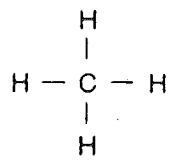
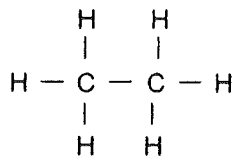
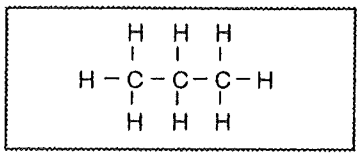
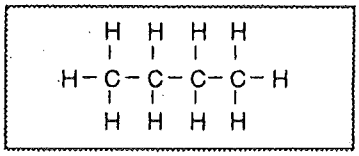
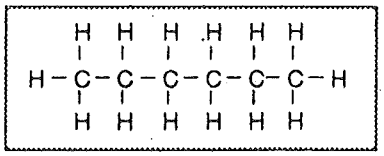
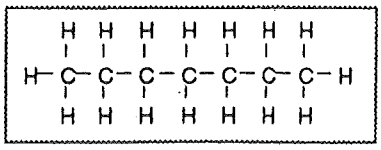
ORGANIC CHEMISTRY

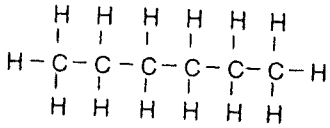
Alkanes

Pages 193 - 196

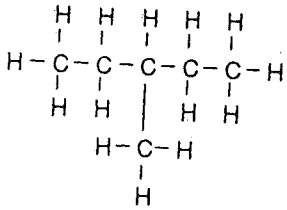
1. Complete the following table:

NAME	MOLECULAR FORMULA	CONDENSED STRUCTURAL FORMULA	STRUCTURAL FORMULA
methane	CH_4	CH_4	
ethane	C_2H_6	$CH_3–CH_3$	
propane	C_3H_8	$CH_3 – CH_2 – CH_3$	
butane	C_4H_{10}	$CH_3–CH_2–CH_2–CH_3$	
hexane	C_6H_{14}	$CH_3–CH_2–CH_2–CH_2–CH_2–CH_3$	
heptane	C_7H_{16}	$CH_3–CH_2–CH_2–CH_2–CH_2–CH_2–CH_3$	

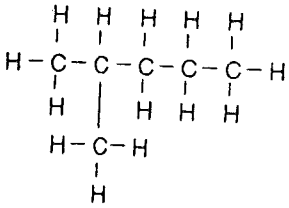
2. Draw structural formulas for and name the five isomers of C_6H_{14}.



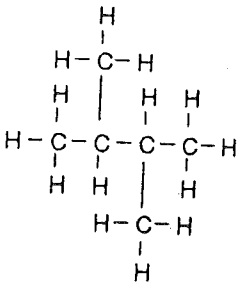
n-hexane



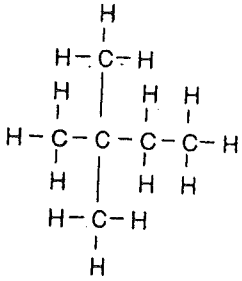
3-methylpentane



2-methylpentane



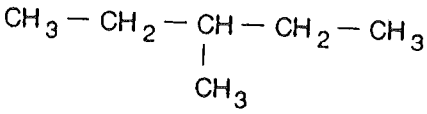
2, 3-dimethylbutane



2, 2-dimethylbutane

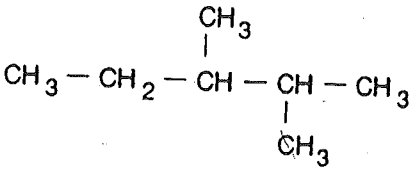
3. Name each of the following compounds:

a.



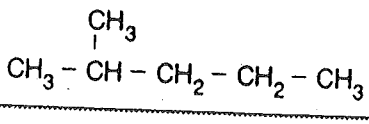
3-methylpentane

b.



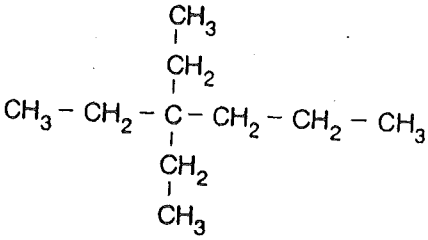
2,3-dimethylpentane

c.



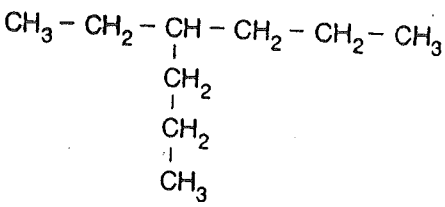
2-methylpentane

d.



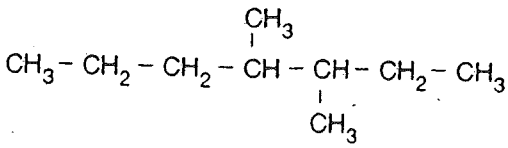
3,3-diethylhexane

e.



4-ethylheptane

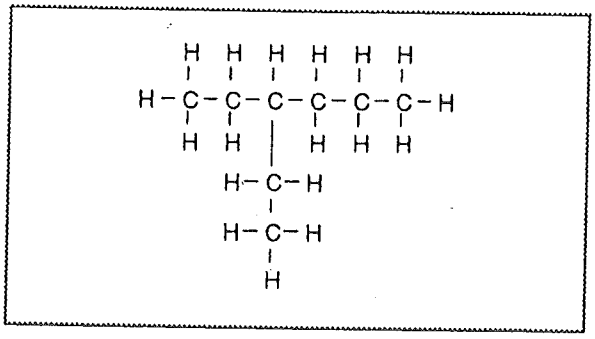
f.



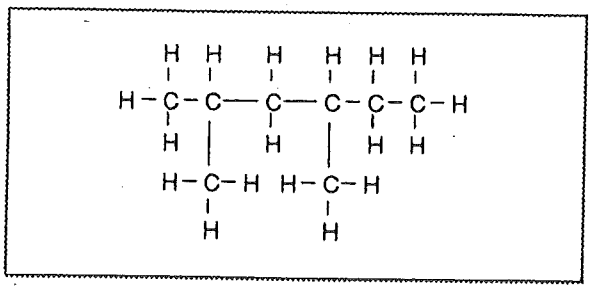
3,4-dimethylheptane

4. Write structural formulas for the following compounds:

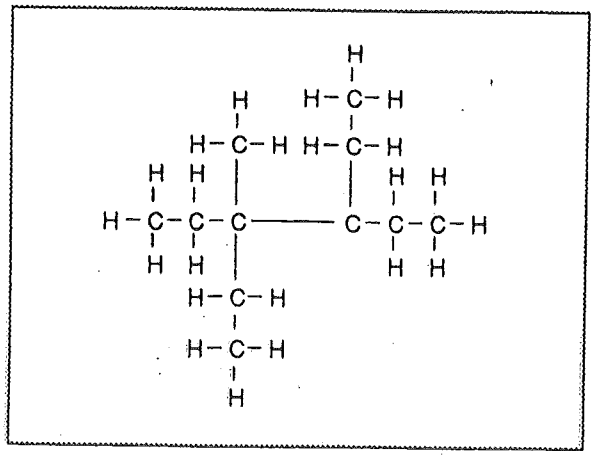
a. 3-ethylhexane



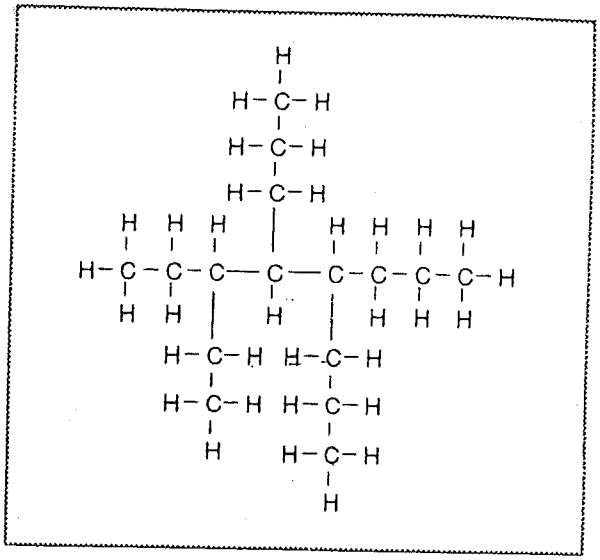
b. 2,4-dimethylhexane



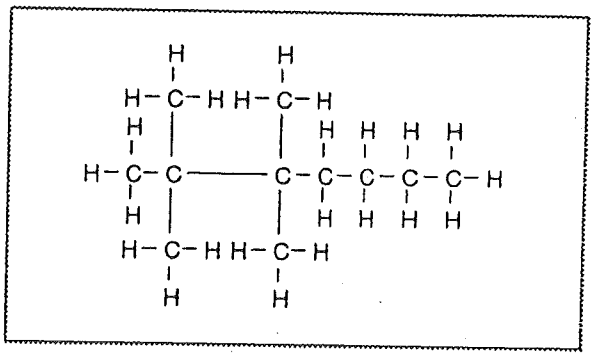
c. 3,4-diethyl-3-methylhexane



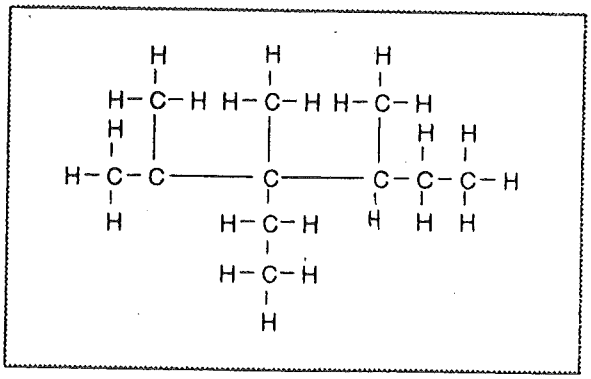
d. 3-ethyl-4,5-dipropyloctane



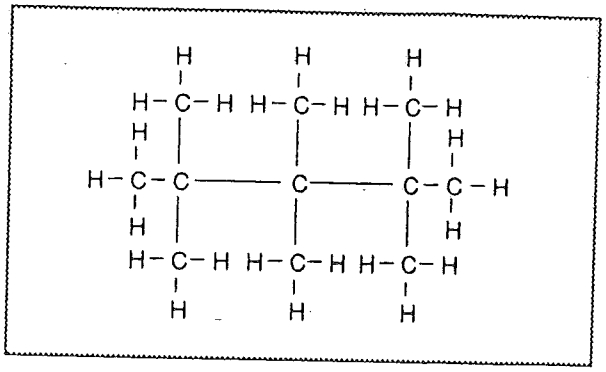
e. 2,2,3,3-tetramethylheptane



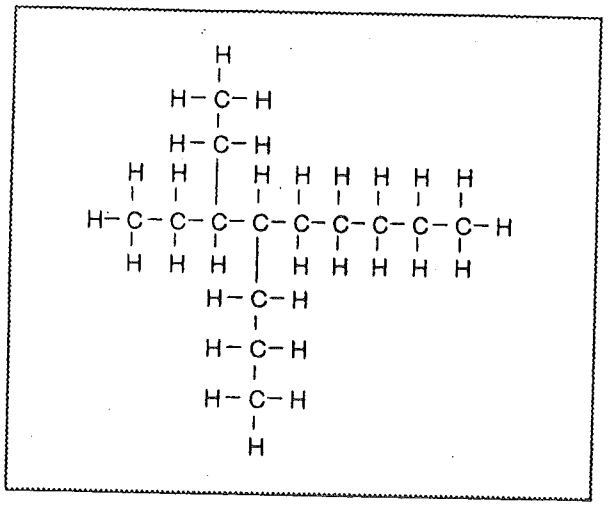
f. 3-ethyl-2,3,4-trimethylhexane



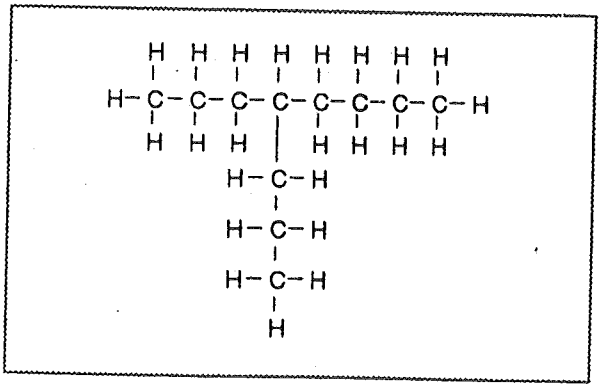
g. 2,2,3,3,4,4-hexamethylpentane



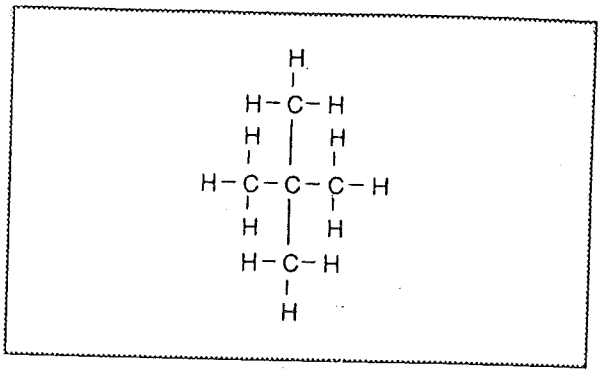
h. 3-ethyl-4-propylnonane



i. 4-propyloctane



j. 2,2-dimethylpropane



Alkenes, Alkynes, Aromatics

Pages 201 - 204

1. Give the IUPAC name for each of the following compounds:

a. $CH_3 - CH_2 - CH_2 - CH = CH - CH_3$

2-hexene

b. $CH_3 - CH = C(CH_3) - CH_3$

2-methyl-2-butene

c. $CH_2 = CH - C(CH_3)_2 - CH_2 - CH_3$

3,3-dimethyl-1-pentene

d. $CH_3 - CH = CH - CH(CH_2CH_3) - CH_2 - CH_3$

4-ethyl-2-hexene

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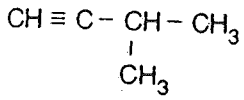
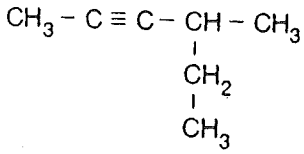
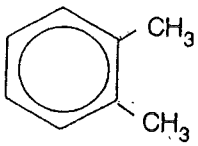
e. 

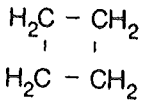
3-methyl-1-butyne

f. 

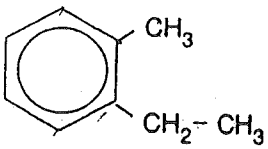
4-methyl-2-hexyne

g. 

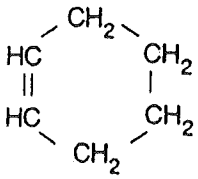
1,2-dimethylbenzene

h. 

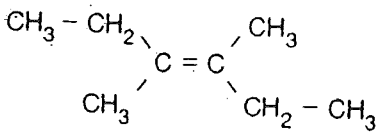
cyclobutane

i. 

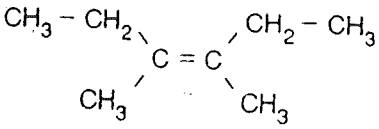
1-ethyl-2-methylbenzene

j. 

cyclohexene

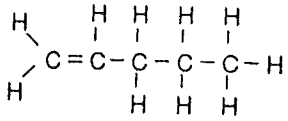
k. 

trans 3,4-dimethyl-3-hexene

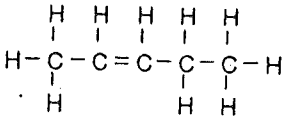
l. 

cis 3,4-dimethyl-3-hexene

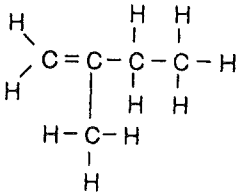
2. Draw the structural formulas and give names for three noncyclic isomers of C_5H_{10}.



1-pentene

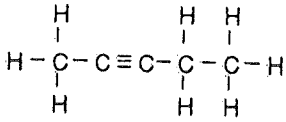


2-pentene



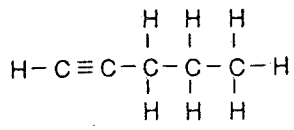
2-methyl-1-butene

3. Draw the structural formulas and give names for three noncyclic isomers of C_5H_8.

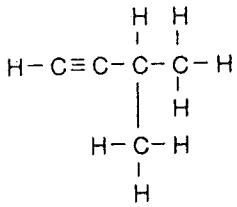


2-pentyne

...cont'd next page



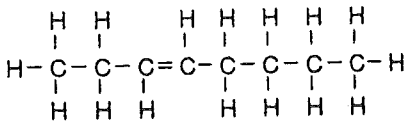
1-pentyne



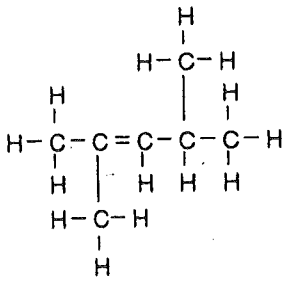
3-methyl-1-butyne

4. Draw structural formulas for:

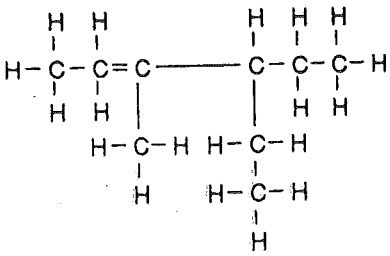
a. 3-octene



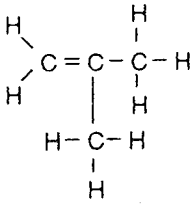
b. 2,4-dimethyl-2-pentene



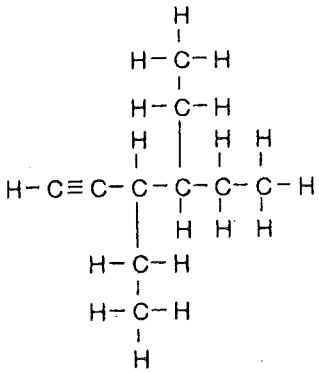
c. 4-ethyl-3-methyl-2-hexene



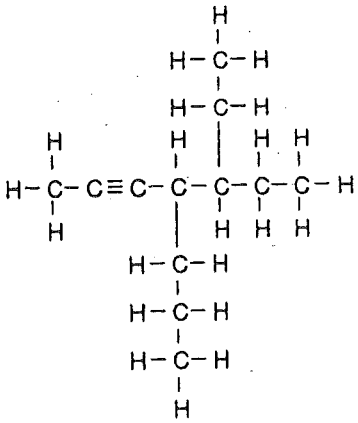
d. 2-methylpropene



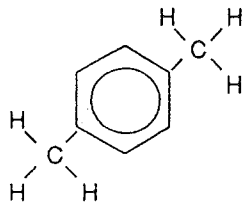
e. 3,4-diethyl-1-hexyne



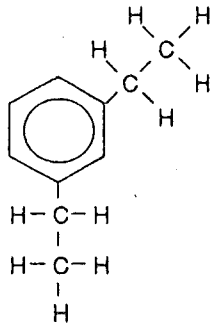
f. 5-ethyl-4-propyl-2-heptyne



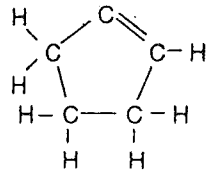
g. 1,4-dimethylbenzene



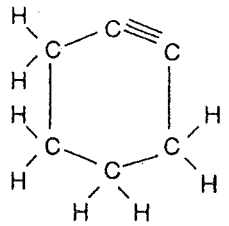
h. 1,3-diethylbenzene



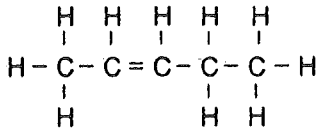
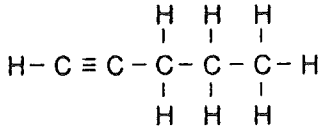
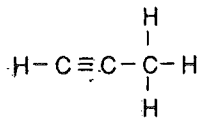
i. cyclopentene



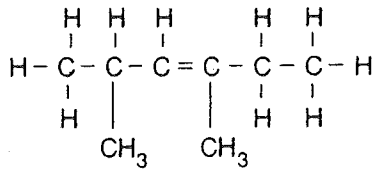
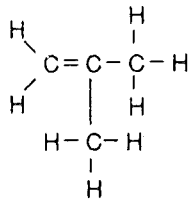
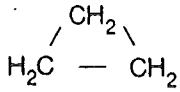
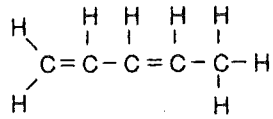
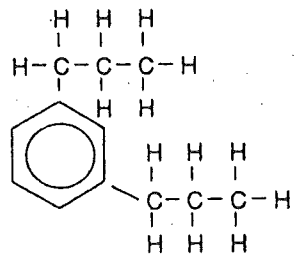
j. cyclohexyne



5. Complete the following table:

NAME	MOLECULAR FORMULA	STRUCTURAL FORMULA
2-pentene	C_5H_{10}	
1-pentyne	C_5H_8	
propyne	C_3H_4	

... cont'd next page

NAME	MOLECULAR FORMULA	STRUCTURAL FORMULA
2-4-dimethyl-3-hexene	C_8H_{16}	
2-methylpropene	C_4H_8	
cyclopropane	C_3H_6	
1,3-pentadiene	C_5H_8	
1,3-dipropylbenzene	$C_{12}H_{18}$	

Hydrocarbon Reactions

Pages 208 - 209

1. Write a balanced equation to represent the following **combustion** reactions:

   a. Combustion of butane in very short supply of oxygen.

   $C_4H_{10(g)} + \frac{5}{2}O_{2(g)} \rightarrow 4C_{(s)} + 5H_2O_{(l)}$

   b. Combustion of hexene in limited supply of oxygen.

   $C_6H_{12(g)} + 6O_{2(g)} \rightarrow 6CO_{(g)} + 6H_2O_{(l)}$

   c. Combustion of propane in abundant supply of oxygen.

   $C_3H_{8(g)} + 5O_{2(g)} \rightarrow 3CO_{2(g)} + 4H_2O_{(g)}$

   d. Combustion of benzene in very short supply of oxygen.

   $C_6H_{6(g)} + \frac{3}{2}O_{2(g)} \rightarrow 6C_{(s)} + 3H_2O_{(l)}$

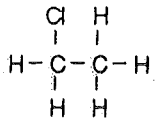
   e. Combustion of ethyne in abundant supply of oxygen.

   $C_2H_{2(g)} + \frac{5}{2}O_{2(g)} \rightarrow 2CO_{2(g)} + H_2O_{(l)}$

2. Write a balanced equation to represent the following **substitution** reactions. Represent the organic product with a structural formula and name it. (Primary or next product only)

   a. $C_2H_{6(g)} + Cl_{2(g)} \rightarrow$

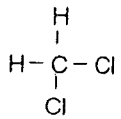
   $C_2H_{6(g)} + Cl_{2(g)} \rightarrow C_2H_5Cl_{(g)} + HCl_{(g)}$

   chloroethane

   b. $CH_3Cl_{(g)} + Cl_{2(g)} \rightarrow$

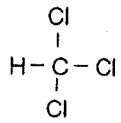
   $CH_3Cl_{(g)} + Cl_{2(g)} \rightarrow CH_2Cl_{2(g)} + HCl_{(g)}$

   dichloromethane

   c. $CH_2Cl_{2(g)} + Cl_{2(g)} \rightarrow$

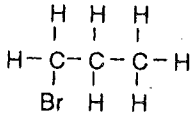
   $CH_2Cl_{2(g)} + Cl_{2(g)} \rightarrow CHCl_{3(g)} + HCl_{(g)}$

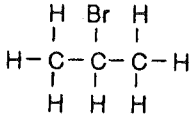
   trichloromethane

   d. $C_3H_{8(g)} + Br_{2(g)} \rightarrow$
   (Two possible isomers--show and name both)

   $C_3H_{8(g)} + Br_{2(g)} \rightarrow C_3H_7Br_{(g)} + HBr_{(g)}$

   1-bromopropane

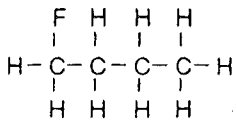
   

   2-bromopropane

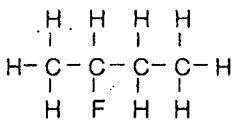
   Remember, the Br can replace any hydrogen in the C_3H_8 reactant.

e. $C_4H_{10(g)} + F_{2(g)} \rightarrow$
(Two possible products--show and name both)

$C_4H_{10(g)} + F_{2(g)} \rightarrow C_4H_9F_{(g)} + HF_{(g)}$



1-fluorobutane

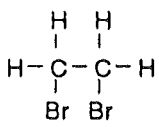


2-fluorobutane

3. Write a balanced equation to represent the following **addition** reactions. Represent the organic product with a structural formula and name it.

a. ethene + $Br_{2(g)} \rightarrow$

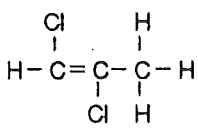
$C_2H_{4(g)} + Br_{2(g)} \rightarrow C_2H_4Br_{2(g)}$



1,2-dibromoethane

b. propyne + $Cl_{2(g)} \rightarrow$

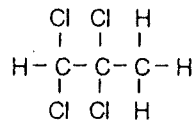
$C_3H_{4(g)} + Cl_{2(g)} \rightarrow C_3H_4Cl_{2(g)}$



1,2-dichloropropene

c. propyne + $2Cl_{2(g)} \rightarrow$

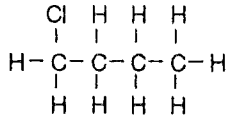
$C_3H_{4(g)} + 2Cl_{2(g)} \rightarrow C_3H_4Cl_{4(g)}$



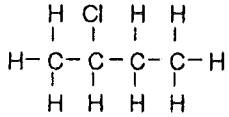
1,1,2,2-tetrachloropropane

d. 1-butene + $HCl_{(g)} \rightarrow$
(Two possible products--show and name both)

$C_4H_{8(g)} + HCl_{(g)} \rightarrow C_4H_9Cl_{(g)}$



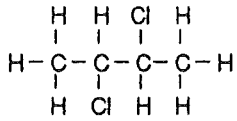
1-chlorobutane



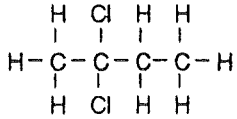
2-chlorobutane

e. 2-butyne + $2HCl_{(g)} \rightarrow$
(Two possible products--show and name both)

$C_4H_{6(g)} + 2HCl_{(g)} \rightarrow C_4H_8Cl_{2(g)}$



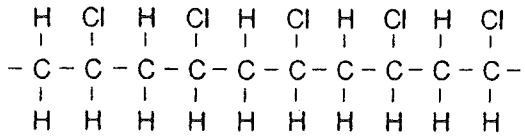
2,3-dichlorobutane

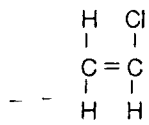


2,2-dichlorobutane

4. Draw the structural formula and give an IUPAC name for the monomer that would produce the following addition polymers:

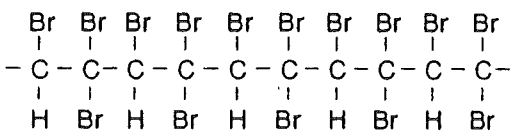
a.

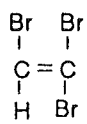




chloroethene

b.

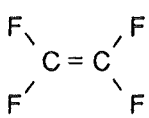


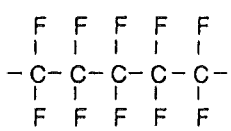


1,1,2-tribromoethene

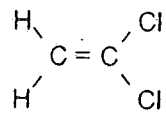
5. Draw a segment of the addition polymer that could be formed from these monomers:

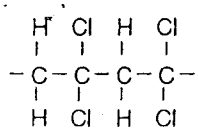
a.





b.



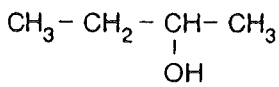


Alcohols, Aldehydes and Ketones

Pages 214 - 216

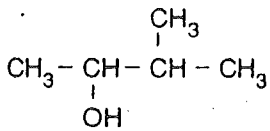
1. Name the following alcohols:

a.



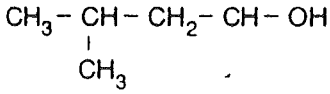
2-butanol

b.



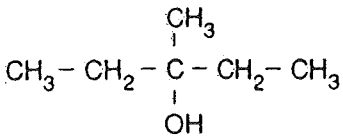
3-methyl-2-butanol

c.



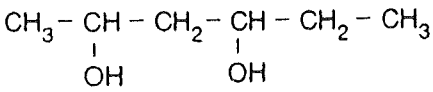
3-methyl-1-butanol

d.



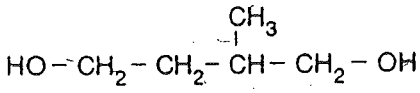
3-methyl-3-pentanol

e.



2,4-hexanediol

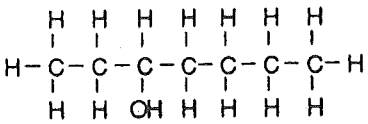
f.



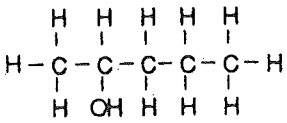
2-methyl-1,4-butanediol

2. Draw structural formulas for the following alcohols:

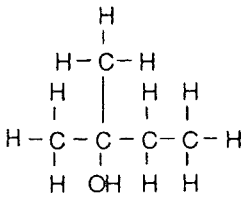
a. 3-heptanol



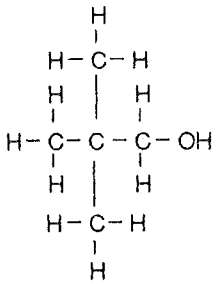
b. 2-pentanol



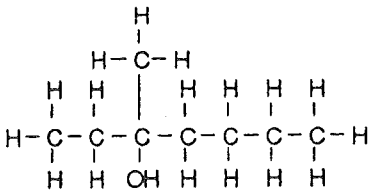
c. 2-methyl-2-butanol



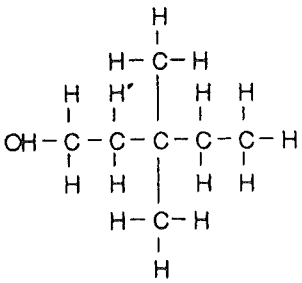
d. 2,2-dimethyl-1-propanol



e. 3-methyl-3-heptanol

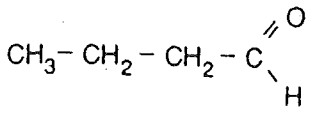


f. 3,3-dimethyl-1-pentanol



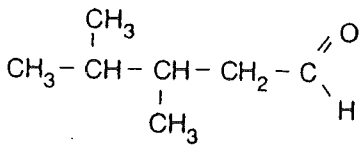
3. Name the following aldehydes:

a.



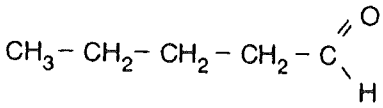
butanal

b.



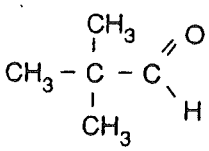
3,4-dimethylpentanal

c.



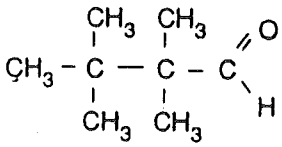
pentanal

d.



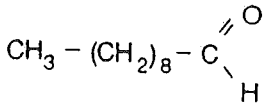
2,2-dimethylpropanal

e.



2,2,3,3-tetramethylbutanal

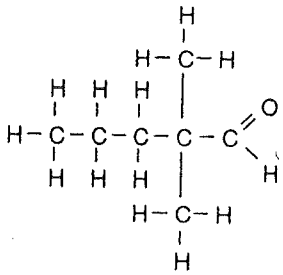
f.



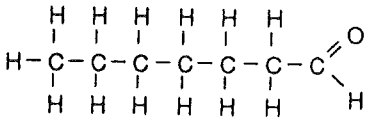
decanal

4. Draw structural formulas for the following aldehydes:

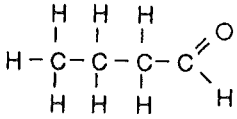
a. 2,2-dimethylpentanal



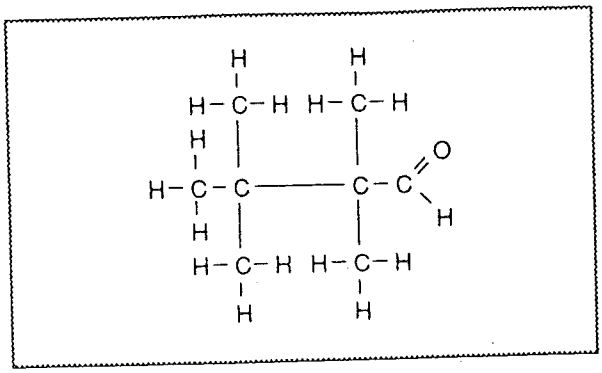
b. heptanal



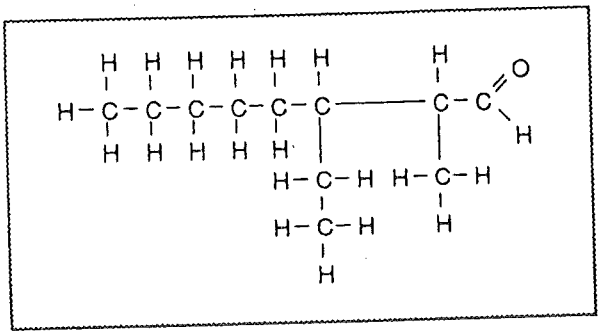
c. butanal



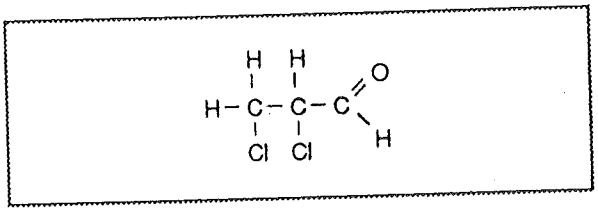
d. 2,2,3,3-tetramethylbutanal



e. 3-ethyl-2-methyloctanal

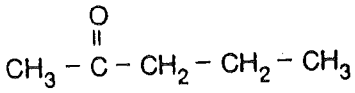


f. 2,3-dichloropropanal



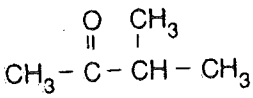
5. Name the following ketones:

a.



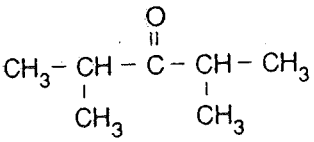
2-pentanone

b.



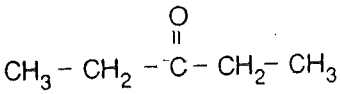
3-methyl-2-butanone

c.



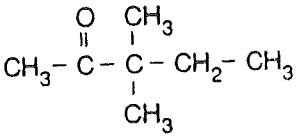
2,4-dimethyl-3-pentanone

d.



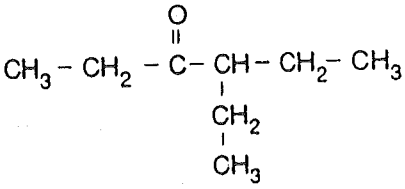
3-pentanone

e.



3,3-dimethyl-2-pentanone

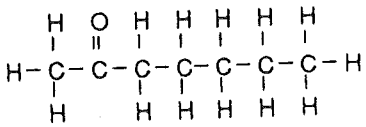
f.



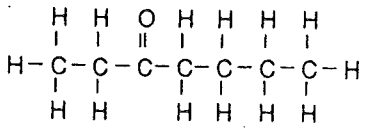
4-ethyl-3-hexanone

6. Draw structural formulas for the following ketones:

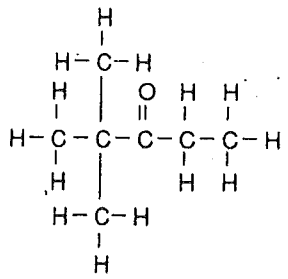
a. 2-heptanone



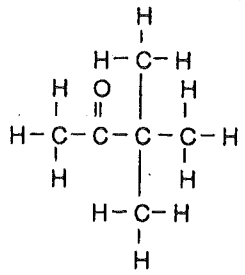
b. 3-heptanone



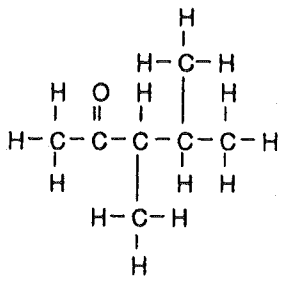
c. 2,2-dimethyl-3-pentanone



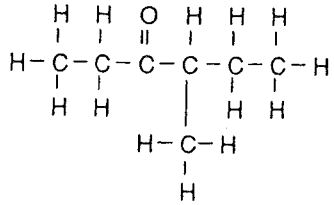
d. 3,3-dimethyl-2-butanone



e. 3,4-dimethyl-2-pentanone



f. 4-methyl-3-hexanone

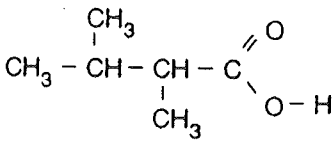


Carboxylic Acids and Esters

Pages 220 - 221

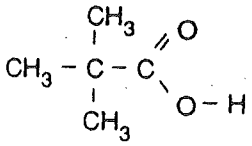
1. Name the following carboxylic acids:

a.



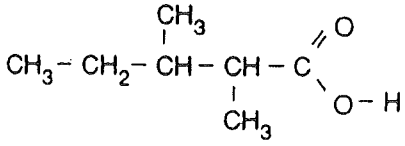
2,3-dimethylbutanoic acid

b.



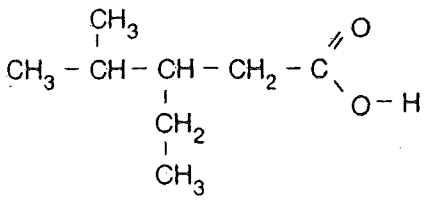
2,2-dimethylpropanoic acid

c.



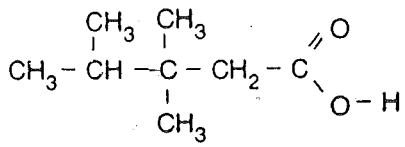
2,3-dimethylpentanoic acid

d.



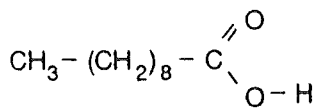
3-ethyl-4-methylpentanoic acid

e.



3,3,4-trimethylpentanoic acid

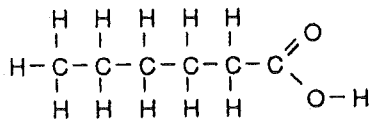
f.



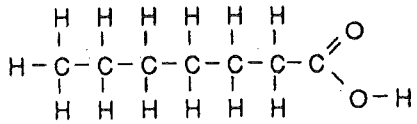
decanoic acid

2. Draw structural formulas for the following carboxylic acids:

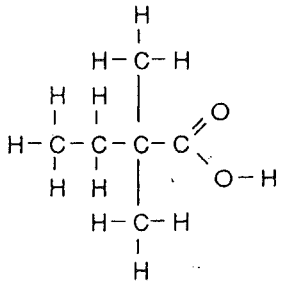
a. hexanoic acid



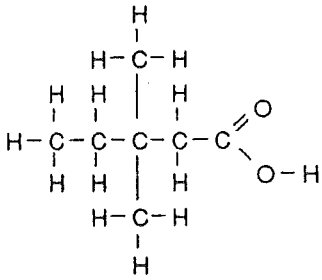
b. heptanoic acid



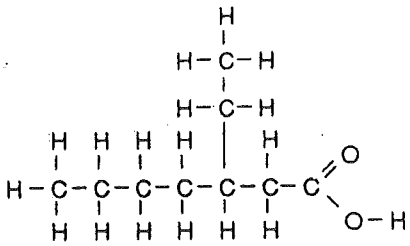
c. 2,2-dimethylbutanoic acid



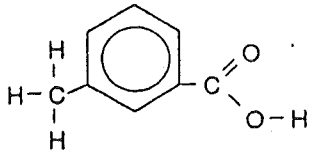
d. 3,3-dimethylpentanoic acid



e. 3-ethylheptanoic acid

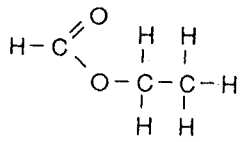


f. 3-methylbenzoic acid



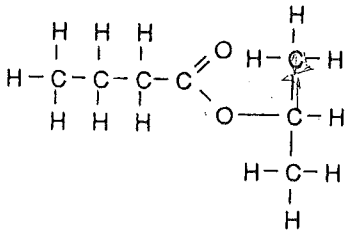
3. Write structural formulas and give the IUPAC name for the esters formed in these esterification reactions:

a. methanoic acid + ethanol →



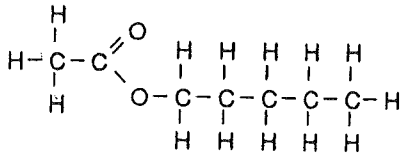
ethyl methanoate

b. butanoic acid + 2-propanol →



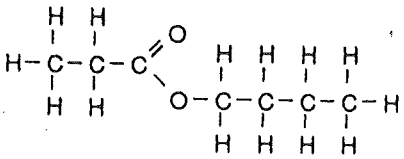
2-propylbutanoate

c. ethanoic acid + 1-pentanol →



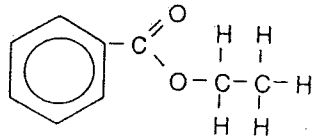
pentyl ethanoate

d. propanoic acid + 1-butanol →



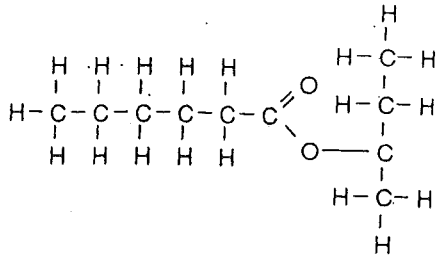
butyl propanoate

e. benzoic acid + ethanol →



ethyl benzenoate

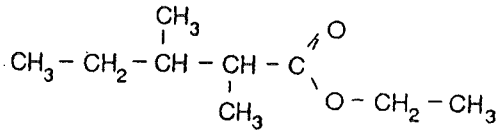
f. hexanoic acid + 2-butanol →



2-butyl hexanoate

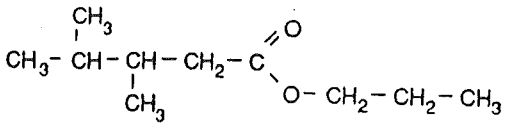
4. Name the following esters:

a.



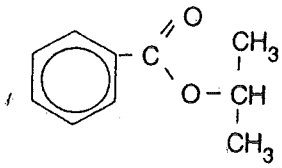
ethyl 2,3-dimethylpentanoate

b.



propyl 3,4-dimethylpentanoate

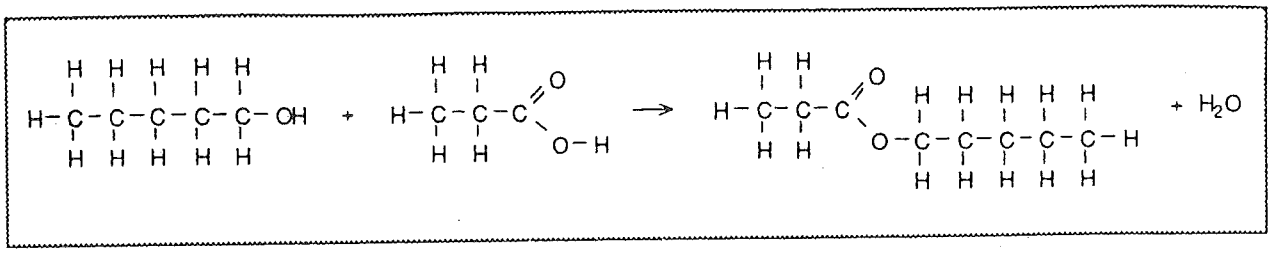
c.



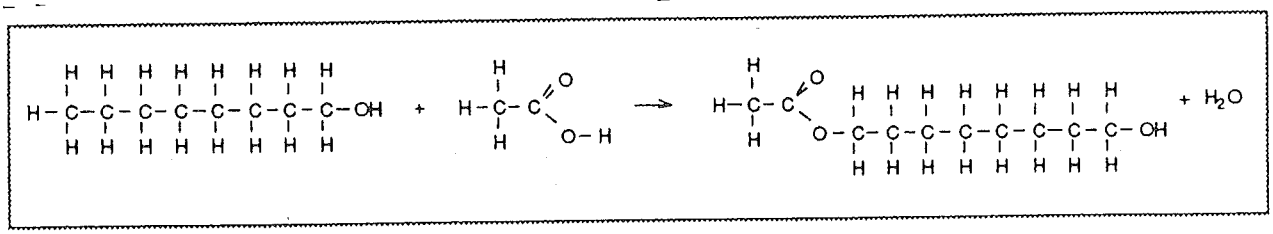
2-propyl benzoate

5. Write the equations to describe the making of

a. pentyl propanoate (apricot flavor)



b. octyl ethanoate (orange flavor)

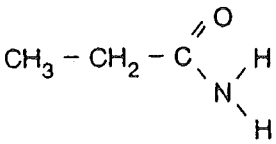


Amides and Amines

Pages 225 - 227

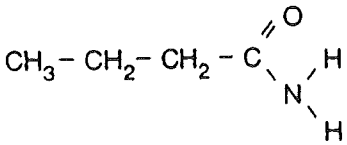
1. Name the following amides:

a.



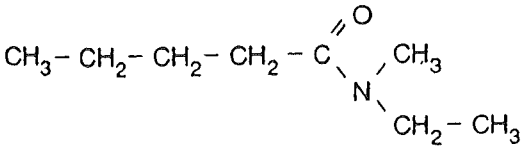
propamide (propanamide)

b.



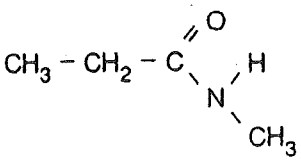
butamide (butanamide)

c.



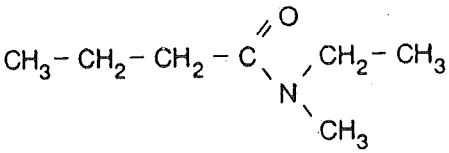
ethylmethylpentamide (pentanamide)

d.



methylpropamide (propanamide)

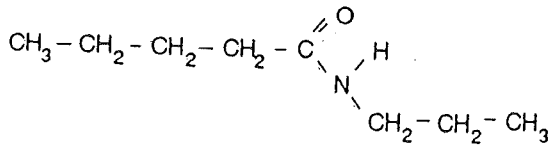
e.



ethylmethylbutanamide

62

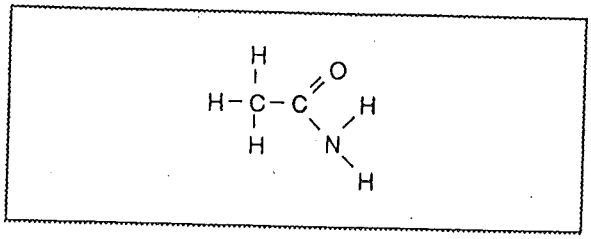
f.



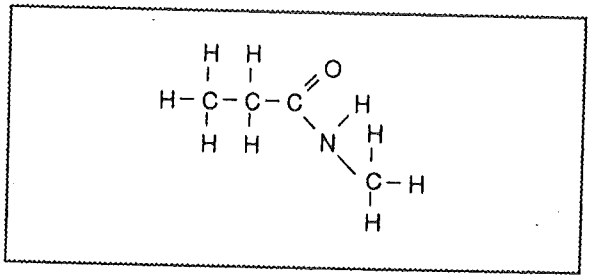
propylpentamide

2. Draw structural formulas for the following amides:

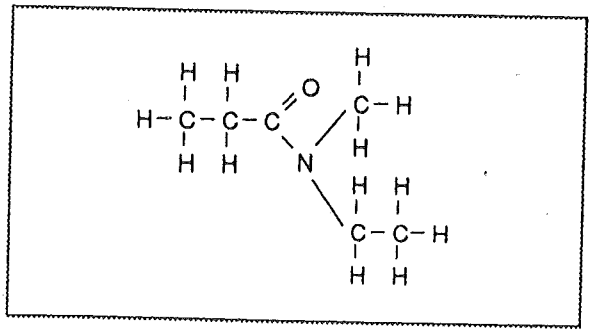
a. ethanamide



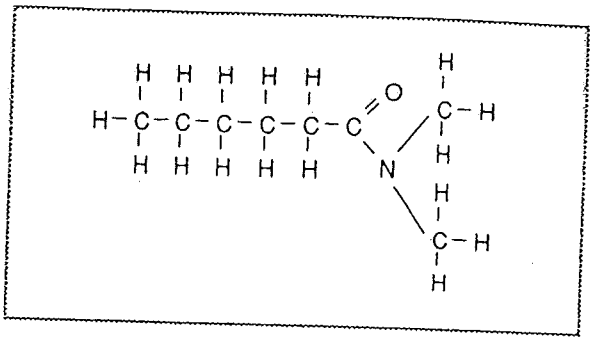
b. methylpropanamide



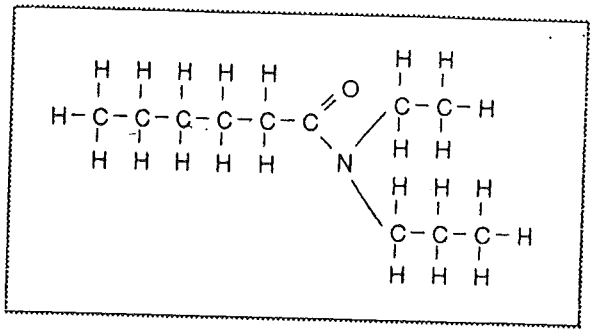
c. methylethylpropanamide



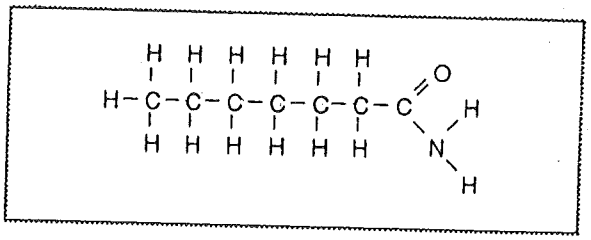
d. dimethylhexanamide



e. ethylpropylhexanamide

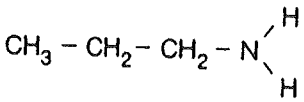


f. heptanamide



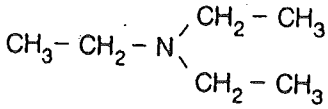
3. Name the following amines:

a.



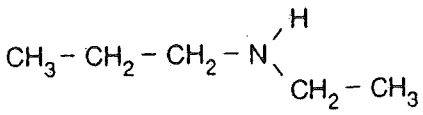
propylamine

b.



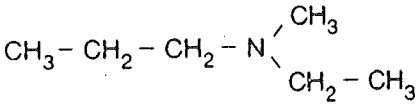
triethylamine

c.



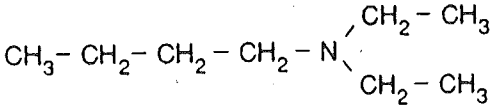
ethyl-propylamine

d.



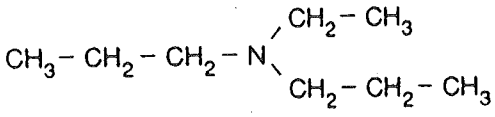
ethyl-methyl-propylamine

e.



butyl-diethylamine

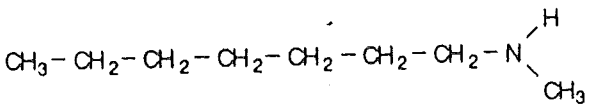
f.



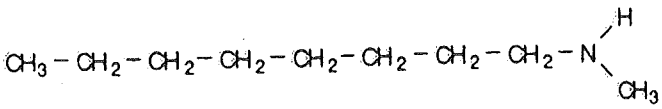
ethyl-dipropylamine

4. Draw structural formulas for the following amines:

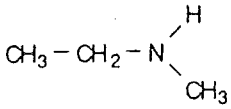
e. heptylamine



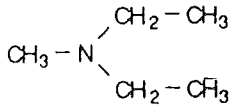
f. methyloctylamine



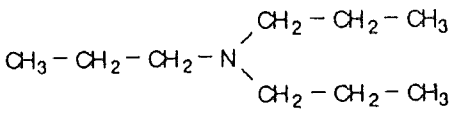
a. ethylmethylamine



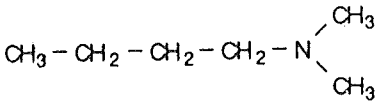
b. diethylmethylamine



c. tripropylamine



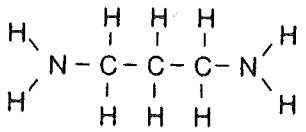
d. dimethylbutylamine



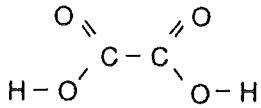
5. Classify the amines in questions 3 and 4 as primary, secondary, or tertiary amines.

3. a) primary	4. a) secondary
b) tertiary	b) tertiary
c) secondary	c) tertiary
d) tertiary	d) tertiary
e) tertiary	e) primary
f) tertiary	f) secondary

6 Two monomers are reacted in a condensation polymerization reaction:

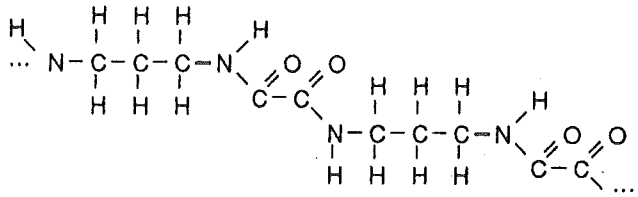


and



1,3-diaminopropane oxalic acid

Draw a segment of the polyamide that can be formed by the condensation polymerization of these two monomers.



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