

Bridging the Gap



Welcome to Dereham Sixth Form College. Before you start your Chemistry course in September you need to have completed this booklet and all associated tasks. It has been written for you, as students, to help give you some practice of key skills that you will be using over the next two years. There will be some GCSE content that you need to be confident with and some A-Level material that will be part of the foundation we will build on in lessons.

Deadline—This is to be completed over the summer and handed in during your FIRST chemistry lesson in September.

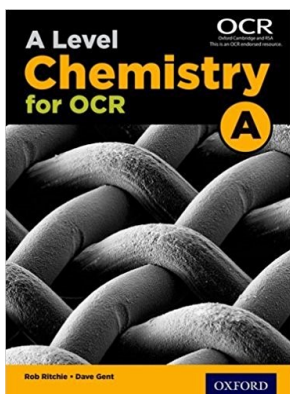
Name:

High School:

Induction Teacher:

Course Material

The following textbooks are used throughout the course and will form the basis for your examinations, you will need to purchase your own copy of this book:



Places you can purchase this book:

Oxford University Press—<https://goo.gl/sj2BBd>

Amazon UK—<https://goo.gl/pGLMDg>

WHSmith—<https://goo.gl/7K8VJs>

ISBN: 978-0-19-835197-9

Price Range: £33—£42 (including second hand prices)

It is highly recommended that you have a look at the following links as they contain information that is relevant to the chemistry course or are useful places to find additional material that will help develop your understanding in the subject.

OCR Chemistry A A-Level Specification: <https://goo.gl/MCo5dj>

OCR Practical Skills Handbook: <https://goo.gl/SbXUTM>

OCR Maths Skills Handbook for GCE Chemistry: <https://goo.gl/52gGpz>

OCR Periodic Table of Elements: <https://goo.gl/XXu1ja>

Royal Society of Chemistry; Learn Chemistry: <http://www.rsc.org/learn-chemistry/>

Royal Society of Chemistry Resources: <http://www.rsc.org/learn-chemistry/resource>

Chemicool Interactive Periodic Table: www.chemicool.com

Chemguide—www.chemguide.co.uk

Doc Brown—<https://goo.gl/FhFJM8>



edmodo

Edmodo is an online education network that enables students and teachers to communicate and interact with digital resources. Throughout the Chemistry course you will find that lots of resources, lessons and messages are passed through Edmodo. You will need to create an account (if you don't already have one) and sign up to the A-Level Chemistry 2018-20 group. The Group code will be given to you in lesson.

PLEASE BE AWARE THAT THE GROUP CODE IS ONLY ACTIVE FOR A COUPLE OF WEEKS SO PLEASE SIGN UP QUICKLY

Group Code:

Part of your bridging work is to complete the questions by using this link: <https://goo.gl/2itjyD>

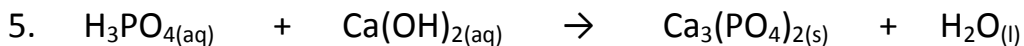
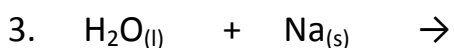
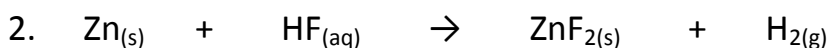
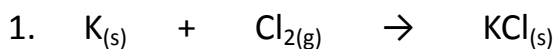
This is assessed online; instructions are provided when you log in. This is not a compulsory assignment but there is a prize for the two people with the highest scores. For your login details and further information please email Mr Russell:

rsussell.northgate@dsfc.org.uk

Complete the table below using the periodic table to help:

Element/ion	Symbol	Atomic Number	Atomic Mass	Number of protons	Number of neutrons	Number of electrons
Sodium						
		6	12			
		7	15			
Chlorine			35			
Chloride			37			
Iron (III) ion			56			

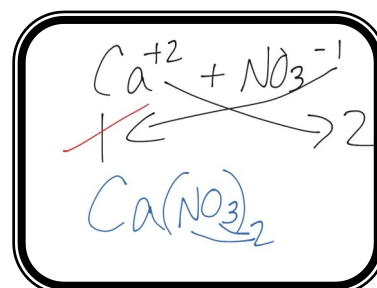
Balance these equations:



Determine the chemical formulae of the following ionic substances (SOME of the ions have been given to you, others you should know from GCSE)

- Silver nitrate: _____
- Ammonium Hydroxide: _____
- Calcium Chloride: _____
- Iron (II) sulphide: _____
- Sodium Nitride: _____
- Copper Sulphate: _____
- Potassium Carbonate: _____
- Iron (III) Nitrate: _____
- Aluminium Oxide: _____

Positive Ions	Negative Ions
Ag^+	NO_3^-
NH_4^+	OH^-
Fe^{2+} (iron II)	SO_4^{2-}
Fe^{3+} (iron III)	CO_3^{2-}
Cu^{2+}	NO_3^-



A mole is a chemical unit based on Avogadro's Number. One mole of atoms contains 6×10^{23} atoms, no matter what element it is. This number is used in chemistry because if you could count out this many carbon atoms, the total mass of carbon you would have is 12 g, which is the same as its atomic mass. One mole of water weighs 18g because the atomic mass of oxygen is 16, the atomic mass of hydrogen is 1, water has the formula $H_2O \rightarrow 16 + 1 + 1 = 18$.

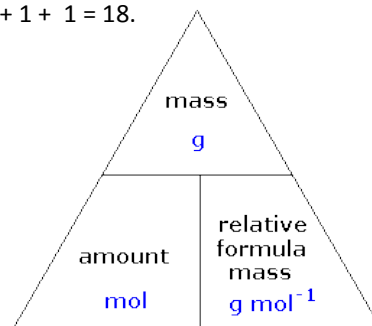
Calculate the number of moles or mass of the materials below;

Moles:

1. 22g CO_2 :
2. 75g $CaCO_3$:
3. 16g $CuSO_4$:
4. 46.1g $Mg(NO_3)_2$:
5. 13.6g $Fe(OH)_3$:
6. 19.44g $NiCl_2(PC_{18}H_{15})_2$:

Mass

1. 0.125 mol $LiAlH_4$:
2. 0.002 mol C_{60} :
3. 2.8 mol $NaCl$:
4. 3 mol $(NH_4)_3PO_4$:
5. 0.5 mol $CaCO_3$:
6. 0.92 mol $NaBH_4$:



How many individual atoms are in the following materials:

- | | | |
|-----------------------------|-----------------------|---|
| 1. 0.5 mol of Na: _____ | 3. 0.75 mol Li: _____ | 5. 4×10^{-6} mol N_2 : _____ |
| 2. 1.0 mol of O_2 : _____ | 4. 3.5 mol K: _____ | 6. 2.125 mol H_2SO_4 : _____ |

Describe the similarities and differences between a base and an alkali:

.....

.....

.....

Give an example of the following chemical reactions, with the products, as a word and balanced symbol equation and identify what type of reaction they are:

Inorganic Acid + Metal Oxide

Inorganic Acid + Metal Hydroxide

Inorganic Acid + Metal Carbonate

Type of reaction:

Ionic Equation:

For the experiment you did in your introductory lesson, write a method and include a labelled diagram of the equipment you used.

Draw and complete a results table for the titration you completed. Show your workings for your averages.

Concentration is measured in mol dm^{-3} (moles per decimetre cubed / moles per litre). From this you can calculate the amount of a substance used and do mole calculations for a solution.

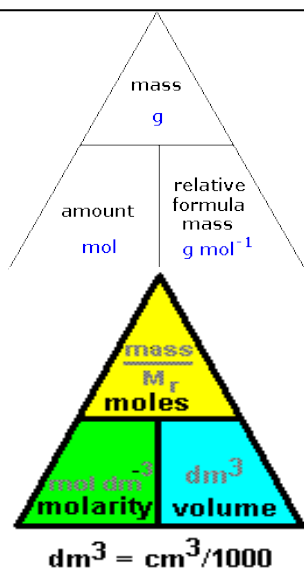
Calculate the concentration of the solution you made using the two triangles below:

Write a balanced symbol equation for the reaction that you carried out.

.....

What is the ratio of sodium hydroxide to hydrochloric acid?

Calculate the concentration of the hydrochloric acid solution using your titration results.



Assuming that the stock solution your acid came from had a total volume of 5L, what mass of anhydrous hydrogen chloride would be needed to make a stock at this concentration?

Chemists have developed models for bonding and structure which are used to explain different properties.

Ammonia, NH_3 , is a covalent compound.

Explain what is meant by a *covalent bond*.

..... [1]

Draw a '*dot-and-cross*' diagram to show the bonding in NH_3 .

Show **outer** electrons only.

[1]

Name the shape of the ammonia molecule.

Explain, using your '*dot-and-cross*' diagram, why ammonia has this shape and has a bond angle of 107° .

shape:

explanation:

.....

.....

.....

.....

.....

..... [3]

The alcohols are an example of an homologous series.

The table shows the boiling points for the first four members of straight-chain alcohols.

alcohol	structural formula	boiling point / °C
methanol	CH ₃ OH	65
ethanol	CH ₃ CH ₂ OH	78
propan-1-ol	CH ₃ CH ₂ CH ₂ OH	97
butan-1-ol	CH ₃ CH ₂ CH ₂ CH ₂ OH	118

What is the general formula of a member of the alcohol homologous series?

..... [1]

Deduce the molecular formula of the alcohol that has 13 carbon atoms per molecule.

..... [1]

Alcohols contain the hydroxyl functional group.

What is meant by the term *functional group*?

.....

 [2]

At room temperature and pressure, the first four members of the alcohol homologous series are liquids whereas the first four members of the alkanes homologous series are gases.

Explain this difference.

.....

 [3]

A student investigated the conductivity of ammonium chloride.

She noticed that when the ammonium chloride was solid it did **not** conduct electricity. However, when ammonium chloride was dissolved in water, the resulting solution did conduct electricity.

Explain these observations.

.....
.....
.....
.....
.....
..... [2]

Ammonium compounds such as ammonium sulfate, $(\text{NH}_4)_2\text{SO}_4$, can be used as fertilisers.

Write a balanced equation to show how ammonium sulfate could be formed by the reaction between aqueous ammonia and sulfuric acid.

..... [1]

Ammonium sulfate is an example of a salt formed when an acid is neutralised by a base.

Explain what is meant by the term *salt*.

.....
..... [1]

Why is ammonia acting as a base in this neutralisation?

..... [1]

.... What is the relative formula mass of $(\text{NH}_4)_2\text{SO}_4$?

Give your answer to **one** decimal place.

..... [1]

Flipped Learning

What is Flipped Learning

Flipped learning is a style of teaching that we used in Chemistry and in various subjects at Dereham Sixth Form College. The main principle of this style of learning is to generally improve your own study skills and help develop you into a confident and independent learner. You will make notes on topics and chapters in the textbook before the lesson and come to every lesson with your pre-prepared notes. Then in class you spend more time on exam technique and question practice.

Your Notes

Before you are taught each chapter in the course, you will prepare a set of notes. These do not have to be pages of rewriting the textbooks; examples of different methods of note-taking can be found in one of the folders on the transition Edmodo page. Your notes can be in the form of mind-maps, flash cards or typed bullet points. Your notes should contain all key diagrams, structures, mechanisms and key equations. This then means you already have them and don't need to spend time in lesson writing these down/drawing them. You should always bring the relevant notes to the lesson you are in as a reference and aid when answering questions in class. You can add to your notes in lesson but you should not be making a whole new set of notes during class.

What This Means in Practice

The course in Chemistry largely follows the same structure as the course textbook. At the start of each chapter you will be given a note-taking quiz. This is to make sure you have got all the key concepts in your notes and there are no gaps in your basic knowledge. You will be able to refer to your notes during these quizzes so it is important that you have them prepared in advance.

An key thing to bear in mind is that we are not expecting you to be confident or necessarily understand all of the information you have written down.

The course material will still be taught in lesson but will be taught at quite a fast pace. This means that more time can be spent securing understanding, developing exam technique and answering any questions you have from the notes you have taken.

6.1.1 Aromatic Compounds

There are two major classes of organic chemicals: aliphatic (straight or branched) and aromatic substances. Aromatic are those molecules that have a ring of six carbon atoms with delocalised bonding. Benzene belongs to the aromatic class.

Benzene's Structure
The simplest aromatic is benzene. It has the molecular formula C_6H_6 . Its basic structure is six C atoms in a hexagonal ring, with one H atom bonded to each C atom. Kekulé's model of benzene is shown by single covalent bonds. This leaves one unpaired electron on each C atom in a p-orbital perpendicular to the plane of the ring. The six p electrons are delocalised in a ring structure above and below the plane of the benzene ring.

Delocalisation
This structure is not correct. Evidence suggests that all the C-C bonds are the same length.

In benzene we draw a circle to show the delocalised system.

The six electrons in the pi bonds are delocalised and spread out over the whole ring. Delocalised means not attached to a particular atom.

Benzene is a planar molecule. The evidence suggests all the C-C bonds are the same and have a length and bond energy between a C-C single and C=C double bond.

The H-C-C bond angle is 120° in Benzene.

Explanations of delocalisation
Theoretically because there are 2 pi double bonds one might expect the amount of energy to be 3 times as much. However, the real amount of energy is less. The 6 pi electrons are delocalised and not arranged in 3 double bonds. This is represented in an energy level diagram where the delocalised benzene is more thermodynamically stable.

The increase in stability compared to delocalisation is called the delocalisation energy.

Reasons of evidence for why benzene has a delocalised structure:

- Bond length intermediate between sp^3C-C and sp^2C-C .
- Hydrogenation less exothermic than expected when compared to: Hydrogenation for Kekulé structure.
- Only reacts with Br_2 at high temp or in presence of a halogen carrier.

Normal aromatic compounds can be complicated. The simplest molecules are derivatives of benzene and have benzene at the root of the name.

Methylbenzene (toluene), ethylbenzene, chlorobenzene, bromobenzene, nitrobenzene, benzenedicarbonyl (phthalic anhydride), benzocyclohexane.

If two or more substituents are present on the benzene ring, their positions must be indicated by the use of numbers. This should be done to give the lower number numbers to the substituents. When two or more different substituents are present, they are listed in alphabetical order and d, e, f prefixes should be used.

1,4-dimethylbenzene (p-xylene), 1,3-dimethylbenzene (m-xylene), 4-hydroxyphenylmethanecarboxylic acid (p-aminobenzoic acid), 2,4,6-trinitrochlorobenzene.

In other molecules the benzene ring may be regarded as a substituent side group on another molecule, see alkyl groups are. The C_6H_5 group is known as the phenyl group.

phenylamine, phenylpropane, 2-phenylpropane, phenylethene, phenylacetate.

Reactions of Benzene
Benzene does not generally undergo addition reactions because the aromatic system would be destroyed. Most of benzene's reactions involve a substituting one H for another atom or group of atoms. It reactions are usually reversible.

Reactions of Benzene with alkenes: reaction with bromine
Alkenes react with bromine easily at room temperature. Benzene does not react with bromine without additional reagent. In benzene, electrons in pi bonds are delocalised. In alkenes, the electrons are localised between the carbons. Benzene therefore has a lower electron density than $C=C$. Benzene therefore reacts with bromine less easily than alkenes.

Toxicity of Benzene
Benzene is a carcinogen (benzene causing molecules) and is banned for sale in shops. Methylbenzene is less toxic and also results more readily than benzene as the methyl side group reduces electron ring pi delocalisation system making it more electron rich and electrophilic.

The image shows a page of handwritten chemistry notes. The notes are organized into sections with headings such as 'Alkenes', 'Alkynes', 'Aldehydes', 'Ketones', 'Carboxylic Acids', and 'Esters'. Each section contains chemical structures, reaction equations, and detailed text explaining the reactions and mechanisms. The handwriting is clear and legible, and the page is filled with information, including diagrams and tables.

Make your First Flipped Learning Notes

The first topics you will be taught are: Atoms, Ions and Compounds and Electrons and Bonding. Below are some links to online resources and videos. You will also find slides that will be used on the Chemistry Transition Edmodo page. These links are starting points for you, as you can always do some additional research basing it on the OCR H032/H432 specification:

Atoms Ions and Compounds

- <https://chemrevise.org/ocr-revision-guides/>
- <https://tinyurl.com/psut5nt>
- <https://tinyurl.com/y2mu8nkx>
- <https://tinyurl.com/y6qgxw6j>
- <https://www.youtube.com/watch?v=xjY5p-1CDr8>
- <https://www.youtube.com/watch?v=hUVzb0fzHsk>
- https://www.youtube.com/watch?v=SdhLTfma_Eg
- <https://www.youtube.com/watch?v=URc75hoKGLY>
- <https://www.youtube.com/watch?v=p9iQ5Qn42DM>

Electrons and Bonding

- <https://tinyurl.com/y39bdhos>
- <https://tinyurl.com/yyyyr2wfr>
- https://www.diffen.com/difference/Covalent_Bonds_vs_Ionic_Bonds
- <https://tinyurl.com/y7s2ejps>
- <https://tinyurl.com/y3n6xvhp>
- <https://www.youtube.com/watch?v=Aoi4j8es4gQ>
- <https://www.youtube.com/watch?v=Lc-QVVFuoj0>
- <https://www.youtube.com/watch?v=P5iCRKxd37Q>
- <https://www.youtube.com/watch?v=vp9mfW7dqE0>
- <https://www.youtube.com/watch?v=Qf07-8Jhhpc>
- <https://www.youtube.com/watch?v=IV404giwIE0>
- <https://www.youtube.com/watch?v=CGA8sRwqIFg>
- <https://www.youtube.com/watch?v=cKOGMNpNeQo>

Links for both aspects

- <https://www.youtube.com/watch?v=oH0tpyrlcSY>