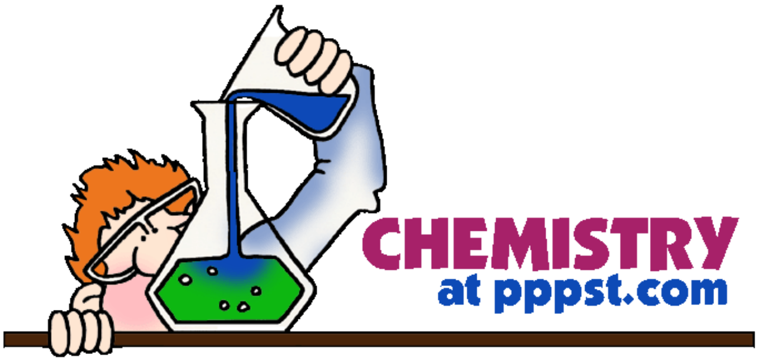
Quintin Kynaston
A SPECIALIST TECHNOLOGY SCHOOL



AS Chemistry

Course Information

2011 - 2012

Course Details:
AS Chemistry
Chemistry H034 (Part of H434)
http://www.ocr.org.uk/qualifications/type/gce/science/chemistry_a/index.html

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Name: ________________________________

Tutor Group: _____________________________

Contents

Drop –in Study and Homework club

Wednesday after school you will be able to go to SC8 for help with Chemistry homework and work covered within the week.

Assessment

Course: OCR Chemistry A H034/ H434

Module	Weightings	Assessment details
Atoms, Bonds and Groups	15% (30% of AS)	Jan Yr 12 (60 min)
Chains, Energy and Resources	25% (50% of AS)	June Yr 12 (105 min)
Practical Skills in Chemistry 1	10% (20% of AS)	Throughout Yr 12
Rings, Polymers and Analysis	15%	Jan Yr 13 (60 min)
Equilibria, Energetics and Elements	25%	June Yr 13 (105 min)
Practical Skills in Chemistry 2	10%	Throughout Yr 13

Assessment Criteria

Exam questions will assess the following objectives in relation to the content covered within each module (see the Learning Objectives section):

- Knowledge and understanding of science and of How Science Works
- Application of knowledge and understanding of science and of How Science Works
- How Science Works

AO Weightings in Advanced GCE

Unit	% of Advanced GCE			
	AO1	AO2	AO3	Total
AS Unit F321: *Atoms, Bonds and Groups*	7	7	1	15%
AS Unit F322: *Chains, Energy and Resources*	10.5	12	2.5	25%
AS Unit F323: *Practical Skills in Chemistry 1*	1.5	1	7.5	10%
A2 Unit F324: *Rings, Polymers and Analysis*	5	9	1	15%
A2 Unit F325: *Equilibria, Energetics and Elements*	9	13.5	2.5	25%
A2 Unit F326: *Practical Skills in Chemistry 2*	1	1.5	7.5	10%
	34%	44.%	22%	100%

	Assessment Objective 1	Assessment Objective 2	Assessment Objective 3
Assessment Objectives	**Knowledge and understanding of science and of How Science Works** Candidates should be able to: • recognise, recall and show understanding of scientific knowledge; • select, organise and communicate relevant information in a variety of forms.	**Application of knowledge and understanding of science and of How Science Works** Candidates should be able to: • analyse and evaluate scientific knowledge and processes; • apply scientific knowledge and processes to unfamiliar situations including those related to issues; • assess the validity, reliability and credibility of scientific information.	**How Science Works** Candidates should be able to: • demonstrate and describe ethical, safe and skilful practical techniques and processes, selecting appropriate qualitative and quantitative methods; • make, record and communicate reliable and valid observations and measurements with appropriate precision and accuracy; • analyse, interpret, explain and evaluate the methodology, results and impact of their own and others' experimental and investigative activities in a variety of ways.
A/B boundary Performance Descriptions	Candidates characteristically: a) demonstrate knowledge and understanding of most principles, concepts and facts and from the AS specification; b) select relevant information from the AS specification; c) organise and present information clearly in appropriate forms; d) write equations for most straightforward reactions using scientific terminology.	Candidates characteristically: a) apply principles and concepts in familiar and new contexts involving only a few steps in the argument; b) describe significant trends and patterns shown by data presented in tabular or graphical form; interpret phenomena with few errors; and present arguments and evaluations clearly; c) comment critically on statements, conclusions or data; d) carry out accurately most structured calculations specified for AS; e) use a range of chemical equations; f) translate successfully data presented as prose, diagrams, drawings, tables or graphs from one form to another.	Candidates characteristically: a) devise and plan experimental and investigative activities, selecting appropriate techniques; b) demonstrate safe and skilful practical techniques; c) make observations and measurements with appropriate precision and record these methodically; d) interpret, explain, evaluate and communicate the results of their own and others' experimental and investigative activities, in appropriate contexts.
E/U boundary Performance Descriptions	Candidates characteristically: a) demonstrate knowledge and understanding of some principles and facts from the AS specification; b) select some relevant information from the AS specification; c) present information using basic terminology from the AS specification; d) write equations for some straightforward reactions.	Candidates characteristically: a) apply a given principle to material presented in familiar or closely related contexts involving only a few steps in the argument; b) describe some trends or patterns shown by data presented in tabular or graphical form; c) identify, when directed, inconsistencies in conclusions or data; d) carry out some steps within calculations; e) use simple chemical equations; f) translate data successfully from one form to another, in some contexts.	Candidates characteristically: a) devise and plan some aspects of experimental and investigative activities; b) demonstrate safe practical techniques; c) make observations and measurements and record them; d) interpret, explain and communicate some aspects of the results of their own and others' experimental and investigative activities, in appropriate contexts.

Course Outline: AS Chemistry 2011 – 2012

Week	Date	Teacher A (CCO)	Teacher B (DKR)	Assessment
1	5th Sept			
2	12th Sept	1.1.1. Changing atom 1.1.2. Atomic structure	1.2.1. Evidence for shells	
		1.1.3. Atomic masses 1.1.4. Mole		
3	19th Sept	1.1.5. Types of formula,	1.2.2. Shells and orbitals 1.2.3. Sub-shells and energy levels	
		1.1.6 Moles and gas volume 1.1.9. Moles and reactions		
4	26th Sept	Revision	1.2.4. Electrons and the periodic table 1.2.5. Intro to chemical bonding	
		1.1.7. Moles and solution,		Unit 1, Module 1: Atomic Structure Homework
5	3rd Oct	1.1.8. Chemical equations 1.1.9. Moles and reactions	1.2.6. Ionic bonding 1.2.7. Ions and the Periodic Table	
		1.1.10. Acids and bases 1.1.11. Salts		
6	10th Oct	1.1.12. Water of crystallisation	1.2.8. Covalent bonding 1.2.9. Further covalent bonding	
		1.1.13. Titrations		
7	17th Oct	PA	1.2.10. Shapes of molecules and ions 1.2.11. Electronegativity and polarity	Quantitative Task 3
		PA		Unit 1, Module 1 + Module 2 Test
8	31st Oct	1.1.14. Oxidation number	1.2.12. Intermolecular forces 1.2.13. Hydrogen bonding	
		1.1.15. Redox		
9	7th Nov	Revision	1.2.14. Metallic bonding and structure 1.2.15. Structure of ionic compounds	
		1.3.1.Periodic Table 1.3.2. Periodic Table 1.3.3. Modern Periodic Table		
10	14th Nov	1.3.6. Group 2 elements: redox reactions	1.2.16. Structure of covalent compounds	
		1.3.7. Group 2 compounds: reactions		Unit 1, Module 3: Group2 trends and reactions Homework
11	21st Nov	1.3.8. Group 7 elements: redox reactions	Revision	

		1.3.9. Group 7 elements, uses and halide tests		
12	28th Nov	1.3.4. Periodicity: ionisation energies 1.3.5.Periodicity: boiling pts	Revision	
		Revision		
13	5th Dec	Revision	Revision	
		PA		Qualitative Task 2
14	12th Dec	PA	Revision	
		Test		Unit 1 Mock exam

15	Thurs 5th Jan			
16	9th Jan	2.1.1. Intro to Organic chemistry 2.1.5 Structural and skeletal formulae, 2.1.6	2.3.1. Enthalpy 2.3.2. Exothermic and endothermic reactions	
		2.1.2. Naming hydrocarbons 2.1.3. Functional groups 2.1.4. Formulae		
17	16th Jan	2.1.9. HC from crude oil 2.1.10. HC as fuels	2.3.3. Enthalpy profile diagrams 2.3.4. Standard enthalpy changes	
		2.1.8. Organic reagents and their reactions		
18	23rd Jan	2.1.11. Fossils fuels 2.1.12. Substitution reactions of alkanes	2.3.5. Determination of enthalpy changes	
		2.2.13 Alkenes 2.2.14. Reactions of Alkenes		
19	30th Jan	Revision	2.3.6. Enthalpy change of combustion 2.3.7. Bond enthalpies	
		2.2.15 Further reactions of alkenes 2.1.16. Alkenes and bromine		Unit 2, Mod 1: HC nomenclature
20	6th Feb	2.1.17. Industrial importance of alkenes	2.3.8. Enthalpy changes from ΔHcɵ 2.3.9. Enthalpy changes from ΔHfɵ	
		PA		
21	20th Feb	PA	Rev	Evaluative Task 2
		Test		Unit 2, Module 1 + 3 Test
22	27th Feb	2.1.18 Polymer chemistry	2.3.10. Rates of reaction - collision theory 2.3.11. Catalysts	

		2.1.19 Polymers - dealing with waste 2.1.20.Other uses of polymer waste		
23	5th Mar	2.2.1. Making and using alcohol 2.2.2. Properties of alcohol	2.3.12. Economic importance of catalysts 2.3.13. Boltzmann distribution	
		2.2.3. Combustion and oxidation of alcohol 2.2.4 Esterification		
24	12th Mar	2.3.5. Intro to halogenoalkanes 2.3.6. Reactions of halogenoalkanes	2.3.14. Chemical equilibrium 2.3.15. Equilibrium and industry	
		2.3.7. Halogenoalkanes and the environment		Unit 2, Mod 1: Reactions of Alkenes
25	19th Mar	2.3.8. Percentage yield 2.3.9. Atom economy	2.4.1. Greenhouse effect 2.4.2. Climate change 2.4.3. Solutions	
		2.3.10. IR spec 2.3.11. IR spec : functional groups		
26	26th Mar	2.3.12. Mass spec 2.3.13. Mass spec in organic chemistry	2.4.4. Ozone layer 2.4.5. Ozone depletion	
		2.3.14. Mass spec: fragmentation 2.3.15. Reaction mechanisms		Unit 2 Revision
27	16th April	PA	2.4.6. Controlling air pollution 2.4.7. Green chemistry 2.4.8. CO2	Quantitative Task 1:
		Test		Unit 2 Test

Lesson Objectives

You will be given an objective sheet at the start of each module. You will use this at the start of each lesson to complete the date section on the handout. You must keep this in your folder and take it to every lesson. See below for an example.

Module 1- Atoms and reactions	
Atoms	**Date**
Describe protons, neutrons and electrons in terms of relative charge and relative mass.	
Describe the distribution of mass and charge within an atom.	
Describe the contribution of protons and neutrons to the nucleus of an atom, in terms of atomic (proton) number and mass (nucleon) number.	
Deduce the numbers of protons, neutrons and electrons in: (i) an atom given its atomic and mass number (ii) an ion given its atomic number, mass number and ionic charge.	

Examiners' Tips

General guidance

Each module of the AS chemistry specification consists of a series of *Learning Outcomes*. This is the information that you, the student, are expected to know, and it forms the basis of what the examiner will ask you in an examination. Consequently, it is imperative that you are prepared and know as many of these *Learning Outcomes* as possible before you start your exams.

Although the AS chemistry exam is not synoptic, there are some areas of overlap. For example, the *Moles and equation* section of Module 1 is a key building block – all chemistry examinations will test the ability to calculate.

Key areas to concentrate upon within modules

Chemistry has developed its own language and methods. Consequently, different chemists can understand each other's concepts through the use of certain formal definitions. Since AS chemistry is a building block for A2 chemistry and beyond, quite a number of these formal definitions are included in the AS specification. Learning these definitions would be a useful starting point for you – they have been *italicised* in this section to help you identify them.

The key points have been highlighted to guide you through your revision. These points appear under their appropriate AS chemistry sections, and these sections appear under their corresponding Modules. This arrangement allows you to dip in and out, enabling you quick and easy access to the section you are revising at the time. The information listed here does not include the full content of what you might be asked; it does, however, contain the basic points. Think of them as guides; they will give you a good grounding and point you in the right direction – the actual learning is down to you!

Points to note by module

Each module of the physics specification consists of a series of *Learning Outcomes* and these outcomes often revolve around specific definitions, for example, the volt or the Newton. Make sure you highlight these definitions in your revision and learn them. See the separate Glossary booklet.

You will be given an Examiner's Tips section for each module. See below for an example.

Module 1 - Atoms and reactions
Section 1.1.1 Atoms
Here are some basic facts you need to be aware of: • Atomic number = number of protons • Mass number = number of protons + number of neutrons • For atoms, number of protons = number of electrons • For positive ions, number of protons will be more than number of electrons • For negative ions, number of protons will be less than number of electrons You will also need to know the definition of: • *relative isotopic mass* • *relative atomic mass*

AS Unit F321: Atoms, bonds and groups

Module 1: Atoms and reactions

Question 1	**Total marks: 15**

Potassium was first isolated by Sir Humphrey Davy in 1807. It has two main isotopes, ^{39}K and ^{41}K. Both isotopes are able to form a positive ion with a single charge.

(a) Complete the table below.

Particle	**Number of protons**	**Number of neutrons**	**Number of electrons**
^{39}K			
$^{41}K^+$			

Marks available: 2

Student answer:

(a)

Particle	Number of protons	Number of neutrons	Number of electrons
^{39}K	19	20	19
$^{41}K^+$	19	22	18

Examiner comments:

(a) Good. Mass number = protons + neutrons.
If an ion is positive, it will have *fewer* electrons than protons.

The two main isotopes, ^{39}K and ^{41}K, are stable and naturally occur with the following percentage abundances. This information can be used to calculate the relative atomic mass of potassium.

Isotope	Percentage abundance
^{39}K	93%
^{41}K	7%

(b) Define the term relative atomic mass.

Marks available: 3

Student answer:

(b) The average mass of an atom compared with an atom of carbon-12, on a scale in which carbon-12 has a mass of 12.000.

Examiner comments:

(b) The weighted mean mass of an atom compared with 1/12th the mass of a carbon-12 atom would be an equally acceptable response.

(c) Use the information in the table above to calculate the relative atomic mass of potassium.

Give your answer to two decimal places.

Marks available: 3

Student answer:

(c) (93/100 x 39) +(7/100 x 41)
Ans = 39.14

Examiner comments:

(c) Always show full working. Make sure you round off to 2 decimal places as this is what the question asked for.

(d) A compound consisting of nitrogen and hydrogen has a composition of 87.5% nitrogen and 12.5% hydrogen. The relative molecular mass is 32. Calculate the empirical formula and the molecular formula.

Marks available: 3

Student answer:

(d)

		N	H
Ratio by mass	=	87.5%	12.5%
Ratio by atoms	=	$\frac{87.5}{14}$	$\frac{12.5}{1}$
	=	6.25	12.5
Simplest ratio	=	$\frac{6.25}{6.25}$	$\frac{12.5}{6.25}$
	=	1	2

Empirical formula = NH_2

M_r = 32, M_r NH_2 = 16, $\frac{32}{16}$ = 2 molecular formula = 2 x NH_2 = N_2H_4

Ans = N_2H_4

Examiner comments:

(d) To save time, the accompanying explanations seen here are not normally seen in an exam answer.

However, once you have done the easy part in finding the empirical formula, then you do need to explain why the molecular formula is twice the empirical formula.

(e) Lithium reacts with water as shown in the following equation:

$$2Li(s) + 2H_2O(l) \longrightarrow 2LiOH(aq) + H_2(g)$$

In an experiment, 0.76 g of lithium was added to 200 cm^3 of distilled water.

(i) How many moles of lithium reacted?

(ii) The experiment was carried out at room temperature and pressure. What volume of hydrogen gas was produced? [1 mol of gas occupies 24.0 dm^3 at room temperature and pressure]

(iii) 25.0 cm^3 of the lithium hydroxide solution formed was neutralised by 23.6 cm^3 of dilute hydrochloric acid. Calculate the concentration of the dilute hydrochloric acid used. Give your answer to an appropriate number of significant figures.

$$LiOH(aq) + HCl(aq) \longrightarrow LiCl(aq) + H_2O(l)$$

Marks available:
(i) 1 (ii) 2 (iii) 3

Student answer:

(e) (i) $\frac{0.76}{6.9} = 0.1101449$

Ans = 0.11 mol

(ii) Ratio Li : H_2 = 2 : 1

Moles H_2 = $\frac{0.1101449}{2}$ = 0.0550724 mol

Volume H_2 = 0.0550724 x 24 = 1.3217

Ans = 1.3 dm^3

(iii) Moles Li in 200 cm^3 = moles LiOH

Moles of LiOH in 25.0 cm^3 = $\frac{25.0 \times 0.1101449}{200}$ = 0.0137681 x 10^{-3} mol

Moles of HCl in 23.6 cm^3 = 0.0137681 x 10^{-3} mol

Moles of HCl in 1000 cm^3 = $\frac{1000 \times 0.0137681 \times 10^{-3} \text{ mol}}{23.6}$ = 0.583394

Ans = 0.58 mol dm^{-3}

Examiner comments:

(e) (i) Answer is given to only 2 significant figures because M_r of Li is to 2 significant figures.

(ii) Although working is done to many significant figures, the answer is given to only 2 significant figures because M_r of Li is to 2 significant figures.

(iii) Once again, working is done to several significant figures, but the answer is given to only 2 significant figures. However, do not round your working to 2 significant figures as this introduces ‘rounding errors’.

Module 1: Atoms and reactions	
Question 2	**Total marks: 15**
(a) Explain what is meant by the term *acid*.	
	Marks available: 1

Student answer:

(a) An acid is a substance that can donate protons.

Examiner comments:

(a) All that is needed is a simple recall of a specification statement. Avoid any references to pH, corrosive nature etc.

(b) **Sulfuric acid is a common acid. It will react with solid sodium carbonate, a white powder, to form an aqueous salt, water and carbon dioxide gas.**

(i) Describe what would be seen when dilute sulfuric acid reacts with solid sodium carbonate.

(ii) Name the salt formed.

(iii) Construct a balanced equation to represent the reaction between dilute sulfuric acid and solid sodium carbonate. Include state symbols.

Marks available:

(i) 2 (ii) 1 (iii) 2

Student answer:

(b) (i) Effervescence is seen and a colourless gas is given off. The white powder dissolves to form a colourless solution.

(ii) Sodium sulfate.

(iii) $Na_2CO_3(s) + H_2SO_4(aq) \longrightarrow Na_2SO_4(aq) + H_2O(l) + CO_2(g)$

Examiner comments:

(b) (i) There are two marks available here, so remember to give two (and not more than two) separate responses.

(ii) Remember, sulfuric acid always forms sulfates.

(iii) Make sure the state symbols fit with both the information in the question and your observations e.g. Na_2CO_3 is a *solid* and you've said it has *dissolved*, so the product is aqueous.

(c) Magnesium ribbon combusts brightly in air.

$$2Mg(s) + O_2(g) \longrightarrow 2MgO(s)$$

Explain any reduction and oxidation changes which occur in terms of electron transfer.

Marks available: 1

Student answer:

(b) Magnesium transfers two electrons to oxygen. Therefore magnesium has lost electrons, which is oxidation, and oxygen has gained electrons, which is reduction.

Examiner comments:

(c) 'OILRIG' is probably the easiest acronym to remember! It is usually easier to spot the oxidised species as it becomes more *positive*. Make sure you also spot the species which becomes more *negative*.

(d) Nitrogen can form a nitrate(V) ion, NO_3^-. It is called nitrate(V) because the nitrogen atoms have a +5 oxidation number. When heated, sodium nitrate(V) will decompose as shown.

$$2NaNO_3(g) \longrightarrow 2NaNO_2(s) + O_2(g).$$

(i) Name the compound formed.

(ii) Explain any reduction and oxidation changes that have occurred in terms of changes in oxidation number.

Marks available:

(i) 1 (ii) 2

Student answer:

(d) (i) Sodium nitrate(III).

(ii) The oxidation number of the nitrogen has decreased from +5 to +3, which is reduction, and the oxidation number of the oxygen atoms has increased from -2 to 0, which is oxidation.

Examiner comments:

(d) (i) Sodium nitrite is an acceptable alternative. The key to scoring the mark here is to include the oxidation number as a roman numeral.

(ii) It is always better to state the old and new oxidation numbers. Simply saying the oxidation number of nitrogen has decreased may not get you the full marks.

(e) Hydrated magnesium sulfate, sometimes known as Epsom salts, exists as white crystals. When heated, it will reduce in mass and form anhydrous magnesium sulfate. The equation for this change is shown below.

$$MgSO_4.xH_2O(s) \longrightarrow MgSO_4(s) + xH_2O(l)$$

Describe any changes in appearance you might observe when hydrated magnesium sulfate is heated.

Marks available: 1

Student answer:

(e) The white crystals will turn to a white powder.

Examiner comments:

(e) The key point is that anhydrous substances tend to form powders not crystals.

(f) In an experiment, hydrated magnesium sulfate crystals were heated until the mass no longer decreased. The results are shown in the table below.

Initial mass of hydrated magnesium sulfate / g	**0.333**
Final mass of anhydrous magnesium sulfate / g	**0.164**

(i) How many moles of anhydrous magnesium sulfate, $MgSO_4$, remain?

(ii) Calculate the mass of water given off and use this value to calculate the number of moles of water given off.

(iii) Use your answers to parts (i) and (ii) to calculate the value of x in $MgSO_4.xH_2O$.

Marks available:

(i) 1 (ii) 1 (iii) 2

Student answer:

(f) (i) $\frac{0.164}{120.4}$ = 0.0013621 moles

Ans = 0.00136 mol

(ii) Mass of water given off = 0.333 – 0.164 = 0.169 g

Moles of water given off = $\frac{0.169}{18}$ = 0.0093888

Ans = 0.00939 mol

(iii) Ratio of $MgSO_4$: H_2O = 0.00136 : 0.00939

Simplest ratio = $\frac{0.00136}{0.00136}$: $\frac{0.00939}{0.00136}$

= 1 : 6.90

x = 7

Examiner comments:

(f) (i) Make sure you use the data book value for the M_r of Mg. Round your answer to 3 sig figs.

(ii) The mass of water given off has been found by subtracting mass of solid left behind from the initial mass.

(iii) This is a good answer as the final value of **x** has to be a whole number.

Practical Assessment

What are practical skills?

- This is the formal internal assessment of your practical work, entitled *Practical Skills in Chemistry 1* (unit code F323).

How much are practical skills worth?

- The practical skills assessments are worth 40 marks, which will be scaled by OCR to a mark out of 60. This represents 20% of the maximum 300 marks for the whole AS course (and 10% of the maximum of 600 marks for the A Level course).
- Remember that for *every* two marks you gain from your practical skills assessments you will achieve 1% towards your final AS percentage.

Who does the marking and when?

- Your teacher will mark all the practical skills exercises you carry out during your AS course, using a mark scheme provided by OCR.
- The marking will be checked by OCR moderators and marks can be changed to bring the marks of your centre into line with those from other centres around the country.

What proportion of the exercises is done in lessons?

- As with all your coursework your teacher must be able to verify that the exercises have been undertaken by you alone.
- Both you and your teacher will have to sign documents to this effect.
- All tasks will be carried out under supervision during lesson time.

How many tasks do I have to do?

- All tasks will be set by OCR.
- There are *three* types of tasks that are used to assess practical skills:
    - a qualitative task – worth 10 marks
    - a quantitative task – worth 15 marks
    - an evaluative task – worth 15 marks

What is covered by the qualitative task?

- You have to carry out a practical task using instructions supplied by OCR.
- You are expected to perform the task skilfully and safely using *qualitative* techniques (generally few or no calculations).
- Possible types of task are shown below.
- You will need to make and record valid observations and organise them in an appropriate way.

What is covered by the quantitative task?

- You have to carry out a practical task using instructions supplied by OCR.
- You are expected to perform the task skilfully and safely using *quantitative* techniques (generally involving detailed calculations).
- Possible types of task are shown below.
- You will need to make and record accurate observations and organise them in an appropriate way.
- You will then process your results to reach valid conclusions.

What is covered by the evaluative task?

- Evaluative tasks will not require additional data collection.
- You will need to be able to:
    - recognise trends in data and identify anomalies
    - reach valid conclusions
    - assess the reliability and accuracy of an experimental task
    - identify significant weaknesses in procedures and measurements
    - understand and select simple improvements to procedures and measurements.

Do I have to plan a practical?

- No, but you may be required to suggest changes to techniques or apparatus which will improve the accuracy or reliability of the results and/or the validity of the conclusions.

Will every piece of practical work be assessed?

- No. OCR provides certain tasks for assessment which can be done at any point during the course. Your teacher will do other practical work with you to develop your skills but this will not be assessed.
- The *minimum* number of practical assessments would be one for each of the three tasks but it is highly likely that you will do more than one of each type.

If I do more than three practical assessments, which ones count towards AS?

- Your final mark out of a possible 40 will be comprised of the *best* scores that you achieve for a qualitative task, a quantitative task and an evaluative task. Remember that more marks are available for the quantitative and evaluative tasks.

The qualitative task

Possible qualitative tasks include:

- Making a salt (see specimen task 1: Preparation of ammonium sulfate)
- Reactions of Group 2 metals and their compounds
- Reactions of Group 7 elements and their compounds
- Organic preparations
- Changing equilibrium position with heat or concentration.

When carrying out qualitative tasks:

- You may be expected to comment on the safety aspects of the experiment. Such comments must only refer to the practical you are doing.
- You may be expected to choose the most appropriate piece of equipment from a list and explain your choice.
- Organise your work area and wipe up any spillages immediately.
- Wear safety glasses and gloves when advised to do so.
- When using measuring cylinders, dropping pipettes and other items to measure your chemicals, keep these next to the appropriate chemical container to avoid potential contamination from other chemicals.
- Dispose of chemicals as instructed – this may *not* be down a sink.
- Transfer reactions to a fume cupboard if noxious fumes are produced.

- Make a record of *all* observations such as changes in colour or temperature, or smells (do *not* deliberately smell substances unless specifically asked to).
- Record any measurements to the correct number of significant figures and always give units.
- When heating your apparatus do not leave it unattended.
- Remember that overheating salts can result in thermal decomposition producing harmful, irritating or toxic gases.
- When using glassware ensure it is assembled properly and is free from any leaks, for example, Quickfit for organic preparations. Clamps should be used on boiling flasks (tight), on condensers (loose) and on delivery tubes to avoid any loss of material.

The quantitative task

Possible quantitative tasks include:

- Titrations, including dilutions
- Determination of the percentage of water of crystallisation in a hydrated salt
- Determination of relative atomic mass of a metal via gas collection
- Percentage yields in organic preparations
- Direct and indirect enthalpy changes
- Rates of reaction.

When carrying out quantitative tasks:

- The points already listed for carrying out qualitative tasks also apply to quantitative tasks.
- Burettes and pipettes should first be washed thoroughly in water, followed by a small amount of the solution which is to be measured.
- Initial and final burette readings should be recorded.
- Titration results should be quoted to the nearest 0.05cm^3.
- When calculating the mean titre, it is important to *tick* the results you have used – those within 0.10cm^3 of each other (i.e. concordant results). Only include the concordant results in your average.
- Remember to cross out the word *rough* if you intend to use the rough reading.
- When carrying out dilutions it is important to fill up to the *mark* on the volumetric flask with deionised or distilled water, rather than just adding a fixed amount of water. For example, to dilute 25.0cm^3 of acid to 250cm^3 you *don't* add 225cm^3 of water to the acid.
- When carrying out calculations, it is important to explain each line of your working. For example:

amount of acid used = 2.00 x 25.0/1000 = 0.0500mol

- It is also important to use the correct units at each stage of the calculation – e.g. kJ for kilojoules, *not* KJ, kj *or* Kj.
- Superscripts must be used where appropriate – e.g. dm^3 *not* dm3.
- Subscripts in formulae must also be used – e.g. H_2O *not* H2O.
- The accuracy of the final answer is dictated by the *least* accurate piece of data. For example, data accurate to 3 significant figures but using a mass of 0.10g (2 sig fig) would suggest that any final answer should be quoted to 2 sig fig. However, it is acceptable to use one more significant figure in your working than in your answer. Avoid increasing the number of significant figures from one line of working to the next.
- When plotting graphs you need to consider the following:

- Is the origin, (0,0), a point?
- Which quantity should go on the x-axis? This is generally the *independent* variable. However, if time is plotted on the x-axis as in rate graphs, the gradient of the line will then represent the rate.
- Scales must be linear and be appropriate for the size of graph paper used.
- Scales must be labelled, with the physical quantity being measured and its units given.
- Tangents and gradients should be clearly shown. Δy and Δx values should be quoted *before* calculating gradients.

The evaluative task

Possible evaluative tasks include:

- Determination of the percentage of water of crystallisation in a hydrated salt
- Determination of relative atomic mass of a metal via gas collection
- Enthalpy changes
- Rates of reaction.

When carrying out evaluative tasks:

- You should be able to identify anomalous results and hence assess the reliability of the experiment.
- You may have to perform some calculations using the correct mean of a set of results.
- When carrying out a practical it is extremely helpful to note any procedural errors as they happen.
- You will probably be asked to put certain errors in order of significance.
- You have to be able to calculate the potential percentage error of your measurements.
- In order to compare procedural and measurement errors, you may also be expected to estimate percentage errors of your procedural errors. However, this is not always possible.
- You must be prepared to suggest modifications to procedures or to any apparatus which would improve the accuracy of an experiment. Your modifications should be achievable in a *school* laboratory.
- You need to be able to calculate amounts of chemicals in *moles*, in order to determine whether a particular chemical is in excess.

What you need for a practical assessment
Equipment

- Calculator
- 30cm ruler
- Flexible curve – helps to draw curves if needed
- Sharp pencil
- Blue/black pen

Reference items

- OCR *Data Sheet* including a Periodic Table

Getting the basics right - study skills

Your AS chemistry examinations are not synoptic. This means that you need only know the specification that is being tested at the time, i.e. for that particular unit. Each unit is split into modules and each module is split into sections. The *Learning Outcomes* for each section are listed alphabetically. These form the key basics which must be learned.

Your OCR book contains sections which closely follow these *Learning Outcomes*. When revising, start with a small part of the specification – it can be as little as a single page. As you continue to revise, begin to choose a greater number of pages. In this way you will gradually build up your chemistry knowledge and by the time of the exams you should know your basic key points.

- **Keep your notes organised**

  Your folder (with dividers) should be taken to every lesson. You should have a section in your folder for the following:
  - DKR notes
  - DKR homework
  - CCO notes
  - CCO homework
  - Formal assessments (Anything with a green sticker!)

Getting the basics right - exam skills

It's easy to forget that the examiners are on your side – they want you to pass and pass well! By sticking to the following points you can help the examiners in *their* task and ensure you don't lose marks through illegible writing or silly mistakes.

- **Make sure your writing is legible**

Your handwriting does not have to be perfect *copperplate* but the examiner must be able to read it! When you're in a hurry it's easy to write key words that are difficult to decipher. Practise quickly writing ethane and ethene (or ethanol and ethanal) alongside each other. Then ask a friend to read the words back to you – can they tell the difference?

- **Write all numerical answers on the lines provided**

Occasionally, where more than one step is involved you will have stage answers, and it is sometimes difficult to see which answer has finally been arrived at. If there is more than one set of sums make it clear to the examiner which is your final answer.

- **Avoid using *quirky* letters**

Everybody has their individual writing style but there are occasions when style has to give way to conformity. For example, use a clear letter K to represent potassium's symbol rather than a stylised one, K, which may be hard for the examiner to decipher. Also ensure that your lower case letters are not easily confused with your capital letters. For instance, putting a horizontal tail on a lower case letter l can effectively convert it to a capital L and may lose you marks if you've been asked to write the symbol for aluminium, Al not AL! Furthermore, be careful when writing units; you don't want your correct unit of $kJmol^{-1}$ being read as an incorrect $Kjmol^{-1}$.

By carefully reading your exam paper you can also avoid silly mistakes that may lose you vital marks. Here are some tips that should help you during the exam.

- **Look at how the marks are awarded**

As a rule of thumb the going rate for answering questions is around one mark per minute. Along with the writing time this includes any reading and thinking time (and also checking time if the answer is numerical). Use your time proportionately. For instance, if a question says give *two* uses of substance X and there are only *two* marks available, it would be pointless spending 15 minutes writing down everything you know about substance X!

- **Look out for words in** bold

These words are highlighted for your benefit and are to alert you to something in particular. For example, a question may be talking about the hydrocarbons propane, butane and **pentane**. By using bold for **pentane** it may only want you to draw the isomers for this hydrocarbon.

- **Look out for words in *italics***

These are often used for terms which you will have to define or explain. If two words appear in italics then *both* words must be addressed. For instance, 'Explain what is meant by the term *strong acid*', requires that both the terms *strong* and *acid* are explained. If you answered, 'an acid which completely dissociates into ions when dissolved in water', you have only explained the term *strong*. A full answer would be, 'a proton donor which completely dissociates into ions when dissolved in water'.

- **Correcting written errors**

AS questions are structured in a way that requires you to write in the spaces provided. If you make a mistake, neatly cross through the work you think is wrong and write a fresh answer alongside or above. You can also use asterisks to direct the examiner to your continued answer if you need to use extra space lower down the page. When crossing out, do not heavily obliterate what you have written – a single line through the work will do. You may decide that the work crossed out is in fact the correct answer and it is easier to write, 'crossed out in error – please mark this', rather than rewriting the whole piece.

- **Correcting calculations and numbers**

Never overwrite one number with another. Although it may be obvious to you in the exam room that you have changed a 0 into a 9, by the time your paper reaches the examiner it may be difficult to interpret whether it was a 0 changed to a 9 or a 9 changed to a 0. If you make a mistake, be clear. Cross through the number you think is wrong and write the new number alongside or above.

- **Correcting diagrams and graphs**

In structured papers such as the AS Chemistry papers, there are usually spaces for a diagram or a graph. In these instances you should use a sharp *pencil.* If a mistake is made you can simply rub it out rather than redraw the diagram or graph from scratch. Please be aware that you are not allowed to use liquid paper during examinations.

Getting the basics right - command words

Command words are used to instruct you *how* to answer a question. Consequently, it is vital that you spot these command words and answer the question as the examiner expects. Look at the instructions given in the question.

- **List** – give a simple inventory. Answers can consist of one word, one phrase or one sentence. If the question asks, 'List two uses of substance X', then only give *two*. If you give three uses and one is incorrect you will not receive the full marks allocated for this question – it is not up to the examiner which two answers should be marked.

- **State** – write a simple response to the answer. There is no need for you to explain or expand upon your statement.

- **Describe** – a more detailed answer is required here. The answer may contain diagrams, graphs or tables. If a question asks you to describe an organic mechanism, and states that you may use diagrams if you wish, then use them – the examiner will expect them and can allocate marks accordingly.

- **Define** – give a formal definition. Your specification will state which definitions are required. It is a good idea to learn a response you are confident with for each of these definitions.

- **Explain** – normally used when you are given a fact and asked to explain it, using your chemistry knowledge in your answer.

- **Calculate** – you need to show your working. Even if you give an incorrect answer you may still get method marks if you have clearly shown the correct steps involved in the calculation. For example, a common error when calculating a mass of substance produced in a reaction is using an incorrect relative atomic mass or incorrectly determining a relative molecular mass. However, if this mistake is evident in the first line of your calculation then any subsequent stages (providing they are correct) will still get credit. Examiners call these '*ecf*' (error carried forward) marks.

Getting the basics right - practice questions

Here are some questions for you to try. Remember to note the command words!

1 **List** two uses of ethanol.

2 **State** the names of two alcohol isomers for C_3H_7OH.

3 Draw two isomers of C_3H_7Cl in the boxes shown below.

Isomer 1	
Isomer 2	

4 **Define** standard enthalpy of combustion.

5 **Predict** how the first ionisation of magnesium compares with that of aluminium.

Stretch yourself - study skills

Once you are comfortable that you know your *Learning Outcomes* chemistry, you can start to reinforce this knowledge. There are numerous ways of achieving this; choose the one you have a preference for and that works for you.

The following points are just suggestions. You may wish to use more than one approach or adapt some of them. If you already have your own successful method, then carry on using it!

- **Produce condensed versions of your notes**
  Just include the pertinent information.

- **Use practice exam questions**
  Preferably with specimen answers so you can check your own.

- **Make up your own questions**
  Try your questions with a fellow student and check each other's answers.

- **Convert your work to mnemonics**
  A common one here is OILRIG (oxidation is loss, reduction is gain). Another example could be '**B**az **S**tops **C**atching **M**onkeys' to remember the order of reactivity for the Group 2 metals: barium; strontium; calcium; and magnesium.

- **Use spider diagrams**
  These can be useful when revising organic chemistry. One homologous series can be connected to another with arrows to and from boxes containing the names of the series. The essential reaction conditions can be written above or below the arrows.

- **Practise writing the relevant equations for all the specification reactions**
  There aren't too many and the important equations are usually highlighted within the appropriate module sections. You should earn marks for being able to write these equations correctly.

- **Acquire knowledge that is not directly found within your specification**

You may wish to use the *New Scientist* link on the Exam Café CD.

Although you may find some of the above suggestions useful, it is important to remember that it is *your* revision session and as such should suit *you*. Everyone has an optimum *concentration time* which can be remarkably short. You may therefore find it more useful to revise *little and often* rather than revising for long sessions at a time. Again there are no hard and fast rules on how to revise – it's your personal choice.

Stretch yourself - exam skills

Most of the common pitfalls students encounter and how to avoid them are listed in the *Reach your potential – getting started* section of this CD. Another common hazard is not fully addressing the question. Certain open-ended questions require multiple answers. For instance, for the question, 'Describe what you would see when air reacts with magnesium and with calcium, including any equations', you would need to include *two* observations and *two* equations in your answer – an observation and equation for the magnesium reaction as well as an observation and equation for the calcium reaction.

Practising questions from past papers will also help to improve your exam skills. Completing at least one whole past paper in the run-up to your exam should help you get a feel for the pace of the exam and make the real thing less daunting.

Stretch yourself - command words

- ***Describe*** – a more detailed answer is required, possibly containing diagrams, graphs or tables.
- ***Explain*** – normally used when you are given a fact and asked to explain it, using your chemistry knowledge in your answer.
- ***Predict*** – often used to establish if you know a trend as stated in the specification.
- ***Outline*** – give general principles *not* specific facts.
- ***Sketch*** – usually applied to graphs where a trend is known but not the exact figures. The clue here is the term *sketch*, where only the general shape of the curve or gradient of the line is required. Remember that all axes must be labelled.
- ***Suggest*** – frequently regarded as the hardest type of question, as you will probably *not* know the answer before you enter the exam room. Instead, you will be required to use information gleaned from the question as well as from your previous answers in order to come up with a suitable reply. For this type of question there are often many correct answers.
- ***Discuss*** – this type of question does not often appear in AS exams but when it does, then a fuller, more detailed account is required. You often need to introduce more than one topic into your response for this type of question.

Stretch yourself - practice questions

Here are some questions for you to try. Remember to note the command words!

1 **Describe** the physical states of chlorine, bromine and iodine at room temperature and explain any trend.

2 **Outline** with the aid of equations the free radical substitution of methane by chlorine.

3 **Sketch** a graph showing how increasing the concentration of a reactant would affect the rate of a chemical reaction.

4 **Discuss** the differences in the reactions of ethane and ethene with bromine.