



BTEC Level 3 Extended Certificate in Applied Science

Transition Handbook

Name:

Booklet Contents

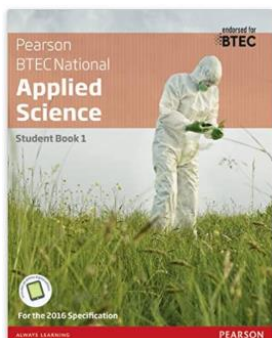
- **Introduction**
- **Useful resources**
- **Summer Viewing Suggestions**
- **Compulsory Tasks (these will be collected in September)**

What is the Level 3 BTEC Applied Science course like?

Our Science course allows you to study biology, chemistry and physics to prepare as professionals of the future for university and employment. You will learn how to apply science in a range of different situations in our laboratories.

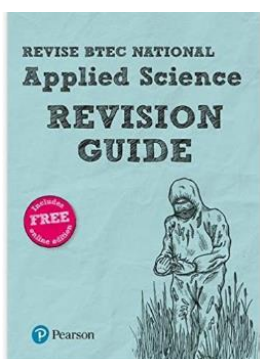
Useful Resources

Course textbooks – It is not a requirement for you to purchase these books, however we do highly recommend the Revision guide as it will prove to be a very useful tool for you throughout the course.



BTEC National Applied Science Student Book 1 (BTEC Nationals Applied Science 2016)

Amazon Link:



BTEC National Applied Science Revision Guide: (with free online edition)

Amazon Link:



Website links – It could be a good use of your time to have a look through some of the information on the websites below. It will give you an idea about how the course is structured and what content you can expect to cover.

Pearson Exam Board Website:



Subject content You Tube Links:

Biology



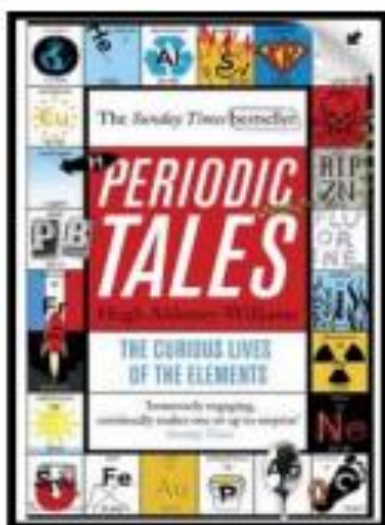
Chemistry



Physics



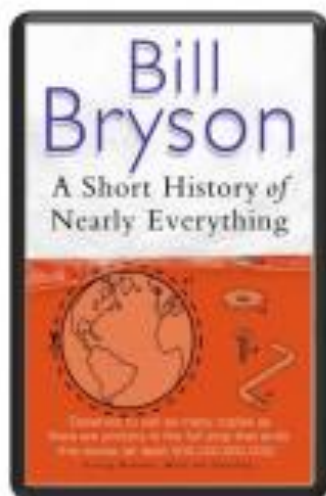
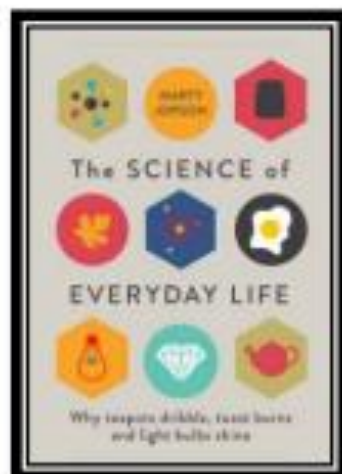
Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of Chemistry.



Periodic Tales: The Curious Lives of the Elements

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

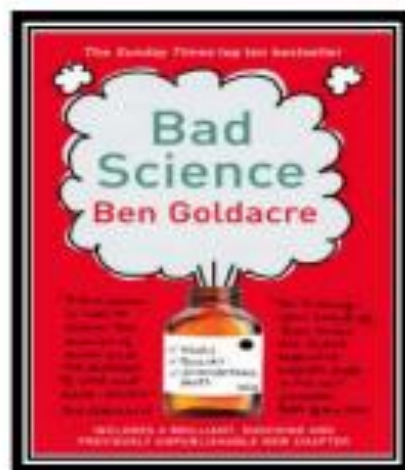
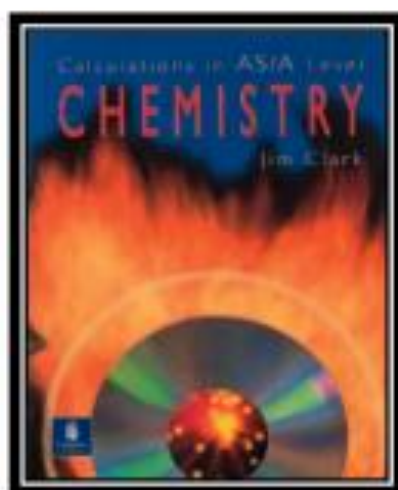


A Short History of Nearly Everything

A whistle-stop tour through many aspects of history from the Big Bang to now. This is a really accessible read that will re-familiarise you with common concepts and introduce you to some of the more colourful characters from the history of science! Available at amazon.co.uk

Calculations in AS/A Level Chemistry

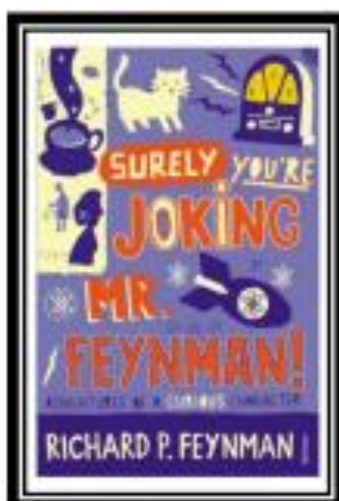
If you struggle with the calculations side of chemistry, this is the book for you. Covers all the possible calculations you are ever likely to come across. Brought to you by the same guy who wrote the excellent chemguide.co.uk website.



Bad Science

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'.

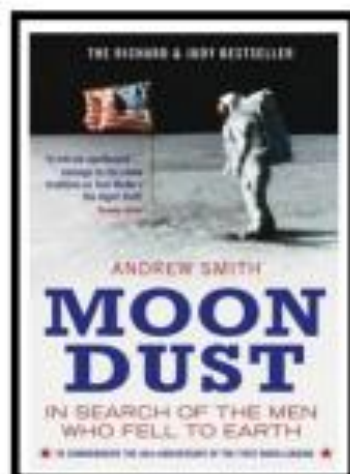
Kick back this summer with a good read. The books below are all popular science books and great for extending your understanding of Physics.



Surely You're Joking Mr Feynman: Adventures of a Curious Character
Richard Feynman was a Nobel Prize winning Physicist. In my opinion he epitomises what a Physicist is. By reading this books you will get insight into his life's work including the creation of the first atomic bomb and his bongo playing adventures and his work in the field of particle physics.

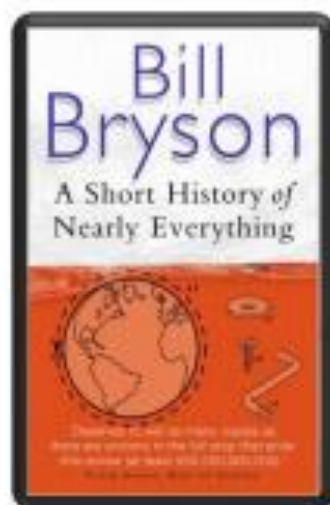
Moon dust: In Search of the Men Who Fell to Earth

One of the greatest scientific achievements of all time was putting mankind on the surface of the moon. Only 12 men made the trip to the surface, at the time of writing the book only 9 are still with us. The book does an excellent job of using the personal accounts of the 9 remaining astronauts and many others involved in the space program.



A Short History of Nearly Everything

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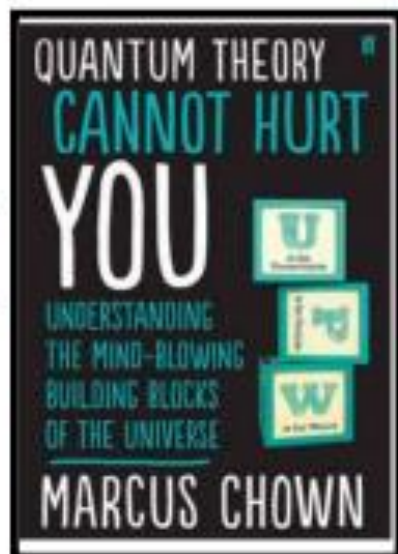


An easy read..
Thing Explainer: Complicated Stuff in Simple Words

This final recommendation is a bit of a wildcard – 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.

Quantum Theory Cannot Hurt You: Understanding the Mind-Blowing Building Blocks of the Universe

Any Physics book by Marcus Chown is an excellent insight into some of the more exotic areas of Physics that require no prior knowledge. In your first year of A-Level study you will meet the quantum world for the first time. This book will fill you with interesting facts and handy analogies to whip out to impress your peers!



Interesting Viewing

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. Use the link or scan the QR code to view:

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/maria_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_atalla_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.

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. Use the link or scan the QR code to view:

Rough science – the Open University – 34 episodes available

Real scientists are 'stranded' on an island and are given scientific problems to solve using only what they can find on the island. Great fun if you like to see how science is used in solving problems. There are six series in total
<http://bit.ly/pixlchemvid1a>
<http://bit.ly/pixlchemvid1b>



A thread of quicksilver – The Open University

A brilliant history of the most mysterious of elements – mercury. This program shows you how a single substance led to empires and war, as well as showing you come of the cooler properties of mercury.
<https://youtu.be/MBggDg8iGM>

Why Doctors Don't Know About the Drugs They Prescribe

Available at : 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.

http://www.ted.com/talks/ben_goldacre_what_doctors_don_t_know_about_the_drugs_they_prescribe?language=en



10 weird and wonderful chemical reactions

10 good demonstration reactions, can you work out the chemistry of any... of them?

<https://www.youtube.com/watch?v=0Rt6RP2ANI>

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. Use the link or scan the QR code to view:

Shock and Awe, The Story of Electricity

In this three-part documentary physicist and science communicator Jim Al-Khalili takes the viewer on a journey exploring the most important historical developments in electricity and magnetism. This documentary discusses how the physics and the people behind the physics changed the world forever.

<https://youtu.be/Gtp51eZkw0I>



Brian Cox Life Of A Universe

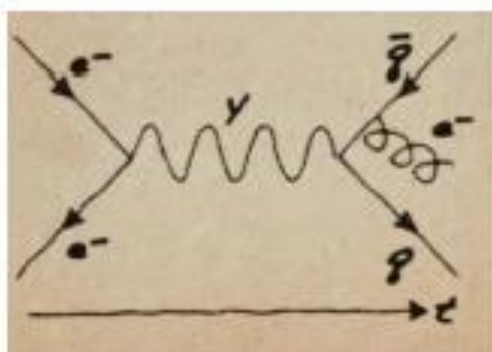
Professor Brian Cox tells the biggest story of them all. Inspired by the night sky as he travels, Brian reveals our very latest understanding about how the Universe began and how it will end.

<https://youtu.be/udefAsZem98>

The Fantastic Mr Feynman

Richard Feynman is one of the most iconic, influential and inspiring scientists of the 20th century. He helped design the atomic bomb, solved the mystery of the Challenger Shuttle catastrophe and won a Nobel Prize. This is the story of the most captivating communicator in the history of science

<https://youtu.be/LyqleixXTpw>



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.

Task 1: Report Writing

Some of the units that you will study in the BTEC Level 3 Applied Science course are assignment based. This means that you will need to produce a number of reports that require you to demonstrate the skills of research, extracting relevant information from internet sites and books/journals, and presenting information in a clear, concise way that avoids plagiarism (copying and pasting).

Your Task

Prepare a 250-word report based on one of the following topics:

Biology

- The history of the microscope
- The differences between light and electron microscopes
- Specialised cells

Chemistry

- The history of the periodic table
- The alkali metals
- The halogens

Physics

- The Electromagnetic spectrum
- Uses of fibre optic cables
- Transverse and longitudinal waves

You will research the topic, and produce the report using information from a range of resources.

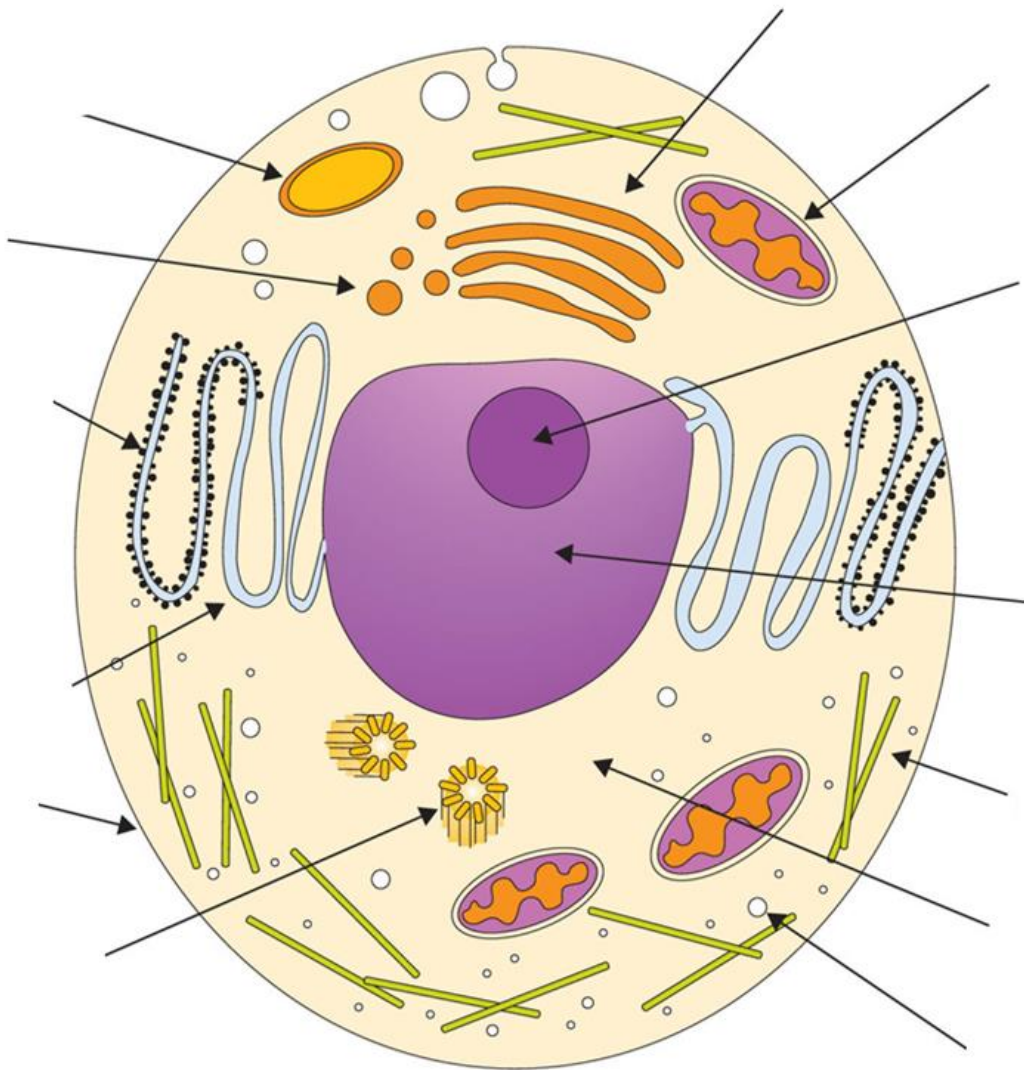
This will show your ability to work independently and that you can produce work to a post 16 standard.

Task 2 – Biology Cell Structure and Function

Watch the video from the link below

<https://www.youtube.com/watch?v=cj8dDTHGJBY>

Q1. Use the information in the video link to help you label the Eukaryotic cell below;










Q2. Complete the table listing all the 13 parts of the cell (organelles), adding a description of the structure, and stating its function.

Organelle	Description of Structure	Function

Q3. There are many examples of specialised cells. These are cells that are adapted to be able to effectively carry out a specific function.

Complete the blanks in the table below to identify the functions of the specialised cells.

Picture	Plant/Animal?	Function (it's job) & features
<p>Red blood cell</p> 		<p>Contains haemoglobin to carry oxygen to the cells.</p>
<p>Sperm cell</p> 		
<p>Egg cell</p> 		
<p>Nerve cell</p> 		
<p>Epithelial cell</p>		
<p>Root hair cell</p> 		
<p>Palisade cell</p> 		<p>These cells are packed with...</p>
<p>White blood cell</p> 		

Task 3 – Chemistry Atomic Structure

Q1. Define the following terms:

Atom:

Ion:

Compound:

Mixture:

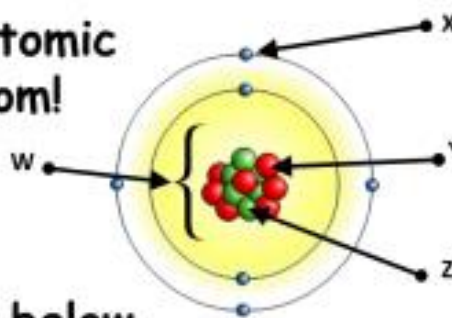
Molecule:

Identify which are elements, compounds or molecules:

O₂, Na, CO₂, K, Ca, H₂, H₂O, CH₄, Cl₂

Q2.

1: Label the sub-atomic particles on the atom!



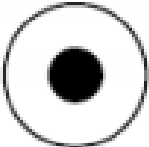
2: Copy and complete the table below.

Particle	Relative Mass	Relative Charge
Proton		
Neutron		
Electron		

Q3.

Atoms are the basic building blocks of matter. They are not the smallest of particles, and within Chemistry, we are interested in the sub-atomic particles especially the **electron**.

Using a periodic table, draw the **electronic configuration**, as well as identifying **how many sub-atomic particles** there are for the following atoms and its corresponding ions:

<p>Hydrogen</p>  <p>Number of: p: e: n:</p>	<p>Nitrogen</p> <p>Number of: p: e: n:</p>	<p>Calcium</p> <p>Number of: p: e: n:</p>
<p>Hydrogen ion, H⁺</p> <p>Charge:</p> <p>Number of: p: e: n:</p>	<p>Nitrogen ion</p> <p>Charge:</p> <p>Number of: p: e: n:</p>	<p>Calcium ion</p> <p>Charge:</p> <p>Number of: p: e: n:</p>

*Don't forget brackets for ions

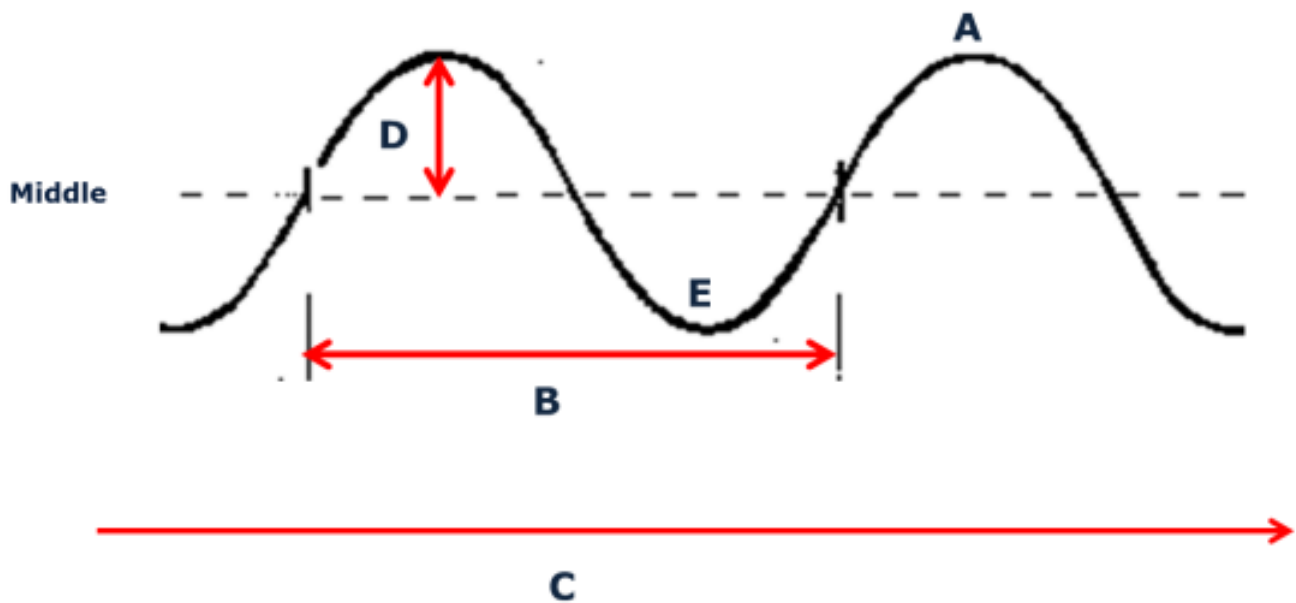
Task 4 – Physics Waves

Q1.

A transverse wave has five key terms you need to know and be able to label on a diagram.

1. **Wavelength** – This is the distance of one complete wave.
2. **Wave direction** – This is the direction the wave is travelling.
3. **Peak** – The top of the wave.
4. **Trough** – The lowest part of the wave.
5. **Amplitude** – The height of the peak, or the depth of the trough from the middle.

Task: Label the main features of a wave below on the diagram.



Q2.

Waves may be longitudinal or transverse.

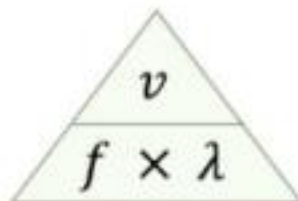
Describe the differences between longitudinal waves and transverse waves.

(3)

Name **one** type of wave that may be either transverse or longitudinal.

.....
(1 mark)

Q3.



v = velocity
f = frequency
 λ = wavelength

Rearrange the following:

v =

f =

λ =

What are the units for each symbol?

Q4. Wave Equation Calculations

Basics - Substitute values

- 1 Use wave speed = frequency \times wavelength to calculate wave speed for:
- (a) frequency = 20 Hz wavelength = 4.0 m
 - (b) frequency = 0.040 Hz wavelength = 30 m
 - (c) frequency = 1200 Hz wavelength = 0.8 m

Pass - Rearrange equation and substitute

- 2 Calculate the missing values.
- (a) frequency = 500 Hz **wavelength = ?** wave speed = 120 m/s
 - (b) **frequency = ?** wavelength = 60 m wave speed = 3000 m/s
 - (c) frequency = 240 Hz wavelength = 0.25 m **wave speed = ?**
 - (d) frequency = 0.40 Hz **wavelength = ?** wave speed = 35 m/s
 - (e) frequency = 70 Hz wavelength = 2.2 m **wave speed = ?**
 - (f) **frequency = ?** wavelength = 1.4 m wave speed = 560 m/s

Merit - Rearrange and/or convert units

- 3 In water, sound travels at a speed of 1.5 km/s. Calculate the wavelength of an underwater sound wave of frequency 440 Hz.
- 4 A wave on a slinky has wavelength of 80 cm and travels at a speed of 1.8 m/s. Calculate its frequency.
- 5 An earthquake wave travels at a speed of 6.0 km/s and its wavelength is 5.0 km. Calculate the frequency of the wave.
- 6 Radio waves travel at a speed of 3.0×10^8 m/s. An FM radio station broadcasts using radio waves of frequency 97.7 MHz. Calculate the wavelength of these radio waves.
- 7 A tsunami wave travels at 0.22 km/s. Its frequency is 5.0×10^{-3} Hz. Calculate its wavelength.
- 8 An ultrasound wave is used for a pre-natal scan. It has frequency 20 MHz and wavelength 0.08 mm. Calculate the speed of the wave.