Practice Question Set For A-Level
Subject : Chemistry
Paper-2 Topic: Alkenes

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Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Mark Schemes

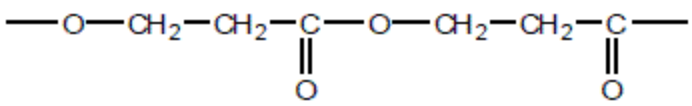
Q1.

(a) 3-hydroxypropanoic acid

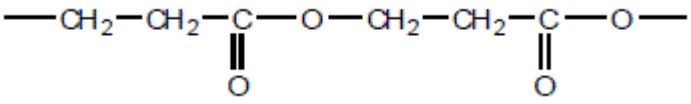
allow 3-hydroxypropionic acid
must be correct spelling

1

(b) (i) must show trailing bonds



or can start at any point in the sequence, e.g.



not allow dimer
allow $–O–CH_2CH_2COOCH_2CH_2CO–$
or $–CH_2CH_2COOCH_2CH_2COO–$
ignore ( ) or n
NB answer has a total of 6 carbons and 4 oxygens

1

(ii) condensation (polymerisation)

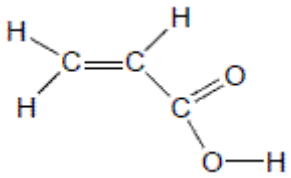
Allow close spelling

1

(c) (i) C=C or carbon-carbon <u>double</u> bond

1

(ii)

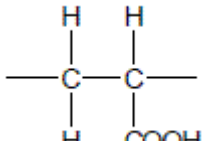


must show **ALL** bonds including O–H

1

(iii) must show trailing bonds

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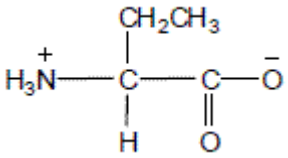


allow polyalkene conseq on their c(ii)

ignore n

1

(d)

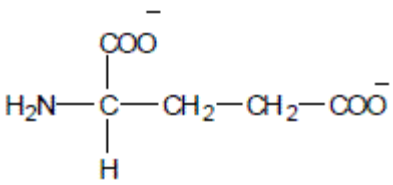


allow NH_3^+—

allow COO^-

1

(e) (i)



In (e), do not penalise a slip in the number of carbons in the $-CH_2CH_2-$ chain, but all must be bonded correctly

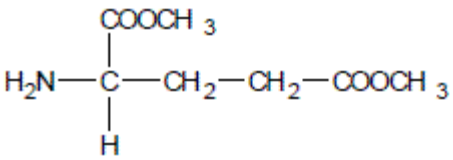
NB two carboxylate groups

Allow COONa or $COO^-\ Na^+$ but not covalent bond to Na

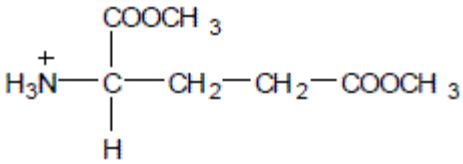
allow NH_2–

1

(ii)



OR



In (e), do not penalise a slip in the number of carbons in the $-CH_2CH_2-$ chain, but all must be bonded correctly

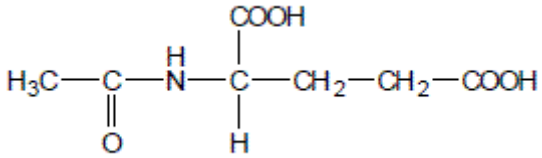
NB two ester groups

allow NH_2– or $^+NH_3$–

1

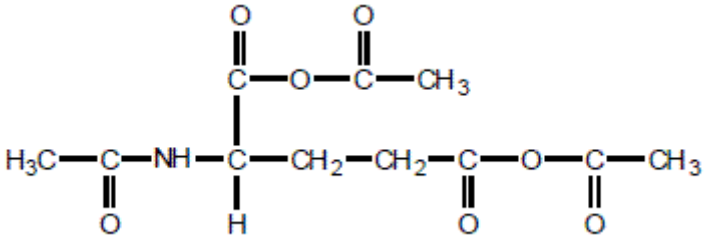
(iii)

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In 4(e), do not penalise a slip in the number of carbons in the -CH_2CH_2- chain, but all must be bonded correctly

allow anhydride formation on either or both COOH groups (see below) with or without amide group formation



1

(f) **M1** phase or eluent or solvent (or named solvent) is <u>moving or mobile</u>

1

M2 stationary phase or solid or alumina/silica/resin

1

M3 separation depends on balance between solubility or affinity (of compounds) in each phase
OR
different adsorption or retention
OR
(amino acids have) different R_f values
OR
(amino acids) travel at different speeds or take different times

1

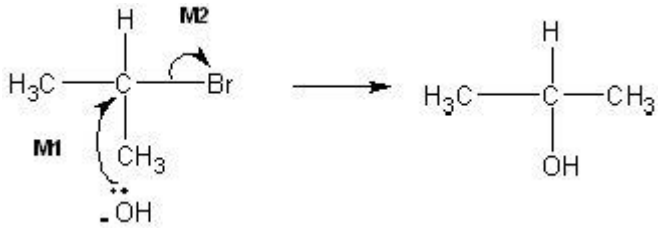
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Q2.

(a) (i) Nucleophilic substitution

1



2

M1 must show an arrow from the lone pair of electrons on the oxygen atom of the negatively charged hydroxide ion to the central C atom.
M2 must show the movement of a pair of electrons from the C-Br bond to the Br atom. Mark M2 independently.

Penalise M1 if covalent KOH is used

Penalise M2 for formal charge on C or incorrect partial charges

Penalise once only for a line and two dots to show a bond.

Max 1 mark **for the mechanism** for the wrong reactant and/or "sticks"

Ignore product

Award full marks for an S_N1 mechanism in which M1 is the attack of the hydroxide ion on the intermediate carbocation.

(ii) 2-bromopropane ONLY

1

(iii) Polar C–Br **OR** polar carbon–bromine bond **OR** dipole on C–Br **OR** δ+ (δ–)
C atom of carbon–bromine bond is δ+/electron deficient **OR** C—Br

(Credit carbon–halogen bond as an alternative to carbon–bromine bond)

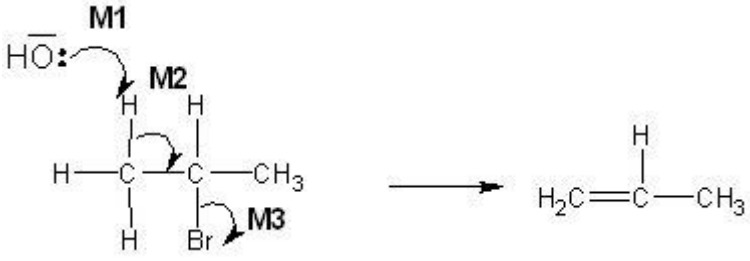
It must be clear that the discussion is about the carbon atom of the C–Br bond. NOT just reference to a polar molecule.
Ignore X for halogen

1

(b) Elimination

Credit "base elimination" but NOT "nucleophilic elimination"
No other prefix.

1



3

M1 must show an arrow from the lone pair on oxygen of a negatively charged hydroxide ion to the correct H atom
M2 must show an arrow from the correct C-H bond to the C-C bond

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and should only be awarded if an attempt has been made at M1
M3 is independent.

Mechanism
Penalise M1 if covalent KOH
Penalise M3 for formal charge on C or incorrect partial charges
Penalise once only for a line and two dots to show a bond.
Max 2 marks **for the mechanism** for wrong reactant and/or "sticks"
Ignore product

Award full marks for an E1 mechanism in which M2 is on the correct carbocation.

(c) Any one condition from this list to favour elimination;
Apply the list principle

- alcohol(ic)/ethanol(ic) (solvent)
- high concentration of KOH/alkali/hydroxide **OR** concentrated KOH/hydroxide
  Ignore "aqueous"
- high temperature or hot or heat under reflux or T = 78 to 100°C
  Ignore "excess"

1

(d) (i) Addition (polymerisation) ONLY
Penalise "additional"

1

(ii) But-2-ene ONLY (hyphens not essential)
Ignore references to cis and trans or E/Z
Ignore butane

1

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