



Rewarding Learning

General Certificate of Secondary Education
2013–2014

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

THURSDAY 14 NOVEMBER 2013, 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.

- 1 (a) potassium chloride [1]
- (b) potassium carbonate [1]
- (c) idea that solid disappears/dissolves [1]
bubbles/fizzing [1]
heat given off [1]
colourless solution formed [1]
any *two* [2]

(d)

Name of element	Number of atoms of the element in the formula
potassium	2
carbon	1
oxygen	3

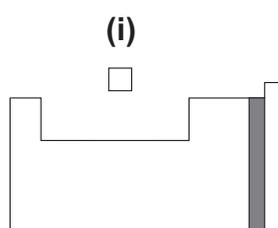
[3]

7

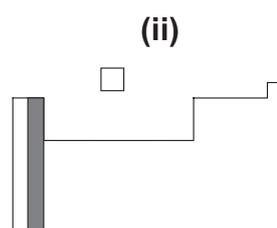
6 correct = [3]; 4 or 5 correct = [2]; 2 or 3 correct = [1]
Number of atoms depends on correct element

- 2 (a) an element is a substance which has only one type of atom/
cannot be broken down into anything simpler (by chemical means) [1]
- (b) (i) (John) Newlands [1]
- (ii) When elements are arranged in order of (relative)
atomic mass [1]
(**NOT mass number**)/every 8th element has
similar properties. [1] [2]
- (c) atomic number [1]
- (d) (i) periods [1]
- (ii) groups (apply cm) [1]
- (e) any 2 suitable general physical properties of a metal
e.g. conduct heat, conducts electricity, ductile, malleable, sonorous,
high melting point, shiny NOT hard, NOT dense, NOT solid, NOT
high B.P. [2]

(f)



halogens [1]



alkaline earth metals [1]

[2]

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3 (a)

Particle	Relative charge	Relative mass
electron	-1	(almost) 0*
proton	+1	1
neutron	0	1

[3]

row

*allow $\frac{1}{1800}$ - $\frac{1}{2000}$

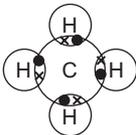
6 correct = [3], 4 or 5 correct = [2], 2 or 3 correct = [1]

- (b) idea that each atom has 6 electrons and 6 protons/same number of protons and electrons [1]
 carbon-14 has more neutrons or carbon-12 has fewer neutrons [1]
 carbon-14 has 2 (more neutrons) or carbon-12 has (2) fewer neutrons [1]

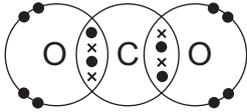
[3]

- (c) (i) a molecule is a substance which contains two or more atoms [1]
 which are covalently bonded [1]

[2]

- (ii)  correct sharing [1]
 correct total number of electrons [1]

[2]

- (iii)  correct sharing [1]
 correct total number of electrons [1]
 dot and cross in BOTH c(ii) and c(iii) [1]

[3]

- (iv) candidate must indicate at least 1 pair of non-bonded electrons. [1]

- (v) have low boiling points/do not dissolve in water/do not conduct electricity any 2 NOT low melting point [2]

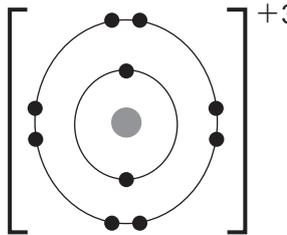
- (d) (i) H⁺ [1]

- (ii) Idea that its pH in range 4-5 (i.e. a weak acid)
 or does not contain many H⁺ ions
 NOT because of its pH - unless qualified [1]

[1]

AVAILABLE
MARKS

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- 4 (a) (i) $2\text{Al}_2\text{O}_3 \rightarrow 4\text{Al} + 3\text{O}_2$
 [1] [1] [2]
- (ii) idea that electrolysis is the decomposition/breaking down of a substance/compound [1] using electricity [1]
 allow idea of molten/in solution as long *BOTH* are given [2]
- (iii) cryolite [1]
- (iv) cryolite also increases the (electrical) conductivity (of the electrolyte)/decreases cost *NOT* lowers melting point [1]
- (b) (i)  $^{+3}$
 electron configuration [1]
 charge [1] [2]
- (ii) idea that cathode is negative/negatively charged [1]
 aluminium ions are positively charged/are attracted to the cathode [1] [2]
- (iii) the aluminium ions gain electrons [1] 3 electrons (gained) [1] to become an (aluminium) atom [1]
 (for $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al}$ allow [1]) [3]
- (c) (i) idea of *attraction* between positive ions and (negative)/delocalised electrons [1]
- (ii) (layers of) aluminium ions/atoms [1] can slide/move over one another [1] without disruption to the bond [1]
 NOT just 'layers' [3]

AVAILABLE
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5 Indicative content

Comparisons

- both products are hydroxides (this can be expressed in several different ways)
- both dissolve/disappear
- both leave colourless solutions
- both form a ball
- move on surface
- both form alkaline solutions
- both float on water
- both produce bubbles/fizzing/effervescence
- both produce hydrogen
- both vigorous/fast/violent
- both exothermic
- or other correct

Maximum number of comparisons allowed is 5.

Contrasts

- K catches fire immediately/very quickly
- lilac flame
- Na may catch fire
- yellow/orange flame
- K is more reactive than Na (more vigorous)
- or other correct

Maximum number of contrasts allowed is 5.

Response	Mark
Candidates must use appropriate specialist terms to compare the reaction of sodium and potassium with water using 7–10 indicative points. They use good spelling, punctuation and grammar and the form and style are of a high standard.	5–6
Candidates use 4–6 indicative points to compare the reaction of sodium and potassium with water. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	3–4
Candidates make reference to 1–3 indicative points using limited spelling, punctuation and grammar. The form and style is 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]

6

AVAILABLE
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- 6 (a) idea that a more reactive (halogen) element takes the place of/
replaces a *less reactive* (halogen) element (from a halide compound) [1]
- (b) (i) Idea that bromine is present [1]
- (ii) chlorine [1]
- (iii) Fluorine chlorine bromine iodine [2]
Fluorine most reactive [1] other three in correct order (1)
award [1] for iodine bromine chlorine fluorine i.e. wrong way round [2]
- (c) all halogens have seven outer electrons/same number of electrons on
the outer shell [1] require one electron to form a full outer shell [1] [2]
- (d) ionic lattice – idea that iodine does not have ions or other correct [1]
molecular covalent ✓ [1]
giant covalent – idea that iodine does not have high melting/boiling
point [1] e.g. iodine sublimates *easily*
metallic – idea that iodine does not conduct electricity [1] [4]

Total**AVAILABLE
MARKS**

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