Rewarding Learning

General Certificate of Secondary Education
2017–2018

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

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.

AVAILABLE MARKS

1 **(a)**

Atom/ion	Mass number	Number of protons	Number of neutrons	Number of electrons
Atom P	9	**4** [1]	5	4
Atom Q	**40** [1]	18	22	18
Ion R	19	9	**10** [1]	10
Ion S	24	12	12	**10** [1]
Atom T	37	17	20	**17** [1]

[5]

(b) Isotopes have the same number of protons but a different number of neutrons
or
Isotopes have the same atomic number but different mass numbers
or
combinations of these answers [1]

6

2 **(a)** **(i)** 2 [1]

(ii) 1 [1]

(iii) XY_2 not CaF_2 not Y_2X not XY^2 [1]

(iv) an ion which is positively charged **or** an ion which moves to/is attracted to the cathode (during electrolysis)
or
an ion formed when an atom loses electron [1]

(b) correct sharing [1]
correct total number of electrons [1]
dot and cross [1]
correct labelling of lone pair on nitrogen [1] [4]

(c) 6 [1]

9

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

(b) they are **mixtures** of more than one element (implied) [1]
they contain at least one metal [1]
second mark depends on **'mixture'**
for this particular question allow 'mixture of metals' [2] [2]

(c) **(i)** the higher the number of carats, the lower the hardness [1]

(ii) 18 carat gold [1]

			AVAILABLE MARKS
	(d)	Idea that it has a high gold content [1] Idea that it is hard(er)/won't go out of shape easily [1] [2]	
	(e)	£11.60 × 5 = £58 [1] **or** £28.30 – £11.60 = £16.70 [1] £28.30 × 5 = £141.50 [1] £16.70 × 5 [1] = £83.50 £141.50 – £58 = £83.50 Correct answer gains all [3] [3]	10
4	**(a)**	7 or 8 points correctly plotted [2] 5 or 6 points correctly plotted [1] Points joined to form a smooth curve/line [1] [3]	
	(b)	the solubility increases as the temperature increases [1]	
	(c)	51.25 [1]	
	(d)	At 26 °C the solution can hold 36 g ± 0.5 g [1] 44 – 36 = 8 g ± 0.5 g [1] for correct answer without work shown award both marks [2]	7
5	**(a)**	**(i)** Any **two** of: the electrodes are made of carbon/graphite the current is carried by ions a metal is formed at the cathode a gas is formed at the anode 2 × [1] [2]	
		(ii) the anodes in the aluminium oxide have to be replaced Accept idea that one (diagram) shows an industrial process/one uses a Bunsen burner Accept that in the aluminium oxide the metal is tapped off/removed idea that cryolite is added to the aluminium oxide [1]	
	(b)	bauxite [1]	
	(c)	cost less/uses less energy [1] reduces waste [1] conserves natural resources [1] or other correct, e.g. reduces amount of CO_2 released Max 2 × [1] [2]	
	(d)	$2O^{2-} - 4e^- \longrightarrow O_2$ LHS [1] RHS [1] Balancing if LHS & RHS correct [1] Allow $2O^{2-} \longrightarrow O_2 + 4e^-$ [3]	
	(e)	**(i)** it reduces the operating temperature/lowers melting point – unless wrongly qualified, e.g. NOT melting point of aluminium NOT melting and boiling point it improves (electrical) conductivity [1] correct idea that reducing the temperature/increasing conductivity reduces the **energy** costs i.e. this mark is dependent on at least one of the first two marking points being correct [1] [3]	

AVAILABLE MARKS
14

(ii) idea that the crust keeps the heat in [1]
which reduces the energy costs [1] second mark depends on first [2]

6 Indicative content

- Allotrope – different forms 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** 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] 6

					AVAILABLE MARKS
7	**(a)**	**(i)**	Mg [1] + **2**HCl [1] balancing [1]	[3]	
		(ii)	Na_2CO_3 [1] H_2O [1]	[2]	
	(b)		use of limewater [1] turns milky [1]	[2]	
	(c)		hydroxide (ion)	[1]	
	(d)		$H^+_{(aq)} + OH^-_{(aq)} \longrightarrow H_2O_{(l)}$ LHS [1] RHS [1] state symbols [1]	[3]	11
8	**(a)**		displacement	[1]	
	(b)		bromine is less reactive than chlorine or vice versa [1] and cannot displace it [1] second mark depends on first.	[2]	
	(c)		$2KCl + F_2 \longrightarrow 2KF + Cl_2$ 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**