



GCE MARKING SCHEME

**CHEMISTRY
AS/Advanced**

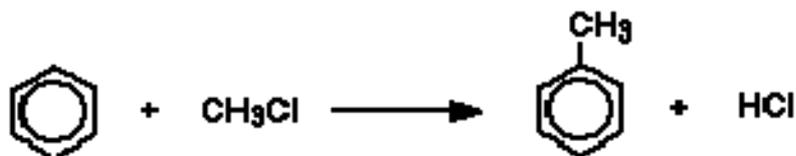
JANUARY 2011

CH4

SECTION A

1. (a) (i) $C_6H_5NO_2$ (1)
the blue light is absorbed / there is no yellow light to be reflected /
transmitted (1)
equivalent (1) [3]

- (b) (i)



[1]

- (ii) aluminium chloride / iron(III) chloride / correct formulae [1]

- (c) (i) The chlorine's (lone pair of) electrons interact with the ring π cloud of electrons (1)
making it less polar / stronger bond (1)
and therefore less susceptible to **nucleophilic** substitution (1) [3]

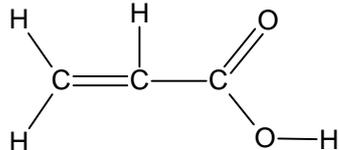
- (ii) Any TWO from
e.g. ease of manufacture / availability of starting materials /
percentage yield / shelf life of product / life of product in use /
effectiveness / suitability / range of colours [2]

- (d) (i) esters [1]

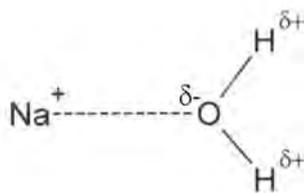
- (ii) reagents iodine / sodium hydroxide
OR sodium chlorate(I) / potassium iodide
 $I_2 / NaOH$ or OH^- $NaClO / ClO^- / KI / I^-$ (1)

- observation **yellow** precipitate / solid / crystals (1)
(antiseptic smell is a neutral answer) [2]

Total [13]

2. (a) (i) 3-bromopropene/3-bromoprop-1-ene [1]
- (ii) Reagent A (aqueous) sodium hydroxide / NaOH / OH⁻ (1)
 Reagent B potassium dichromate / K₂Cr₂O₇ / Cr₂O₇²⁻ (1) [2]
- (b) (i) condensation / (nucleophilic) addition – elimination [1]
- (ii) red / yellow / orange solid (a solid must be implied) [1]
- (iii) take its melting temperature, compare this with known values [1]
- (iv) Displayed formula  [1]
- Type of reaction oxidation / redox [1]
- (c) (i) Both carbon atoms of the double bond need to have different atoms / groups attached to them [1]
- (ii) Reagent iron(III) chloride / FeCl₃ OR aqueous bromine (1)
 Observation purple/blue/green colour white precipitate (1) [2]
- (iii) It is shown by compounds that have the same structural formula but where their bonds take up different positions in space [1]
- (do not accept descriptions of geometrical/optical isomerism)
- Total [12]

3. (a) (i) Chromophore [1]
- (ii)



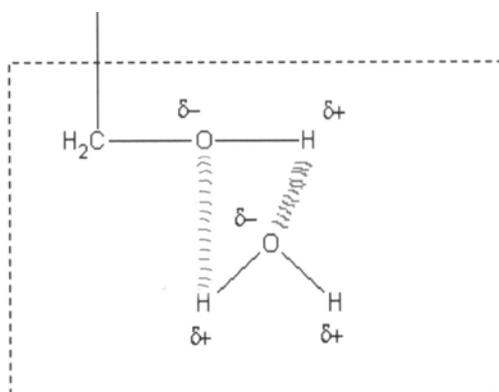
- The sodium ions are attracted to the δ^- oxygen atom of a water molecule [1]
- (iii) I 0 - 10 °C / <10°C [1]
- II (An ion that is) an electron **pair** acceptor / seeks out an electron rich site [1]
- (accept an electron deficient group/species)

- (b) (i) Brilliant Blue FF (1) as it has R_f value 0.80 and this has been identified on the chromatogram (1) [2]
must have the correct deduction, either 2 or 0 here

- (ii) Any TWO from e.g.
repeat the chromatography using a different solvent / take its visible spectrum and compare its λ_{\max} with those of the two dyes / take its infrared spectrum and compare with the spectrum of the two dyes / take its NMR spectrum and compare its spectrum with the NMR spectrum of each individual dye (1), (1) [2]

- (c) $(\text{CH}_3\text{CH}_2\text{COO})_2\text{Ca} + \text{Ca}(\text{OH})_2 \rightarrow 2 \text{CaCO}_3 + 2 \text{C}_2\text{H}_6$
correct balancing (1) correct formula of ethane (1) [2]

- (d)

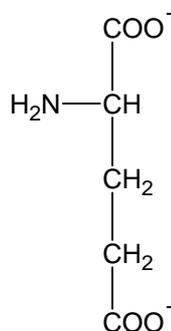


polarisation (1)

hydrogen bonding (1)

[2]

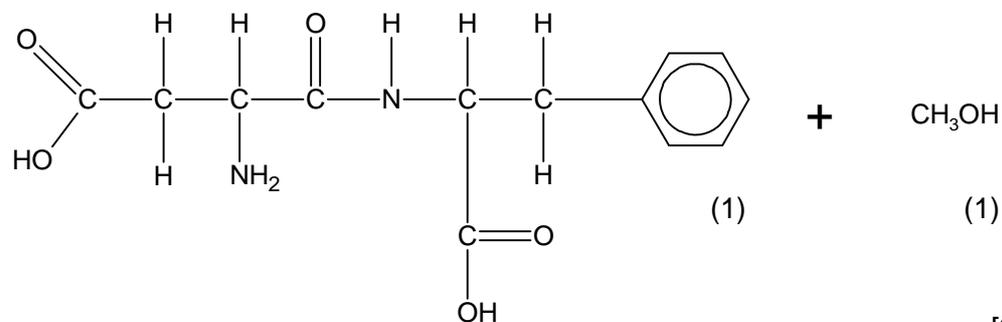
- (e)



accept the formula with Na^+ ions

[1]

- (f)



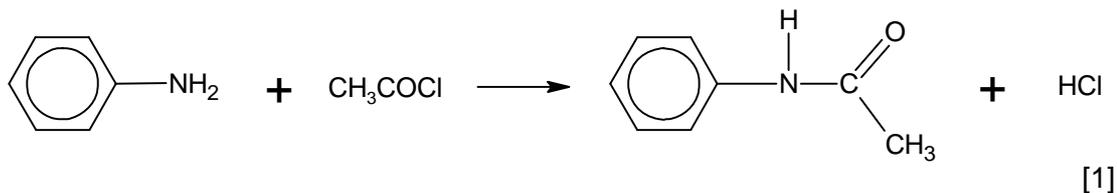
[2]

Total [15]

Section A Total [40]

SECTION B

4. (a) (i)



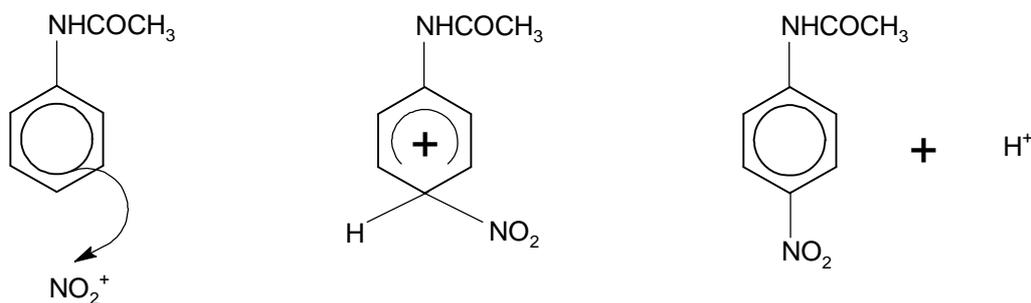
[1]

(ii) To remove **soluble** impurities [1]

(iii) The impure crystals are added to the **minimum** quantity of **hot water** / added to sufficient cold water and heated until all the crystals just dissolve / OWTTE (1) filter hot (1)
 Allow the mixture to cool (1)
 The product is then filtered (1) (washed) and dried in an oven at a **temperature <113 °C** / accept other drying methods that imply the temperature is <113 °C (1) [4]

QWC Information organised clearly and coherently, using specialist vocabulary when appropriate [1]

(b) (i)



(1)

(1) (Wheland) intermediate

(1) products

electrophilic substitution (1) [4]

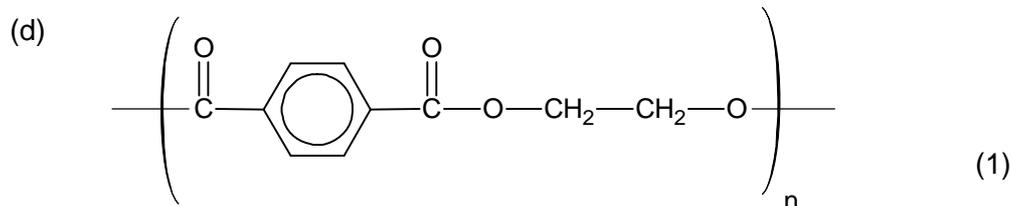
(ii) Since the 2-isomer is yellow (1) and the 4-isomer is colourless; when the 4-isomer is colourless / 'not yellow' then the 4-isomer is no longer contaminated (1) [2]

(iii) Moles of N-phenylethanamide = $\frac{8.10}{135} = 0.060$ (1)

Moles of the 4-isomer = $\frac{6.48}{180} = 0.036$ (1)

% Yield = $\frac{0.036 \times 100}{0.060} = 60.(0)$ (1) [3]

- (c) (i) Potassium manganate(VII) / permanganate / KMnO_4 [1]
 (ii) To convert the (sodium) salt back to the (parent) acid [1]



in condensation polymerisation a small molecule / water is lost / produced (1)

[2]

Total [20]

5. (a) (i) Hydrogen cyanide ionises/dissociates (giving a hydrogen ion / H^+ and a cyanide ion / CN^-) (1)
 (The mechanism is described as nucleophilic addition) because the CN^- ion acts as a nucleophile / base / electron pair donor (attacking (accept 'approaches') a δ^+ site) (1)
 Electron density increases / negative charge produced on the oxygen atom (1)
 This oxygen atom acts as an electron pair donor, attracting a hydrogen ion (1)
 In effect a molecule of hydrogen cyanide has added across the carbon to oxygen double bond (1)
 (Accept any four correct points) [4]
- QWC Legibility of text; accuracy of spelling, punctuation and grammar; clarity of meaning [1]
- (ii) Hydrolysis is a reaction with water (or a water containing reagent), where water 'splits' the 'organic molecule' (1)
 In this reaction, hydrochloric / (dilute) sulfuric acid is used (1) [2]
- (b) (i) Number of moles of sodium hydroxide = $\frac{20.00 \times 0.250}{1000} = 0.005$ (1)
 Number of moles of lactic acid = 0.005
 Mass of lactic acid = $0.005 \times 90 = 0.45 \text{ g}$ (1)
 Percentage of lactic acid in the yoghurt = $\frac{0.45 \times 100}{50} = 0.90$ (1) [3]
- (ii) It would produce a much smaller titre and this will lead to larger % errors - both statements required [1]
- (c) The dione does not react with Fehling's reagent (1)
 The dial produces a brown solid (1) [2]

(d) Molecular formula must be $\frac{172}{43} = 4 \therefore \text{C}_8\text{H}_{12}\text{O}_4$ (1)

All oxygen atoms in ester group(s) - each ester group needs two oxygen atoms

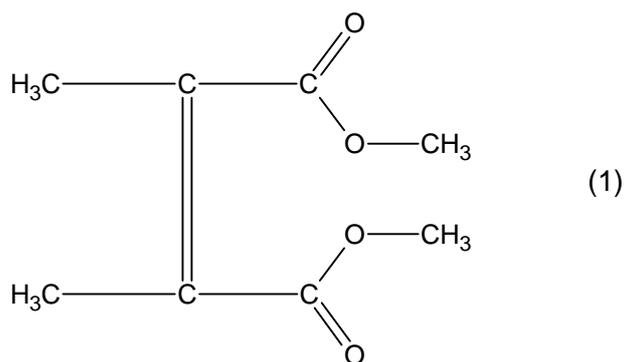
\therefore 2 ester groups (1)

Decolourises aqueous bromine $\therefore \text{C}=\text{C}$ (1)

Gives methanol as the only alcohol on hydrolysis \therefore methyl ester (1)

^1H NMR suggests each signal \equiv 6 protons, 'remotely bonded' (1)

Ester is



[6]

QWC Selection of a form and style of writing appropriate to purpose and to complexity of subject matter [1]

Total [20]

Section B Total [40]