



**Level 3**  
**Applied Science**



**Year 11 Summer Transition**  
**Work**



## An Introduction to Applied Science

### What will I study on this course?

The table below outlines the different units you will study in this course over the two years. You will complete **three** Mandatory units, **one** Optional Unit.

<http://qualifications.pearson.com/en/qualifications/btec-nationals/appliedscience-2016.html#tab-1>

Unit (number and title)	Unit size (GLH)	Certificate (180 GLH)	Extended Certificate (360 GLH)
1 Principles and Applications of Science I	90	M	M
2 Practical Scientific Procedures and Techniques	90	M	M
3 Science Investigation Skills	120		M
4 Laboratory Techniques and their Application	90		
5 Principles and Applications of Science II	120		
6 Investigative Project	90		
7 Contemporary Issues in Science	120		
8 Physiology of Human Body Systems	60		O
9 Human Regulation and Reproduction	60		O
10 Biological Molecules and Metabolic Pathways	60		O
11 Genetics and Genetic Engineering	60		O
12 Diseases and Infections	60		O
13 Applications of Inorganic Chemistry	60		O
14 Applications of Organic Chemistry	60		O
15 Electrical Circuits and their Application	60		O
16 Astronomy and Space Science	60		O

## TASKS TO COMPLETE IN PREPARATION FOR YOUR COURSE

During the summer term and in preparation for your studies in year 12, we would like you to complete some tasks that will help you with some of the units we will study. You are to bring this completed work to your first Applied Science lesson in September.

These tasks will form the basis of your first lessons, as you will be discussing your work; it will also get you researching along with working to a deadline.

Your tasks cover elements of GCSE science you must be familiar with and understand if you are going to be successful on the Applied Science course. It is essential you research any areas you may feel unsure of e.g. use revision guides, YouTube clips, etc. so you start to become independent in your learning. It is essential you complete all the tasks and you may present the answers however you like. Expect to share or present your answers with others in the group.

## **Biology Task**

### **Comparing animal, plant and prokaryotic cells**

#### **1) Fill in the gaps**

It was once common practice to classify all living organisms as either animals or plants. With improved knowledge of living things it has become apparent that there are \_\_\_\_\_ fundamentally different types of cell. The most obvious difference between the two types is that one possesses a nucleus and the other does not.

The cells of animals, \_\_\_\_\_ and fungi contain many organelles some of which are bound by a membrane. These are referred to as \_\_\_\_\_ cells. The cells of bacteria are very different, they lack membrane bound organelles such as a \_\_\_\_\_. This type of cell is referred to as a \_\_\_\_\_ cell (meaning *before nucleus*). Prokaryotic cells are about 1000 to 10000 times smaller than eukaryotic cells and are much simpler in structure. Biologists believe eukaryotes evolved from \_\_\_\_\_.

2) Eukaryotic cells contain membrane bound organelles, give 5 examples:

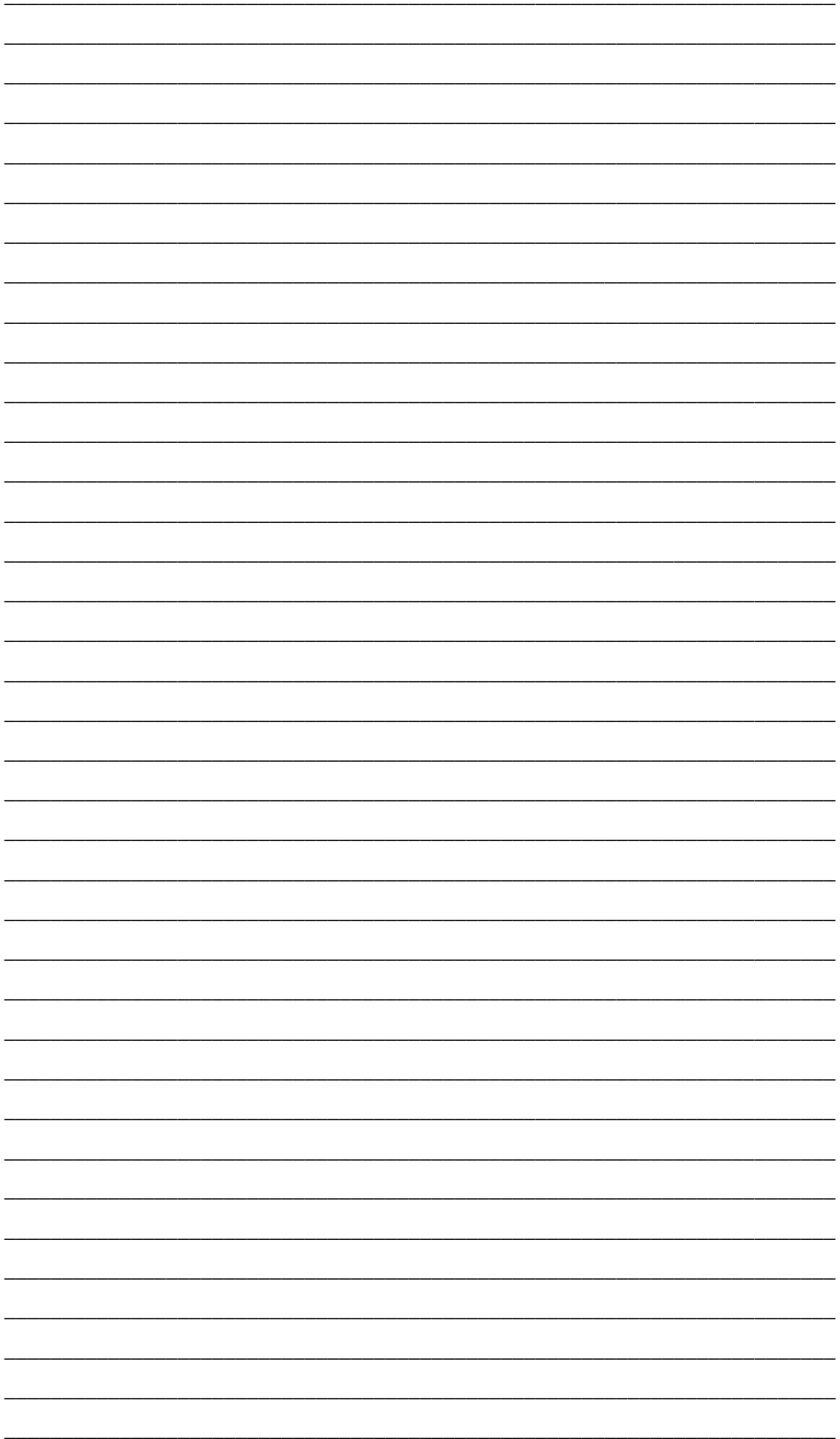
3) Prokaryotic cells have one membrane, where about is it?

4) Use table 1 to compare plant (eukaryote), animal (eukaryote) and prokaryotic cells. For each cell type indicate whether the feature is present or absent using a tick or cross.

<b>Feature</b>	<b>Plant cells</b>	<b>Animal cells</b>	<b>Prokaryote cells</b>
Chloroplasts			
Large permanent vacuole			
Cellulose cell wall			
Peptidoglycan (murein) cell wall			
Linear chromosome			
Circular chromosome			
Plasmids			
Endoplasmic Reticulum			
Golgi body			
DNA free in the cytoplasm			
ATP is produced in the mitochondria			
ATP is produced at infolded regions of the cell membrane called mesosomes			
Undulipodia contain 9 + 2 circular arrangement of microtubules			
Flagella made form spiral protein called Flagellin			
Ribosomes			
Cell membrane			

5) Give 2 ways in which prokaryotes are useful to humans





## Chemistry Task

### Chemical Bonding/ Formula

Q1a. Write the **electronic configurations** of following elements referring to a periodic table.

Potassium .....

Chlorine.....

Oxygen.....

Sulphur.....

Nitrogen.....

Phosphorus.....

<b>Valencies of Common Ions (Learn by heart)</b>			
<b>Positive Ions (cations)</b>		<b>Negative Ions (anions)</b>	
<b>Name</b>	<b>Formula</b>	<b>Name</b>	<b>Formula</b>
Hydrogen	H <sup>+</sup>	Chloride	Cl <sup>-</sup>
Sodium	Na <sup>+</sup>	Bromide	Br <sup>-</sup>
Silver	Ag <sup>+</sup>	Fluoride	F <sup>-</sup>
Potassium	K <sup>+</sup>	Iodide	I <sup>-</sup>
Lithium	Li <sup>+</sup>	Hydroxide	OH <sup>-</sup>
Ammonium	NH <sub>4</sub> <sup>+</sup>	Nitrate	NO <sub>3</sub> <sup>-</sup>
Barium	Ba <sup>2+</sup>	Oxide	O <sup>2-</sup>
Calcium	Ca <sup>2+</sup>	Sulphide	S <sup>2-</sup>
Copper(II)	Cu <sup>2+</sup>	Sulphate	SO <sub>4</sub> <sup>2-</sup>
Magnesium	Mg <sup>2+</sup>	Carbonate	CO <sub>3</sub> <sup>2-</sup>
Zinc	Zn <sup>2+</sup>	Hydrogencarbonate	HCO <sub>3</sub> <sup>-</sup>
Lead	Pb <sup>2+</sup>		
Iron(II)	Fe <sup>2+</sup>		
Iron(III)	Fe <sup>3+</sup>		
Aluminium	Al <sup>3+</sup>		

Q1 b Make flash cards or a revision resource to help you remember the common ions above.

Q2. Name the following *ionic* compounds using above table:

- 1)  $\text{PbF}_2$  \_\_\_\_\_
- 2)  $(\text{NH}_4)_2\text{CO}_3$  \_\_\_\_\_
- 3)  $\text{Li}_2\text{S}$  \_\_\_\_\_
- 4)  $\text{MgI}_2$  \_\_\_\_\_

Q3. Write the formulas for the following *ionic* compounds using above table:

- 6) sodium iodide \_\_\_\_\_
- 7) calcium oxide \_\_\_\_\_
- 8) aluminum chloride \_\_\_\_\_
- 9) potassium nitrate \_\_\_\_\_
- 10) calcium carbonate \_\_\_\_\_
- 11) lithium sulfate \_\_\_\_\_
- 12) beryllium phosphide \_\_\_\_\_
- 13) magnesium hydroxide \_\_\_\_\_
- 14) sodium phosphate \_\_\_\_\_
- 15) aluminum carbonate \_\_\_\_\_
- 16) calcium chloride \_\_\_\_\_
- 17) sodium cyanide \_\_\_\_\_
- 18) aluminum oxide \_\_\_\_\_
- 19) Lithium acetate \_\_\_\_\_
- 20) Silver chloride \_\_\_\_\_

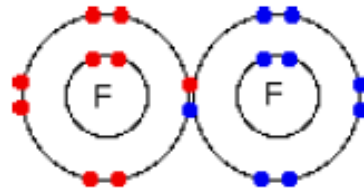
Q4. Write the names of the following *covalent* compounds:

- 21)  $\text{SO}_3$  \_\_\_\_\_
- 22)  $\text{N}_2\text{S}$  \_\_\_\_\_
- 23)  $\text{PH}_3$  \_\_\_\_\_
- 24)  $\text{BF}_3$  \_\_\_\_\_
- 25)  $\text{CO}$  \_\_\_\_\_
- 26)  $\text{SiO}_2$  \_\_\_\_\_
- 27)  $\text{NH}_3$  \_\_\_\_\_
- 28)  $\text{NO}_2$  \_\_\_\_\_



**Q5. Draw Electron Dot diagrams of (one example is shown)**

1)  $F_2$



2)  $H_2$

3)  $HCl$

4)  $H_2O$

5)  $NH_3$

Q6. An important compound used as fertilizer is Ammonium sulphate. It has both ionic and covalent bonding explain.

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.....  
.....  
.....

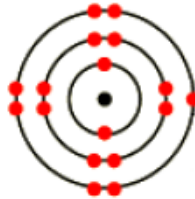
a) Write a reaction showing its formation from sulphuric acid.

.....  
.....

b) It is a solid at room temperature. Predict two other properties of this compound.

.....  
.....

Q7. The diagram below shows the electronic arrangement of an unknown substance.



(a) (i) How many protons would there be if the unknown substance was a neutral atom?

.....  
.....

(ii) What would the diagram represent if it was a neutral atom?

.....

(b)(i) How many protons would there be if the substance was a 2+ ion?

.....  
.....

(ii) What would the diagram represent if it was a 2+ ion?

(c) (i) In what group of the periodic table would the unknown substance be if the represented a 1+ ion?

.....

(ii) How many neutrons would the 1+ ion have if its relative atomic mass was 39?

.....

(d) (i) In what group of the periodic table would the unknown substance be if it represented a 1- ion?

.....

(ii) What would the relative atomic mass of the 1- ion be if it had 20 neutrons?

.....

Q8. If calcium is heated and put into a gas jar of chlorine a violent reaction takes place and solid calcium chloride is formed. The reaction proceeds due to the transfer of electrons.

(i) Use the electron arrangements and the idea of electron transfer to explain how the reaction between atoms of calcium and chlorine takes place in terms of bonding.(Draw diagram of product formed).

(ii) Write down the formulae of the ions that calcium and chlorine form during the reaction.

.....

(iii) Write down the formula of calcium chloride.

.....

(c) Calcium chloride is a solid at room temperature and has a high melting point. Explain why calcium chloride has a high melting point.

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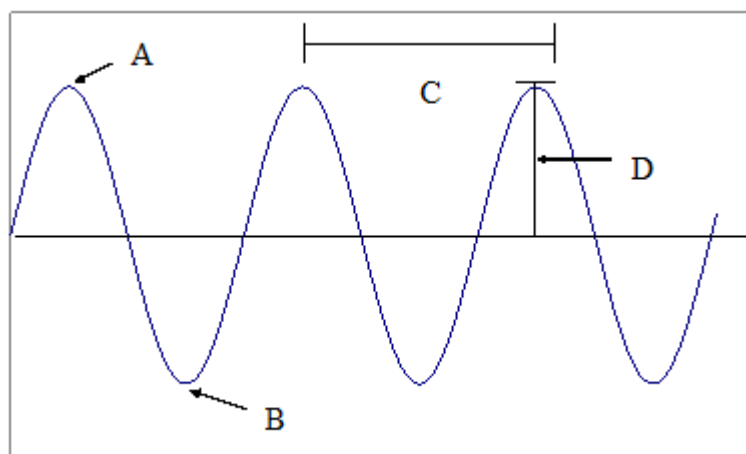
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## Physics Task

### Waves and Optics

1. Label the following diagram:



$$v = f\lambda$$

v = velocity  
f = frequency  
 $\lambda$  = wavelength

2. Explain the difference between a transverse and a longitudinal wave and give examples of each.

(4)

3. Water waves move a distance of 15 metres in 3 seconds. Calculate the wave speed. (2)
  
4. During a thunderstorm, a pupil notices that the sound of thunder came 15 seconds after they had seen the flash of lightning. The average speed of sound in air is 340 m/s. Calculate how far away from the storm the pupil is. (2)
  
5. A lighthouse sends out a flash of light and a burst of sound at the same time. The average speed of sound in air is 340 m/s. Calculate after how long the light is seen will an observer on the bridge of a ship 1.5 km away hear the sound. (2)
  
6. The wavelength of the radio waves transmitted by the Wyvis AM radio transmitter is 200 m. Calculate the frequency allocated to the Wyvis AM radio station in kHz. Assume the velocity of the wave is  $3 \times 10^8$  m/s. (2)
  
7. The frequency of the radio waves transmitted by BBC Radio 1 is 99.2 MHz and the wavelength of the radio waves is 3 m. Calculate the speed at which the radio waves travel. (2)
  
8. Moray Firth Radio broadcasts on a frequency of 97.4 MHz. Calculate the wavelength of the radio waves transmitted. Assume that speed of the wave is  $3 \times 10^8$  m/s. (2)
  
9. State, in order of increasing wavelength, the members of the electromagnetic spectrum. (7)

# Applied Science Reading List and Useful websites

## Resources/Research for Practical skills you will be studying

<https://www.creative-chemistry.org.uk/alevel/practical.htm>

<http://www.titrations.info/acid-base-titration>

[http://www2.hkedcity.net/sch\\_files/a/scg/scg-chem/visitor\\_cabinet/5324/N6lab\\_1.pdf](http://www2.hkedcity.net/sch_files/a/scg/scg-chem/visitor_cabinet/5324/N6lab_1.pdf)

<http://mccscience.yolasite.com/resources/EXP%204.2.pdf>

<http://www.rsc.org/learn-chemistry/resource/res00000697/titrating-sodium-hydroxide-with-hydrochloric-acid>

<http://www.sparknotes.com/chemistry/acidsbases/titrations/section1.rhtml>

<http://www.chemguide.co.uk/physical/acidbaseeqia/phcurves.html>

[https://chem.libretexts.org/Textbook\\_Maps/Analytical\\_Chemistry\\_Textbook\\_Maps/Map%3A\\_Analytical\\_Chemistry\\_2.0\\_\(Harvey\)/02\\_Basic\\_Tools\\_of\\_Analytical\\_Chemistry/2.5%3A\\_Preparing\\_Solutions](https://chem.libretexts.org/Textbook_Maps/Analytical_Chemistry_Textbook_Maps/Map%3A_Analytical_Chemistry_2.0_(Harvey)/02_Basic_Tools_of_Analytical_Chemistry/2.5%3A_Preparing_Solutions)

<https://www.sciencecompany.com/Preparing-Chemical-Solutions.aspx>

<http://www.virtlab.com/main.aspx>

<http://sciencing.com/use-colorimeter-5382170.html>

<http://www.ar.cc.mn.us/chemistry/chem1061/labs/beerslaw/beerslaw-07.htm>

<http://www.westminster.edu/about/community/sim/pdf/sdeterminingtheconcentrationofacopper.pdf>

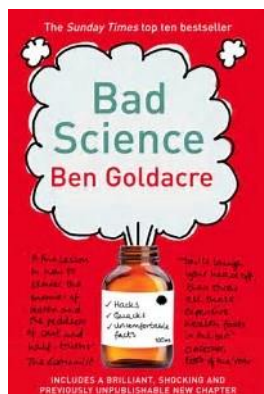
<https://www.britannica.com/science/colorimetry>

<http://www.rod.beavon.org.uk/brass.htm>

<http://www.docbrown.info/page07/appendixtrans09.htm>

[http://www.bbc.co.uk/schools/gcsebitesize/science/add\\_aqa/](http://www.bbc.co.uk/schools/gcsebitesize/science/add_aqa/)

## More Suggested Reading



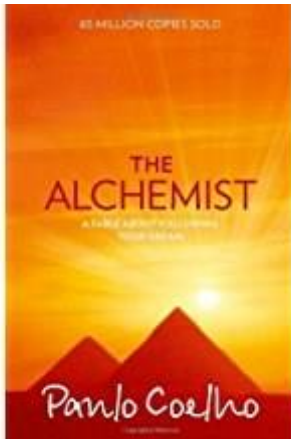
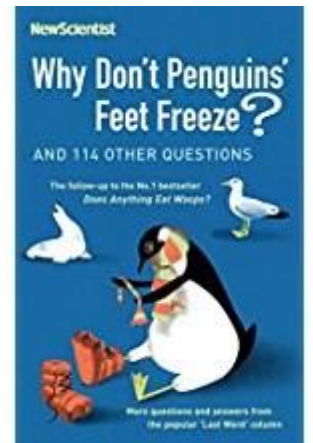
By Ben Goldacre

<http://bit.ly/pixlchembook3>

Here Ben Goldacre takes apart anyone who published bad or misleading science. This book will make you think about everything the advertising industry tries to sell you by making it sound 'scieny'.

By New Scientist

*Why Don't Penguins' Feet Freeze?* is the latest compilation of readers' answers to the questions in the 'Last Word' column of *New Scientist*, the world's best-selling science weekly.



By Paulo Coelho

Santiago, a young shepherd living in the hills of Andalusia, feels that there is more to life than his humble home and his flock. One day he finds the courage to follow his dreams into distant lands, each step galvanised by the knowledge that he is following the right path: his own. The people he meets along the way, the things he sees and the wisdom he learns are life-changing. With Paulo Coelho's visionary blend of spirituality, magical realism and folklore, *The Alchemist* is a story with the power to inspire nations and change people's lives.

## Start Studying for Applied Science Now!

### SENECA learning Task

Seneca is a great independent study resource that can help you get a head in your learning.

It is free to set up an account if you do not have one already.

If you click the link below then this will take you to the Year 11 Applied Science class.

<https://app.senecalearning.com/dashboard/join-class/d6p78gnxp0>

or follow the instructions below



To join nikki anderson's class: Year 11  
Applied Science

1. Go to the website:  
[app.senecalearning.com/join-class](http://app.senecalearning.com/join-class)
2. Sign up as a student
3. Type in the class code: **d6p78gnxp0**

Or scan the QR code with your phone



When you enter the class then I suggest you start with Unit 1 then Unit 2 as these are units you will start in year 12.



### You Tube Task

Also there are some great You tube channels you can watch which covers the Applied Science Curriculum.

Below is a link to you tube to help you with Unit 1 Applied Science

Unit 1 Videos Chemistry, Physics and Biology

<https://www.youtube.com/playlist?list=PLsz05IRkJmFqZiQfTfRhgzCkKWzoemArQ>

**Task : Why not make some study notes on each of the you tube clips**

Happy Studying

The Applied Science Team.

Further information about this subject then contact  
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