New Specification

Rewarding Learning

General Certificate of Secondary Education
2011–2012

Double Award Science: Chemistry

Unit C1

Higher Tier

[GSD22]

TUESDAY 28 FEBRUARY 2012
11.00 am–12.00 noon

MARK SCHEME

General Marking Instructions and Mark Grids

Introduction

Mark schemes are intended to ensure that the GCSE examination is marked consistently and fairly. The mark schemes provide markers with an indication of the nature and range of candidates' responses likely to be worthy of credit. They also set out the criteria that they should apply in allocating marks to candidates' responses. The mark schemes should be read in conjunction with these marking instructions.

Quality of candidates' responses

In marking the examination papers, examiners should be looking for a quality response reflecting the level of maturity which may reasonably be expected of a 16-year-old which is the age at which the majority of candidates sit their GCSE examinations.

Flexibility in marking

Mark schemes are not intended to be totally prescriptive. No mark scheme can cover all the responses which candidates may produce. In the event of unanticipated answers, examiners are expected to use their professional judgement to assess the validity of answers. If an answer is particularly problematic, then examiners should seek the guidance of the Supervising Examiner.

Positive marking

Examiners must be positive in their marking, giving appropriate credit for description, explanation and analysis, using knowledge and understanding and for the appropriate use of evidence and reasoned argument to express and evaluate personal responses, informed insights and differing viewpoints. Examiners should make use of the whole of the available mark range of any particular question and be prepared to award full marks for a response which is as good as might reasonably be expected of a 16-year-old GCSE candidate.

Awarding zero marks

Marks should only be awarded for valid responses and no marks should be awarded for an answer which is completely incorrect or inappropriate.

Types of mark scheme

Mark schemes for questions which require candidates to respond in extended written form are marked on the basis of levels of response which take account of the quality of written communication.

Other questions which require only short answers are marked on a point for point basis with marks awarded for each valid piece of information provided.

					AVAILABLE MARKS
1	**(a)**	**(i)**	Mg^{2+}	[1]	
		(ii)	SO_4^{2-}/NO_3^-	[1]	
		(iii)	Na	[1]	
		(iv)	NO_3^-	[1]	
	(b)		Lithium structure showing 2,1 e.c. oxygen structure showing 2,6 e.c.	[1] [1]	
	(c)		Correct direction of transfer of electrons [1] Correct number transferred from lithium [1] Correct number transferred to oxygen/idea of 2:1 ratio [1] Idea of covalency = [0]	[3]	
	(d)		Any **two** from: • solid/white/solid white/crystalline [1] • high melting point (**not** high boiling point) [1] • soluble/dissolves (in water) [1] • does not conduct electricity (as a solid) [1] • will conduct electricity in liquid form [1] • brittle [1]	[2]	11

AVAILABLE MARKS

2 **(a)** Idea that a solvent is a substance that is capable of dissolving another substance [1]

(b)

Response	Mark
Candidates must use appropriate specialist terms throughout to describe fully the chemical identification of water 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 some appropriate specialist terms to describe the chemical identification of water in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	([3]–[4])
Candidates make reference to 1–2 of the main points shown below 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 below and offer no other suitable response.	([0])

Use of anhydrous [1] copper sulfate [1]
White [1] to blue [1]
Practical idea of addition of the $CuSO_4$ to water/testing each sample individually [1]
Idea that this result indicates water [1]

Alternative to first 4 marking points:
Anhydrous [1] cobalt chloride [1] (paper)
Blue [1] to pink [1]

Accept for a maximum of [2]
Boiling point = 100 °C [1]
Freezing point = 0 °C [1] [6]

7

AVAILABLE MARKS

3 **(a)**

Elements	Atomic Number	Electronic configuration	Group Number
A	12	2,8,2	**2** [1]
B	6	**2,4** [1]	4
C	**9** [1]	2,7	7
D	15	**2,8,5** [1]	5

[4]

(b) 2 (electrons) [1]

(c) Sulfur [1] 6

4 **(a)** Oxygen and carbon dioxide [1]

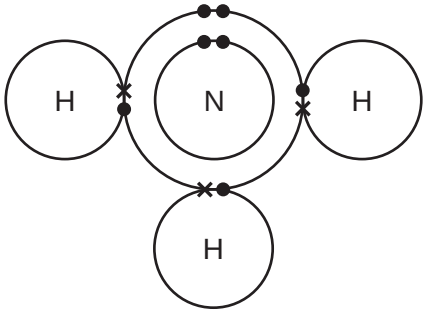
(b) Idea that fish require (dissolved) oxygen for survival [1]
As the temperature increases the dissolved oxygen (content of the water) decreases [1]
Link decreasing oxygen content to death of fish/distress [1] [3]

(c) **(i)** $\frac{2}{5} \times 100$ [1] = 40 [1] [2]

(ii) 5 points correctly plotted [2]
3 – 4 points correctly plotted [1]
curve drawn through the points [1] [3]

(d) **(i)** 42 g/100 g water (read from the graph) [1]

(ii) Unsaturated [1] 11

					AVAILABLE MARKS
5	**(a)**	**(i)**	Ammonia  dot and cross [1] correct sharing [1] correct number of electrons [1] (last point dependent on 2nd)	[3]	
		(ii)	Lone pair correctly labelled	[1]	
	(b)		 [1] [1]		
			Correct number of electrons [1] dependent on 1st two marks	[3]	7
6	**(a)**	**(i)**	B	[1]	
		(ii)	Iodine/sulfur/phosphorus	[1]	
	(b)		D	[1]	
	(c)		A	[1]	
	(d)	**(i)**	Gas at room temperature simple molecular structure/molecular covalent/simple covalent	[2]	
		(ii)	No	[1]	
		(iii)	Idea that simple covalent substances are generally insoluble in water	[1]	8
7	**(a)**		pH 0–2	[1]	
	(b)	**(i)**	$CuCO_3 + H_2SO_4 \rightarrow CuSO_4 + H_2O + CO_2$	[3]	
		(ii)	Essential: green (solid) [1] to blue (solution) [1] colourless liquid/bubbles produced/heat produced/solid disappearing [1]	[3]	
	(c)		$H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$ [1] for reactants [1] for products [1] for state symbols	[3]	10

			AVAILABLE MARKS
8	**(a)**	Bauxite [1]	
	(b)	Reduces melting pt/reduces operating temperature [1] helps to improve the electrical conductivity [1] [2]	
	(c)	$Al^{3+} + 3e^- \rightarrow Al$ [2]	
	(d)	The oxygen produced at the anode [1] reacts with the carbon [1] anodes to produce carbon dioxide [1] [3]	
	(e)	Any **two** from: less energy is used (recycling aluminium than extracting it from its ore) [1]/ idea of saves resources [1]/reduces waste [1]/ reduces amount of CO_2 (therefore reducing carbon footprint)/idea of more cost effective [2]	10
		Total	**70**