

# Chemistry Department

## Bridging Work

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This bridging work **MUST** be completed by the time you start your course and it will be assessed in September. The aims are for you re-familiarise yourself with work studied during GCSE but largely ignored for the past 10 weeks, but vital for progression at post 16 level.

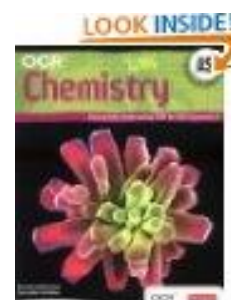
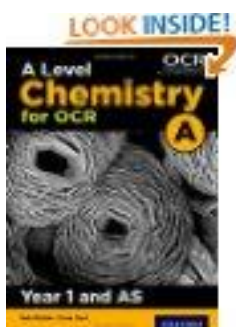
Chemistry can be a fun subject but requires hard work to succeed with few shortcuts. Please use resources such as the internet, library and your Chemistry GCSE notes to help you complete this work.

The AS Course comprises of two written exams which will test your understanding of Chemistry and test practical knowhow though these written papers. There is no longer any ISA's which contributes to your final grade, but for those that go onto complete the full A-level there is a Practical Endorsement which you will be internally assessed on over the next two years through a minimum of twelve set practical's.

**Exam board:** OCR Chemistry

|  | <b>Length</b> | <b>% of total AS</b> |
|--|---------------|----------------------|
| <b>Paper 1</b><br>Breadth in Chemistry<br>70 marks | 1 hr 30min    | 50                   |
| <b>Unit 2</b><br>Depth in Chemistry<br>70 marks    | 1 hr 30min    | 50                   |

We recommend the following textbooks for the course: have a look at them to see if you like the style and layout. We will use some of the material from these books during lessons.





## Task 2 – Constructing formulae from common ions

Writing chemical formulae is an essential skill for both AS and A2 Chemistry and requires a knowledge of both the common positive and negative ions.

| Positive ions |                              | Negative ions |                               |
|---------------|------------------------------|---------------|-------------------------------|
| Name          | Formula                      | Name          | Formula                       |
| 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>             | Sulfide       | S <sup>2-</sup>               |
| Copper(II)    | Cu <sup>2+</sup>             | Sulfate       | 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>             |               |                               |
| Lead          | Pb <sup>2+</sup>             |               |                               |
| Iron(II)      | Fe <sup>2+</sup>             |               |                               |
| Iron(III)     | Fe <sup>3+</sup>             |               |                               |
| Aluminium     | Al <sup>3+</sup>             |               |                               |

Unlike GCSE these are not given on any data sheet and therefore important to learn and the best way of learning them is using them.

You can though use the periodic table and this can be helpful, particular with the metal ions; try to spot the connect between the metals and their position in the Periodic table.

Complete the table for the formula making sure the charges balance;-

|                               | Na <sup>+</sup> | K <sup>+</sup>   | Mg <sup>2+</sup>    | Ca <sup>2+</sup>  | Al <sup>3+</sup>                                | Cu <sup>2+</sup> (III) |
|-------------------------------|-----------------|------------------|---------------------|-------------------|---|------------------------|
| Cl <sup>-</sup>               | NaCl            |                  |                     |                   |   |                        |
| O <sup>2-</sup>               |                 | K <sub>2</sub> O |                     |                   |   |                        |
| OH <sup>-</sup>               |                 |                  | Mg(OH) <sub>2</sub> |                   |   |                        |
| CO <sub>3</sub> <sup>2-</sup> |                 |                  |                     | CaCO <sub>3</sub> |   |                        |
| SO <sub>4</sub> <sup>2-</sup> |                 |                  |                     |                   | Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> |                        |

Name the five compounds formed in the grey highlighted boxes above.

- 1.
- 2.
- 3.
- 4.
- 5.

Using the ion table give the formulae of the following ionic compounds:

1. Potassium nitrate
2. Lithium hydroxide
3. Barium fluoride
4. Ammonium nitrate
5. Sodium hydrogen carbonate
6. Iron (II) chloride
7. Iron (III) chloride
8. Zinc nitrate
9. Hydrochloric acid
10. Ammonium hydroxide
11. Sodium sulfate
12. Sodium sulphide
13. Sulphuric acid
14. Potassium phosphate
15. Potassium dichromate (VI)

### Task 3 - Dot cross diagrams

You would have covered ionic and covalent bonding in your GCSE. Using your knowledge, draw the dot cross diagrams for the following compounds, showing only outer electrons.

You will need to decide what type of bonding is present within these compounds, before you start remember **ionic compounds** contain ions and must contain **both a metal and a non-metal**; **covalent molecules** share electrons and contain **non-metals**.

|                                 |                         |
|---------------------------------|-------------------------|
| <b>Chlorine gas</b>             | <b>Sodium chloride</b>  |
| <b>Magnesium oxide</b>          | <b>Water</b>            |
| <b>Carbon dioxide</b>           | <b>Calcium chloride</b> |
| <b>Methane (CH<sub>4</sub>)</b> | <b>Nitrogen gas</b>     |

## Task 4 - Rearranging Formulae

When solving chemistry problems you will often be required to rearrange an equation to solve for an unknown. You would have seen this in Physics when trying to solve speed.

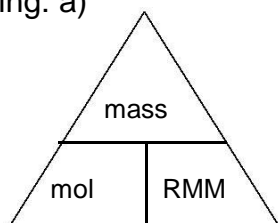
$$\text{Speed (m/s)} = \text{distance (m)} / \text{time (s)}$$

We can write this to show distance and time as follows:

$$\text{Distance (m)} = \text{speed (m/s)} \times \text{time (s)}$$

$$\text{Time (s)} = \text{distance (m)} / \text{speed (m/s)}$$

Rearrange the following: a)

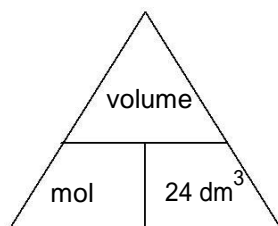


mass =

mol =

RMM =

b)



Volume =

mol =

c)

$$n = c v$$

c =

v =

The units of  $n$  is mol and the unit for  $v$  is  $\text{dm}^3$ . Write down the units for  $c$ .

d) There are  $1000\text{cm}^3$  in  $1\text{dm}^3$ . Convert the following:

|    |                      |               |    |                         |               |
|----|----------------------|---------------|----|-------------------------|---------------|
| 1. | $250\text{ cm}^3$ is | $\text{dm}^3$ | 4. | $0.8\text{ dm}^3$ is    | $\text{cm}^3$ |
| 2. | $30\text{ cm}^3$ is  | $\text{dm}^3$ | 5. | $10\text{ dm}^3$ is     | $\text{cm}^3$ |
| 3. | $500\text{ cm}^3$ is | $\text{dm}^3$ | 6. | $0.0065\text{ dm}^3$ is | $\text{cm}^3$ |

# Task 5 - Significant Figures and Standard Form

## Significant Figures

You need to be able to quote answers to the correct number of significant figures.

1) Write the following numbers to the quoted number of significant figures.

- a) 345789 4 sig figs ..... d) 6 3 sig figs .....  
b) 297300 3 sig figs ..... e) 0.001563 3 sig figs .....  
c) 0.07896 3 sig figs ..... f) 0.01 4 sig figs .....

2) Complete the following sums and give the answers to 3 significant figures.

- a)  $6125 \times 384$  ..... d)  $750 \div 25$  .....  
b)  $25.00 \times 0.01$  ..... e)  $0.000152 \times 13$  .....  
c)  $13.5 + 0.18$  ..... f)  $0.0125 \times 0.025$  .....

## Standard Form

You need to be able to work with numbers in standard form.

3) Write the following numbers in non standard form.

- a)  $1.5 \times 10^{-3}$  ..... d)  $0.0534 \times 10^4$  .....  
b)  $0.046 \times 10^{-2}$  ..... e)  $10.3 \times 10^5$  .....  
c)  $3.575 \times 10^5$  ..... f)  $8.35 \times 10^{-3}$  .....

4) Write the following numbers in standard form.

- a) 0.000167 ..... d) 34500 .....  
b) 0.0524 ..... e) 0.62 .....  
c) 0.000000015 ..... f) 87000000 .....

5) Complete the following calculations and give the answers to 3 significant figures.

- a)  $6.125 \times 10^{-3} \times 3.5$  .....  
b)  $4.3 \times 10^{-4} \div 7.0$  .....  
c)  $4.0 \times 10^8 + 35000$  .....  
d)  $0.00156 + 2.4 \times 10^3$  .....  
e)  $6.10 \times 10^{-2} - 3.4 \times 10^{-5}$  .....

## Task 6 - Balancing equations

Look at the following equations – some need balancing, others do not. Balance the equations that need it.

- 1) C + O<sub>2</sub> → CO
  - 2) Na + O<sub>2</sub> → Na<sub>2</sub>O
  - 3) H<sub>2</sub> + O<sub>2</sub> → H<sub>2</sub>O
  - 4) Na + I<sub>2</sub> → NaI
  - 5) CH<sub>4</sub> + O<sub>2</sub> → CO<sub>2</sub> + H<sub>2</sub>O
  - 6) SO<sub>2</sub> + O<sub>2</sub> → SO<sub>3</sub>
  - 7) Fe<sub>2</sub>O<sub>3</sub> + C → Fe + CO
  - 8) Fe<sub>2</sub>O<sub>3</sub> + CO → Fe + CO<sub>2</sub>
  - 9) NH<sub>3</sub> + O<sub>2</sub> → NO + H<sub>2</sub>O
  - 10) Fe<sub>3</sub>O<sub>4</sub> + H<sub>2</sub> → Fe + H<sub>2</sub>O
  - 11) C + CO<sub>2</sub> → CO
  - 12) Fe + S → FeS
  - 13) Ca + H<sub>2</sub>O → CaOH + H<sub>2</sub>
  - 14) Al + Cl<sub>2</sub> → AlCl<sub>3</sub>
  - 15) Fe + HCl → FeCl<sub>2</sub> + H<sub>2</sub>
- 

## Task 6 - Relative formula mass

Use a Periodic Table to work out the relative formula mass of the following compounds

NaOH : Na + O + H = 23 + 16 + 1 = 40

CuSO<sub>4</sub> .....

Mg(HCO<sub>3</sub>)<sub>2</sub> .....

NH<sub>4</sub>NO<sub>3</sub> .....

CuCO<sub>3</sub> .....

Ca(OH)<sub>2</sub> .....

H<sub>2</sub>SO<sub>4</sub> .....

C<sub>3</sub>H<sub>8</sub> .....

HgO .....

NH<sub>4</sub>Fe(SO<sub>4</sub>)<sub>2</sub>·12H<sub>2</sub>O .....

K<sub>4</sub>Fe(CN)<sub>6</sub> .....

Al<sub>2</sub>(SO<sub>4</sub>)<sub>3</sub> .....



## Task 7 – Organic Chemistry

Organic chemistry is the study of the structure, properties, reactions, and preparations of carbon containing compounds and often derived from living systems.

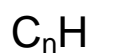
The hydrocarbons are some of the simplest organic compounds and contain only carbon and hydrogen atoms e.g. Methane. At GCSE you have come across two families of hydrocarbons called the ALKANES and ALKENES.

Complete the tables for the first six alkanes and alkenes.

### The Alkanes

| Name    | Formula                       | Display Formula  |
|---------|-------------------------------|--|
| Methane | CH <sub>4</sub>               | $\begin{array}{c} \text{H} \\   \\ \text{H}-\text{C}-\text{H} \\   \\ \text{H} \end{array}$  |
| Ethane  |                               |  |
|         | C <sub>3</sub> H <sub>8</sub> |  |
|         |                               | $\begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\   &   &   &   \\ \text{H}-\text{C} & -\text{C} & -\text{C} & -\text{C}-\text{H} \\   &   &   &   \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array}$ |
| Pentane |                               |  |
|         |                               |  |

The Alkanes all share a general formula – using *n* to represent the number of carbon atoms, complete the general formula below:-

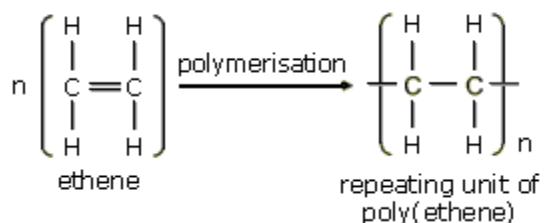


## The Alkenes

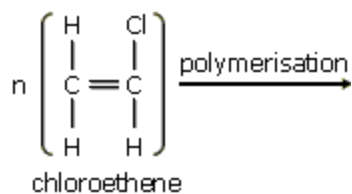
The alkenes are a second group of hydrocarbons with the general formula  $C_nH_{2n}$ , they differ from the alkanes due to their  $C=C$  double bond and are said to be **UNSATURATED**. Complete the table for the first five alkenes.

| Name   | Formula  | Display Formula   |
|--------|----------|---|
| Ethene |          | $\begin{array}{c} \text{H} & & \text{H} \\ & \diagdown & / \\ & \text{C} = \text{C} \\ & / & \diagdown \\ \text{H} & & \text{H} \end{array}$  |
|        | $C_3H_6$ |   |
|        |          | $\begin{array}{cccc} & \text{H} & \text{H} & \text{H} & \text{H} \\ &   &   &   &   \\ \text{H} & - \text{C} & - \text{C} & - \text{C} & = \text{C} \\ &   &   & &   \\ & \text{H} & \text{H} & & \text{H} \end{array}$ |
|        |          |   |
|        |          |   |

The alkenes are often used for the starting materials for the production of polymers such as polyethene; polypropene and polystyrene, see equation below showing the formation of the repeat unit of poly(ethene) from its monomer ethane.



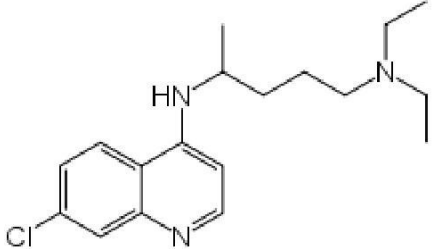
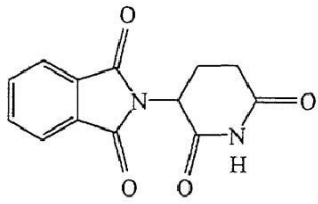
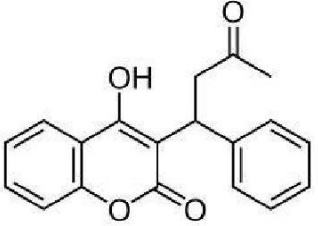
Complete the equation below showing the repeat unit for polymer - Poly(chloroethene)



## Task 8 (optional) – Research

Choose one (or more) of the following medicines/drugs and find out:

1. Common brand names
2. Class of drug
3. Brief history of discovery
4. State the chemical functional group found in the compound
5. Uses
6. List any side effects

| Chloroquine   | Thalidomide   | Warfarin  |
|---|---|---|
|  <chem>CCN(CC)CCCCNC1=CN=C2C=C(Cl)C=CC2=N1</chem> |  <chem>O=C1NC(=O)c2ccccc12C1CCNC(=O)C1=O</chem> |  <chem>CC(=O)CC(c1ccccc1)C2=C(O)C(=O)Oc3ccccc23</chem> |