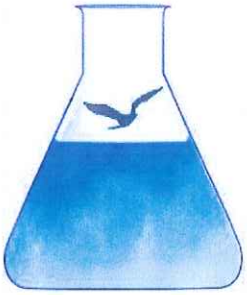
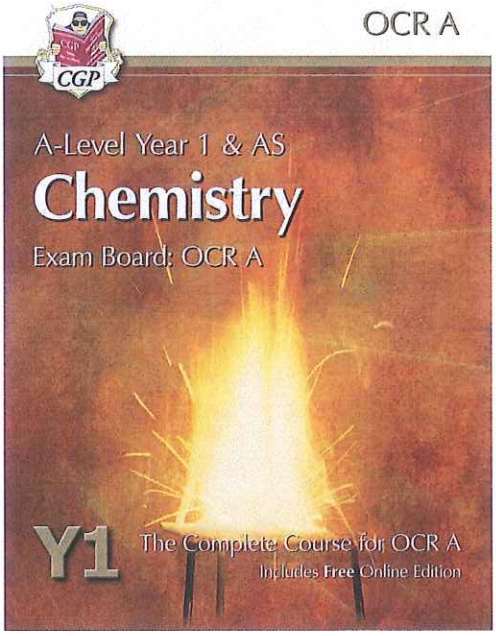


SNS Chemistry Summer Assignment

To keep you sharp and ready for Chemistry next year you need to complete the following summer assignment. This needs to be completed before the course.

Some of the tasks you may need to research or may be rusty on, that is why you need to do them. Start early, you may find some of the tasks quite difficult, try to find out the right answer. Success at A-level Chemistry is not just from natural ability most of it is having the fight and determination to understand. We have no issue with you getting things wrong but we do object to you not trying or doing half a job

It may help you to use the following website: chemsheets.co.uk or purchase the textbook for next year. This can be purchased for £10 from the science office or around £15 from amazon (**ISBN:** 978 1 78294 322 8) make sure you get the correct one as it is a new syllabus many will be old.



If you have any issues completing the tasks or any questions about the course or Sixth Form Science in general, feel free to contact Mr Hind (Martin.Hind@sns.hackney.sch.uk)

TASK 1 – WRITING FORMULAS OF IONIC COMPOUNDS

1) silver bromide .....
2) sodium carbonate .....
3) potassium oxide .....
4) iron (III) oxide .....
5) chromium (III) chloride .....
6) calcium hydroxide .....
7) aluminium nitrate .....
8) sodium sulfate .....
9) lead (II) oxide .....
10) sodium phosphate .....
11) zinc hydrogencarbonate .....
12) ammonium sulphate .....
13) gallium hydroxide .....
14) strontium selenide .....
15) radium sulfate .....
16) sodium nitride .....

TASK 2 – WRITING FORMULAS 1

1) lead (IV) oxide .....
2) copper .....
3) sodium .....
4) ammonium chloride .....
5) ammonia .....
6) sulfur .....
7) sulfuric acid .....
8) neon .....
9) silica .....
10) silicon .....
11) barium hydroxide .....
12) tin (IV) chloride .....
13) silver nitrate .....
14) iodine .....
15) nickel .....
16) hydrogen sulfide .....
17) titanium (IV) oxide .....
18) lead .....
19) strontium sulfate .....
20) lithium .....

TASK 3 – WRITING FORMULAS 2

1) silver carbonate .....
2) gold .....
3) platinum (II) fluoride .....
4) nitric acid .....
5) ammonia .....
6) silicon (IV) hydride .....
7) phosphorus .....
8) diamond .....
9) vanadium (V) oxide .....
10) cobalt (II) hydroxide .....
11) barium hydroxide .....
12) ammonia .....
13) hydrochloric acid .....
14) fluorine .....
15) silicon .....
16) calcium phosphate .....
17) rubidium .....
18) germanium (IV) oxide .....
19) magnesium astatide .....
20) nitrogen oxide .....

2 - EQUATIONS

From an early age you should have been able to balance chemical equations. However, at A level, you will often need to:

- work out the formulas yourselves
- work out what is made (so you need to know some basic general equations)
- for reactions involving ions in solution, write ionic equations

Some general reactions you should know:

General Reaction	Examples
substance + oxygen → oxides	$2\ Mg + O_2 \rightarrow 2\ MgO$ $2\ H_2S + 3\ O_2 \rightarrow 2\ H_2O + 2\ SO_2$ $C_3H_8 + 5\ O_2 \rightarrow 3\ CO_2 + 4\ H_2O$
metal + water → metal hydroxide + hydrogen	$2\ Na + 2\ H_2O \rightarrow 2\ NaOH + H_2$
metal + acid → salt + hydrogen	$Mg + 2\ HCl \rightarrow MgCl_2 + H_2$
oxide + acid → salt + water	$MgO + 2\ HNO_3 \rightarrow Mg(NO_3)_2 + H_2O$
hydroxide + acid → salt + water	$2\ NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$
carbonate + acid → salt + water + carbon dioxide	$CuCO_3 + 2\ HCl \rightarrow CuCl_2 + H_2O + CO_2$
hydrogencarbonate + acid → salt + water + carbon dioxide	$KHCO_3 + HCl \rightarrow KCl + H_2O + CO_2$
ammonia + acid → ammonium salt	$NH_3 + HCl \rightarrow NH_4Cl$
metal carbonate → metal oxide + carbon dioxide (on heating)	$CaCO_3 \rightarrow CaO + CO_2$

TASK 4 – WRITING BALANCED EQUATIONS

1) Balance the following equations.

   a) $Mg + HNO_3 \rightarrow Mg(NO_3)_2 + H_2$

   b) $CuCl_2 + NaOH \rightarrow Cu(OH)_2 + NaCl$

   c) $SO_2 + O_2 \rightarrow SO_3$

   d) $C_4H_{10} + O_2 \rightarrow CO_2 + H_2O$

2) Give balanced equations for the following reactions.

   a) sodium + oxygen → sodium oxide

   b) aluminium + chlorine → aluminium chloride

   c) calcium + hydrochloric acid → calcium chloride + hydrogen

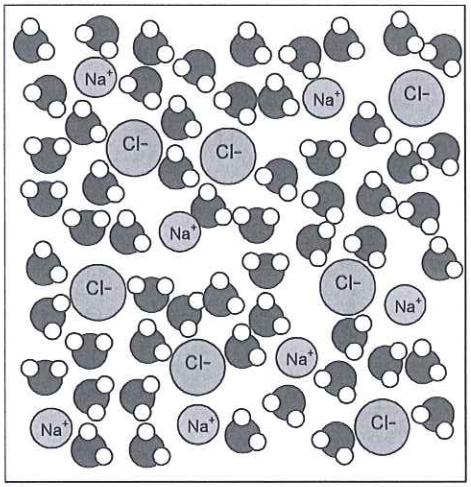
   d) ammonia + sulphuric acid → ammonium sulphate

TASK 5 – WRITING BALANCED EQUATIONS 2

Write balance equations for the following reactions:

1) burning aluminium
2) burning hexane (C_6H_{14})
3) burning ethanethiol (CH_3CH_2SH)
4) reaction of lithium with water
5) reaction of calcium carbonate with nitric acid
6) thermal decomposition of lithium carbonate
7) reaction of ammonia with nitric acid
8) reaction of potassium oxide with water
9) reaction of calcium hydroxide with hydrochloric acid
10) reaction of zinc with phosphoric acid
11) reaction of sodium hydrogencarbonate with sulfuric acid
12) reaction of potassium hydroxide with sulfuric acid

Ionic equations



When an ionic substance dissolves in water, the positive and negative ions separate and become hydrated (they interact with water molecules rather than each other). For example, a solution of sodium chloride could also be described as a mixture of hydrated sodium ions and hydrated chloride ions in water.

In reactions involving ionic compounds dissolved in water, some of the ions may not be involved in the reaction. These are called ***spectator ions***. For such reactions, we can write an ***ionic equation*** that only shows the species that are involved in the reaction.

Simple examples are equations for which ionic equations can be written include:

Reactions of acids:

Common ionic equations are:	acid + hydroxide	$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$
	acid + carbonate	$2\ H^+(aq) + CO_3^{2-}(aq) \rightarrow H_2O(l) + CO_2(g)$
	acid + hydrogencarbonate	$H^+(aq) + HCO_3^-(aq) \rightarrow H_2O(l) + CO_2(g)$
	acid + ammonia	$H^+(aq) + NH_3(aq) \rightarrow NH_4^+(aq)$

We can even use these ionic equations to work out the ratio in which acids react without writing any equation.

For example, in the reaction of $H_2SO_4(aq)$ with $NaOH(aq)$ we know that one lot of H_2SO_4 contains two lots of H^+ ions. As H^+ ions react with OH^- ions in the ratio 1:1 [$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$] we know that we need two lots of NaOH to provide two lots of OH^- ions to react with the two lots of H^+ ions. Therefore, one lot of H_2SO_4 reacts with two lots of NaOH, i.e. the reacting ratio of H_2SO_4 : NaOH = 1:2

TASK 6 – IONIC EQUATIONS

1) Use your knowledge of ionic equations to give the molar ratio in which the following acids react with bases. Complete the table to show your answers.

Acid	Formula of acid	Base	Formula of base	Molar ratio of acid:base
hydrochloric acid		lithium hydroxide		
sulphuric acid		sodium hydrogencarbonate		
nitric acid		ammonia		
sulphuric acid		potassium carbonate		
nitric acid		strontium hydroxide		

2) Write ionic equations for each of the following reactions.

a) reaction of hydrochloric acid (aq) with potassium hydroxide (aq)

b) precipitation of silver iodide from reaction between silver nitrate (aq) and potassium iodide (aq)

c) reaction of potassium carbonate (aq) with nitric acid (aq)

d) precipitation of calcium hydroxide from reaction between sodium hydroxide (aq) and calcium chloride (aq)

e) reaction of ammonia (aq) with hydrochloric acid (aq)

f) reaction of sodium hydrogencarbonate (aq) with sulfuric acid (aq)

g) precipitation of calcium sulfate from reaction between calcium chloride (aq) and sulfuric acid (aq)

h) precipitation of lead (II) chloride from reaction between lead nitrate (aq) and sodium chloride (aq)

i) reaction of barium hydroxide (aq) with nitric acid (aq)

3 – SIGNIFICANT FIGURES & STANDARD FORM

Some general rules in chemistry:

- usually give final answers to 3 significant figures (but it is best to keep the whole number on your a during the calculation)
- give M_r's to 1 decimal place

Note: 0.00346678 = 0.00347 (3 sig fig) = 3.47×10^{-3} (3 sig fig) 346678 = 347000 (3 sig fig) = 3.47×10^{5} (3 sig fig)

TASK 7 – SIGNIFICANT FIGURES & STANDARD FORM

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 x 384 ..... d) 750 ÷ 25 .....

b) 25.00 x 0.01 ..... e) 0.000152 x 13 .....

c) 13.5 + 0.18 ..... f) 0.0125 x 0.025 .....

3) Write the following numbers in non standard form.

a) 1.5×10^{-3} ..... d) 0.0534×10^{4} .....

b) 0.046×10^{-2} ..... e) 10.3×10^{5} .....

c) 3.575×10^{5} ..... f) 8.35×10^{-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) $4.3 \times 10^{-4} \div 7.0$ .....

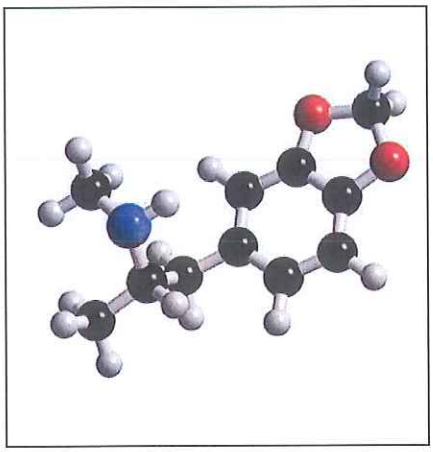
c) $4.0 \times 10^{8} + 35000$ .....

d) $0.00156 + 2.4 \times 10^{3}$ .....

e) $6.10 \times 10^{-2} - 3.4 \times 10^{-5}$ .....

f) $8.00 \times 10^{-3} \times 0.100 \times 10^{-3}$ .....

MDMA, called "Adam," "ecstasy,", "e," or "X-TC" on the street, is a synthetic, psychoactive (mind-altering) drug with hallucinogenic and amphetamine-like properties.



The chemical structure (or structural formula) of ecstasy

Molecular formula: $C_{11}H_{15}NO_2$

Relative Formula Mass (RFM) .....

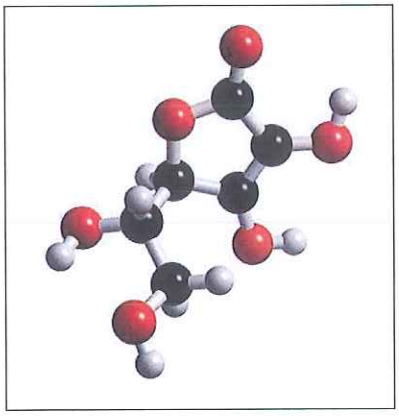
Questions: Answers on a separate sheet

1. How many elements are present in an ecstasy molecule?
2. For each of the elements mentioned in question 1, copy and complete the following table:

Element	Symbol	Atomic number	Number of protons	Number of neutrons	Number of electrons	Electronic structure (e.g. 2,8,1)	Group number

3. Classify each as metal or non metal. How do the properties of metallic and non-metallic elements differ?
4. What sort of bonds form between these elements? Explain why. (HINT: Ionic, covalent or metallic)
5. Carbon forms the basis of the ecstasy molecule, as it can form very stable chains held together by strong covalent bonds. Carbon bonds to many other elements in this way. Use electrons in shells diagrams to show how carbon bonds to hydrogen in the methane molecule (CH_4) and to oxygen in the carbon dioxide molecule (CO_2).
6. Ecstasy interferes with neurons and neurotransmitters in the brain. It causes an increase of serotonin and dopamine at the synapse (space between neurons). Find out the molecular formulas and the relative molecular masses of these two chemicals.
7. What are the effects on the body caused by the increase of these chemicals in the brain?

Ecstasy is a base. Bases react with acids to produce salts, neutralising the acid during the reaction. Thus, ecstasy reacts with ascorbic acid (vitamin C)



Vitamin C (Ascorbic acid)

The chemical structure of vitamin C

Molecular formula: $C_6 H_8 N O_6$

Relative Formula Mass (RFM) .....

Questions- Continued, answers on a separate sheet

8. Acids give away hydrogen ions (H^+) in solution. Use a diagram to show how a hydrogen atom becomes a hydrogen ion.

9. Describe and explain how you would expect the two particles (hydrogen atom and hydrogen ion) to behave if they are near the positive pole of a strong magnet. Would they be affected by the magnetic field? Explain why.

10. Vitamin C is a weak acid. In what way are weak acids different from strong acids? Outline their similarities and differences, giving examples.

11. Acids react to form salts. Sometimes other products are formed. Complete the following word equations:

    a. Acid + Base →

    b. Acid + Metal →

    c. Acid + Metal hydroxide (alkali) →

    d. Acid + Carbonate →

12. Link the formula to the type of compound

NaOH	metal hydroxide
Mg	base
Na_2CO_3	carbonate
CuO	metal

13. Use the information in question 11 to write balanced equations between hydrochloric acid (HCl) and the substances in questions 12. Include state symbols.

14. Two of the above reactions give off a gas. Explain how you could test each of the gases to help you confirm their identity.