revision/1

1. What is the difference between an ionic bond and a covalent bond?

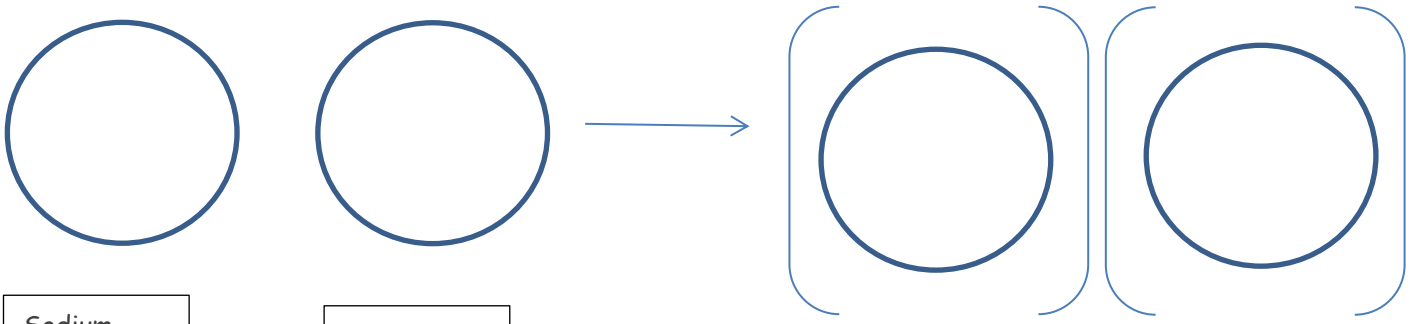
2. Why do atoms share electrons?

3. Which group of the periodic table do atoms 'try to be like'? How would you describe the atoms of elements in this group?

4. Draw the bonding, using dot and cross diagrams, for a molecule of chlorine.

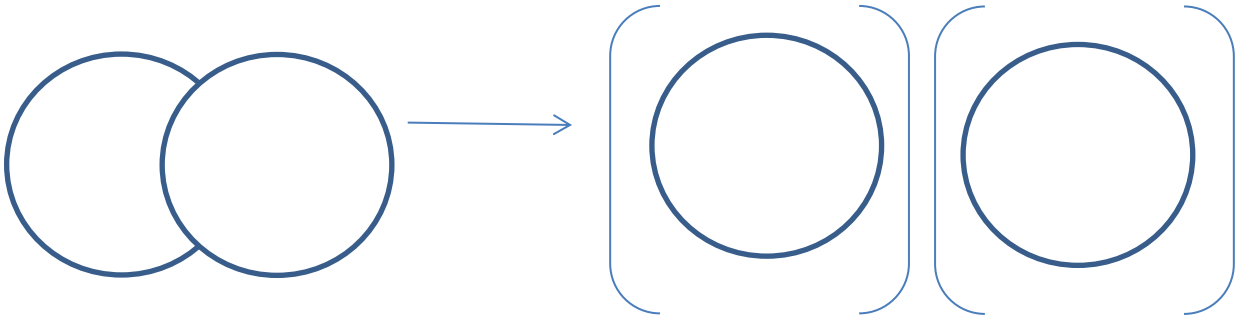
Ionic bonding: Complete the diagrams to show the electrons in each atom charge on the ions they form.

https://www.bbc.co.uk/bitesize/guides/zyydng8/revision/1



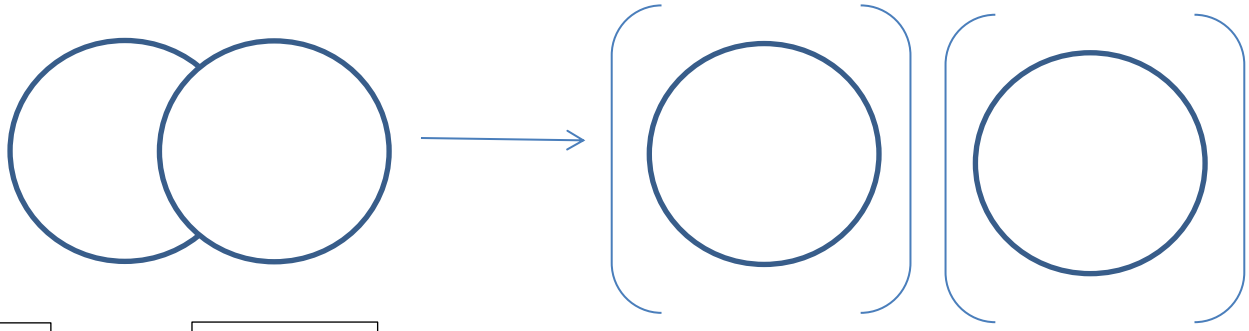
Sodium

Chlorine



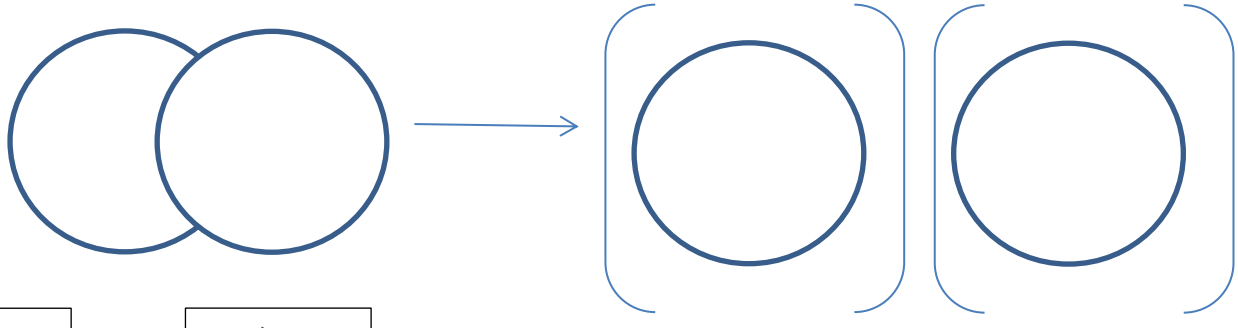
Potassium

Chlorine



Calcium

Oxide



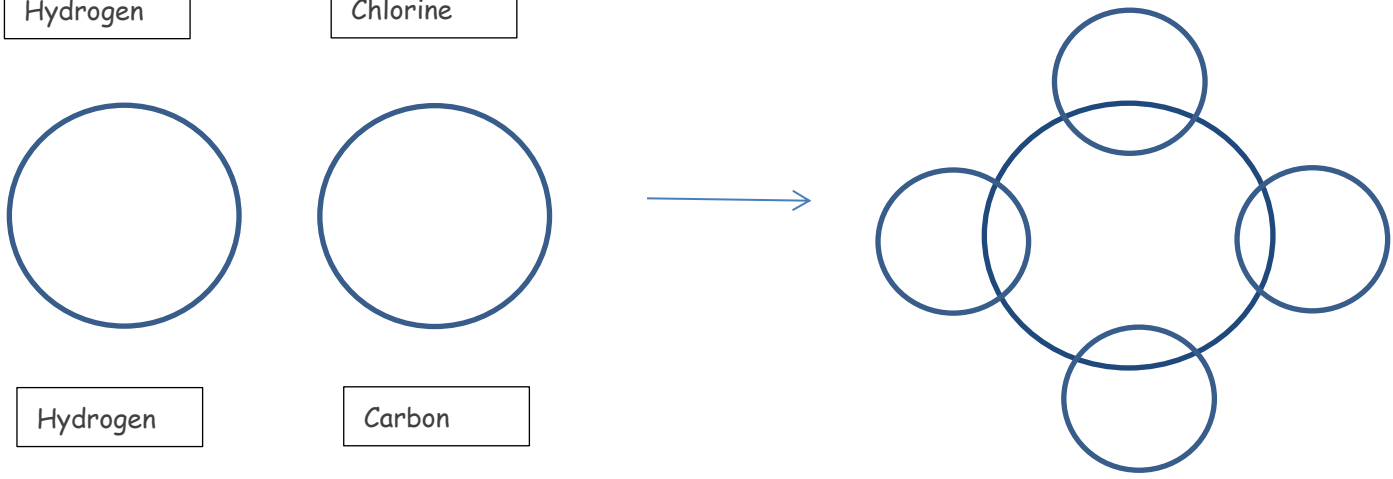
Magnesium

Oxide

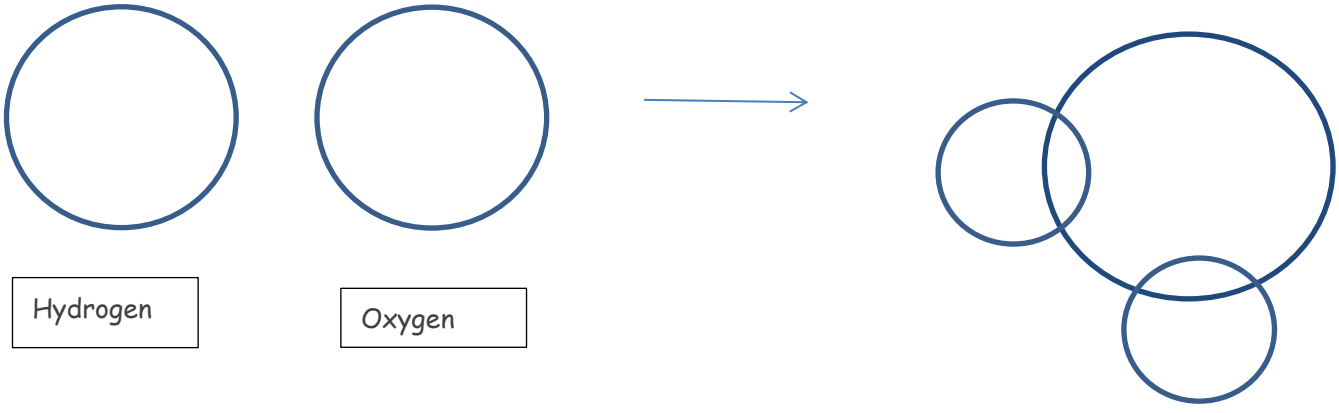
Covalent bonding: Complete the diagrams to show the electrons in each atom and in the covalent molecule they form. https://www.bbc.co.uk/bitesize/guides/zcpjfcw/revision/1

Hydrogen Hydrogen

Hydrogen Chlorine



Hydrogen Carbon



Hydrogen Oxygen

Tasks: Physics

1. Wave definitions
https://a-levelphysicstutor.com/wav-wave-props.php
https://www.bbc.co.uk/bitesize/topics/zcwkgdm

What is a wave?

Find definitions for the following:

Wavelength

Amplitude

Period

Frequency

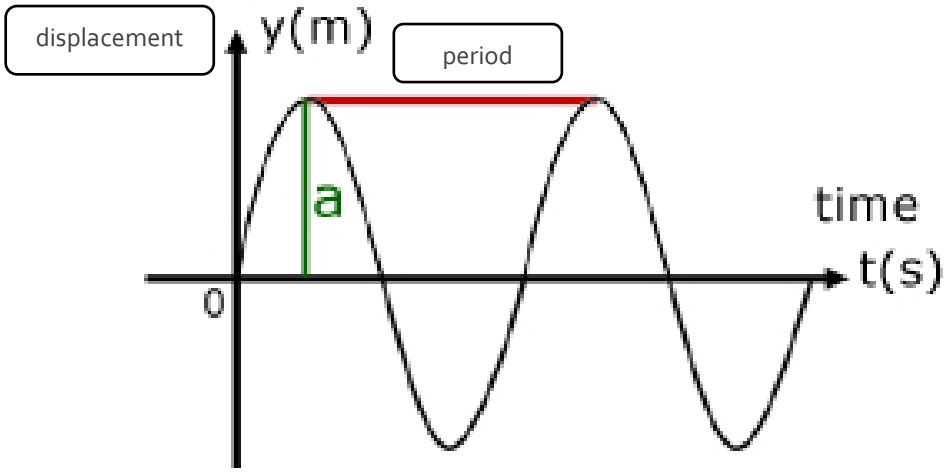
Rest position

Displacement

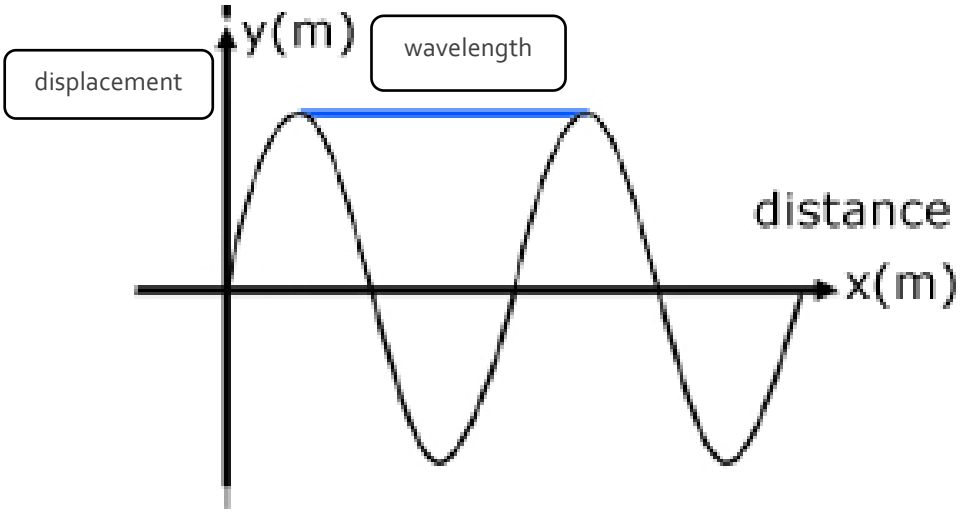
2. Period and frequency

On a displacement-time graph of a wave, period can be found by noting the time taken for one complete wave.

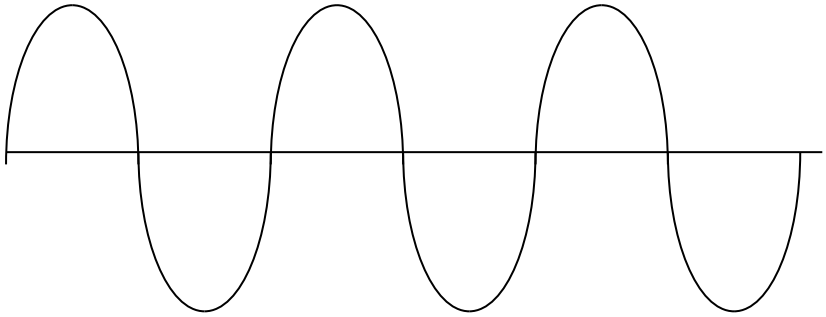
Amplitude can be read from the maximum height reached on the y-axis

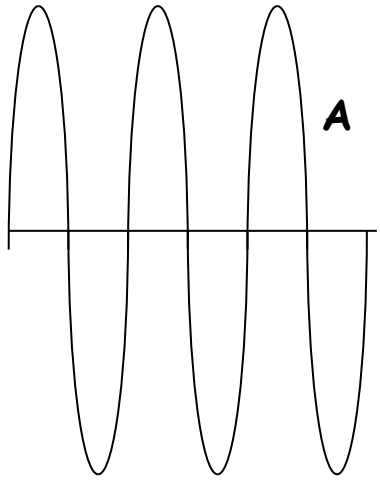


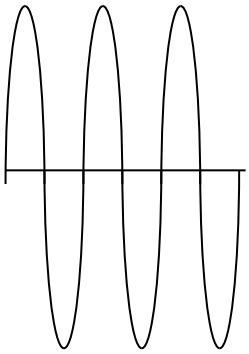
On a displacement-distance graph of a wave, wavelength can be found by noting the distance for one complete wave

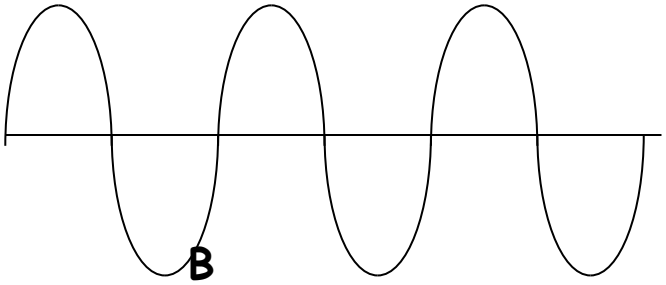


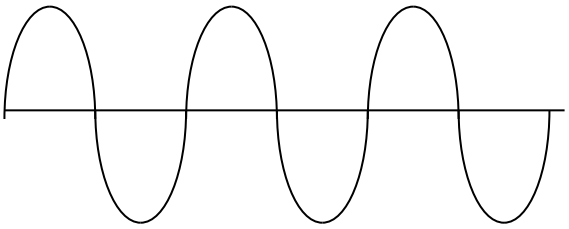
Label the amplitude and wavelength for each of the waves below. Once you have done this, answers the questions at the bottom of the worksheet in your book.

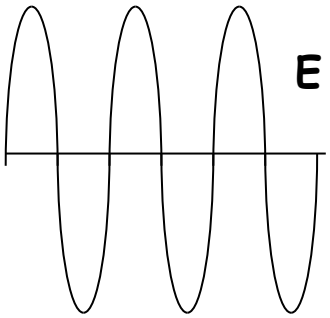












Which of the above waves has:
The highest frequency?
The shortest wavelength?
The largest amplitude?
The longest wavelength?

The lowest pitch?
The loudest intensity?
The smallest amplitude?

3. Transverse and longitudinal waves

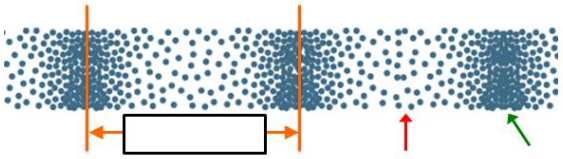
https://www.bbc.co.uk/bitesize/guides/z9bw6yc/revision/1

Find a definition for these two types of waves:

Transverse waves

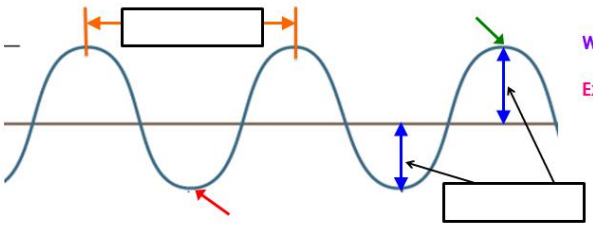
Longitudinal waves

Label and name these waves



Wave Name:

Examples:



Wave Name:

Examples:

Light (electromagnetic waves)

Sound

Compare light and sound waves – examples of criteria you could compare: transverse or longitudinal, needs a medium?, speed, frequency, uses

4. Using the wave formula: wave speed, frequency and wavelength

$$v = f \times \lambda$$

***v* speed** (metres per second, m/s)

λ wavelength (metres, m)

***f* frequency** (hertz, Hz)

$$f = v \div \lambda$$

$$\lambda = v \div f$$

Worked example:

Q: A sound wave of frequency 220 Hz travels at a speed of 340 m/s in air. What is its wavelength?

A: Wavelength, λ = v ÷ f = 340 ÷ 220 = ***1.55 m***

Prefix	Symbol	Power
atto	a	10^{-18}
femto	f	10^{-15}
pico	p	10^{-12}
nano	n	10^{-9}
micro	μ	10^{-6}
milli	m	10^{-3}
kilo	k	10^{3}
mega	M	10^{6}
giga	G	10^{9}
tera	T	10^{12}

1. Calculate the **wave speed** (in m/s) for the following waves:

a) A sound wave in steel with a frequency of 500 Hz and a wavelength of 3.0 metres.

b) a ripple on a pond with a frequency of 2 Hz and a wavelength of 0.4 metres.

c) A radio wave with a wavelength of 30 m and a frequency of 10,000,000 hertz.

2. Calculate the **wavelength** (in metres) for the following waves:

a) A wave on a slinky spring with a frequency of 2 Hz travelling at 3 m/s.

b) An ultrasound wave with a frequency 40,000 Hz travelling at 1450 m/s in fatty tissue.

c) A sound wave with frequency 440 Hz travelling at 340 metres per second in air.

3. Calculate the **frequency** (in Hz) for the following waves:

a) A sound wave of wavelength 10 metres travelling at 340 metres per second in air.

b) A wave on the sea with a speed of 8 m/s and a wavelength of 20 metres.

c) A microwave of wavelength 0.15 metres travelling through space at 300,000,000 m/s.

Glossary

Command verb	Explanation of what you have to do
Analyse	Explore the main ideas of the subject. Explain the importance of each idea and how they are related.
Assess	Give your judgement on the importance of something.
Compare/Contrast	Explain the similarities and the differences between the two or more subject matters.
Conclude	After having written about a topic give a reasoned judgement stating what your overall opinion is.
Critically analyse	Give your opinion of the subject of interest – consider all of the evidence and then write about both the advantages and disadvantages
Demonstrate	Give a number of related examples or details from a variety of sources to support the argument you are making. In a practical situation, this means that you must practically carry out the activity/skill while being observed
Describe	**Give a detailed account of something**
Discuss	Examine the advantages and disadvantages of the subject of interest and then try to complete the discussion with a conclusion.
Distinguish	Explain the differences
Evaluate	Give evidence to support the good and bad points of the topic and then give your opinion based upon the evidence.
Examine	Inspect something closely
Explain	**Give a detailed account to give the meaning of something with reasons. Include the 'how' and 'why' of the topic of interest**
Identify	Point out (choose the right one), give a list of the main features.
Illustrate	This usually means that you should draw or use images to help answer the question.
Interpret	Explain the meaning of something by giving examples, diagrams and/or opinions
Justify	Give supported reasons for your view to explain how you have arrived at these conclusions
List	Bullet points of information or a record that includes an item-by-item account of relevant information
Outline	A brief description of something that really only looks at the main topic or item

The most common BTEC verbs are

PASS – describe

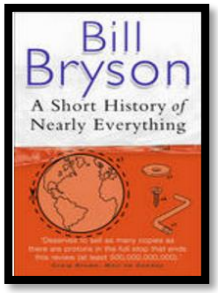
MERIT - explain

DISTINCTION - analyse.

Additional Reading

Below is a selection of books that should appeal to a scientist looking for science in everyday life!

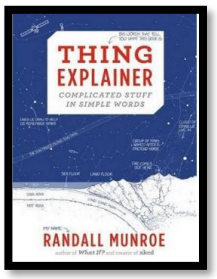
1. **A Short History of Nearly Everything**



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

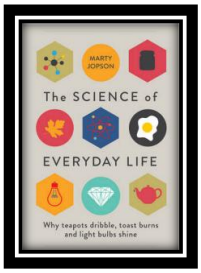
2. **Thing Explainer: Complicated Stuff in Simple Words**



ISBN – 1408802384 - This final recommendation is a bit of a wild-card – a book of illustrated cartoon diagrams that should appeal to the scientific side of everyone. Written by the creator of online comic XTCD (a great source of science humour) is a book of blueprints from everyday objects such as a biro to the Saturn V rocket and an atom bomb, each one meticulously explained BUT only with the most common 1000 words in the English Language. This would be an excellent coffee table book in the home of every scientist.

https://www.waterstones.com/book/thing-explainer/randall-munroe/9781473620919

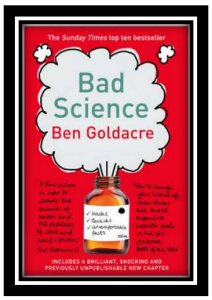
3. **The Science of Everyday Life: Why Teapots Dribble, Toast Burns and Light Bulbs Shine (Hardback) Marty Jopson**



ISBN-10: 1782434186 http://bit.ly/pixlchembook2

The title says it all really, lots of interesting stuff about the things around you home!

4. **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'.

Online Clips / Series

1. **Shock and Awe, The Story of Electricity –** A 3 part BBC documentary that is essential viewing if you want to see how our lives have been transformed by the ideas of a few great scientists a little over 100 years ago. The link below takes you to a stream of all three parts joined together but it is best watched in hourly instalments. Don't forget to boo when you see Edison. (alternatively watch any Horizon documentary – loads of choice on Netflix and the I-Player)

   https://www.youtube.com/watch?v=Gtp51eZkwoI

2. **NASA TV –** Online coverage of launches, missions, testing and the ISS. Plenty of clips and links to explore to find out more about applications of Physics in Space technology.

   http://www.nasa.gov/multimedia/nasatv/

Online Journals/Podcasts

1. https://www.livescience.com/ - For the science geek in everyone, Live Science breaks down the stories behind the most interesting news and photos on the Internet, while also digging up fascinating discoveries that hit on a broad range of fields, from dinosaurs and archaeology to wacky physics and astronomy to health and human behavior. If you want to learn something interesting every day, Live Science is the place for you.

2. https://www.nursingtimes.net/careers/your-nursing-career/listen-to-the-navigating-nursing-podcast-03-03-2022/ - for those considering a career in nursing or similar caring profession. You will hear from nurses working across all fields and in a variety of jobs, discussing their current roles, educational achievements and their careers to date – while sharing their plans for the future.

3. https://open.spotify.com/show/6GMjF5TBywEJ2jdkkWY4Tf - The College of Paramedics presents a new series of podcasts bringing news, interviews, discussion and up to date analysis from around the world of paramedic practice.

4. https://engineeringmatters.reby.media/ - Engineering Matters celebrates the work of engineers who use ingenuity, practicality, science, theory and determination to build a better world.

Additional Reading Log:

Additional Reading Title	Dates?	Points of interest	How does it link to the course?

Supporting Resources

Khan Academy
A much-loved resource for a multitude of subjects, Khan Academy offers detailed insight into a whole host of science topics as well as providing free access to articles, exercises, and videos for you to browse through.
Although they don't offer exam board specific resources, Khan Academy offers students a comprehensive guide to the fundamentals of biology that form part of your Applied Science course.

https://www.khanacademy.org/

Get Revising
Get Revising offers a series of revision tools including downloadable revision guides, and study planners. Use this site to find everything from past papers and insightful mind maps to downloadable documents, presentations and revision notes. As notes are uploaded by past and current students, be sure to look out for teacher recommended resources and positive teacher comments to ensure you are learning from the correct information.

https://getrevising.co.uk/

S-cool
S-cool is a free provider of educational resources. Simply select your level of study and area you want to focus on and S-Cool will present you with a topic breakdown for you to scroll through and take notes from. For additional learning resources, like past papers and revision summaries, S-cool does require you to sign up but don't worry, it's totally free!

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Physics & Maths Tutor
Despite the name this site has tons of excellent resources and allows you to get straight to the materials that matter to you.

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