EXAM PAPERS PRACTICE

Boost your performance and confidence with these topic-based exam questions

Practice questions created by actual examiners and assessment experts

Detailed mark scheme

Suitable for all boards

Designed to test your ability and thoroughly prepare you

Time allowed
62 Minutes

Score /52

Percentage %

CHEMISTRY

AQA
AS & A LEVEL

Mark Scheme

3.3 Organic chemistry

1 (a) (i) Two rings only around nitrogen or sulfur

Lose this mark if more than 2 atoms are ringed.

Do not allow two atoms at the same end of the ion.

1

(ii) 275.8

Accept this answer only. Do not allow 276

1

(iii) Carboxylate / COO^-

Allow salt of carboxylic acid or just carboxylic acid.

1

(b) (32.1 / 102.1) = 31.4%

Do not penalise precision but do not allow 1 significant figure.

1

(c) Zineb is mixed with a solvent / water

Max=2 if M1 missed

1

Use of column / paper / TLC

Lose M1 and M2 for GLC

1

Appropriate collection of the ETU fraction
OR Appropriate method of detecting ETU

Allow ETU is an early fraction in a column or collecting a

range of samples over time, lowest retention time / travels furthest on paper or TLC (allow 1 mark for having the longest retention time in GLC).

1

Method of identification of ETU (by comparison with standard using chromatography)

If method completely inappropriate, only M1 is accessible

1

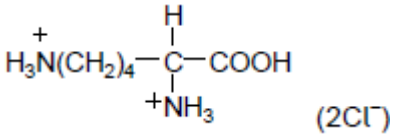
[8]

2 (a) 2,6-diaminohexanoic acid

Ignore additional , or – or spaces.

1

(b) (i)



(2Cl⁻)

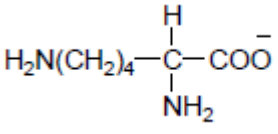
NB both N must be protonated.

Allow $-NH_3^+$ allow CO_2H Allow $-^+H_3N$.

Penalise – C_4H_8 – here.

1

(ii)



(Na^+)

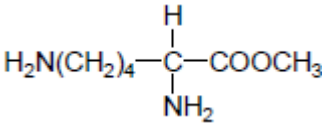
Allow CO_2^-.

Allow $-H_2N$.

Allow –COONa but penalise O–Na bond shown.

1

(iii)

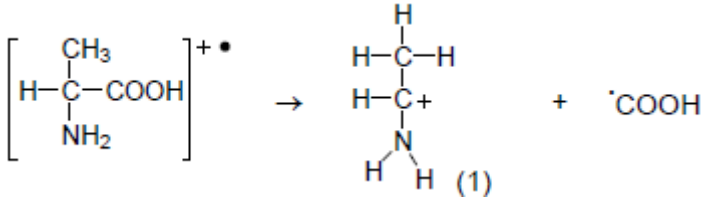


Allow CO_2CH_3.

Allow $-NH_3^+$ or $-H_2N$.

1

(c)



(1)

1 for displayed formula of fragment ion.

1 for molecular ion of alanine AND radical.

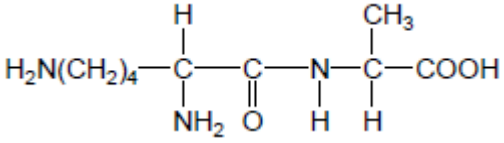
Allow molecular ion without brackets and fragment ion in brackets with outside +.

Allow dot anywhere on radical.

Allow $[C_3H_7NO_2]^{+\bullet}$ for molecular ion.

2

(d)



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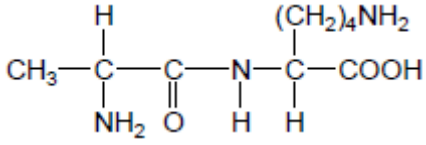

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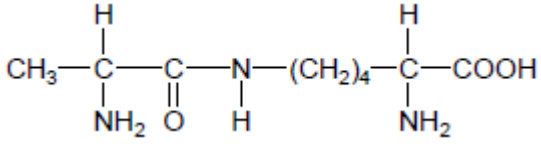


Dipeptide, not repeating unit /.

Allow CO_2H Allow $-H_2N$.

Allow –CONH–.

1

(e) M1 In acid lysine has double positive or more positive charge

1

M2 (Lysine ion) has greater affinity / greater attraction / adheres better / sticks better to polar / stationary phase

M2 only scores after a correct M1.

Ignore greater retention time.

1

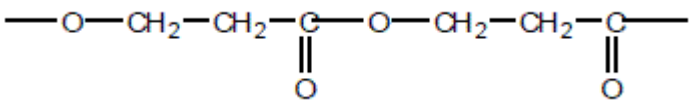
[9]

3 (a) 3-hydroxypropanoic acid

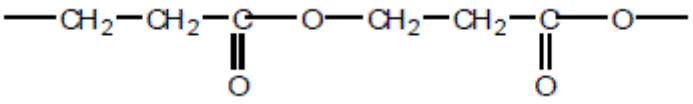
allow 3-hydroxypropionic acid
must be correct spelling

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)

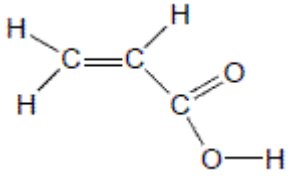
Allow close spelling

1

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

1

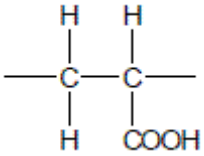
(ii)



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

1

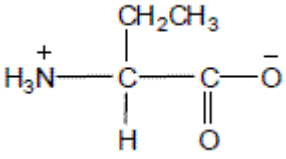
(iii) must show trailing bonds



allow polyalkene conseq on their c(ii)
ignore n

1

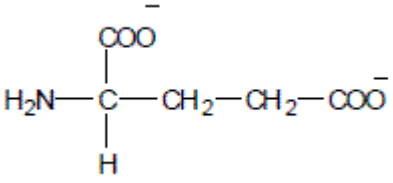
(d)



allow NH_3^+—
allow COO^-

1

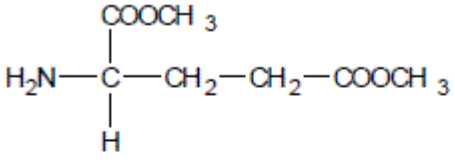
(e) (i)



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)



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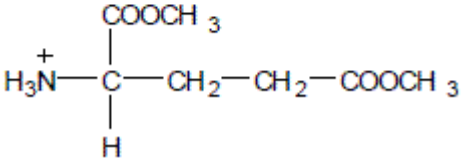


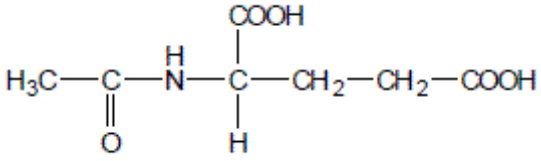
In (e), do not penalise a slip in the number of carbons in the -CH_2CH_2- chain, but all must be bonded correctly

NB two ester groups

allow NH_2– or $^+NH_3$–

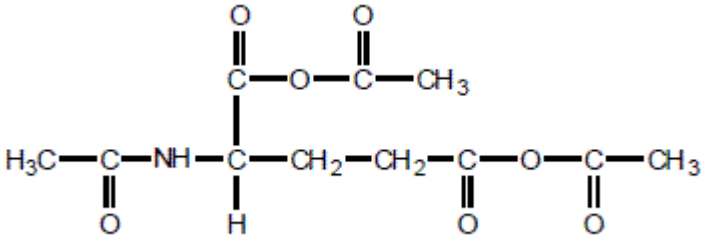
1

(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

(f) **M1** phase or eluent or solvent (or named solvent) is moving or mobile

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

[13]

4 (a) **If 2 stage test for one compound, award no marks for that compound, eg no mark for ROH or RX to alkene then test. If reagent is wrong or missing, no mark for that test; if wrong but close/incomplete, lose reagent mark but can award for correct observation. In each test, penalise each example of wrong chemistry, eg $AgClr_2$**

propan-1-ol

acidifiedpotassiumdichromate

sodium

Named acid + conc H_2SO_4

named acyl chloride

PCl_5

M1 **1**

(orange) turns green

effervescence

Sweet smell

Sweet smell /misty fumes

Misty fumes

M2 **1**

propanal

add Tollens or Fehlings / Benedicts

acidifiedpotassiumdichromate

Bradys or 2,4-dnph

if dichromate used for alcohol cannot be used for aldehyde

M3 **1**

Tollens: silver mirror or Fehlings/ Benedicts: red ppt

(orange) turns green

Yellow or orange ppt

M4 **1**

propanoic acid

Named carbonate/ hydrogencarbonate

water and UI (paper)

Named alcohol + conc H_2SO_4

sodium or magnesium

PCl_5

if sodium used for alcohol cannot be used for acid

M5 **1**

effervescence

orange/red

Sweet smell

effervescence

Misty fumes

if PCl_5 used for alcohol cannot be used for acid

M6 **1**

1-chloro propane

NaOH then acidified $AgNO_3$

$AgNO_3$

If acidification missed after NaOH,no mark here but allow mark for observation

M7

white ppt **1**

white ppt

M8

1

(b) oxidation (of alcohol by oxygen in air)

M1

1

absorption at 1680 -1750 (due to C=O)

Must refer to the spectrum

M2

1

comparison of polarity of molecules or correct imf statement:propanone is less polar OR propan-2-ol is more polarOR propanone has dipole-dipole forcesOR propan-2-ol has hydrogen bonding

M3

1

about attraction to stationary phase or solubility in moving phasePropan-2-ol has greater affinity for stationary phase or vice versaOR propanone is more soluble in solvent/moving phase or vice versa

M4

1

[12]

5 .(a) **Wear plastic gloves:**

Essential – to prevent contamination from the hands to the plate

1

Add developing solvent to a depth of not more than 1 cm^3:

Essential – if the solvent is too deep it will dissolve the mixture from the plate

1

Allow the solvent to rise up the plate to the top:

Not essential – the R_f value can be calculated if the solvent front does not reach the top of the plate

1

Allow the plate to dry in a fume cupboard:

Essential – the solvent is toxic

Allow hazardous

1

(b) Spray with developing agent or use UV

1

Measure distances from initial pencil line to the spots (*x*)

1

Measure distance from initial pencil line to solvent front line (*y*)

1

R_f value = *x* / *y*

1

(c) Amino acids have different polarities

1

Therefore, have different retention on the stationary phase or different solubility in the developing solvent

1

[10]