Rewarding Learning

General Certificate of Secondary Education
2012–2013

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

MONDAY 20 MAY 2013, AFTERNOON

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

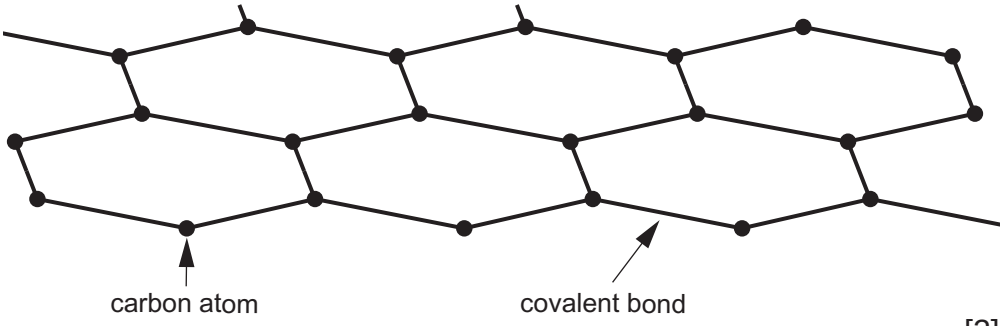
Examination papers are set and revised by teams of examiners and revisers appointed by the Council. The teams of examiners and revisers include experienced teachers who are familiar with the level and standards expected of students in schools and colleges.

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)**	It contains **only** carbon atoms/It contains one **type** of atom Idea that it is a form of (the element) carbon [1]	
	(b)	It is a (good) conductor of electricity [1] it is a (good) conductor of heat [1] [2] Allow [1] for (good) conductor on its own	
	(c)	Carbon is a **non-metallic** element/It is transparent/It has an extremely/very high melting point/It has covalent bonds. (Any **two** × [1]) [2] **not** it is an allotrope of carbon **not** it is a form of carbon	
	(d)	 [2]	7
2	**(a)**	Under oil [1]	
	(b)	Idea that a large piece could pose a danger or idea that sodium is **very** reactive **or** idea of safety reason. [1]	
	(c)	Idea of cause burning/being corrosive (to skin) [1]; idea that using tongs prevents this [1] idea of reacting with moisture on skin [1] (Any **two** × [1]) [2]	
	(d)	Moves quickly across the surface of the water [1] melts into a silvery ball [1] eventually disappears [1] [3]	
	(e)	The product is an alkali/the product is soluble in water not just base [1]	
	(f)	All have one electron in their outer shell/all need to lose one electron/ all have same number of electrons in their outer shell [1]	
	(g)	Idea that rubidium is **too** reactive/**too** dangerous [1] **not** idea of cost **not** very reactive **not** more reactive	10

AVAILABLE MARKS

3 **(a)** Candidates draw a magnesium atom with an electronic configuration 2,8,2 [1]
and a chlorine atom with the electronic configuration 2,8,7 [1] [2]

(b) Indicative content

- Idea of electron transfer from magnesium to chlorine
- Magnesium loses 2 electrons
- To 2 chlorine atoms/forms $MgCl_2$
- To become a magnesium ion with a charge of 2+/to form Mg^{2+}
- Each chlorine atom gains one electron
- To become a chloride ion with a charge of 1−/to become Cl^-
- The ions are held together by electrostatic forces/oppositely charged ions are attracted

Response	Mark
Candidates make correct reference to 6–7 of the indicative points shown. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates make correct reference to 4–5 of the indicative points shown. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates make correct reference to 1–3 of the indicative points shown using limited spelling, punctuation and grammar. The form and style are of limited standard and they have made no use of specialist terms.	[1]–[2]
Candidates make no reference to the main points above and offer no other suitable response.	[0]

[6]

(c) Molecule must be recognisable H_2 for credit [2]
Correct sharing, dot and cross, correct total electrons [2]
Correct sharing, dot and cross, incorrect total electrons [1]
Correct sharing, not dot and cross, correct total electrons [1]
Correct total electrons is dependent on correct sharing

(d) Apply a lighted splint [1]
a popping sound is heard if hydrogen is present [1] [2]

12

			AVAILABLE MARKS
4	**(a)**	The decomposition/breaking down of a compound/substance [1] due to the passage of/using electricity [1] [2]	
	(b)	Bauxite [1]	
	(c)	To reduce the melting point [1] (**not** if wrongly qualified, e.g. of aluminium) to reduce the operating temperature [1] to increase the (electrical) conductivity [1] reduces costs/saves energy [1] (max 2 × [1]) [2]	
	(d)	$Al^{3+} + 3e^- \longrightarrow Al$ [1] [1] [2]	
	(e)	2 oxide ions [1] lose 2 electrons each [1] to form a molecule of oxygen [1] [3] **or** an oxide ion loses 2 electrons [1] to form an oxygen atom [1] 2 oxygen atoms combine to form oxygen (gas) [1]	
	(f)	Carbon/graphite (anode) reacts with [1] (oxygen formed at the anode) to produce carbon dioxide (gas) [1] [2]	12
5	**(a)**	Diamond – giant covalent/macromolecular [1] Carbon dioxide molecular covalent/simple covalent [1] [2] (Accept simple molecular)	
	(b)	Allotropes are different forms of the same element [1] in the same (physical) state [1] [2] second mark dependent on first i.e. 'the same element'	
	(c) **(i)**	In the range 3000 °**C**–4000 °**C** [1]	
	(ii)	Idea that graphite has a similar structure to diamond (therefore will have a similar melting point) **or** idea of giant covalent/macromolecular structure [1]	
	(d)	Atoms are held together by covalent bonds [1] idea of a giant structure/tetrahedral arrangement [1] These bonds require a lot of energy to break [1] [3] **NOT JUST** hard to break	
	(e)	Molecules [1] are held together by weak (van der Waals) forces [1] which require a small amount of energy to break [1] **or** Idea of weak attractive forces [1] Idea of these being between molecules [1] Idea of these forces needing little energy to break [1] If hard to break given in **(d)** don't penalise easy to break in **(e)** [3]	
	(f)	Diamond does not have free electrons **not** if incorrectly qualified [1]	13

			AVAILABLE MARKS
6	**(a)**	Iron oxide [1]	
	(b)	In **this** reaction a base reacts with an acid [1] to form water [1] **not** alkali [2]	
	(c)	H_3PO_4 [2] allow [1] for HPO_4 or H_2PO_4, or H_4PO_4 or PO_4H_3	
	(d)	An alloy is a **mixture** of two or more elements [1] at least one of which is a metal [1] [2]	7
7	**(a)**	$CuO + H_2SO_4 \longrightarrow CuSO_4 + H_2O$ [1] [1] [2]	
	(b)	Black solid [1] solid disappears [1] blue (solution) formed [1] [3] allow idea of exothermic reaction **or** Idea of **blue** (solution) formed [1] solid dissolves or disappears [1] either solid was black or solution was colourless or heat is given out [1]	
	(c)	$CuCO_3 + H_2SO_4 \longrightarrow CuSO_4 + H_2O + CO_2$ [1] [1] [2]	
	(d)	idea that copper [II] carbonate reacts more quickly idea of gas formed (with copper(II) carbonate) [1] idea that copper(II) carbonate is green [1] idea that CuO needs heat before it reacts [1] **or** other correct (Any **two** × [1]) [2] N.B. formation of gas is wrong	9
		Total	**70**