Rewarding Learning

General Certificate of Secondary Education
2014–2015

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

WEDNESDAY 25 FEBRUARY 2015, 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)

Atom/ion	Mass number	Number of protons	Number of electrons	Number of neutrons
A	**6** [1]	3	3	3
B	27	13	13	**14** [1]
C	11	**5** [1]	5	6
D	**23** [1]	11	10	12
E	**35** [1]	17	18	18

[5]

(b) A – Li [1]
D – Na^+ [1]
E – Cl^- [1] [3] 8

2 (a) six or seven points correctly plotted [2]
four or five correct [1]
appropriate line through points [1] [3]

(b) As temperature increases, solubility increases [1]
potassium nitrate increases more steadily
idea potassium chloride increases steadily/slightly [1] [2]

(c) 22 ± 0.5 °C [1]

(d) (i) 68 g/100 g H_2O [1]

(ii) 68–40 [1] 28 [1] g [1]
Any two from three. Unit dependent on 1st/2nd mark
in (ii) apply ecf, e.g. 65/66 – 39 [1] → 26/27 [1] g [1] [2]

(e) 96 [1] – 38 [1] = 58 [2] 58 g [3]
i.e. Award [2] for 58
[3] for 58 g
Some candidates have already been penalised for misreading temperature in (d)
If so then in (e) allow, e.g.:
89 [1] – 34 [1] = 55 [2] 55 g [3]
unit mark awarded if method shown [3] 12

AVAILABLE MARKS

3 Indicative Content

Prediction

- High melting point
- Solid
- Conducts electricity when molten/in solution [1]
- Doesn't conduct as solid
- Soluble in water
- Brittle

Explanation

High melting point

- Strong forces of attraction between ions

Electric conductivity

- Ions can carry charge
- Ions free to move in molten/aqueous state
- Ions not free to move in solid state

Response	Mark
Candidates must use appropriate scientific terms throughout to describe the physical properties, using 7 or more of the points in the indicative content, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use 4 to 6 points from the indicative content to describe the physical properties in a logical sequence 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 1–3 of the points from the indicative content to describe the physical properties. However these are not presented in a logical sequence. 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] 6

AVAILABLE MARKS

AVAILABLE MARKS

4 **(a)**

Metal carbonate	Acid used	Cation in salt	Anion in salt	Formula of salt produced
calcium	hydrochloric	Ca^{2+}	**Cl^-**	$CaCl_2$
sodium	**sulfuric**	Na^+	SO_4^{2-}	**Na_2SO_4**
copper	sulfuric	Cu^{2+}	**SO_4^{2-}**	$CuSO_4$
magnesium	nitric	**Mg^{2+}**	**NO_3^-**	$Mg(NO_3)_2$

7 correct = [4]; 5–6 correct = [3]; 3–4 correct = [2]; 2 correct = [1] [4]

(b) metal carbonate – green [1]
salt solution – blue [1] [2]

(c) carbon dioxide [1]
limewater [1] turns milky [1] [3]

9

5 **(a)** The temperature at which a solid is changed to a liquid.
Accept temperature at which liquid is changed to solid. [1]

(b) **(i)** mercury [1]

(ii) chromium [1]

(iii) idea that they both have a similar difference between melting point and boiling point or they are both liquid over a similar temperature range. [1]

(c) idea that gold is the most ductile and malleable [1]
idea that gold and copper both have the same level of malleability and ductility [1]
iron is very high on the ductility list but low on malleability [1]
The other metals have very similar levels in both [1]
i.e. 3 distinctly different points 3 × [1] [3]

(d) positive ions are in rows/layers/regular arrangements [1]
surrounded by delocalised electrons [1]
idea that they can be pulled into wires or hammered into sheets [1]
idea that layers slide over one another [1]
without disrupting the bond [1] any 4 × [1] [4]

11

6 **(a)** Shared (pair of) electrons [1]

(b) **(i)** Correct sharing [1]
Correct number of electrons [1]
Dot and cross diagram [1] [3]

(ii) Correct sharing for ammonia [1]
Correct number of electrons [1] [2]

(iii) Correctly labelled lone pair on ammonia [1]

7

			AVAILABLE MARKS
7	**(a)**	state at room temperature changes from gas (to liquid) to solid as you move down the group [1] the colour becomes gradually darker as you move down the group [1] idea of darkening must be explicit [2]	
	(b)	They all gain one electron [1] to become stable/have a full outer shell/they all have seven electrons in their outer shell [1] [2]	
	(c)	**(i)** state – solid colour – very dark – black toxicity – high At^- At_2 five correct [2] 3 or 4 correct [1] [2]	
		(ii) sodium astatide [1]	7
8	**(a)**	bauxite [1]	
	(b)	$Al^{3+} + 3e^- = Al$ LHS [1] RHS [1] [2]	
	(c)	Are made of carbon [1] They react with the oxygen produced [1] to form carbon dioxide [1] [3]	
	(d)	Cryolite lowers melting point (of the ore) [1] **Not** lowers melting point of aluminium Cryolite improves the conductivity [1] [2]	
	(e)	Transportation/infrastructure availability of electrical power/energy costs water supply skilled workforce waste disposal availability of raw material, e.g. near a port or other correct idea Any 2 × [1] [2]	10
		Total	**70**