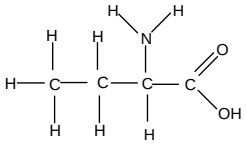
MEGA LECTURE

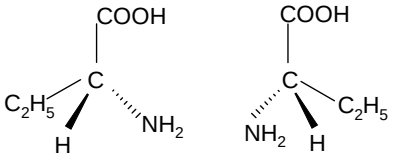
TOPIC 19 ANSWERS TO EXERCISES

Topic 19 Exercise 1

1. a)



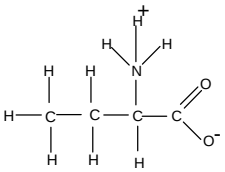
b)



c) i) $C_2H_5CH(NH_2)COOH + HCl \rightarrow [C_2H_5CH(NH_3)COOH]^+Cl^-$

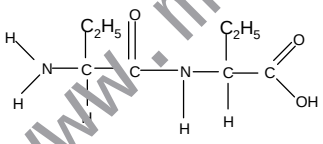
ii) $C_2H_5CH(NH_2)COOH + NaOH \rightarrow C_2H_5CH(NH_2)COO^-Na^+ + H_2O$

d)

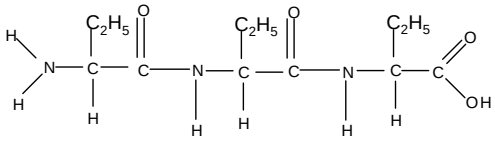


amino acids can form ionic bonds with each other in solid state
strong electrostatic attraction leads to a high melting point

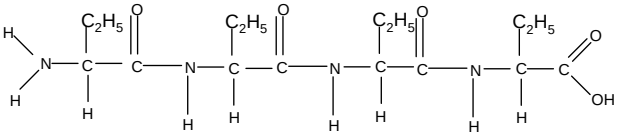
e) i)



ii)



iii)



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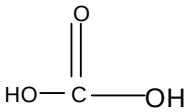
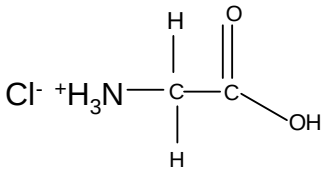
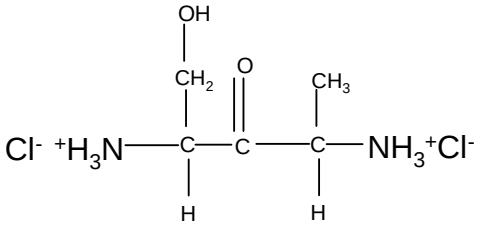
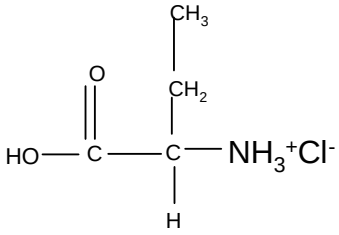
2. a) It has a helical shape.
Attraction between the H attached to the N and the N or O atoms causes the molecule to bend, forming hydrogen bonds between different peptide links.

b)



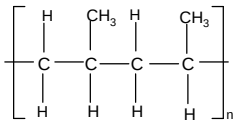




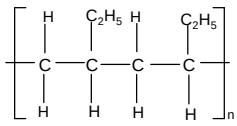


Topic 19 Exercise 2

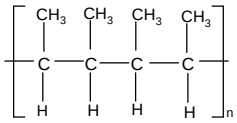
1. a)



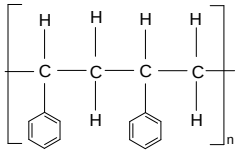
b)



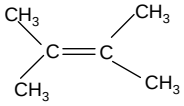
c)



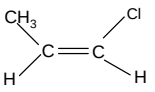
d)



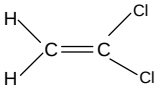
2. a) poly(2,3-dimethylbut-2-ene)



b) poly(1-chloropropene)



c) poly(1,1-dichloroethene)



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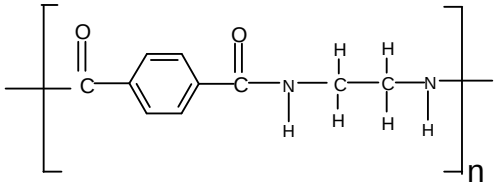
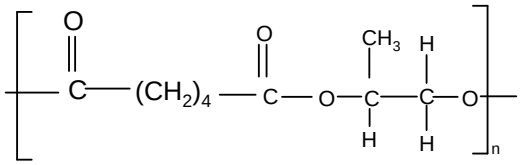
Topic 19 Exercise 3

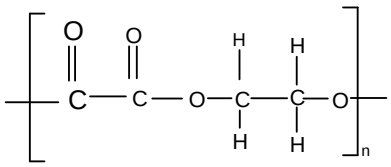
1. a)



b)



c)



2. a) benzene-1,4-diacyl dichloride and ethan-1,2-diol
   b) hexanediacyl dichloride and 1,6-diaminohexane
   c) benzene-1,3-dicarboxylic acid and propan-1,2-diol
   d) ethanediacyl dichloride and 1,2-diaminoethane

3. a) Condensation polymers are biodegradable, but addition polymers are not.
   b) Condensation polymers have a shorter lifetime than addition polymers, but can be much more easily recycled as they can be broken down into their monomers quite easily.

Topic 19 Exercise 4

1. a) add bromine water to both
it will be decolorised by cyclohexene
but not by cyclohexane

b) add NaOH (aq) to both and heat
then allow to cool and add excess dilute nitric acid
then add silver nitrate solution
then add dilute ammonia
1-chlorobutane will give you a white precipitate
soluble in dilute ammonia
1-bromobutane will give you a cream precipitate
insoluble in dilute ammonia

c) add Fehling's solution to both and heat
propanal will turn it brick-red
with propanone it will stay blue
or add Tollen's reagent and heat
with propanal you will get a silver mirror
with propanone you will not

d) add sodium hydrogencarbonate to both
the butanoic acid will effervesce
the ethyl ethanoate will not

e) add water to both
the ethanoyl chloride will give you white fumes
the ethanoic anhydride will not

f) add potassium dichromate and dilute sulphuric acid to both and heat
the propan-2-ol will turn the solution green
with 2-methylpropan-2-ol it will stay orange

g) add a small amount of potassium dichromate and dilute sulphuric acid to both and warm
then add Fehling's solution (or Tollen's reagent) to both and heat
the propan-1-ol solution will produce a brick-red precipitate (or a silver mirror)
the propan-2-ol solution will not

h) add some ethanoic acid and some sulphuric acid and heat
the alcohol mixture will give off a pleasant smell
the ether mixture will not

2. a) Add NaOH (aq)
and heat under reflux
to make ethanol
add potassium dichromate and dilute sulphuric acid
and heat under reflux

b) Add NaOH (aq)
and heat under reflux
to make ethanol
add potassium dichromate and dilute sulphuric acid
and distill off the product
which is ethanal
add NaCN and HCl
to make 2-hydroxypropanenitrile

c) Add excess ammonia
and heat

d) Add KCN
in aqueous ethanol
and heat under reflux
to make propanenitrile
Add $LiAlH_4$ (or hydrogen with platinum)
In dry ether

e) Add NaOH (aq)
and heat under reflux
to make ethanol
Separate the ethanol into two portions
To one portion add potassium dichromate and dilute sulphuric acid
and heat under reflux
to make ethanoic acid
add the other portion
and some sulphuric acid