Rewarding Learning

General Certificate of Secondary Education
2016–2017

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

THURSDAY 18 MAY 2017, 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.

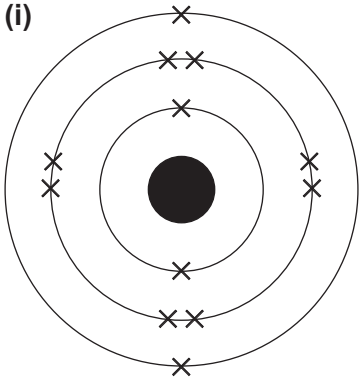
The questions and the mark schemes are developed in association with each other so that the issues of differentiation and positive achievement can be addressed right from the start. Mark schemes, therefore, are regarded as part of an integral process which begins with the setting of questions and ends 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.

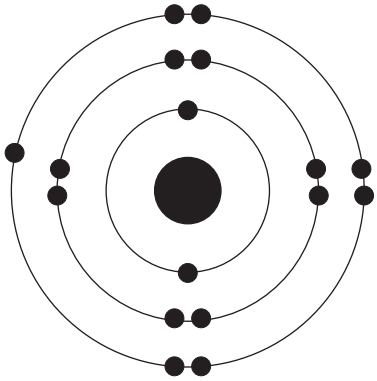
AVAILABLE MARKS

1 **(a)** **(i)**



magnesium atom

[1]



chlorine atom

[1] [2]

(ii) magnesium (atom) loses 2 electrons [1] allow becomes 2, 8
chlorine (atom) gains one electron [1] allow becomes 2, 8, 8 [2]

(iii) (strong) electrostatic attraction/forces
or
(strong) attraction between oppositely charged ions [1]
ignore reference to ionic bonding

(b) **(i)** correct sharing [1]
correct outer electrons [1]
dot and cross [1] [3]

(ii) two atoms in a molecule or two atoms (covalently/chemically) bonded together [1]
ignore reference to the same element
Not two **elements** bonded together
Not **just** "two atoms"

9

2 Indicative content

AVAILABLE MARKS

Safety precautions:
- Goggles
- Tongs/tweezers
- Small piece of metal
- Safety screen
- Use a large volume of water/water **trough**

Maximum number of safety points 3

Similarities:
- Floats/moves on surface
- Dissolves/disappears/gets smaller
- Gives off gas/bubbles /fizzing
- Heat produced
- Forms a **colourless** solution

Maximum number of similarities 3

Differences:
- Potassium melts/forms a ball/lithium does not
- Potassium catches fire/burns with lilac flame/lithium does not ignite
- Potassium reacts faster than lithium

Maximum number of differences 3

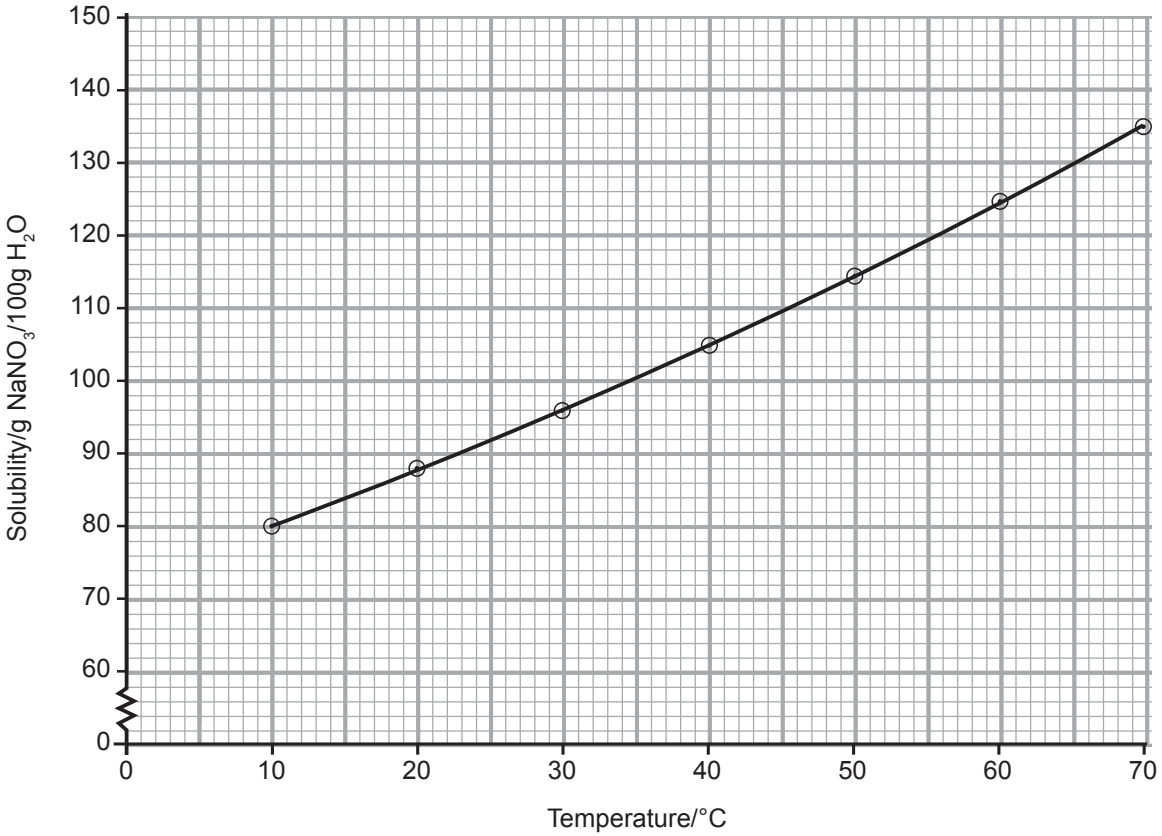
Response	Mark
Candidates use **7–9** of the points above to describe the reactions of lithium and potassium. They use appropriate specialist terms and the spelling, punctuation and grammar and form and style are of a good standard.	[5]–[6]
Candidates use **4–6** of the points above to describe the reactions of potassium and lithium. They use appropriate specialist terms and the spelling, punctuation and grammar and form and style are of a satisfactory standard.	[3]–[4]
Candidates make reference to **2–3** of the points above using limited spelling, punctuation and grammar and the form and style are of a limited standard and they have made no use of specialist terms.	[1]–[2]
Response not worthy of credit.	[0]

[6] 6

AVAILABLE MARKS

3 **(a)** The mass of solid required to **saturate** [1] **100 g** [1] of **water/solvent** [1] at a particular **temperature** [1] [4]

(b) **(i)**



Correct plotting of 6 or 7 points [2] Correct plotting of 4 or 5 points [1]
Correct curve [1] – Ignore extrapolation unless clearly wrong, e.g. dip towards origin [3]

(ii) At 25 °C solubility is 92(g/100g H_2O) Accept 92±1 (apply e.c.f.) [1]

(iii) At 65 °C solubility is in the range 128–131 [1]
130 – 92 = 38 [1]
38 ÷ 2 = 19 g [1] (apply e.c.f.) [3]

(c) **(i)** Solubility increases as temperature increases [1]

(ii)

Substance	Solubility **increases** with temperature increase	Solubility **decreases** with temperature increase
potassium chloride	✓ [1]	
carbon dioxide		✓ [1]
copper(II) sulfate	✓ [1]	

[3]

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AVAILABLE MARKS

4 **(a)**

atom/ion	mass number	number of protons	number of neutrons	number of electrons
A	**23** [1]	11	12	11
B	16	8	**8** [1]	10
C	7	**3** [1]	4	2

[3]

(b)

atom/ion	chemical symbol	charge (if ion)
A	**Na** [1]	**0** [1]
B	**O or O^{2-}** [1]	**2^- or $^-2$** [1]

[4] 7

5 **(a)** **(i)** circle round the filter funnel in diagram A [1]

(ii) E [1]

(b) Any **two** from:
sublimes/changes straight to gas [1]
purple vapour/purple gas [1]
idea of crystals/solid being formed (near mouth of boiling tube) [1]
2 × [1] [2]

(c) full outer shell/8 electrons in **outer** shell [1]
idea that it does not need to gain/lose/share electrons
or that it is stable [1] [2] 6

AVAILABLE MARKS

6 (a) (i)

compound	Does it produce H^+ ions in water?	Does it produce OH^- ions in water?	pH	colour of universal indicator in the solution
A	yes	no	4	orange
B	yes	no	1	red
C	no [1]	yes [1]	14	purple
D	no	no	7 [1]	green

[3]

(ii) A – ethanoic acid [1]
B – sulfuric acid [1]
C – sodium hydroxide [1]
D – sodium chloride [1] [4]

(b) $CuO + 2\,HCl \rightarrow CuCl_2 + H_2O$
RHS [1] balancing (if RHS correct) [1] [2]

(c) mol/dm^3 [1] 10

7 (a) (i) ions are free to move [1]
and carry the charge/current [1] [2]
– reference to electrons moving loses first mark

(ii) explicit idea that **chlorine** is (produced and is) poisonous/toxic/harmful/pungent smell [1]

(b) product at cathode: lead
observations at anode: bubbles/yellow-green or green(ish) gas/pungent or choking smell
product at anode: chlorine
Both products correct [1] observations correct [1] [2]

(c) $2Cl^- \rightarrow Cl_2 + 2e^-$ **or** $2Cl^- - 2e^- \rightarrow Cl_2$
LHS [1] RHS [1] balancing [1] [3] 8

				AVAILABLE MARKS
8	**(a)**	diagram which shows: positive ions but no negative ions[1] a regular arrangement of positive ions [1] delocalised electrons [1] if not labelled, maximum mark is [2]	[3]	
	(b)	clear idea of: **layers** of metal ions/atoms which move/slide [1] idea of without disruption to the bond [1]	[2]	
	(c)	**(i)** C	[1]	
		(ii) B	[1]	
		(iii) A	[1]	
		(iv) F	[1]	9
			Total	**70**