

New
Specification



General Certificate of Secondary Education
2017–2018

**Double Award Science:
Chemistry**

Unit C1

Higher Tier

[GDW22]

THURSDAY 22 FEBRUARY 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.

Atom/ion	Mass number	Number of protons	Number of neutrons	Number of electrons
Atom P	19	9 [1]	10	9
Atom Q	38	18	20 [1]	18
Ion R	16 [1]	8	8	10
Ion S	40	20 [1]	20	18
Atom T	63	29	34	29 [1]

[5]

(b) Isotopes have the same atomic number but a different mass number
or

Isotopes have the same number of protons but a different number of neutrons

[1]

6

2 (a) (i) 1 [1]

(ii) 2 [1]

(iii) Q_2R NOT RQ_2 not equation [1]

(b) (i) an ion which is negatively charged or an ion which moves to/
is attracted to the anode (during electrolysis) or ion formed when an
atom gains electrons [1]

(ii) $Cl + e \rightarrow Cl^-$ [1]

5

3 (a) 41.7 % (other metals) [1]

(b) Idea that 18 carat has a high gold content [1]
idea that 18 carat is hard(er)/won't go out of shape easily [1]
idea that cost is a factor, e.g. 9 carat gold is half the cost of 18 carat [1] [3]

(c) Idea that:
An alloy can be described as a formulation [1] accept mixture of metals
a formulation is a mixture designed as a **useful** product [1]
a formulation has carefully measured quantities/proportions [1]
a formulation is made to ensure the product has the required/desirable
properties [1]
Any 3 × [1] [3]

7

4 (a) Indicative content

- Allotrope – different forms/structures of same element
- Allotrope – in same (physical) state
- Structure A is graphite
- Structure B is diamond

- A/Graphite conducts electricity because electrons are free (to move)/ delocalised
- A/Graphite can be used in pencils because the layers can slide over one another
- Idea that A/Graphite can be used in pencils because layers get deposited on the paper **or** because bonds **between layers** are weak/ van der Waals

- Idea that B/Diamond has a very high melting point because it has a giant/3D structure/because each carbon is bonded to 4 other carbon atoms
- Idea that diamond has a very high melting point because the structure is made up of strong (covalent) bonds which need a lot of energy to break – unless wrongly qualified
- Diamond is used in cutting tools because it is very hard

Band	Response	Mark
A	Candidates must use appropriate scientific terms throughout to describe the structures of diamond and graphite 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]
B	Candidates use 5 –7 of the points from the indicative content to describe the structures of diamond and graphite using some scientific terms. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates use 2 – 4 of the points from the indicative content to describe the structures of diamond and graphite. 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]
D	Response not worthy of credit.	[0]

[6]

AVAILABLE
MARKS

			AVAILABLE MARKS
	(b) (i)	idea that it has one layer (of carbon) [1]	
		idea that the layer is one atom thick/is graphite/is made up of hexagons [1]	
		the second mark depends on first [2]	
		For 'a single layer of graphite' [2]	
		but reference to graphite without idea of single layer [0]	
	(ii)	(high) electrical conductivity	[1]
	(iii)	idea of strong covalent bonds in a layer	[1]
5	(a) (i)	sodium atom: correct 2,8,1 drawing [1]	
		oxygen atom: correct 2,6 drawing [1]	[2]
	(ii)	sodium ion: 2,8 [1]	
		oxide ion: 2,8 [1]	[2]
	(iii)	yellow/orange	[1]
	(b) (i)	correct sharing [1]	
		correct total number of electrons [1] second mark dependent on first dot and cross [1]	[3]
	(ii)	2 ECF	[1]
	6	(a) (i)	101
132			[1]
(b) (i)		48	[1]
		35% [3]	
		If answer wrong up to 2 method marks can be awarded	
		$14 \times 2 = 28$ (nitrogen needed) [1]	
	$\frac{28^* \times 100}{80}$ or $\frac{\text{mass of nitrogen} \times 100}{80^{**}}$ [1]		
	Answer of 0.35% with work shown [2]		
	*if 14 used allow mark for recognising correct formula		
	**if "RFM NH_4NO_3 " used allow mark for recognising correct formula		
	if 17.5% given with method [2]	[3]	
(c) (i)	170 g [3]		
	If answer wrong up to 2 method marks can be awarded		
	660 g DAP = 5 moles [1]		
	NH_3 : DAP ratio is 2:1 [1]		
	10 moles of NH_3 are needed [1] i.e. max 2 × [1] method marks		
	For answer = 85 g with work shown [2]	[3]	

		AVAILABLE MARKS
(ii)	85% [2] If answer wrong a method mark can be awarded	
	Percentage yield = $\frac{\text{actual yield} \times 100}{\text{theoretical yield}}$ [1]	
	Answer of 0.85% with work [1]	[2]
(iii)	Any one of: Idea of loss of product in separation from the reaction mixture Other/side reactions taking place A reactant may not have been pure Reaction may not have gone to completion Or other correct	[1] 12
7	(a) (i) Mg [1] + H ₂ SO ₄ [1]	[2]
	(ii) CaCO ₃ [1] H ₂ O [1] correct balancing if all formulae correct accept Ca(HCO ₃) ₂	[3]
	(b) use of limewater [1] changes from colourless to milky [1] second mark depends on first	[2]
	(c) hydroxide (ion) [1]	[1]
	(d) H ⁺ _(aq) + OH ⁻ _(aq) → H ₂ O _(l) LHS [1] RHS [1] state symbols [1] State symbols depend on formula	[3]
	(e) clear idea that a weak acid is (only) partially ionised [1] in water/in solution [1]	[2]
	(f) mol/dm ³ or mol dm ⁻³	[1] 14
8	(a) displacement	[1]
	(b) iodine is less reactive than chlorine [1] and cannot displace it [1] second mark dependent on first	[2]
	(c) 2KBr + F ₂ → 2KF + Br ₂ LHS [1] RHS [1] Balancing if all formulae correct [1]	[3]
	(d) idea that they all need to gain 1 electron to become stable not just that they have 7 electrons in their outer shell	[1] 7
	Total	70

