Rewarding Learning

General Certificate of Secondary Education
2017–2018

Science: Single Award

Unit 2 (Chemistry)

Higher Tier

[GSS22]

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)**	Y, Z, X	[1]	
	(b)	Sodium	[1]	
	(c)	Hydrogen	[1]	
	(d)	Oxidation	[1]	4
2	**(a)**	F and Cl (either order)	[1]	
	(b)	O	[1]	
	(c)	Ca	[1]	
	(d)	He/O/F/Cl/Ne	[1]	
	(e)	Five	[1]	5
3	**(a)**	All points plotted correctly [2] (6 points plotted correctly [1]) correct curve [1]	[3]	
	(b)	As the time increases, the volume of gas increases [1] at 40 s/48 cm^3 the graph levels off [1]	[2]	
	(c)	**(i)** Limewater	[1]	
		(ii) From colourless [1] to cloudy [1]	[2]	8

AVAILABLE MARKS

4 Indicative content

- safety goggles
- safety screen/fume cupboard
- large trough of water
- small piece of metal
- use tongs
- two similarities from: vigorous reaction/metal floats/moves on surface/metal disappears/gas given off/heat produced/forms a colourless solution
- difference: potassium burns with **a lilac** flame/potassium is **more** vigorous/ potassium melts and lithium doesn't

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe the reaction of alkali metals with water using **six to eight** of the points above, in a logical sequence including two similarities and one difference in observations. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to describe the reaction of alkali metals with water using **four to five** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe the reaction of alkali metals with water using **one to three** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Not worthy of credit.	[0]

[6] 6

5 (a) (i) Radiometric dating [1]

(ii) 4 500 million years/4.5 billion years [1]

(b) A vast timescale that is difficult to comprehend [1]

(c) (i) The continents were once one large land mass/Pangaea [1]
over millions of years they have gradually moved apart [1] [2]

(ii) Any **two** from:
- the shape of the **continents** fit like a jigsaw
- the same types of fossils were found on different **continents**
- the same type of rocks were found on different **continents** [2] 7

				AVAILABLE MARKS
6	**(a)**	Ca^{2+}/Mg^{2+}	[1]	
	(b)	**(i)** C	[1]	
		(ii) Moderately hard water has 61–120 mg/L and town A is 100 mg/L	[1]	
	(c)	Any value **greater than** 180 mg/L	[1]	
	(d)	**(i)** Temporary and permanent (either order)	[1]	
		(ii) Any **two** from: • adding washing soda (precipitation)/sodium carbonate • distillation • ion exchange	[2]	
		(iii) $Ca(HCO_3)_2 \longrightarrow CaCO_3 + CO_2 + H_2O$ [1] [1] [1]	[3]	
	(e)	**(i)** Correct sharing [1] correct outer electrons [1] atoms labelled [1]	[3]	
		(ii) Any correct diatomic element, e.g. hydrogen/oxygen/chlorine/ nitrogen	[1]	14
7	**(a)**	Three	[1]	
	(b)	Natural materials do not take as long to biodegrade	[1]	
	(c)	Idea of variable – size of item, temperature	[1]	
	(d)	**(i)** There is no decomposition in the presence of microbes	[1]	
		(ii) Plastic bags haven't existed for 500 years	[1]	
		(iii) Use ultraviolet radiation [1] time how long it takes to crack/break [1]	[2]	7

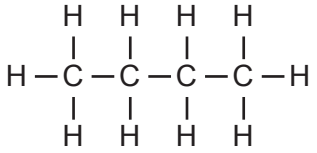
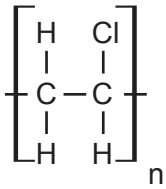
AVAILABLE MARKS

8 Indicative content

- proton: positive charge (+1)
- proton found in the nucleus
- neutron: no charge/neutral
- neutron found in the nucleus
- electron: negative charge (–1)
- electrons found in the electron shells/orbiting the nucleus
- number of electrons and protons are equal/no overall charge
- the atomic number tells us the number of protons
- the mass number tells us the total number of protons and neutrons

Band	Response	Mark
A	Candidates must use appropriate specialist terms throughout to describe the structure of an atom using **seven to nine** of the points above, in a logical sequence. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates use some appropriate specialist terms to describe the structure of an atom using **four to six** of the points above, in a logical sequence. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates describe the structure of an atom using **one to three** of the above points. However, these are not presented in a logical sequence. They use limited spelling, punctuation and grammar and have made limited use of specialist terms. The form and style are of a limited standard.	[1]–[2]
D	Not worthy of credit.	[0]

[6] 6

					AVAILABLE MARKS
9	(a)	(i)		[1]	
		(ii)	CH_4 [1] C_3H_8 [1]	[2]	
	(b)	(i)	Polymerisation	[1]	
		(ii)	**Many** small glucose molecules [1] bond together (to make a long chain) [1]	[2]	
	(c)	(i)	 C-C single bond [1] n [1]	[2]	
		(ii)	Vinyl chloride has **a chlorine** as well as carbon and hydrogen (so therefore cannot be a hydrocarbon)	[1]	9
10	(a)		Electrolysis	[1]	
	(b)	(i)	Carbon [1] anode [1]	[2]	
		(ii)	Al^{3+} [1] 3e [1]	[2]	
	(c)	(i)	Three	[1]	
		(ii)	Eighteen	[1]	
	(d)		A composite material combines **the properties** of two or more materials [1] to produce a **more** useful material [1]	[2]	9
				Total	**75**