

Name of the Student: _____

Max. Marks : 21 Marks

Time : 21 Minutes

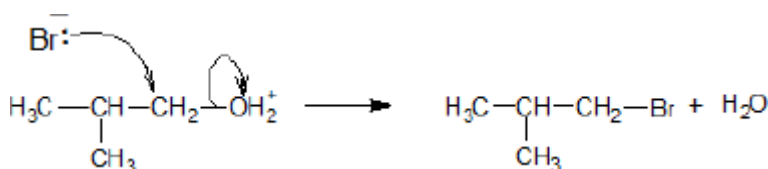
Mark Schemes

Q1.

- (a) (i) **M1** double-headed curly arrow from the lone pair of the bromide ion to the C atom of the CH_2

*Penalise additional arrows.***M2** double-headed arrow from the bond to the O atom

As follows



2

- (ii) **M1** nucleophilic substitution
M1 both words needed (allow phonetic spelling).

M2 1-bromo(-2-)methylpropane**M2** Require correct spelling in the name but ignore any hyphens or commas.

2

- (b) **M1** hydrolysis
 For **M1** give credit for 'hydration' on this occasion only.

M2 $\text{C}\equiv\text{N}$ with absorption range 2220–2260 (cm^{-1})
 Credit 1 mark from **M2** and **M3** for identifying $\text{C}\equiv\text{N}$ **and** either $\text{O}-\text{H}$ (acids) **or** $\text{C}=\text{O}$ **or** $\text{C}-\text{O}$ without reference to wavenumbers or with incorrect wavenumbers.

M3 $\text{O}-\text{H}$ (acids) with absorption range 2500–3000 (cm^{-1})

OR

$\text{C}=\text{O}$ with absorption range 1680–1750 (cm^{-1})

OR

$\text{C}-\text{O}$ with absorption range 1000–1300 (cm^{-1})

*Apply the list principle to **M3***

3

- (c) (i) **M1** Yield / product **OR** ester increases / goes up / gets more

M2 (By Le Chatelier's principle) the position of equilibrium is driven / shifts / moves to the right / L to R / in the forward direction / to the product(s)

M3 – requires a correct statement in M2

(The position of equilibrium moves)

to oppose the increased concentration of ethanol

to oppose the increased moles of ethanol

to lower the concentration of ethanol

to oppose the change and decrease the ethanol

*If no reference to **M1**, marks **M2** and **M3** can still score BUT if **M1** is incorrect CE=0*

*If there is reference to 'pressure' award **M1** ONLY.*

3

(ii) **M1**

Catalysts provide an alternative route / pathway / mechanism

OR

surface adsorption / surface reaction occurs

*For **M1**, not simply 'provides a surface' as the only statement.*

***M1** may be scored by reference to a specific example.*

M2

that has a lower / reduced activation energy

OR

lowers / reduces the activation energy

*Penalise **M2** for reference to an increase in the energy of the molecules.*

*For **M2**, the student may use a definition of activation energy without referring to the term.*

*Reference to an increase in successful collisions in unit time alone is not sufficient for **M2** since it does not explain why this has occurred.*

2

[12]

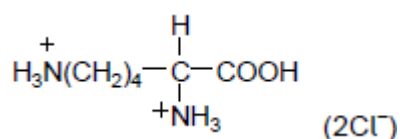
Q2.

(a) 2,6-diaminohexanoic acid

Ignore additional , or – or spaces.

1

(b) (i)



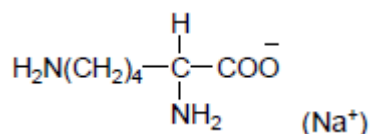
NB both N must be protonated.

Allow $-\text{NH}_3^+$ allow CO_2H Allow $-\text{H}_3\text{N}^+$.

Penalise $-\text{C}_4\text{H}_8-$ here.

1

(ii)



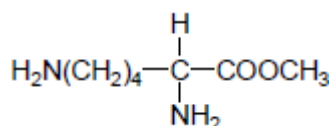
Allow CO_2^- .

Allow $-\text{H}_2\text{N}$.

Allow $-\text{COONa}$ but penalise $\text{O}-\text{Na}$ bond shown.

1

(iii)

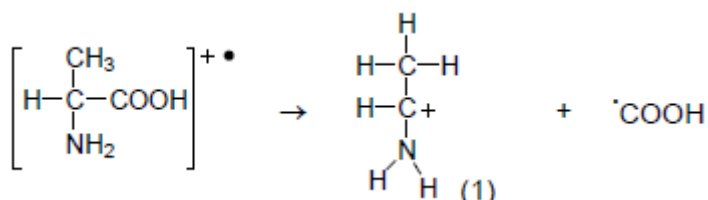


Allow CO_2CH_3 .

Allow $-\text{NH}_3^+$ or $-\text{H}_2\text{N}$.

1

(c)



1 for displayed formula of fragment ion.

1 for molecular ion of alanine AND radical.

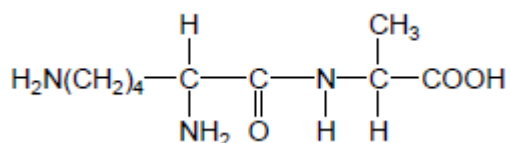
Allow molecular ion without brackets and fragment ion in brackets with outside +.

Allow dot anywhere on radical.

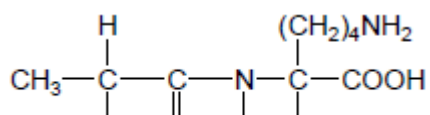
Allow $[\text{C}_3\text{H}_7\text{NO}_2]^+ \cdot$ for molecular ion.

2

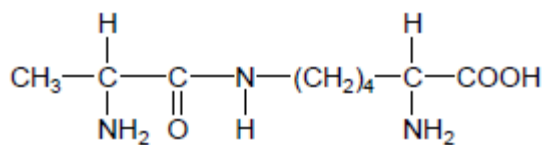
(d)



OR



OR



Dipeptide, not repeating unit /.

Allow CO₂H Allow -H₂N.

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]