Rewarding Learning

General Certificate of Secondary Education
2017–2018

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

THURSDAY 17 MAY 2018, 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)	(i)	alkali metals. **Not** alkaline metals. **Not** alkalis.	[1]	
		(ii)	in oil – unless wrongly qualified	[1]	
	(b)	(i)	passage of/using an electric current [1] to cause decomposition/breakdown [1] Unless wrongly qualified	[2]	
		(ii)	$Li^+ + e \rightarrow Li$ LHS [1] RHS [1]	[2]	
		(iii)	chlorine accept (pale) green gas	[1]	
	(c)		idea that it is a (good) conductor of electricity and lightweight **(both needed)**	[1]	
	(d)		light weight [1] strong [1] if electrical conductivity given, maximum mark [1]	[2]	
	(e)		reason – has many uses or idea that its usage is increasing [1] idea of recycling or idea of new resources/alternative materials – unless wrongly qualified [1]	[2]	12

2 **(a)** correct diagram for sodium atom [1] sulfur atom [1] [2]

(b) **Indicative content**

1. • Correct direction of transfer
   • Sodium loses 1 electron
   • Sulfur gains 2 electrons
   • Two sodium atoms required
   • Correct formula Na_2S
   • Sodium ion Na^+
   • Sulfide ion S^{2-}

2. • Soluble in water
   • White solid
   • High **melting** point
   • Conduct electricity when molten/in solution **or** does not conduct electricity when solid

   Or other correct, e.g. brittle
   Max. 3 IPs for properties

Response	Mark
Candidates must use appropriate scientific terms throughout to describe the bonding of sodium with sulfur using **8–10** 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 **5–7** points from the indicative content to describe the bonding of sodium with sulfur 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 **2–4** of the points from the indicative content to describe the bonding of sodium with sulfur. 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] 8

3 **(a)** a **shared pair** of electrons [1]

(b) correct sharing [1]
correct total number of electrons [1] This mark depends on correct sharing
dot/cross [1] this mark is independent of the other two as long the molecule is an attempt at Cl_2 [3]

(c) non-metal [1]
two [1]
molecule [1]
strong [1] large (or equivalent) [1]
energy [1] [6]

AVAILABLE MARKS

(d) correct showing triple bond [1]
correct total number of electrons [1] This mark depends on correct sharing
correctly labelled lone pair [1] [3]

AVAILABLE MARKS

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4 **(a)** solid/solute [1] required to saturate [1] 100 grams of water/solvent [1]
at a particular temperature [1] [4]

(b) **(i)** sodium [1] ammonium [1] (either order) [2]

(ii) soluble lead (chloride) [1] (both needed) [1]

(c) soluble [1] soluble [1] [2]

(d) idea that lead chloride would be present [1]
idea that a precipitate is formed [1] [2]

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5 **(a)**

Base	Acid	Formula of cation in salt	Formula of anion in salt	Formula of salt produced
calcium hydroxide	hydrochloric acid	**Ca^{2+}**	Cl^-	$CaCl_2$
copper oxide/ hydroxide	sulfuric acid	Cu^{2+}	**SO_4^{2-}**	$CuSO_4$
magnesium oxide	**hydrochloric acid**	Mg^{2+}	Cl^-	**$MgCl_2$**
sodium hydroxide	nitric acid	**Na^+**	NO_3^-	**$NaNO_3$**

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

(b) **(i)** $Na^+ + Cl^- \rightarrow NaCl$

If LHS correct but RHS wrong (Na^+Cl^- is OK) then max mark is [1]
If LHS has 1 error and RHS OK then award [1]
If LHS has 1 error and RHS is wrong (i.e. 2 errors overall) award [0] [2]

(ii) $H^+ (aq) + OH^- (aq) \rightarrow H_2O (l)$

LHS [1] RHS [1] state symbols – if all formulae correct [1] [3]

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			AVAILABLE MARKS
6	**(a)**	Substance D [1] It has a (very) low melting and/or boiling point or does not conduct, unless wrongly qualified, (electricity) (when solid or **molten).** [1] [2] Explanation dependent on correct substance	
	(b)	Substance A [1] It conducts, unless wrongly qualified, (electricity) when molten (but not when solid). [1] [2] Explanation dependent on correct substance	
	(c)	Substance B [1] It has a high melting point **and** it conducts (electricity), unless wrongly qualified (both these points are needed). [1] [2] Explanation dependent on correct substance	
	(d)	Substance C [1] It conducts, unless wrongly qualified, (electricity) **and** idea that its melting point is lower than B or is 660 °C (both these points are needed). [1] [2] Explanation dependent on correct substance	8
7	**(a)**	**(i)** $2NaI + Cl_2 \rightarrow 2NaCl + I_2$ LHS [1] RHS [1] balancing [1] [3]	
		(ii) colourless [1] to brown [1] [2]	
		(iii) chlorine [1] iodine [1] [2]	
	(b)	Chlorine and bromine both need to gain one electron [1] to have complete outer shells [1]/become stable [2]	9
		Total	**70**