OCR

RECOGNISING ACHIEVEMENT

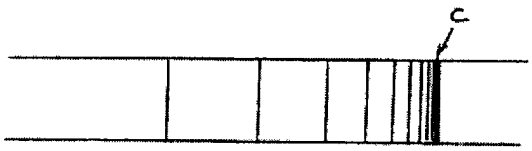
Subject: Methods of Analysis & Detection Code: 2815/04

Session: January Year: 2003

Mark Scheme

MAXIMUM MARK	45

Mark Scheme Page 1 of	Unit Code 2815/04	Session January	Year 2003	Version 1.01
Abbreviations, annotations and conventions used in the Mark Scheme	/ = alternative and acceptable answers for the same marking point ; = separates marking points NOT = answers which are not worthy of credit ( ) = words which are not essential to gain credit _____ = (underlining) key words which **must** be used to gain credit ecf = error carried forward AW = alternative wording ora = or reverse argument			

Question	Expected Answers	Marks
1	**(a)** Each line represents the transfer of an electron between energy levels	1
	The energy levels are quantised (or equiv)	1
	(b) (i) The point at which an electron is removed from the atom (or equiv)	1
	(ii) 	2
	(1) for sketch, (1) for label (needs to be the right way round)	
	(c) $\bullet E = \frac{hc}{\bullet} = \frac{6.63 \times 10^{-34} \times 3.00 \times 10^{8}}{557 \times 10^{9}}$	1
	$= 3.57 \times 10^{-19}$ J	1
	(d) Measuring sodium levels in blood, determining the composition of metal alloys analysing elements present in stars	1
		Total: 8

2	**(a) Partition** : thin-layer / paper / gas-liquid / or real e.g. **Adsorption** : thin-layer / or real e.g.	**1** **1**
	(b) Time between the injection of a sample and the appearance of a given peak	**1**
	(c) Mobile phase : carrier gas **Stationary phase** : liquid held on solid support	**1** **1**
	(d) Based on their measurements : Correction of baseline Correct calculation of peak area Correct use of total area to give % **Example** Area of **A** = $\frac{1 \times 27.5}{2}$ = 13.75 % **A** = $\frac{13.75}{30}$ = 46% $\pm$ 3 Area of **B** = $\frac{1 \times 7}{2}$ = 3.5 %**B** = $\frac{3.5}{30}$ = 12% $\pm$ 3 Area of **C** = $\frac{1.5 \times 17}{2}$ = 12.75 % **C** = $\frac{12.75}{30}$ = 43% $\pm$ 3	**1** **1** **1**

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Question	Expected Answers	Marks
2 (cont.)	**(e)** Description : DC source (1), buffered medium (1) with sample placed in the centre (1) Explanation : ionic forms depend on pH (1) Amino and carboxyl ends can be charged (1) When both are charged remains stationary (1) *Or equivalent points* **QoWC** – Coherent logical argument, correct terminology.	**6** **1** **Total: 15**

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Question	Expected Answers	Marks
3	**(a)** Unsaturated / double / • bonds	1
	lone pair / non-bonding electrons	1
	(b) CH_3CH_2OH and CH_3CHO circled	2 x 1
	(penalty for each incorrect above two circled)	
	(c) **E** has (5) delocalised / conjugated double bonds	1
	Energy levels are closer together	1
	Shifts absorption from uv to visible / longer λ	1
	(d) **(i)** double bond / • electrons	1
	(ii) contains a new chromophore	1
	has non-bonding electrons from bromine	1
	(e) M+1 peaks are due to ^{13}C	1
	M+2 peak in **G** is due to ^{81}Br	1
		Total: 12

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Question	Expected Answers	Marks
4	**(a) (i)** Structure **III**	1
	since 3450 cm^{-1} peak shows –OH	1
	(ii) Triplet is caused by CH_3 adjacent to CH_2	1
	Quartet is caused by CH_2 adjacent to CH_3	1
	(iii) D from D_2O exchanges with the –OH proton	1
	Deuterium does not absorb	1
	(b) (i) Structure **I** has no labile protons	1
	so no peaks would disappear	1
	(could argue the reverse for structure **III**)	
	(ii) Each possible structure for **J** would show a different fragmentation pattern	1
	The fragmentation pattern produced is characteristic of the structure of the molecule **OR** examples of unique fragments	1
		Total: 10