Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
January 2014

Chemistry

Assessment Unit AS 2

assessing

Module 2: Organic, Physical and Inorganic Chemistry

[AC122]

THURSDAY 16 JANUARY, 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 finished.

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.

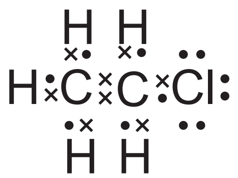
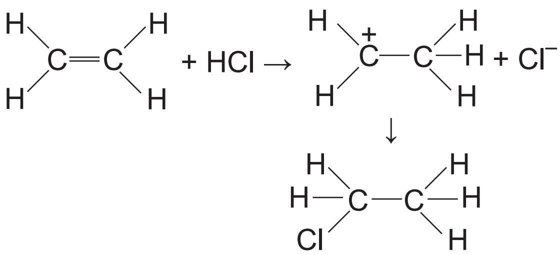
Section A

		AVAILABLE MARKS
1	C	
2	A	
3	C	
4	C	
5	B	
6	D	
7	B	
8	B	
9	D	
10	B	
[2] for each correct answer	[20]	20
	Section A	**20**

Section B

						AVAILABLE MARKS
11	**(a)**	**(i)**	$BaCO_3 \rightarrow BaO + CO_2$		[1]	
		(ii)	Ca^{2+} is smaller (than Ba^{2+})/Ca^{2+} has greater charge density	[1]		
			causes more polarisation of carbonate	[1]		
			so less heat is required to decompose	[1]	[3]	
	(b)		green (flame)		[1]	
	(c)	**(i)**	add water		[1]	
		(ii)	increases down Group		[1]	
		(iii)	$Ba(OH)_2 + H_2SO_4 \rightarrow BaSO_4 + 2H_2O$		[1]	
		(iv)	white		[1]	
	(d)		add potassium chromate solution	[1]		
			yellow precipitate confirms barium ion	[1]		
			add magnesium ions solution	[1]		
			white precipitate confirms carbonate ion	[1]	[4]	
			Quality of written communication		[2]	15
12	**(a)**	**(i)**	C_nH_{2n+2}		[1]	
		(ii)	$C_{20}H_{42}$		[1]	
		(iii)	contains no C $=$ C or C $\equiv$ C bond		[1]	
	(b)		icosane has larger RMM/more electrons	[1]		
			and therefore stronger van der Waals forces	[1]	[2]	
	(c)	**(i)**	0.9 g 61 ºC		[1]	
		(ii)	0.9/282 = 0.0032	[1]		
			$\Delta H = mc\Delta T = 150 \times 4.18 \times 61 = 38\,247$ J	[1]		
			$(38\,247/0.0032)/1000 = 11\,952\ kJ\,mol^{-1}$	[2]		
			insertion of negative sign	[1]	[5]	
		(iii)	heat loss to surroundings/can is not insulated/incomplete combustion		[1]	
	(d)	**(i)**	$C_{20}H_{42} + 30.5\,O_2 \rightarrow 20\,CO_2 + 21\,H_2O$ **or** $2\,C_{20}H_{42} + 61\,O_2 \rightarrow 40\,CO_2 + 42\,H_2O$		[2]	
		(ii)	CO		[1]	15

						AVAILABLE MARKS
13	**(a)**		it provides a different reaction pathway	[1]		
			of lower (activation) energy	[1]	[2]	
	(b)	**(i)**	equilibrium shifts to RHS	[1]		
			in exothermic direction/to produce heat	[1]	[2]	
		(ii)	equilibrium shifts to RHS	[1]		
			where there are fewer molecules	[1]	[2]	
		(iii)	28	[1]		
			0.2	[1]		
			0.3	[1]		
			$7.2\,dm^3$ ($7200\,cm^3$)	[1]	[4]	
	(c)		lead would poison/coat the surface of the catalyst		[1]	11
14	**(a)**		RCH_2OH/one alkyl group/other carbon bonded to the carbon which is bonded to the O—H		[1]	
	(b)		impaired judgment/slow reactions		[1]	
	(c)	**(i)**	orange [1] to green [1]		[2]	
		(ii)	$C_2H_5OH + [O] \rightarrow CH_3CHO + H_2O$ **or** $C_2H_5OH + 2[O] \rightarrow CH_3COOH + H_2O$		[2]	
	(d)	**(i)**	the molecule absorbs infrared radiation	[1]		
			and the bonds vibrate	[1]	[2]	
		(ii)	A is ethanol [1] because the peak for O—H/C—O is present	[1]		
			(B is) propanone as the peak for C=O is present	[1]	[3]	
	(e)		C_2H_5Cl [1] C_2H_5ONa [1] C_2H_5Cl [1]		[3]	
	(f)	**(i)**	ethyl propanoate		[1]	
		(ii)	concentrated sulfuric acid		[1]	
		(iii)	rate of forward reaction is equal to the rate of the backward reaction	[1]		
			amount of each reactant/product remains constant	[1]	[2]	
		(iv)	propanoyl chloride		[1]	19

						AVAILABLE MARKS
15	**(a)**	**(i)**	$C_2H_4 + Cl_2 \rightarrow CH_2ClCH_2Cl$ (allow $C_2H_4Cl_2$ for product)		[1]	
		(ii)	1,2-dichloroethane		[2]	
		(iii)	using heat	[1]		
			to break large molecules into smaller molecules	[1]	[2]	
		(iv)	HCl/hydrogen chloride		[1]	
		(v)	addition		[1]	
	(b)	**(i)**			[1]	
		(ii)		[3]		
			([–1] each error)			
		(iii)	electrophilic [1] addition [1]		[2]	
		(iv)	pi/π		[1]	
	(c)	**(i)**	ultraviolet light		[1]	
		(ii)	$C_2H_6 + Cl\bullet \rightarrow C_2H_5\bullet + HCl$	[1]		
			$C_2H_5\bullet + Cl_2 \rightarrow C_2H_5Cl + Cl\bullet$	[1]	[2]	
		(iii)	butane		[1]	
	(d)		$C_2H_5Cl + 2NH_3 \rightarrow C_2H_5NH_2 + NH_4Cl$			
			or $C_2H_5Cl + NH_3 \rightarrow C_2H_5NH_2 + HCl$	[1]		
			ethylamine/aminoethane	[1]	[2]	20
					Section B	**80**
					Total	**100**