Rewarding Learning

General Certificate of Secondary Education
2017–2018

Double Award Science: Chemistry

Unit C2

Higher Tier

[GSD52]

TUESDAY 13 NOVEMBER 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)	(i)	Any **three** of the following: • Moves across the surface/floats • Ignites/lilac flame • Fizzes/effervesces/bubbles • Heat given out • Potassium disappears/dissolves • Idea of a (very) vigorous reaction • Colourless solution produced • Melts into a ball 3 × [1]	[3]	
		(ii)	potassium hydroxide	[1]	
	(b)	(i)	iron + steam → iron oxide + hydrogen [1] [1]	[2]	
		(ii)	black	[1]	
		(iii)	magnesium **or** aluminium **or** zinc	[1]	
		(iv)	copper or other correct	[1]	
	(c)	(i)	• Idea of heating with a Bunsen flame • Hold the ribbon with tongs/place on a crucible • Wear safety goggles/keep tongs at arms length • Do not look directly at the flame Any 3 or 4 correct [2]; 2 correct [1]	[2]	
		(ii)	bright/white flame [1] white solid/powder/ash formed [1]	[2]	13
2	(a)	(i)	H_2CO_3	[1]	
		(ii)	orange	[1]	
	(b)	(i)	blue	[1]	
		(ii)	pungent	[1]	
	(c)		Corrosion of buildings/statues [1] Defoliation of trees [1] Kills fish [1]	[3]	7

AVAILABLE MARKS

3 **(a)** Advantages

- Cheap source of limestone
- Provides jobs (for locals)
- Good for local economy
- Disused quarry can be used for landfill
- Helps road infrastructure for transporting limestone
- Or other correct

Do not allow answers linked to use.
Allow maximum of **four** indicative points for advantages.

Disadvantages

- Noisy machinery
- Unsightly
- Destruction of habitats
- Fumes from machinery and heavy lorries/dust pollution
- Idea of traffic congestion
- Idea of harming tourism
- Or other correct

Not just air pollution.
Allow maximum of **four** indicative points for disadvantages.

Band	Response	Mark
A	Candidates make correct reference to **6–8** of the indicative points shown. They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
B	Candidates make correct reference to **4–5** of the indicative points shown. They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
C	Candidates make correct reference to **2–3** of the indicative points shown. The form and style is of a limited standard.	[1]–[2]
D	Candidates make very little or no correct reference to any of the indicative points.	[0]

[6]

(b) The making of a chemical bond gives out energy/is exothermic. [1]

7

					AVAILABLE MARKS
4	(a)	(i)	Add soap solution (and shake) [1] a lather forms [1]	[2]	
		(ii)	Boil the sample [1] **then** add soap and shake [1] temporary hard water will lather with soap [1] this mark depends on the first mark	[3]	
	(b)		Calcium ions combine with carbonate ions [1] to produce **insoluble** [1] calcium carbonate [1]	[3]	8
5	(a)	(i)	170	[1]	
		(ii)	132	[1]	
	(b)		the relative formula mass (of the substance) [1] in grams [1] second mark dependent on first	[2]	
	(c)	(i)	40.8 g	[1]	
		(ii)	500 [2] for a correct method mark award [1] e.g. 51 g = 0.5 mol **or** 51 kg = 51 000 g	[2]	
	(d)	(i)	it becomes 40% of its original value	[1]	
		(ii)	it stays the same	[1]	
		(iii)	2 mol/dm^3	[1]	10

6 (a)

			Tick (✓)
$2HBr$	⟶	$H_2 + Br_2$	✓
$CuSO_4 + 5H_2O$	⟶	$CuSO_4.5H_2O$	
$CH_4 + 2O_2$	⟶	$CO_2 + 2H_2O$	✓
$HCl + NaOH$	⟶	$NaCl + H_2O$	

[1] mark of each correct 2 × [1] [2]

(b) Reduction: Lead **ions** gain electrons [1]
Oxidised: Aluminium (atoms) lose(s) electrons [1] [2]

(c) oxidised = carbon monoxide/CO [1]
reduced = Fe^{3+}/iron ions/Fe_2O_3/iron(iii) oxide [1] [2] 6

					AVAILABLE MARKS
7	(a)	(i)	35 **cm³** ±1 units essential	[1]	
		(ii)	160 accept 157–160	[1]	
		(iii)	Graph starts at origin and is steeper [1] curve levels off at 60 cm^3 [1]	[2]	
	(b)	(i)	Any 2 of first 3 points + final point: Particles have more (kinetic) energy [1] Particles are moving faster [1] More particles have energy greater than activation energy [1] Max 2 × [1] More **energetic** collisions/more successful collisions [1] **Not** more collisions	[3]	
		(ii)	More particles (in a given volume) [1] (**Not** molecules or atoms) More successful collisions [1]	[2]	
	(c)		Rate is lower for student A than student B [1] volume of hydrogen gas produced is the same in both [1]	[2]	11
8	(a)	(i)	Any **two** from: • Colourless • Odourless • Tasteless • Insoluble/sparingly soluble in water • **or** other correct 2 × [1]	[2]	
		(ii)	As a coolant/in food packaging **or** other correct	[1]	
	(b)	(i)	iron	[1]	
		(ii)	Any answer in range 200–1000 [1] atm [1]	[2]	
		(iii)	$N_2 + 3H_2 \rightleftharpoons 2NH_3$ LHS [1] RHS [1] balancing if all formulae correct [1] reversible sign [1]	[4]	
		(iv)	Any **two** from: • **Manufacture** of fertilisers • **Manufacture** of nitric acid/explosives • **Manufacture** of nylon • Ingredient in cleaning products • **or** other correct 2 × [1]	[2]	12

AVAILABLE MARKS

9 **(a)** Indicative points:
Definition of homologous series
family of organic molecules with:
- Same general formula
- Similar chemical properties
- Graduation in physical properties
- Differ by CH_2

Maximum 3IPs

Similarities between methanoic acid and ethanoic acid
- Both liquids
- Both colourless
- Both water soluble
- Other correct physical property
- Idea that both are **weak** acids
- One explicit example of a similar reaction

Maximum 5 IPs

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D	Candidates make very little or no correct reference to any of the indicative points.	[0]

[6]

(b) Test: idea of using bromine **water/solution** [1]
Result with hexene – goes from brown/orange [1] colourless [1]
Result with hexane – idea of colour not disappearing [1] [4]

(c) $C_6H_{12} + 9O_2 \rightarrow 6CO_2 + 6H_2O$

LHS [1] RHS [1]
Balancing if all formulae correct [1] [3]

			AVAILABLE MARKS
(d)	Any **three** of: the calcium carbonate/powder/solid would dissolve/disappear gas given off/effervescence/gas evolved **colourless** solution formed heat given off idea of reaction being not very vigorous 3 × [1]	[3]	16
		Total	**90**