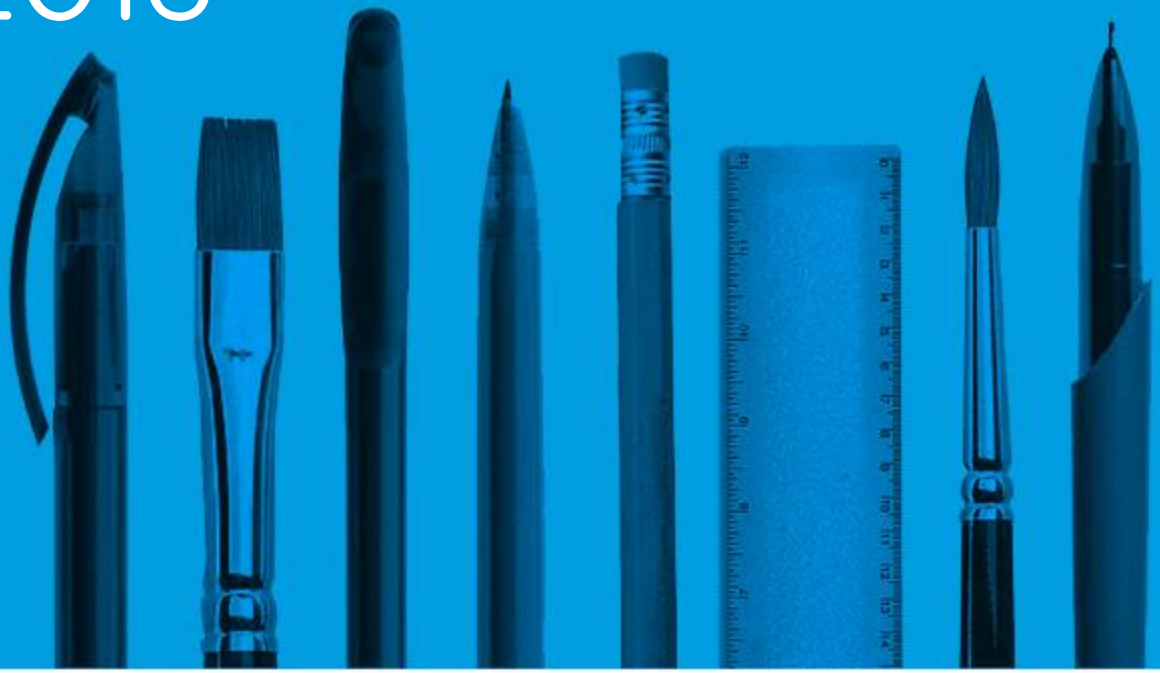
GCE CHEMISTRY
AS EXAMINATIONS
SUMMER 2016



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FEEDBACK ON AS UNIT 1

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AS UNIT 1

Maximum mark = 80	Mean mark = 31.1			Entry = 3360	
Grade boundary	A	B	C	D	E
	43	36	29	22	16
Cumulative % at grade	22.2	36.6	53.9	71.8	85.1

ITEM LEVEL DATA

All Candidates performance across questions						
Question Title	N	Mean	S D	Max Mark	F F	Attempt %
1-7	3386	5.3	2.7	10	53.2	100.0
8	3385	6.4	3.7	16	39.7	100.0
9	3386	4.1	2.5	11	37.4	100.0
10	3386	7.4	3.4	17	43.5	100.0
11	3355	4.9	2.7	13	37.7	99.1
12	3318	3.2	2.8	13	24.7	98.0

SECTION A

2. Accessible mark, range of acceptable answers, 6+ not credited
   Not counted as L2 maths

3. (a) New on specification – positron emission results in loss of 1 proton
   (b) Accessible, ⅕ was commonly seen
   Not L2 maths

6. Accessible but many did not appreciate that M_r for $NaHCO_3$ had to be doubled

7. (a) New on AS specification
   (b) Very many failed to re-arrange the expression
   L2 maths involved here
   AS questions will not involve calculating equilibrium concentrations from initial concentrations

QUESTION 8

(b) Poorly answered, basic numeracy rather than something that would have been taught, ratios and changing units

(c) Accessible but not well done, question was often not read carefully enough and labels were missing or incorrect

(d) Testing knowledge of practical work, only 1 of 3 marks in part (ii) counted as L2 maths

(e) Knowledge of practical work, context used requires careful reading to enable correct application of knowledge

(g) Most knew the link with ionisation energy but very few were able to coherently explain the very high 3rd ionisation energy

Parts (a) and (f) both involved writing simple equations which should be accessible to AS candidates.

QUESTION 9

(a) Quite a familiar calculation type in part (ii), fairly well answered
2 of the 3 marks L2 maths

(c) (i) Knowledge of practical work, very poorly answered
(ii) Familiar calculation type but poorly answered
Only 1 of 3 marks counted as L2 maths

QUESTION 10

(a) Good example of increased level of demand, candidates coped very well with most identifying the percentage of each isotope Simple examples of these calculations now appear at GCSE

(c) Included to contribute towards the L2 maths count, most candidates struggled with this

(d) (i) Application of VSEPR in the context of an unfamiliar species, well done on the whole although lack of precision in describing 'minimum repulsion' was common

(ii) Another unfamiliar calculation involving basic numeracy skills, poorly done

(e) New on AS specification, candidates used the log equation very well although many failed to identify the 1:4 ratio given in the equation

QUESTION 11

(a) A familiar topic but one with which many candidates have difficulty
Dipoles on both interacting molecules and lone pair(s) should be shown along with a representation of the 'bond'

(b) A very demanding question with an element of evaluation, targeting the highest achieving candidates

(c) Testing knowledge of a specified practical method, some application required
Disappointing responses on the whole as this method is also familiar to GCSE students

QUESTION 11

Indicative content

1 aqueous sulfuric acid in burette (accept aqueous ammonia in burette)
2 measure volume of ammonia into flask
3 use of an indicator (not universal indicator)
4 titrate with aqueous sulfuric acid until colour of indicator just changes
5 read burette and repeat without indicator / use of decolorising charcoal and filter
6 concentrate neutralised solution
7 cool (concentrated) solution / leave to evaporate over time
8 filter and dry crystals

QUESTION 11

5-6 marks
The method provided leads to pure dry crystals of ammonium sulfate.
The candidate constructs a relevant and logically structured account including all key elements of the indicative content. Scientific conventions and vocabulary are used accurately throughout.

3-4 marks
The method outlined leads to the production of a solution of ammonium sulfate.
The candidate constructs a logically structured account including the main elements of the indicative content. The use of scientific conventions and vocabulary are generally sound.

1-2 marks
The method provided leads to the production of a solution that contains ammonium sulfate.
The candidate has given an outline method of the production of ammonium sulfate but a number of key points are missing. There is some evidence of the correct use of scientific conventions and vocabulary.

0 marks
The candidate does not make any attempt or give an answer worthy of credit.

QUESTION 12

A demanding final question.

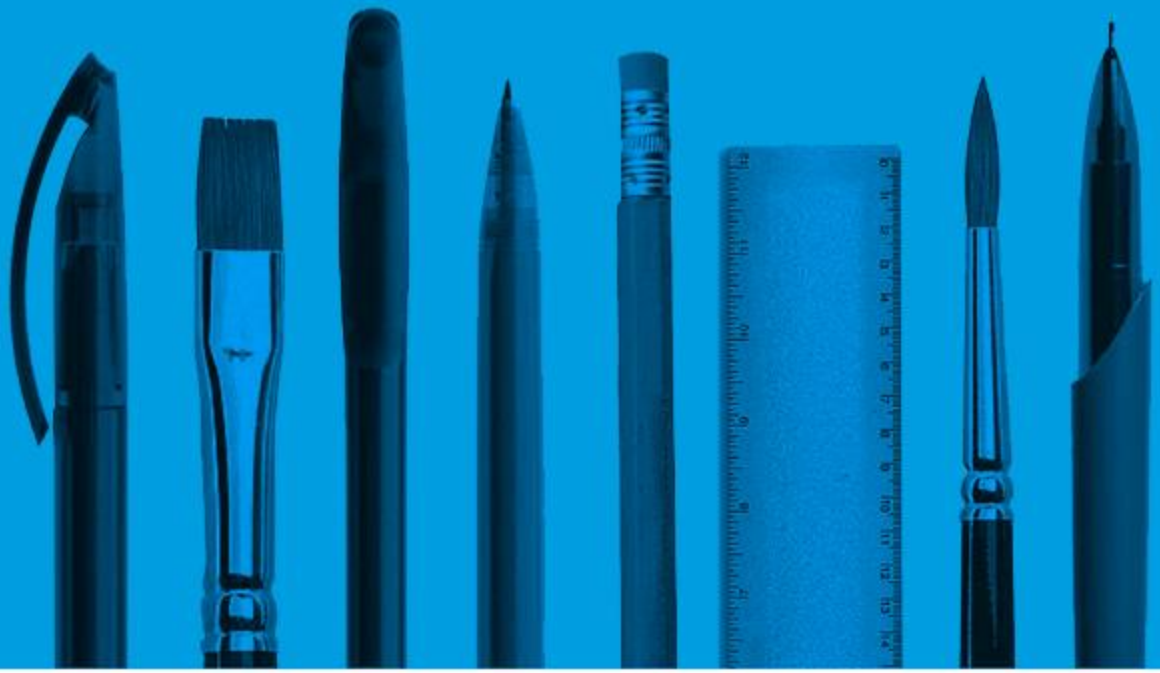
(a) (i) Application of halogen/halide reactions, no recall of electrolysis required, poorly answered
Lack of precision in use of 'iodine' and 'iodide'

(ii) More complex problem based on very well known content, better answered than part (i)

(iii) Titration data in an unfamiliar context, appropriate for final question, less structure within calculations is to be expected
Many lost a mark for mole ratio or dilution factor but most gained the final mark by 'error carried forward'

(b) New on AS specification, involves careful manipulation of units with use of standard form (L2 maths), should be familiar to students but poorly answered

FEEDBACK ON AS UNIT 2



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AS UNIT 2

Maximum mark = 80	Mean mark = 30.0			Entry = 3246	
Grade boundary	A	B	C	D	E
	42	35	28	22	16
Cumulative % at grade	24.2	37.1	52.8	67.5	82.1

ITEM LEVEL DATA

All Candidates performance across questions						
Question Title	N	Mean	S D	Max Mark	F F	Attempt %
1-6	3381	4.1	2.2	10	41.2	100.0
7	3368	4.6	2.3	11	42.1	99.6
8	3380	4.4	2.4	13	34.1	100.0
9	3348	3.8	2.5	9	42.2	99.0
10	3366	3.2	2.2	9	35.9	99.6
11	3375	6.7	4.1	18	37.3	99.8
12	3255	3.5	2.4	10	35.1	96.3

SECTION A

On reflection, this section was not the 'gentle starter' intended

1. Quite a complex compound chosen, reflecting the increase in demand from the previous specification

2. Many did not read the question carefully enough, care also required in labelling

3. Many slipped up in representing the complex group present

4. Following a reaction rate must involve taking readings over intervals of time

6. Very poorly answered, few could write the formula of methanoic acid

QUESTION 7

Candidates were clearly familiar with this practical method

(a) Diagrams – testing knowledge of how the method is carried out rather than artistic ability; marked generously, don't need to spend too much time on them but take care with labelling

(b) Calculation was well done, negative answer required for full marks

(c) The data had to be used to show that acid was no longer in excess, many failed to do so

(d) A difficult but very important idea in designing practical methods, new on specification and poorly answered

(e) Basic idea that a solution must be present in order to measure ΔT because ΔH cannot be measured directly

QUESTION 8

(a) (i) Not looking for a specific wording – basic points 1 mol, excess oxygen, standard conditions

(ii) This type of calculation has always been set but structuring has been removed; clear progression from GCSE

(iii) Many gave vague answers without reference to different strengths of the same bond in different environments

(b) Many candidates wrote all they knew about 'carbon dioxide levels in the atmosphere'
Complete answers required 'heat per gram' calculations and an element of comparison of both fuels

Indicative content

Correct in that energy produced per gram is 32.8 kJ from charcoal and 55.6 kJ from methane

Both give CO_2 on burning
1 mol of each fuel produces 1 mol of CO_2
Wood for charcoal comes from (living) trees
Methane comes from sources living millions of years ago / is a fossil fuel
Charcoal is renewable / methane is non-renewable
Trees take in CO_2 in photosynthesis
Trees release the **same** amount of CO_2 on combustion that they took in during growth
Charcoal burning is overall carbon neutral

5-6 marks
Must calculate energy per gram for both fuels.
The candidate constructs a relevant, coherent and logically structured account including key elements of the indicative content. A sustained and substantiated line of reasoning is evident and scientific conventions and vocabulary are used accurately throughout.
3-4 marks
Clear comparison of methane and charcoal.
The candidate constructs a coherent account including many of the key elements of the indicative content. Some reasoning is evident in the linking of key points and use of scientific conventions and vocabulary is generally sound.
1-2 marks
Main focus on only one of methane or charcoal.
The candidate attempts to link at least two relevant points from the indicative content. Coherence is limited by omission and/or inclusion of irrelevant material. There is some evidence of appropriate use of scientific conventions and vocabulary.
0 marks
The candidate does not make any attempt or give an answer worthy of credit.

QUESTION 9

All 9 marks AO1 – demonstration of knowledge and understanding

(a) Most candidates linked the reactivity of propene to a double bond and that it undergoes electrophilic addition
The nature of π- and δ- bonds was correctly described by fewer
Some drew two lines to represent the double bond as well as showing the p-orbitals above and below plane

(b) A straightforward question as points for inclusion were given
Full range of answers seen, some gave reaction with hydrogen bromide rather than bromine

QUESTION 10

(a) (i) Many candidates gave the correct product but failed to balance the equation

(iii) This part tested practical knowledge with credit awarded for identification of the chloride ions or of the alcohol formed

(b) (i) Rate proportional to conc^{n} of halogenoalkane – few gained this mark; most recognised that conc^{n} of OH^{-} had no effect

(ii) Few candidates correctly described the conflicting effects of bond strength and difference in electronegativity

QUESTION 11

(a) (i) Some drew distillation apparatus rather than reflux
(ii) Descriptions or names of changes of state were required
(iii) A range of answers accepted here, some candidates had clearly discussed why many organic reactions are carried out under reflux

(b) (ii) Most knew the basic method for calculating percentage yield but many did not consider the number of moles of both reactants
(iii) The best answers here showed good knowledge of reactions at equilibrium

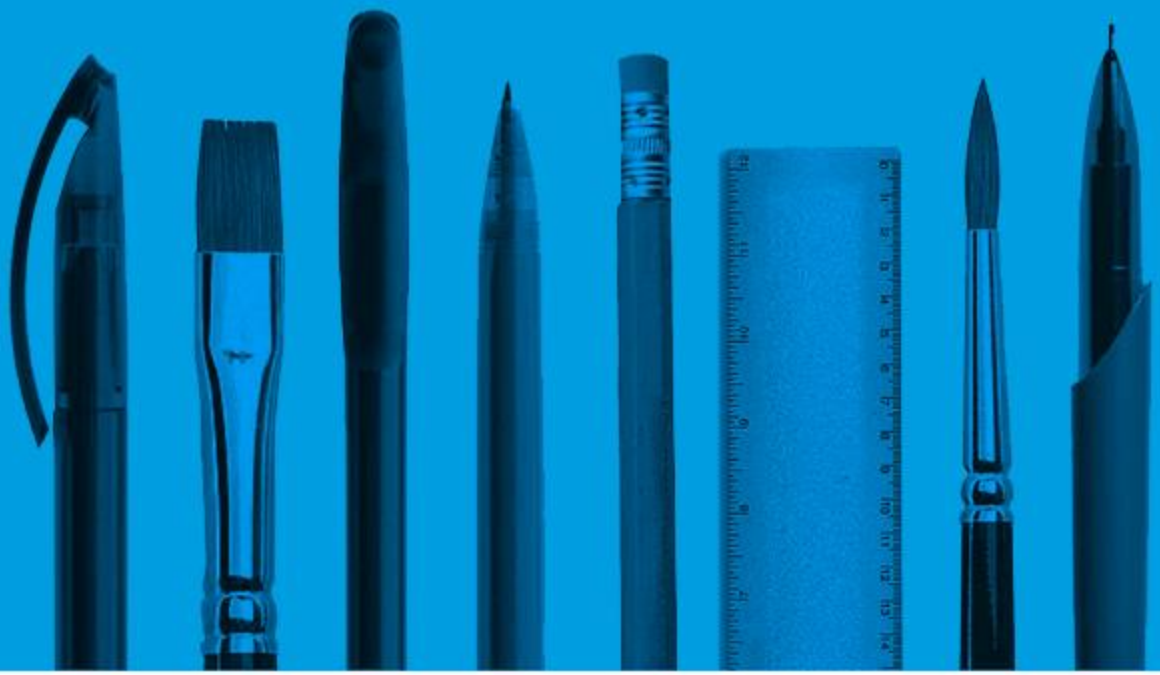
(c) The structured nature of this part made it accessible for most candidates, well answered although many failed to identify compound **C**

QUESTION 12

This question was more accessible that it may have appeared at first. Despite it being a 10-mark question the way the data is presented gives it a clear structure which candidates followed.

Candidates scored marks across the full range, with many excellent answers seen
Weaker candidates picked up marks for finding an empirical formula and identifying the C=C double bond and acid group
Many candidates gave M_r but failed to link it to the mass spectrum
They should remember that ^{13}C NMR identifies the number of carbon *environments* rather than the number of carbon atoms

A2 CONTENT



CONTENT CHANGES – A2 UNITS

- No significant changes to regulatory criteria therefore no major content changes
- Some recall-only statements removed e.g. theory of NMR spectroscopy, ionic liquids
- Emphasis shifts towards development of understanding using a broad range of contexts rather than recall of specific examples

A2 UNIT 3

Physical and Inorganic Chemistry

Written examination: 1 hour 45 minutes (80 marks)
25% of qualification

- Redox and standard electrode potential
- Redox reactions
- Chemistry of the p-block
- Chemistry of the d-block transition metals
- Chemical kinetics
- Enthalpy changes for solids and solutions
- Entropy and feasibility of reactions
- Equilibrium constants
- Acid-base equilibria

A2 UNIT 4

Organic Chemistry and Analysis

Written examination: 1 hour 45 minutes (80 marks)
25% of qualification

- Stereoisomerism
- Aromaticity
- Alcohols and phenols
- Aldehydes and ketones
- Carboxylic acids and their derivatives
- Amines
- Amino acids, peptides and proteins
- Organic synthesis and analysis

A2 UNIT 5

Practical

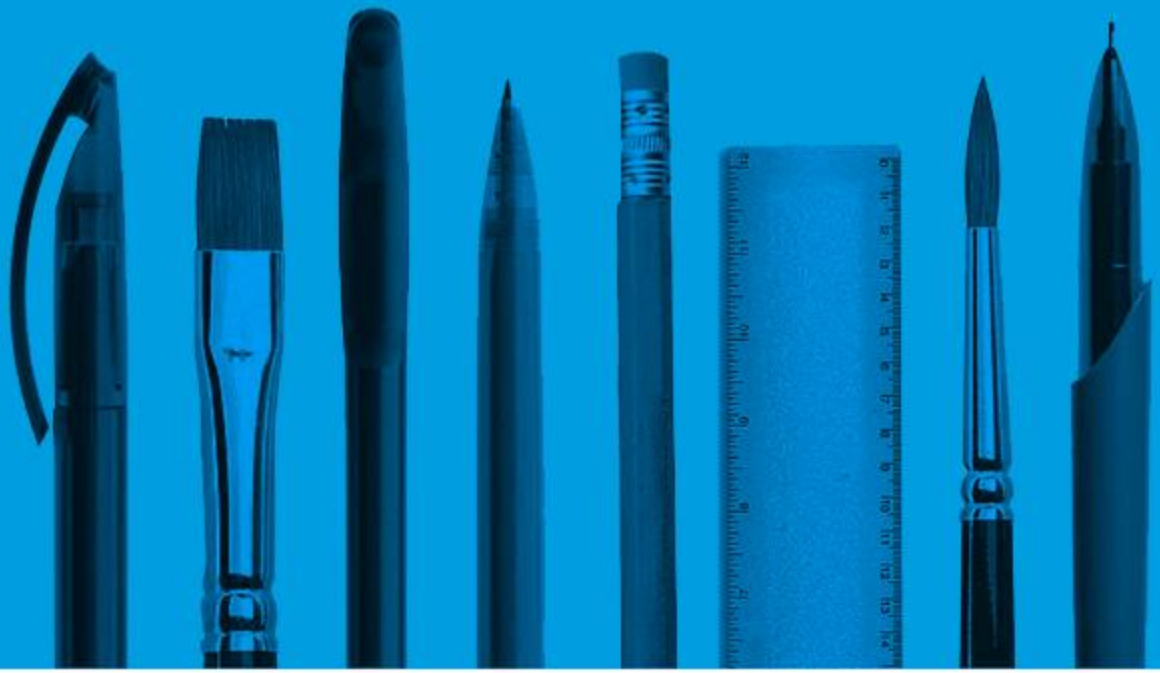
Experimental Task (30 marks)
Practical Methods and Analysis Task (30 marks)
10% of qualification

SYNOPTICITY

Learners' understanding of the connections between the different elements of the subject and their holistic understanding of the subject is a requirement of all A level specifications.

In practice, this means that some questions set in A2 units will require learners to demonstrate their ability to draw together different areas of knowledge and understanding from across the full course of study.

Any Questions?



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