Rewarding Learning

General Certificate of Secondary Education
2015–2016

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

THURSDAY 25 FEBRUARY 2016, MORNING

MARK SCHEME

General Marking Instructions

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 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 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.

				AVAILABLE MARKS
1	**(a)**	The mass of solid/solute [1] required to saturate [1] 100 g of water [1] at a particular temperature [1] **or** The **maximum** mass of solid/solute [1] which will dissolve in [1] 100 g of water [1] at a particular temperature [1] allow 'amount' as equivalent to 'mass'	[4]	
	(b) **(i)**	Cations – potassium [1] and ammonium [1] (either order) – not sodium Anions: soluble [1] lead [1] – not barium nitrates [1] If potassium, ammonium and sodium are given and then lead and barium are given only penalise once	[5]	
	(ii)	potassium iodide – soluble/S [1] lead bromide – insoluble/I [1] copper nitrate – soluble/S [1]	[3]	
	(c) **(i)**	4	[1]	
	(ii)	4	[1]	
	(iii)	15	[1]	
	(iv)	NH_4^+ **or** SO_4^{2-}	[1]	16

2 Indicative content

AVAILABLE MARKS

Newlands:
- idea of Law of Octaves/repeating pattern of eight

Mendeleev:
- arranged in order of atomic mass
- left gaps
- included Groups and Periods
- no noble gases/no actinides/no lanthanides
- Hydrogen in Group 1

or other correct

Modern:
- arranged by atomic number
- idea of block of transition elements
- more elements

or other correct

Response	Mark
Candidates must use appropriate scientific terms throughout to describe the development of the Periodic Table using **7–9** of the points in the indicative content. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use **4–6** of the points in the indicative content to describe the development of the Periodic Table using some scientific terms. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates use **2–3** of the points in the indicative content to describe the development of the Periodic Table. They use limited spelling, punctuation and grammar and make little use of scientific terms. The form and style are of a limited standard.	[1]–[2]
Response not worthy of credit.	[0]

[6] 6

3 (a) correct hydrogen atom [1]
correct chlorine atom, i.e. 2, 8, 7 arrangement [1] [2]

(b) **shared pair** of electrons [1]
idea of chlorine and hydrogen each contributing 1 electron by sharing [1]
bonding is covalent [1]
but
if sharing not explicit, then maximum [1/3] for covalent bonding [3] 5

AVAILABLE MARKS

4 **(a)** Group 1 – potassium or lithium [1]
Group 2 – magnesium [1]
Group 3 – aluminium or indium [1]
Group 4 – carbon or silicon or tin [1] [4]

(b) transition elements [1]

(c) Nd **or** Gd [1]

(d) In_2O_3 [1]

(e) idea that there are delocalised/free electrons [1]
which (move and) carry the charge [1]
idea that (it can be made into wires or is ductile because) layers (of ions) can slide over one another [1] – explanation needed [3]

10

5 **(a)** correct diagram for methane: bonds correct [1]
total number of outer electrons [1] dot and cross [1] [3]
N.B. number of outer electrons dependent on correct bonding

(b) correct diagram for carbon dioxide: double bonds [1]
total number of outer electrons [1] correct inner electrons [1] [3]
N.B. number of outer electrons dependent on correct bonding

(c) correctly labelled double bond [1] lone pair [1] [2]

(d) idea of electron transfer from magnesium to oxygen [1]
idea that two electrons are transferred [1]
explicit that a magnesium ion and an oxygen/oxide ion are formed [1]
ions are held together by electrostatic attraction [1] [4]

12

6 **(a)**

metal oxide	acid used	formula of cation in salt	formula of anion in salt	formula of salt produced
magnesium oxide	sulfuric acid	**Mg^{2+}**	SO_4^{2-}	$MgSO_4$
sodium oxide	hydrochloric acid	Na^+	**Cl^-**	NaCl
copper oxide	**sulfuric acid**	Cu^{2+}	**SO_4^{2-}**	$CuSO_4$
calcium oxide	nitric acid	**Ca^{2+}**	NO_3^-	**$Ca(NO_3)_2$**

7 correct = [4]; 5 or 6 correct = [3]; 3 or 4 correct = [2]; 2 correct = [1] [4]

(b) $H^+_{(aq)} + OH^-_{(aq)} \rightarrow H_2O_{(l)}$
Correct LHS [1]; correct RHS [1]; correct state symbols [1] [3]

(c) **(i)** $Mg + 2HCl \rightarrow MgCl_2 + H_2$
correct LHS [1]; correct RHS [1]; correct balancing [1] [3]

(ii) Use a burning/lit splint [1]
squeaky pop [1] [2]

12

					AVAILABLE MARKS
7	**(a)**	**(i)**	X or fluorine	[1]	
		(ii)	iodine **not** iodide	[1]	
		(iii)	solution changes from colourless [1] to yellow/brown or yellow or brown [1] – not orange **iodine** is displaced (by chlorine) [1]	[3]	
	(b)		$2NaI + Br_2 \rightarrow 2NaBr + I_2$ LHS [1] RHS [1] balancing [1]	[3]	
	(c)		fluorine	[1]	9
				Total	**70**