17 CARBOXYLIC ACIDS AND THEIR DERIVATIVES: NUCLEOPHILIC ADDITION-ELIMINATION AT THE ACYL CARBON

SOLUTIONS TO PROBLEMS

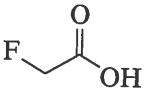
17.1 (a) 2-Methylbutanoic acid

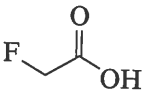
(b) (*Z*)-3-Pentenoic acid or (*Z*)-pent-3-enoic acid

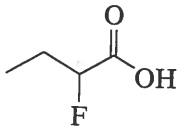
(c) Sodium 4-bromobutanoate

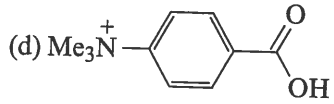
(d) 5-Phenylpentanoic acid

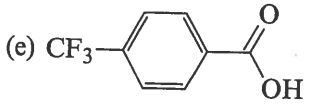
(e) (*E*)-3-Ethyl-3-pentenoic acid or (*E*)-3-Ethylpent-3-enoic acid

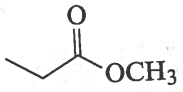
17.2 (a)  (—F is more electronegative than —H)

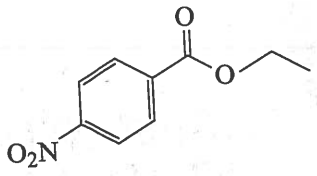
(b)  (—F is more electronegative than —Cl)

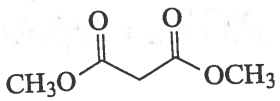
(c)  (—F is closer to $-CO_2H$)

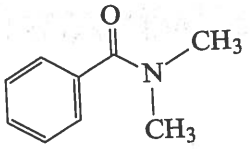
(d)  [$-\overset{+}{N}Me_3$ is more electronegative than —H]

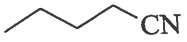
(e)  ($-CF_3$ is more electronegative than $-CH_3$)

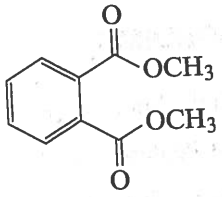
17.3 (a) 

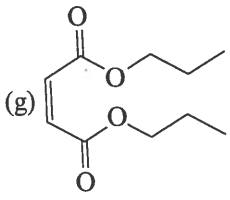
(b) 

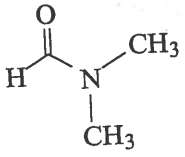
(c) 

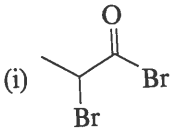
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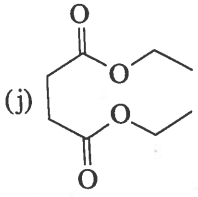
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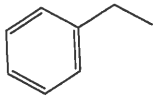
(f) 

(g) 

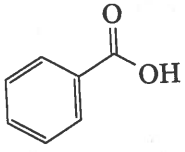
(h) 

(i) 

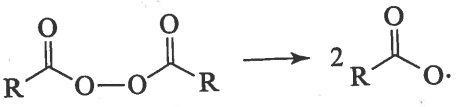
(j) 

17.4 (a) 

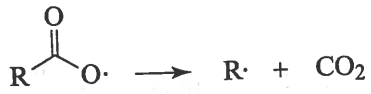
$$\xrightarrow[(2)\ H_3O^+]{(1)\ KMnO_4,\ HO^-,\ \text{heat}}$$

 + CO_2

17.16 (a) The oxygen-oxygen bond of the diacyl peroxide has a low homolytic bond dissociation energy ($DH° \sim 139$ kJ mol^{-1}). This allows the following reaction to occur at a moderate temperature.

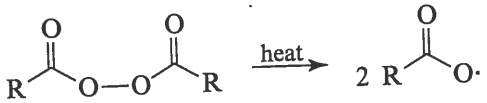


(b) By decarboxylation of the carboxyl radical produced in part (a).

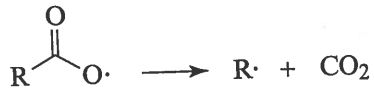


(c) ***Chain Initiation***

Step 1



Step 2



Chain Propagation

Step 3



Step 4

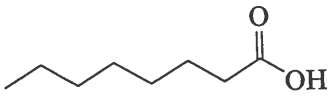


Steps 3, 4, 3, 4, and so on.

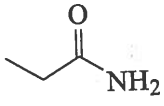
Problems

Structure and Nomenclature

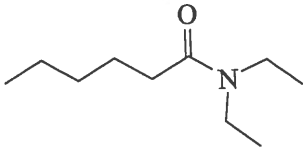
17.17 (a)



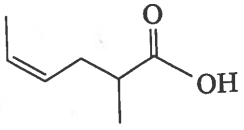
(b)



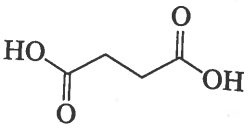
(c)

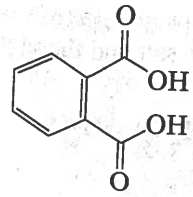


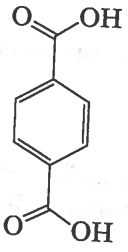
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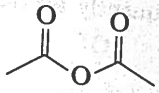


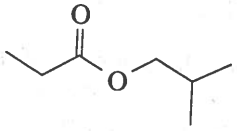
[the (*Z*) isomer]

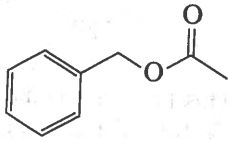
(e) 

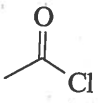
(f) 

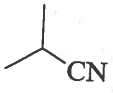
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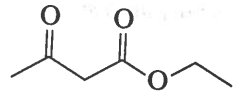
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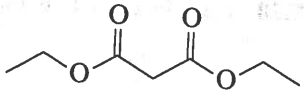
(i) 

(j) 

(k) 

(l) 

(m) 

(n) 

17.18 (a) Benzoic acid

(b) Benzoyl chloride

(c) Acetamide or ethanamide

(d) Acetic anhydride or ethanoic anhydride

(e) Benzyl benzoate

(f) Phenyl propanoate or phenyl propionate

(g) Isopropyl acetate or 1-methylethyl ethanoate

(h) Acetonitrile or ethanenitrile