M1.D

[1]

M2. (a) **X** (O–H) (alcohols)

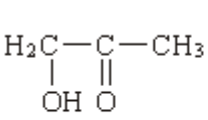
penalise acid or missing "alcohol"

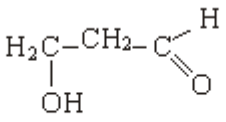
1

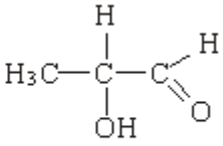
Y C=O

allow carbonyl

1





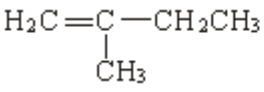


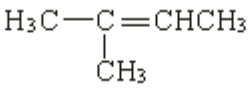
A

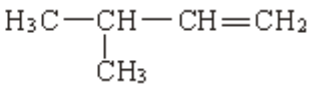
NOT acid

4

(b)





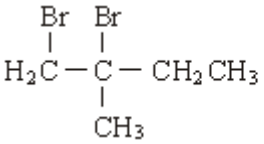


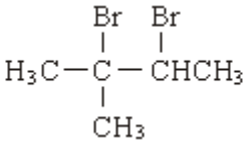
Allow conseq dibromocompounds following incorrect unbranched alkenes

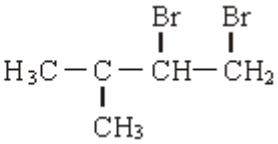
NOT allow dibromocompound consequent on a duplicate alkene

NOT allow monobromocompounds if HBr added

3







3

6:3:1 either next to correct structure or to none

1

Allow a mark for identifying correct dibromocompound with three peaks even if integration ratio is wrong

1

if 6:3:1 missing or wrong, no marks for splitting

Only award a mark for splitting if it is clear which integration number it refers to

6 singlet or drawn

1

3 doublet or drawn

1

1 quartet/quadruplet or drawn

1

(max 10 marks)

[16]

M3. D

[1]

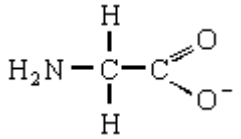
M4. (a) 2-amino(e) propanoic acid **(1)**

1

(b) (i) molecules with same structure / structural formula **(1)**
but with bonds **(atoms or groups)** arranged differently in space (3D) **(1)**

(ii) Plane polarised light **(1)**
Rotated (equally) in opposite directions **(1)**

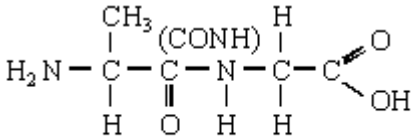
4

(c)  **(1)**

allow $H_2NCH_2COO^-$

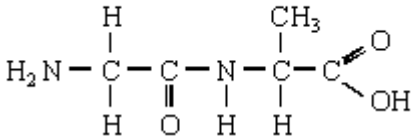
Penalise NH_2^- and OH^- once per paper
but CH_3- is allowed

1



(1)

(d)

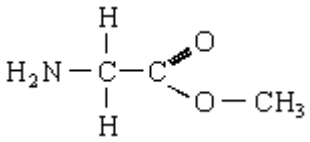


(1)

Not anhydrides; not repeating units

2

(e)



(1)

or $H_2NCH_2COOCH_3$

1

[9]

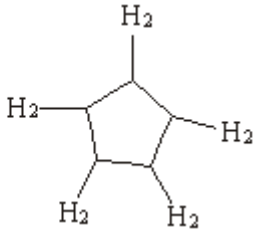
M5. (a) **A** any C_5 alkene

1

B

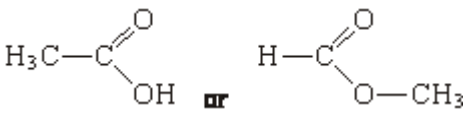
etc

penalise



1

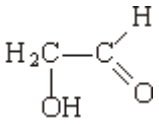
(b) **C**



or CH_3COOH or $HCOOCH_3$

1

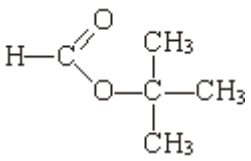
D



or $HOCH_2CHO$

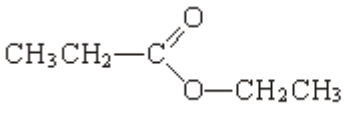
1

(c) **E**



1

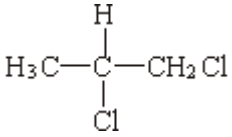
F



(allow C_2H_5)

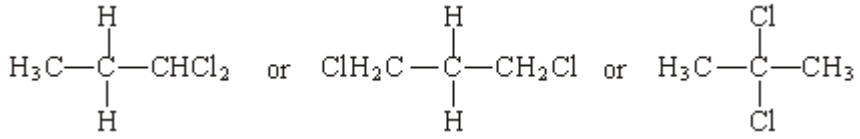
1

(d) **G**



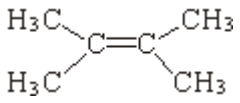
1

H



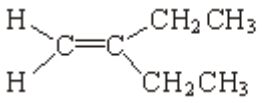
1

(e) **I**



1

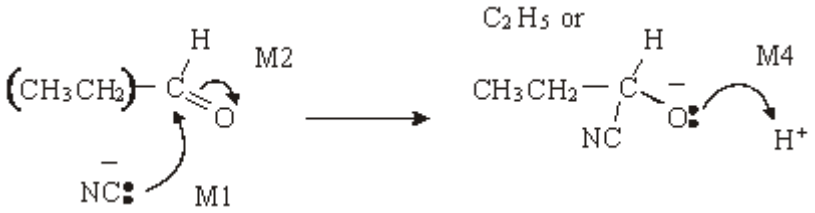
J


(allow C_2H_5) **NOT** hex-3-ene

1

[10]

M6. (a) necleophilic addition;



1

M3 structure;

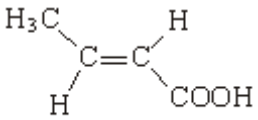
(be lenient on position of charge on CN–)
(M2 not allowed independent of M1,
but allow M1 for correct attack on C+
if M2 show as independent first.)
(+on C of C=O loses M2 but ignore δ+ if correct)
(M4 for arrow and lone pair (only allow for correct M3 or close))

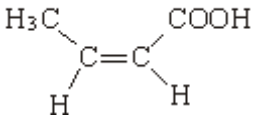
4

(b) (i) 2-hydroxybutanoic acid

1

(ii)



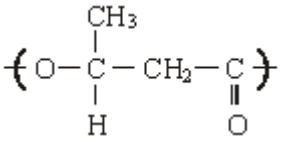


1

geometric(al) or cis-trans

1

(c) (i)



(one unit only) (ignore brackets or n) (trailing bonds are needed)

1

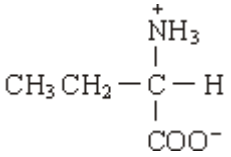
(ii) can be hydrolysed

OR

can be reacted with/attacked by acid/base/nucleophiles/H_2O/OH^-;

1

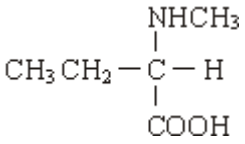
(d) (i)



(allow $-NH_3^+$)

1

(ii)



(or zwitterions product)

1

(iii) nucleophilic substitution;

1

[14]