

**Published Mark Scheme for
GCE AS Chemistry**

January 2009

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NORTHERN IRELAND GENERAL CERTIFICATE OF SECONDARY EDUCATION (GCSE)
AND NORTHERN IRELAND GENERAL CERTIFICATE OF EDUCATION
MARK SCHEMES (2009)

Foreword

Introduction

Mark Schemes are published to assist teachers and students in their preparation for examinations. Through the mark schemes teachers and students will be able to see what examiners are looking for in response to questions and exactly where the marks have been awarded. The publishing of the mark schemes may help to show that examiners are not concerned about finding out what a student does not know but rather with rewarding students for what they do know.

The Purpose of Mark Schemes

Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of 16- and 18-year-old students in schools and colleges. The job of the examiners is to set the questions and the mark schemes; and the job of the revisers is to review the questions and mark schemes commenting on a large range of issues about which they must be satisfied before the question papers and mark schemes are finalised.

The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes therefore are regarded as a part of an integral process which begins with the setting of questions and ends with the marking of the examination.

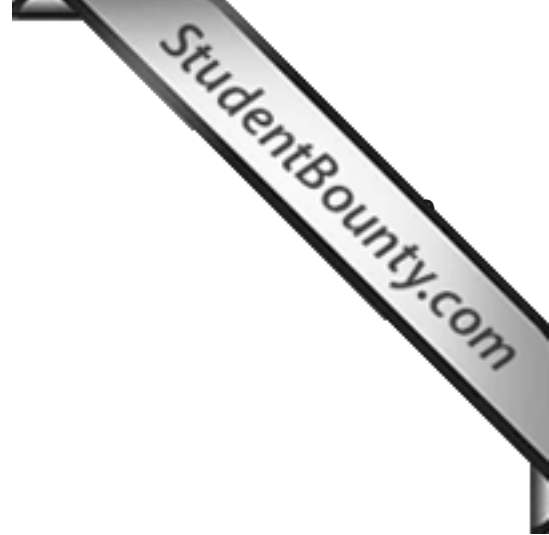
The main purpose of the mark scheme is to provide a uniform basis for the marking process so that all the markers are following exactly the same instructions and making the same judgements in so far as this is possible. Before marking begins a standardising meeting is held where all the markers are briefed using the mark scheme and samples of the students' work in the form of scripts. Consideration is also given at this stage to any comments on the operational papers received from teachers and their organisations. During this meeting, and up to and including the end of the marking, there is provision for amendments to be made to the mark scheme. What is published represents this final form of the mark scheme.

It is important to recognise that in some cases there may well be other correct responses which are equally acceptable to those published: the mark scheme can only cover those responses which emerged in the examination. There may also be instances where certain judgements may have to be left to the experience of the examiner, for example, where there is no absolute correct response – all teachers will be familiar with making such judgements.

The Council hopes that the mark schemes will be viewed and used in a constructive way as a further support to the teaching and learning processes.

CONTENTS

AS 1: Module 1



New
Specification



Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2009

Chemistry

Assessment Unit AS 1

assessing

Basic Concepts in Physical
and Inorganic Chemistry

[AC111]

FRIDAY 16 JANUARY, MORNING

**MARK
SCHEME**

Section A

- 1 D
- 2 C
- 3 D
- 4 D
- 5 D
- 6 C
- 7 C
- 8 B
- 9 C
- 10 B

[2] for each correct answer

[20]

20

Section A

20

Section B

11

Molecule	Shape
Ammonia	Pyramidal
Carbon dioxide	Linear/Straight
Methane	Tetrahedral

(1 mark each)

[3]

3

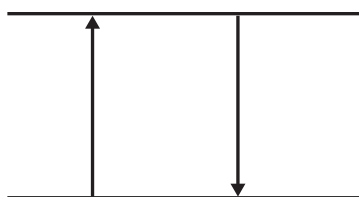
12 (a)

Metal ion	Flame colour
Barium, Ba ²⁺	Green
Calcium, Ca ²⁺	Red/Brick red
Copper, Cu ²⁺	Blue-green

(1 mark each)

[3]

(b)



[1]

Electron(s) excited to higher level, returns to lower level [1] releasing energy as light. [1]

[3]

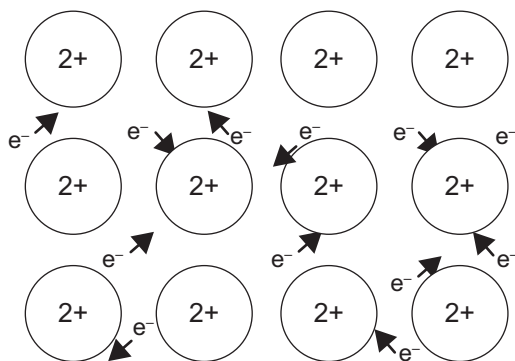
(c) Frequency at convergence limit [1],
Multiply by Planck's constant/use $E = hf$ [1]

[2]

8

- 13 (a) (i) A solution of known concentration [1]
- (ii) $\text{Na}_2\text{CO}_3 + 2\text{HCl} \rightarrow 2\text{NaCl} + \text{H}_2\text{O} + \text{CO}_2$
(unbalanced = 1, balanced = 2) [2]
- (b) Moles of HCl = 2.24×10^{-3}
Moles of Na_2CO_3 in 25 cm^3 = 1.12×10^{-3}
Moles of Na_2CO_3 in sample = 1.12×10^{-2}
Mass of Na_2CO_3 in sample = 1.19 g
Mass of H_2O in sample = 1.61 g
Moles of H_2O in sample = 8.94×10^{-2}
Value of $x = 8$
(-1 for each mistake) [5]
- (c) Methyl orange [1]
Yellow [1] to orange/pink [1] [3] 11
- 14 (a) (i) $\text{MgCO}_3 \cdot \text{CaCO}_3 \rightarrow \text{MgO} + \text{CaO} + 2\text{CO}_2$ [2]
- (ii) $\text{MgO} + \text{C} + \text{Cl}_2 \rightarrow \text{MgCl}_2 + \text{CO}$ [2]
- (iii) Ions are free to move [1]
- (iv) $\text{Mg}^{2+} \rightarrow \overset{\cdot\cdot}{\text{Mg}}$
- $\overset{\text{xx}}{\underset{\text{xx}}{\text{Cl}}}\overset{\cdot}{\text{Cl}} \rightarrow \overset{\text{xx}}{\underset{\text{xx}}{\text{Cl}}}\overset{\cdot}{\text{Cl}} + \text{e}$
- or
- $2\overset{\text{xx}}{\underset{\text{xx}}{\text{Cl}}}\overset{\ominus}{\text{Cl}} + \text{Mg}^{2\oplus} \rightarrow 2\overset{\text{xx}}{\underset{\text{xx}}{\text{Cl}}}\overset{\cdot}{\text{Cl}} + \overset{\cdot\cdot}{\text{Mg}}$ [4]

(b) (i)



Regular array of positive ions [1] with free electrons around [1]
(-1 if no labels)

[2]

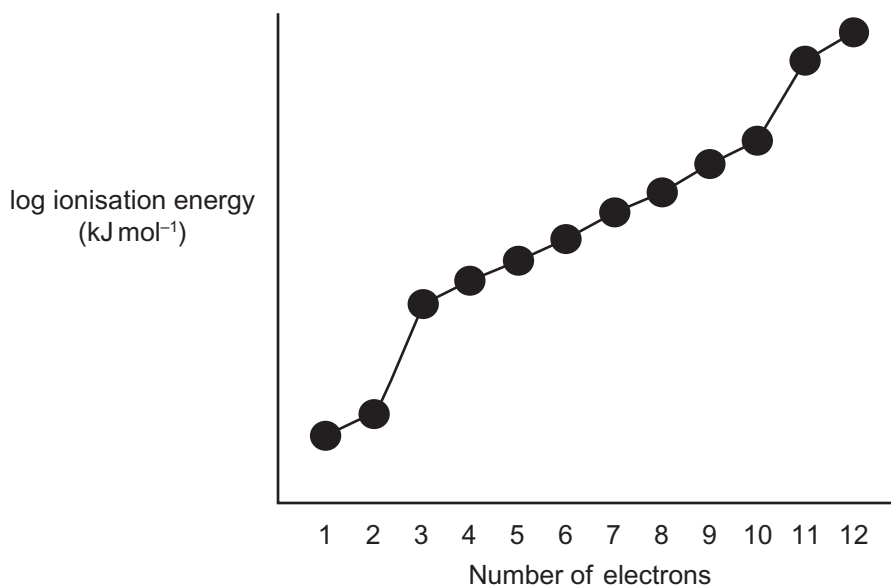
(ii) Free electrons [1] can move [1]

[2]

(c) (i) $Mg(g) \rightarrow Mg^+(g) + e^-$
(no state symbols -1)

[2]

(ii)



(-1 for each mistake)

[2]

(iii) Outer electron further from the nucleus [1]
Increased shielding (from inner electrons) [1]

[2]

19

15 (a) $1/24 = 0.0417$
 $0.0417 \times (6.02 \times 10^{23}) = 2.508 \times 10^{22}$
 $2.508 \times 10^{22} / 2 \times 10^7 = 1.254 \times 10^{15}$ [3]

(b) (i) Same atomic number/number of protons [1]
 different mass number/different number of neutrons [1] [2]

(ii)
$$\frac{((129 \times 27) + (131 \times 23) + (132 \times 28) + (134 \times 12) + (136 \times 10))}{100} = 131.6$$

(-1 for each mistake) [2]

(c) (i) HXeO_4^- : +6
 Xe: 0
 XeO_6^{4-} : +8
 (1 mark each) [3]

(ii) Same species (Xe) both oxidised, $+6 \rightarrow +8$, and reduced, $+6 \rightarrow 0$,
 in the same reaction [1], this is disproportionation
 (simultaneous oxidation and reduction) [1] [2]

12

- 16 (a) (i) Bromine: Red-brown liquid [1]
Iodine: Grey-black solid [1] [2]
- (ii) Greater mass [1] – greater van der Waals forces [1]
or More electrons [1] – greater van der Waals forces [1] [2]
- (iii) Electronegativity: the ability of an element to attract the
electrons in a covalent bond towards it. [1] – essential
As the group is descended increased shielding from inner
electrons [1]
and distance of bonding electrons from the nucleus [1]
means the nucleus has less pull on the bonding
electrons. [1] } Any 2 from 3 [3]
Quality of written communication [2]
- (b) (i) $2\text{NaOH} + \text{Cl}_2 \rightarrow \text{NaOCl} + \text{NaCl} + \text{H}_2\text{O}$ [2]
- (ii) NaClO_3 [1]
- (c) (i) Water is polar, hexane non-polar [1]
Hexane and Iodine non-polar [1] [2]
- (ii) Purple [1]
- (d) (i) $\text{NaCl} + \text{H}_2\text{SO}_4 \rightarrow \text{NaHSO}_4 + \text{HCl}$ [2]
- (ii) Sodium hydrogen sulphate, sulphur dioxide, hydrogen sulphide,
iodine, sulphur, water (any two) [2]
- (iii) Thermal stability decreases down the group [1]
as bond enthalpy decreases [1] [2]

(e) (i) $\text{Ag}^+ + \text{Cl}^- \rightarrow \text{AgCl}$ [1]

(ii)

Halide ion	Colour of silver salt	Effect of adding aqueous ammonia	
		dilute	concentrated
Chloride	White	Soluble	Soluble
Bromide	Cream	Insoluble	Soluble
Iodide	Yellow	Insoluble	Insoluble

[-1] per error

[3]

(f) Fluoride is added to water to reduce tooth decay [1]
Lack of choice for individuals/mass medication [1] [2]

27

Section B

80

Total

100

