Rewarding Learning

General Certificate of Secondary Education
2017

Double Award Science: Chemistry

Unit C2

Higher Tier

[GSD52]

WEDNESDAY 14 JUNE 2017, 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)**	Any **four** of the following: (initially) sinks idea of rising after sinking Idea that it reacts vigorously (*not violent not slow*) fizzing/effervescence/bubbles/gas given off/gas evolved exothermic/heat given out white or grey solid/precipitate forms or idea of turning cloudy calcium disappears/dissolves or other correct (Max 4 × [1]) [4]	
	(b)	hydrogen [1] magnesium oxide [1] [2]	
	(c)	Any **three** of the following ideas: reacts vigorously (Do not accept idea of violent reaction) it sinks/allow sinks and rises fizzing/effervescence/bubbles/gas given off/gas evolved strontium dissolves/disappears exothermic/heat given off white or grey solid/precipitate forms or idea of turning cloudy explicit idea that it reacts more quickly than calcium Do not credit answers which are linked to Group I specific observations with water, e.g. floats/catches fire/forms a ball; Do not accept answers that are wrongly qualified (Max 3 × [1]) [3]	
	(d) **(i)**	potassium/sodium/calcium/magnesium accept strontium [1] Accept any Group I or Group II metal	
	(ii)	zinc/tin/lead/copper [1]	11

AVAILABLE MARKS

2 **(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 4 indicative points for advantages.

Disadvantages

- noisy machinery/explicit idea of noise pollution
- unsightly
- destruction of habitats
- fumes from machinery and heavy lorries/dust pollution
- idea of traffic congestion
- idea of harming tourism

or other correct, e.g. danger if it is correctly qualified
Not just 'air pollution'

Allow maximum of 4 indicative points for disadvantages.

Response	**Marks**
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]
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]
Candidates make correct reference to 2–3 of the indicative points shown. The form and style is of a limited standard.	[1]–[2]
Candidates make very little or no correct reference to any of the indicative points.	[0]

[6]

(b) **(i)** to remove **acidic** impurities/SiO_2/to form slag [1]

(ii) $CaCO_3 \rightarrow CaO + CO_2$
[1] [1]
i.e. LHS [1] RHS [1] if wrongly balanced maximum mark is [1] [2]

9

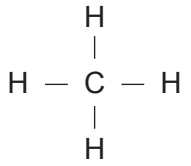
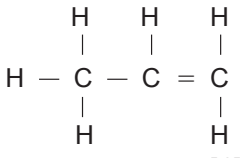
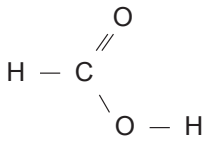
					AVAILABLE MARKS
3	(a)	(i)	to prevent loss of oxygen/gas Do not accept airtight	[1]	
		(ii)	clear idea that volume has to be measured	[1]	
		(iii)	no more bubbles/no change in volume in syringe/no more oxygen/ gas produced	[1]	
	(b)	(i)	y-axis volume of gas (produced)/cm^3 [1] 6 or 7 correct points [2]; 4 or 5 correct points [1] Correct curve (not ruler drawn) [1]	[4]	
		(ii)	23–24 (s) apply e.c.f.	[1]	
		(iii)	B or in the first 10 seconds	[1]	
		(iv)	64 cm^3	[1]	
	(c)		Any **three** of: idea particles have more energy [1] particles move faster/move more [1] If particles not explicit in answer maximum mark is [2] more particles possess activation energy [1] idea of **more energetic** collisions/more **successful** collisions [1] NOT just "more collisions" (Max 3 × [1])	[3]	13
4	(a)		… the mass of the atom [1] compared with that of (the) carbon-12 (isotope) [1], which has a mass of exactly 12 [1] **or** the (average) mass of an atom (of an element) [1] compared to $\frac{1}{12}$ of the mass [1] of the carbon –12 (isotope) [1]	[3]	
	(b)	(i)	34	[1]	
		(ii)	174	[1]	
		(iii)	164	[1]	
	(c)	(i)	15 [2] for 800 g iron(iii) oxide = 5 moles **or** 1:3 ratio Fe_2O_3 : CO and incorrect final answer award [1] method mark	[2]	
		(ii)	80 tonnes [2] For 80 with incorrect units award [1] **or** 1:2 ratio Fe_2O_3 : Fe award [1] method mark **or** 56 tonnes iron = 1 × 10^6 moles award [1] method mark	[2]	
	(d)	(i)	it becomes 0.25 mol/dm^3	[1]	
		(ii)	it stays the same	[1]	12

					AVAILABLE MARKS
5	**(a)**	**(i)**	solution A – (dilute) hydrochloric acid or sulfuric acid or ethanoic acid [1] solid B – zinc or magnesium [1]	[2]	
		(ii)	"collection over water" or displacement of water	[1]	
	(b)	**(i)**	black	[1]	
		(ii)	copper [1] + water [1] either order	[2]	
	(c)	**(i)**	temperature: accept answers in range 350 °C – 500 °C [1] pressure: accept answers in range 200 atm – 300 atm [1] If range given both values must fall inside the correct range	[2]	
		(ii)	$3H_2 + N_2 \rightleftharpoons 2NH_3$ LHS [1] reversible sign [1] RHS [1] Balancing (if all formulae correct)[1]	[4]	12
6	**(a)**		Any **two** of the following ideas: Water tastes better Good for teeth and bones May prevent heart disease Good for brewing beer Needed for tanning leather (Max 2 × [1])	[2]	
	(b)		$Ca^{2+}_{(aq)} + CO_3^{2-}{}_{(aq)} \rightarrow CaCO_{3\,(s)}$ LHS [1] RHS [1] State symbols [1]	[3]	
	(c)	**(i)**	hydrated [1] iron(III) oxide [1]	[2]	
		(ii)	zinc is more reactive than iron [1] Zinc reacts first/reacts in preference to iron [1] **Not** zinc reacts quicker; **not** zinc rusts	[2]	
	(d)		**iron** is losing electrons [1] **copper ions** are gaining electrons [1]	[2]	11

AVAILABLE MARKS

7 **(a)** Family of organic molecules with:
same general formula [1]
idea of similar chemical properties [1]
idea of gradation in physical properties [1]
idea that formulae differ by CH_2 [1]
(any three from four) [3]

(b)

Name	molecular formula	structural formula	physical state at room temperature
	CH_4 [1]	 [1]	
		 [1]	Gas [1]
		 * [1]	Liquid [1]

* accept –OH [6]

(c) **(i)** OH **or** –OH **or** –O–H [1]

(ii) no functional group [1]

(iii) –COOH **or** COOH **or**  **or**  **or** CO_2H [1]

12

AVAILABLE MARKS

8 **(a)** $C_2H_4 + H_2O \rightarrow C_2H_5OH$

LHS [1] RHS [1] [2]

if wrongly balanced maximum mark is [1]

(b) **Indicative points**

Making ethanol:

- yeast needed
- yeast is a catalyst/enzyme **not** reactant
- process called fermentation
- absence of air/oxygen, i.e. anaerobic
- needs to be left in a warm (**not** hot) place/carbon dioxide released

Maximum of **three** of these indicative points

How alcohol can directly damage people's health:

- damage to liver
- kidney damage
- vitamin deficiency
- heart disease
- stroke
- memory loss
- depression/mental health (issues/problems)
- stomach disorders
- brain damage
- high blood pressure
- obesity
- cancer if qualified, i.e. breast/mouth/throat/bowel/liver/larynx
- idea of dangers during pregnancy

or other correct

Maximum of **three** of these indicative points

Social wellbeing:

- **self:** e.g. inability to function properly; embarrassment; an effect of being drunk; loss of job
- **relationships:** e.g. breakdown of marriage; loss of friendship; domestic violence
- **antisocial/aggressive behaviour:** e.g. vandalism, use of inappropriate language specific crime
- driving, e.g. causing an accident whilst driving under the influence of alcohol
- financial consequences: e.g. going into debt

or other correct

Maximum of **three** indicative points

Response	Marks
Candidates must use specialist terms throughout (7–9 indicative points required). They use good spelling, punctuation and grammar and the form and style are of a high standard.	[5]–[6]
Candidates use some specialist terms (4 to 6 indicative points required). They use satisfactory spelling, punctuation and grammar and the form and style are of a satisfactory standard.	[3]–[4]
Candidates give 2 to 3 of the indicative points. They use limited spelling, punctuation and grammar and they have made little use of specialist terms.	[1]–[2]
Response not worthy of credit, i.e. 0 or 1 indicative points.	[0]

[6]

(c) $C_nH_{2n+1}OH$ Accept $C_nH_{2n+2}O$

Each error (up to 2) reduces maximum mark by [1]

e.g. $C_nH_{2n}OH$ is worth [1]

$C_nH_{2n}OH_2$ is worth [0] [2] 10

Total **90**

AVAILABLE MARKS
10
90