



## Summer Preparation Work

Chemistry is a central science and impacts on all areas of our lives. All of the materials used by engineers and technologists are made by chemical reactions and we all experience chemical reactions continuously, whether it be doing the washing or cooking, driving a car or listening to an iPod, or even just breathing!

Chemistry is an essential subject if you intend to have a career in medicine, dentistry, pharmacy, physiotherapy, and veterinary science. It also supports other science subjects such as biology and physics. However, chemistry is so important that it is useful for nursing, fire-fighting, plumbing, hairdressing, truck driving, paint and decorating to name but a few. Chemistry is a facilitating subject which means that the problem solving and analytical skills used in chemistry are valuable and transferrable and can enable you to move onto other seemingly unconnected careers such as accountancy or law.

**Please be aware that prep work** is an important aspect of your induction onto all courses at Wilberforce Sixth Form College. Please have this ready to hand in during enrolment or to your course teacher in the first week of lessons.

Kind regards

Ashley Howe  
**Faculty Head for STEM**

### Task 1 - Research

The shapes of molecules are very important factors to know about as they influence how molecules behave. Carry out a general search on the importance of the shapes of molecules and why this information might be useful to other scientists besides chemists such as biologists or pharmacologists

The link given below is to a free open access molecular modelling website. Here, you are able to type in the names of molecules that you are interested in and see the 2D and 3D-structures of them. You are also able to rotate the 3D models by clicking on them and rotating them in any direction.

<http://molview.org>

## Task 2 - Create

### Warm-up

Saturated hydrocarbons with the general molecular formula  $C_nH_{2n+2}$  are called alkanes. Each carbon atom in an alkane is bonded to four other atoms. Each hydrogen atom is bonded to one other atom.

- Draw out the structural formulae for the first two members of the alkane series, methane ( $CH_4$ ) and ethane ( $C_2H_6$ ). Representing these structures in a two-dimensional way on paper can give a misleading picture of what the molecules look like. Make models of the methane and ethane molecules or search for them on <http://molview.org>. The covalent bonds are spaced as far apart as possible and each carbon atom is at the centre of a regular tetrahedron.
- Draw three-dimensional structures for the methane and ethane molecules using appropriate symbols to represent the 3D shape. (You may have to find out about this. [Chemguide](#) is a useful website.) Mark in the bond angles on your diagrams.
- Why are the bonds in both compounds spaced as far apart as possible? Find out what the angle between each H-C-H bond is. Is it different for methane and ethane? Explain why this might be.
- Research the shapes of the following molecules:  $H_2O$ ,  $CO_2$ ,  $NH_3$ ,  $BF_3$ ,  $SF_6$ . You may find it useful to create computer images of each molecule. You will then be able to see how the image on the screen relates to the molecule in 'real' 3D.

### Main activity

Make a poster that *describes the importance* of knowing about the shapes of the molecules listed above and *compares the shapes* of the compounds listed above.

You should *include 3D drawings* of the molecules using the conventional ways of representing 3D bonds. You should also include *the bond angles* on your drawings and *explain how the size of the angle is affected by bonding pair or lone pair repulsions*.

Dot and cross diagrams can be very useful for working out the arrangement of electron pairs and therefore predicting molecular shapes.

When you have completed this task, you should be able to predict the shapes of, and bond angles in, molecules and ions with different numbers of electron pairs, whether bonded pairs or lone pairs. The principles of electron-pair repulsion enable you to predict the arrangement of electron pairs around a central atom of unfamiliar molecules and ions.

## Task 3 - Question

Complete the activities on Nearpod at <https://share.nearpod.com/vsph/vGM4nVMaNu>  
You can also access the activities using the Nearpod app using this code

Join with this CODE at Nearpod.com or in the app

# TGYSJ

Valid from Tue, Jun 18th 2019 until Mon, Sep 30th 2019 ?

Good luck :)