MEGA LECTURE

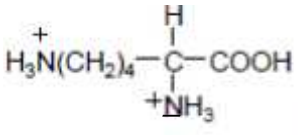
TOPIC 19 HW MS

1. (a) 2,6-diaminohexanoic acid

Ignore additional , or – or spaces.

1

(b) (i)



(2Cl⁻) –

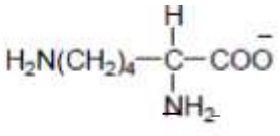
NB both N must be protonated.

Allow NH_3^+ *allow* CO_2H *Allow* ^+H_3N.

Penalise – C_4H_8 *– here.*

1

(ii)



(Na⁺)

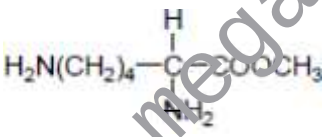
Allow CO_2 .

Allow H_2N.

Allow –COONa but penalise O–Na bond shown.

1

(iii)

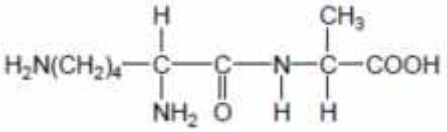


Allow CO_2CH_3.

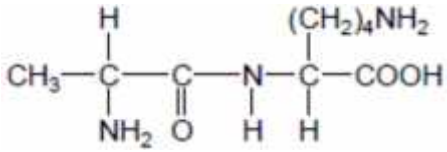
Allow NH_3^+ *or* $–H_2N$.

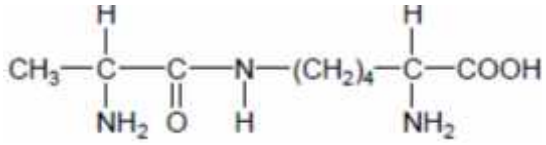
1

(c)



OR





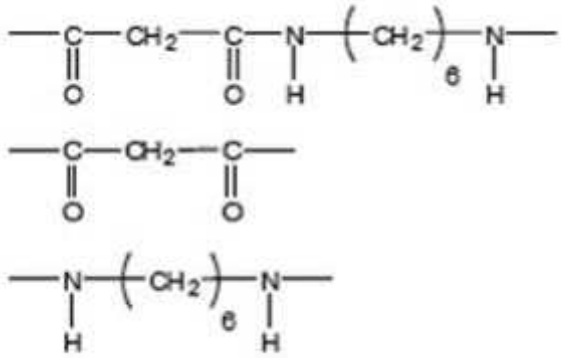
OR

Dipeptide, not repeating unit /.
Allow CO_2H Allow $–H_2N$.
Allow –CONH–.

1

[5]

2. (a) (i)



Allow –CONH- or - COHN -

Mark two halves separately

lose 1 each for missing trailing bonds at one or both ends or error in peptide link or either or both of H or OH on ends

1

Not allow –(C_6H_{12})–

Ignore n

1

(ii) **M1** in polyamides - H bonding

1

M2 in polyalkenes - van der Waals forces

Penalise forces between atoms or van der Waals bonds

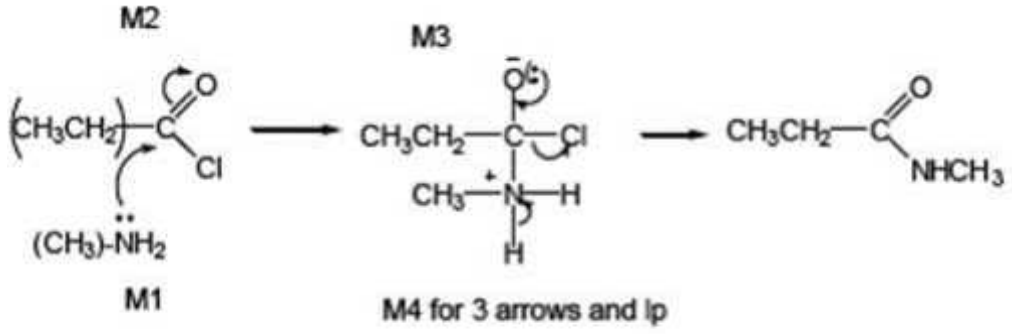
1

M3 Stronger forces (of attraction) in polyamides
Or H bonding is stronger
(must be a comparison of correct forces to score M3)

Do not award if refer to stronger bonds

1

(b) (i) (nucleophilic) addition elimination



Not allow N–H_2

*Minus sign on NH_2 loses **M1***

1

*M2 not allowed independent of **M1**, but allow **M1** for correct attack on C+*
*+ rather than δ+ on C=O loses **M2***
*If Cl lost with C=O breaking, max 1 for **M1***
***M3** for correct structure <u>with charges</u> but*
*lp on O is part of **M4***
*only allow **M4** after correct/ very close M3*
For M4, ignore NH_3 removing H^+ but lose
***M4** for Cl removing H^+ in mechanism,*
but ignore HCl as a product

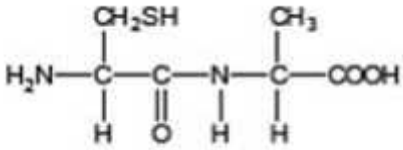
4

(ii) <u>N-methylpropanamide</u>

Not N-methylpropaneamide

1

(c)



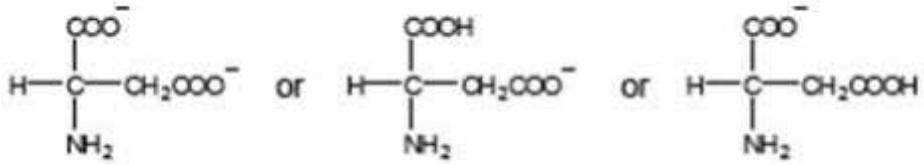
Allow –CONH– or –COHN–

1

(d) (i) 2-amino-3-hydroxypropanoic acid

1

(ii)



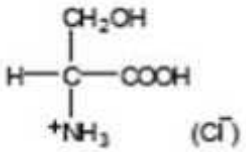
Must be salts of aspartic acid

allow $-CO_2^-$

allow NH_2-

1

(iii) Penalise use of aspartic acid once in d(iii) and d(iv)



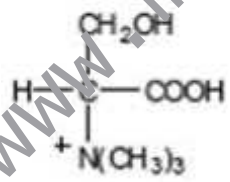
allow $-CO_2H$

allow $^+NH_3-$

don't penalize position of + on NH_3

1

(iv) Penalise use of aspartic acid once in d(iii) and d(iv)



(Br^-)

allow $-CO_2^-$

must show C-N bond

don't penalize position of + on $N(CH_3)_3$

1

[16]

3. (a) polyamide or nylon (2,4)

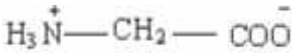
(allow nylon without numbers but if numbers

are present they must be correct)

1

condensation

1



(b)

1

(c) ionic bonding in aminoethanoic acid

(can only score if includes that aminoethanoic is ionic)

1

stronger attractions than Hydrogen bonding in hydroxyethanoic acid

(e.g. stronger Hydrogen bonding in aminoethanoic acid scores 0)

(mention of electrostatic forces between molecules scores 0)

1

[5]

4. (a) (i) hydrolysis

not hydration

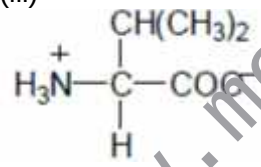
1

(ii) 2-aminopropanoic acid

ignore alanine
QoL

1

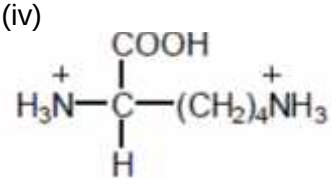
(iii)



allow $-CO_2^-$
allow $^+NH_3-$
don't penalize position of + on NH_3

1

(iv)

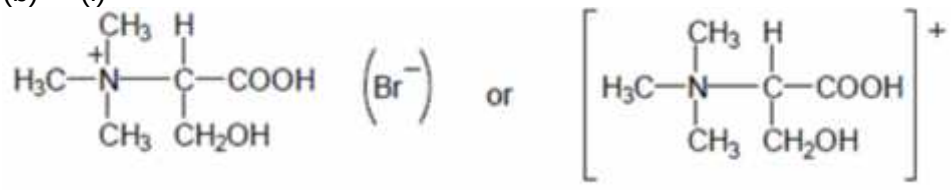


allow $-CO_2^-$
allow $^+NH_3-$
don't penalize position of + on NH_3

1

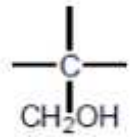

MEGA LECTURE

(b) (i)



or

allow –CO_2H

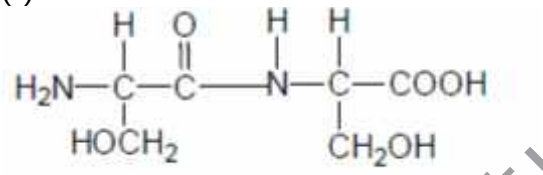


allow limit as

+ on N or outside [ ]

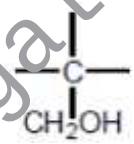
1

(ii)



allow –CO_2H allow –CONH– or –COHN–

allow NH_2–



allow limit as

1

[6]

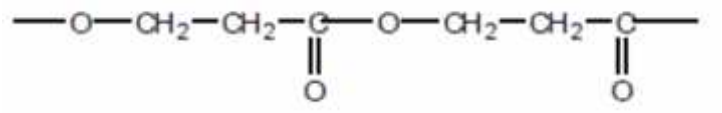
5. (a) 3-hydroxypropanoic acid

allow 3-hydroxypropionic acid

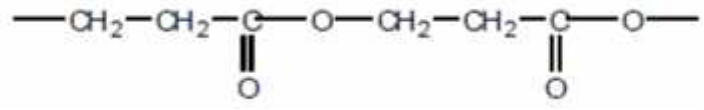
must be correct spelling

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)

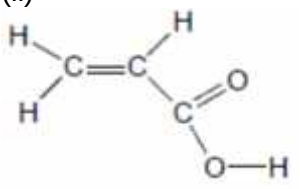
Allow close spelling

1

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

1

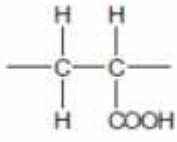
(ii)



*must show **ALL** bonds including O–H*

1

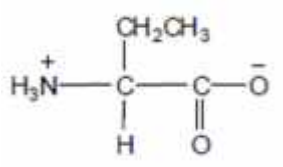
(iii) must show trailing bonds



allow polyalkene conseq on their c(ii)

ignore n

1



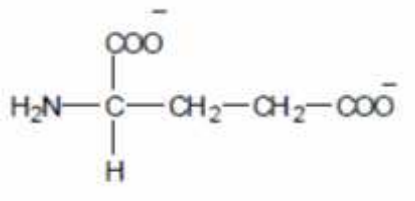
(d)

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)

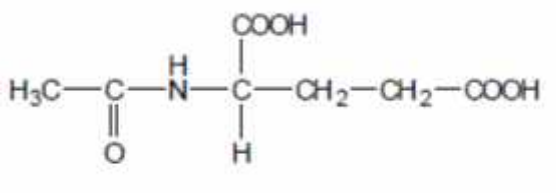
In (e), do not penalise a slip in the number of carbons in the
-CH_2CH_2- chain, but all must be bonded correctly

NB two ester groups

allow NH_2– or $^+NH_3$–

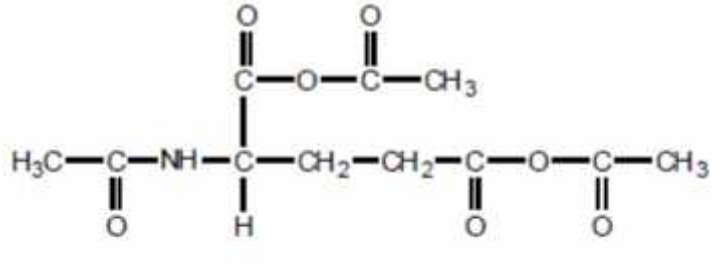
1

(iii)



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



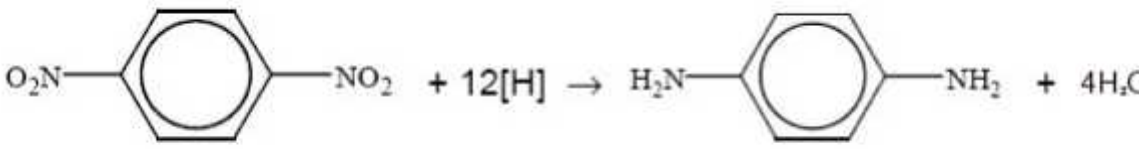
1

[10]

6. (a) (i) H_2/Ni or H_2/Pt or Sn/HCl or Fe/HCl (conc or dil or neither)
allow dil H_2SO_4
ignore mention of NaOH

Not $NaBH_4$
Not $LiAlH_4$
Not Na/C_2H_5OH
not conc H_2SO_4 or any HNO_3

1

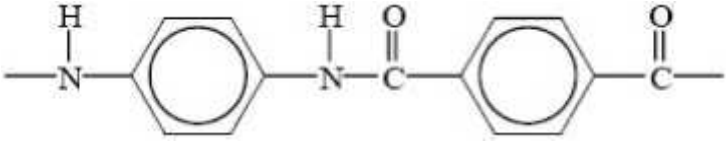


(Or $6H_2$)

allow $C_6H_4(NO_2)_2$ etc ,
allow NO_2– NH_2–
i.e. be lenient on structures, the mark is for balancing equ

1

(ii)



allow –CONH

ignore [ ]$_n$ as in polymer

1st mark for correct peptide link
2nd mark for the rest correct including trailing bonds

2

(iii) **M1** Kevlar is <u>biodegradeable</u> but polyalkenes not

allow Kevlar is <u>more</u> biodegradeable

1

M2 Kevlar has <u>polar</u> bonds/is a (poly) amide/has peptide link

comment on structure of Kevlar

1

M3 can be hydrolysed/attacked by nucleophiles/acids/ bases/enzymes

1

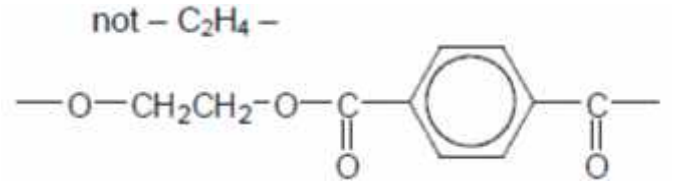
M4 polyalkenes <u>non polar</u>/has <u>non-polar</u> bonds

comment on structure of polyalkenes but not just strong bonds

1

[8]

7.



First mark for correct ester link second mark for the rest including trailing bonds

If ester link wrong, lose second mark also

2

Adv reduces landfill
saves raw materials
lower cost for recycling than making from scratch
reduces CO_2 emissions by not being incinerated

not allow cost without qualification
ignore energy uses

1

Disad difficulty/cost of collecting/sorting/processing
product not suitable for original purpose, easily contaminated

not allow cost without qualification
ignore energy uses

1

[4]

8. (a) (i) (As a) soap

Allow washing, cleaning, degreasing, detergents

1

(ii) (Bio)diesel or biofuel or fuel for cars/lorries

Allow <u>to make</u> soap

1

(iii) (Cationic) surfactant /detergent /fabric softener /germicide / shampoos /(hair) conditioners /spermicidal jelly

Allow cleaning

1

(b) (i) (Poly)ester

1

Terylene ***OR*** PET

Allow polyester

1

(ii) (Poly)amide

1

Kevlar ***OR*** nylons

Ignore numbers with nylons Allow polyamide(e)

1

(iii) (Independent marks)

CE = 0

Hydrogen bonding in b(ii)

1

Imfs in (b)(ii) are stronger

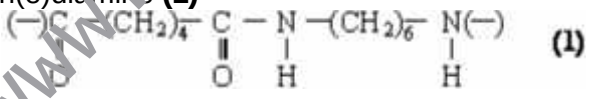
OR

H bonding stronger than dipole–dipole/van der Waals/ dispersion/London
forces in b(i)

1

[9]

9. (a) (i) hexane-1,6-diamine or 1,6-diaminohexane **(allow ammine)** or 1,6 hexan(e)diamine **(1)**

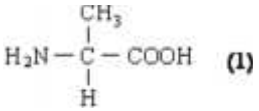


(1)

(ii)

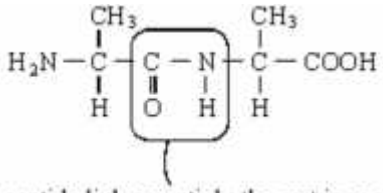
Allow –CONH–

2



(1)

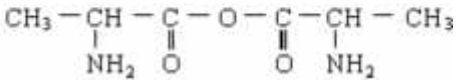
(b) (i)



(I)

peptide link essential : the rest is consequential on b(i)
(allow CONH)

allow anhydride



(ii)

2

(c) (i) quaternary ammonium bromide salt **(1)**

(not ion, not compound)

Allow quarternery

(ii) *Reagent*: CH_3Br or bromomethane **(1)**

penalise CH_3Cl but allow excess for any halomethane

Condition: excess (CH_3Br) **(1)**

(iii) nucleophilic substitution **(1)**

4

[8]

10. (i) Single reagent

If wrong single reagent, CE = zero

Incomplete single reagent (e.g. carbonate) or wrong formula (e.g.$NaCO_3$) loses reagent mark, but mark on

For "no reaction" allow "nothing"

Different reagents

If different tests on E and F; both reagents and any follow on chemistry must be correct for first (reagent) mark.
Reagent must react i.e. not allow Tollens on G (ketone) – no reaction.
Second and third marks are for correct observations.
i.e. for different tests on E and F, if one reagent is correct and one wrong, can score max 1 for correct observation with correct reagent.

PCl_5 PCl_3

$SOCl_2$

1

E ester

Na_2CO_3/$NaHCO_3$ named carbonate

metal e.g.Mg

no reaction

no reaction

named indicator

no effect

No reaction

1

F acid

Na_2CO_3/$NaHCO_3$ named carbonate

Effervescence or CO_2

metal e.g.Mg

Effervescence or H_2

named indicator

acid colour

fumes

1

(ii) Single reagent

If wrong single reagent, CE = zero
Incomplete single reagent (e.g. carbonate) or wrong formula (e.g.$NaCO_3$) loses reagent mark, but mark on
For "no reaction" allow "nothing"

Different reagents

If different tests on E and F, **both** reagents and any follow on chemistry must be correct for first (reagent) mark.
Reagent must react; i.e. not allow Tollens on G (ketone) – no reaction.
Second and third marks are for correct observations.

1

i.e. for different tests on E and F, if one reagent is correct and one wrong, can score max 1 for correct observation with correct reagent.

G ketone

$AgNO_3$

no reaction

Na_2CO_3/$NaHCO_3$ named carbonate

water

no reaction

named indicator

no effect

Named alcohol

no reaction

Named amine or ammonia

no reaction

1

H Acyl chloride

$AgNO_3$

(white) ppt

Na_2CO_3/$NaHCO_3$ named carbonate

Effervescence or CO_2 or fumes or exothermic

water

fumes

named indicator

acid colour

Named alcohol

Smell or fumes

Named amine or ammonia

fumes

1

Allow iodoform test or Brady's reagent (2,4,dnph) test (both positive for G)

(iii) Single reagent

If wrong single reagent, CE = zero
Incomplete single reagent (e.g. carbonate) or wrong formula (e.g.$NaCO_3$) loses reagent mark, but mark on

For "no reaction" allow "nothing"

Different reagents

If different tests on E and F; **both** reagents and any follow on chemistry must be correct for first (reagent) mark.

Reagent must react: i.e. not allow Tollens on G (ketone) – no reaction.

Second and third marks are for correct observations.

i.e. for different tests on E and F, if one reagent is correct and one wrong, can score max 1 for correct observation with correct reagent.

1

J Primary alcohol

$K_2Cr_2O_7$/ H^+

goes green

$KMnO_4$/ H^+

decolourised / goes brown

Lucas test ($ZnCl_2$/HCl)

Penalise missing H^+ but mark on

1

K Tertiary alcohol

$K_2Cr_2O_7$/ H^+

No reaction

$KMnO_4$/ H^+

no reaction

Lucas test ($ZnCl_2$/HCl)

Rapid cloudiness

1

If uses subsequent tests e.g. Tollens/Fehlings, test must be on product of oxidation

[9]