



GCE MARKING SCHEME

**CHEMISTRY
AS/Advanced**

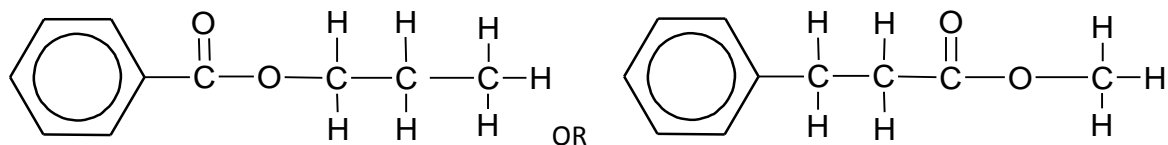
SUMMER 2012

CH4

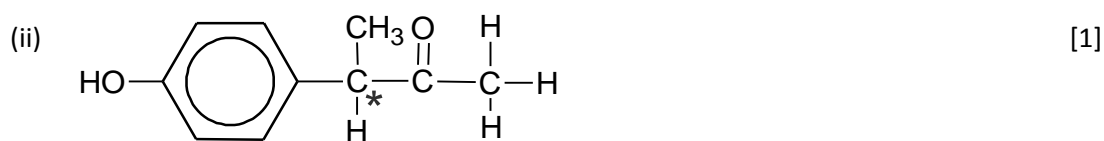
Question 1

(a) Any valid ester structure with formula $C_{10}H_{12}O_2$ [1]

Examples:



(b) (i) Compound X [1]



(iii) Rotate the plane of polarised light in opposite directions [1]

(c)

Reagent(s)	Observation if the test is positive	Compound(s) that would give a positive result
$I_2 / NaOH$ (aq)	Yellow solid	X
Na_2CO_3 (aq)	Bubbles of colourless gas / effervescence	W
$FeCl_3$ (aq)	Dark purple/blue/green - do not accept 'precipitate'	X, Z

(1 mark for each box) [6]

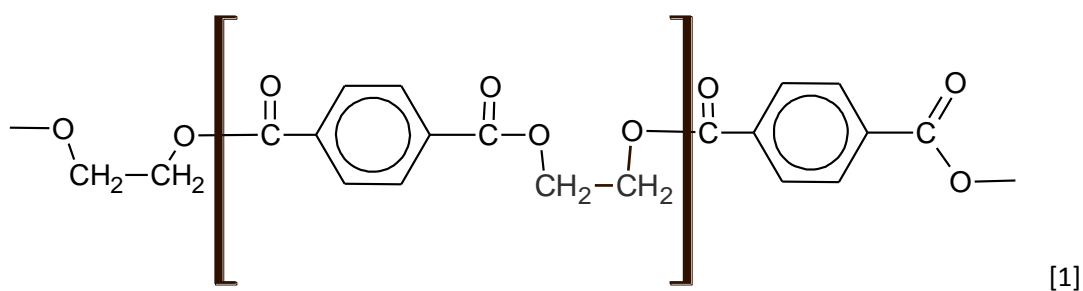
(d) (i) Heat / Alkaline / Potassium manganate(VII) / then acidify
 (1 mark for Potassium manganate + 1 other point; 2 marks for all) [2]

(ii) I. Addition polymer – One large molecule formed only / Condensation polymer – one large molecule with small molecules (e.g. water) lost. (1)

Addition polymer – one starting material / Condensation – two starting materials

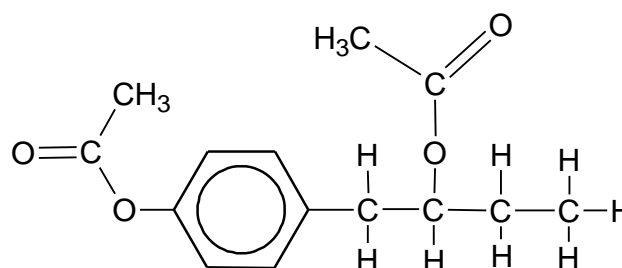
OR Addition polymer – one functional group in each molecule/ Condensation polymer – two functional groups in each molecule (1) [2]

II.



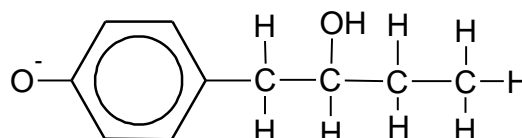
(e) (i) NaBH₄ / LiAlH₄ or name(1) Reduction (1) [2]
 - ignore conditions unless LiAlH₄ in water - do not accept 'redox'

(ii)



Accept structures with only one -OH group reacted. [1]

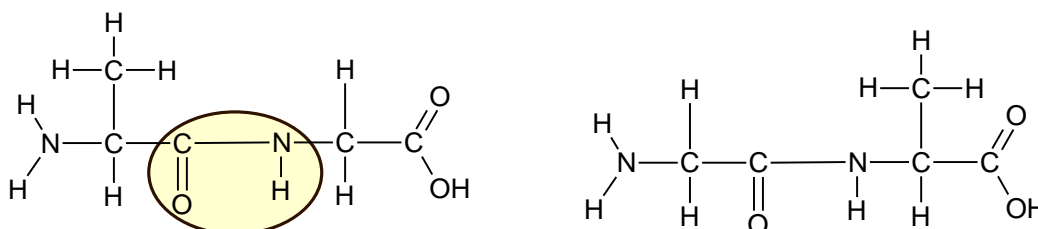
(iii) [1]



[19 marks]

Question 2

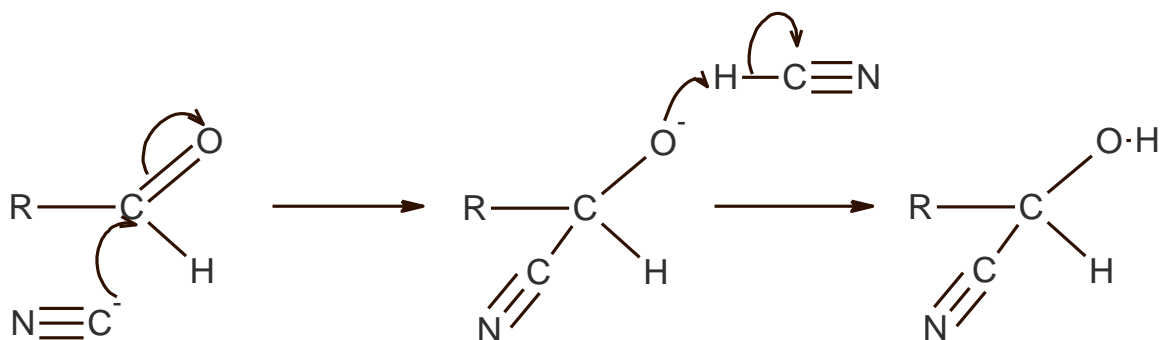
- (a) (i) Alanine forms a zwitterion (1)
 Forces between alanine molecules are ionic bonding (1)
 Ionic bonding much stronger than hydrogen bonding / van der Waals (1)
 Max 2 marks [2]
- (ii) 1 mark for each correct structure [2]



- (iii) 1 mark for correct identification of peptide link [1]

- (b) Enzymes / Structural proteins / Hormones or specific example [1]

- (c) 1 mark for arrows in first stage; 1 mark for correct intermediate; 1 mark for arrow giving gain of proton in second stage (from HCN or from H⁺).



[3]

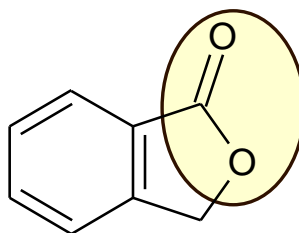
- (d) Soda lime [1]

[10 marks]

Question 3

(a) (i)

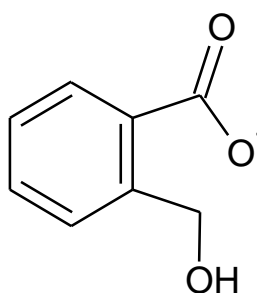
[1]



Phthalide

(ii)

[1]



(b) Distillation / Chromatography

[1]

(c) Hydrogenation of 3-butyl phthalide removes a benzene ring (1)

Benzene ring is more stable than alkene/ Reference to delocalisation energy (1) [2]

(d) 62.1%

[1]

(e) (i) Greater variety of different phthalides that can be produced

[1]

(ii) Higher atom economy / less waste / carbon monoxide is toxic

[1]

- do not accept references to yield

(f) Silver nitrate and ammonia / Tollen's reagent (1); Q = Silver mirror (1); R = No reaction (1)

OR 2,4,-DNP (1); Orange precipitate with Q (1); No reaction with R (1)

OR Fehling's solution (1); Orange solid with Q (1); No reaction with R (1)

[3]

[11 marks]

(ii) Structure 1 mark + 4 marks for explanations.

- Product is ethyl ethanoate. (1)
- Two points from the following required for each mark– MAX 4 marks
 - Sweet-smelling = ester
 - Peak at 1.0ppm implies – CH₃
 - Peak area 3 = CH₃
 - Peak area 2 = CH₂
 - Triplet shows CH₃ is next to a CH₂ group.
 - Singlet shows CH₃ no hydrogen atoms bonded to adjacent carbon.
 - Peak at 2.1 ppm suggests this is next to C=O.
 - Quartet shows CH₂ is adjacent to a CH₃ group.
 - Peak at 4.0 ppm shows it is –O-CH₂-
 - IR Peak at 1752 cm⁻¹ = C=O
 - IR Peak at 2981 cm⁻¹ = C-H or O-H
 - Cannot be –OH as we know there is no –OH in NMR spectrum

[5]

QWC: selection of a form and style of writing appropriate to purpose and to complexity of subject matter. (1)

QWC: organisation of information clearly and coherently; use of specialist vocabulary where appropriate. (1)

[2]

[20 marks]

Question 5

(a) (i) (Concentrated) nitric acid / (concentrated) sulfuric acid / Temperature of 40-80°C

(Any 2 = 1 mark; All 3 = 2 marks)

Electrophilic substitution (1) [3]

(ii) I. Peak area is proportional to amount of substance (1)

Percentage = $(30 / 38) \times 100 = 79\%$ (1)

(Can obtain both marks from correct percentage) [2]

II. 45 = COOH^+ , 46 = NO_2^+ , 122 = $\text{C}_6\text{H}_4\text{NO}_2^+$ and 167 = $\text{C}_7\text{H}_5\text{NO}_4^+$.

(Any 2 = 1 mark; All 4 = 2 marks) [2]

(iii) I. Lower melting point / melts over a range [1]

II. 1 mark for each point.

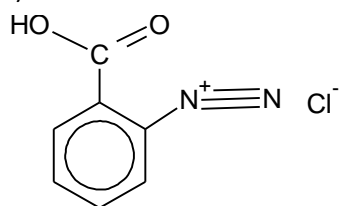
- Dissolve in the minimum volume
- Of hot water
- Filter hot
- Allow to cool
- Filter
- Dry residue under suction / in oven below 142°C

Max 4 marks [4]

QWC: legibility of text, accuracy of spelling, punctuation and grammar, clarity of meaning. [1]

(b) (i) Tin and concentrated hydrochloric acid [1]

(ii) Below 10°C (1)



(1) [2]

(iii) N=N double bond is chromophore (1)

Compound absorbs blue /green / complementary colours to red / all colours but red (1)

Remaining frequencies are transmitted, giving the red colour seen. (1)

Any 2 out of 3 [2]

(c) Nitrogen has a lone pair (1) which can accept a proton (1) [2]

[20 marks]