CHAPTER 4

ANSWERS

Multiple Choice Questions

1.	(b)	**2.**	(d)	**3.**	(a)	**4.**	(c)
5.	(c)	**6.**	(b)	**7.**	(a)	**8.**	(b)
9.	(a)	**10.**	(d)	**11.**	(a)	**12.**	(d)
13.	(b)	**14.**	(a)	**15.**	(c)	**16.**	(c)
17.	(c)	**18.**	(d)	**19.**	(c)	**20.**	(a)
21.	(b)	**22.**	(c)	**23.**	(d)	**24.**	(c)
25.	(d)	**26.**	(a)	**27.**	(d)	**28.**	(d)
29.	(a)						

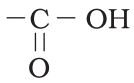
Short Answer Questions

30.  Electron dot structure of ethyne (C_2H_2)

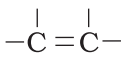
 Structural formula of ethyne

31. (a) Pentanoic acid
(b) Butyne
(c) Heptanal
(d) Pentanol

32. (a) — OH Hydroxyl/Alcohol

(b)  Carboxylic acid

(c)  Ketone

(d)  Alkene

33. (a) Carboxylic acid is ethanoic acid
(b) Alcohol is ethanol
(c) X is ethyl ethanoate

$$CH_3—COOH + C_2H_5OH \xrightarrow{H_2SO_4} CH_3—COOC_2H_5 + H_2O$$

Ethanoic acid — Ethanol — Ethyl ethanoate

34. Detergents work as cleansing agent both in hard and soft water. The charged ends of detergents do not form insoluble precipitates with calcium and magnesium ions in hard water.

35. (a) Ketone
(b) Carboxylic acid
(c) Aldehyde
(d) Alcohol

36. Ethanol on heating with excess concentrated sulphuric acid at 443 K results in the dehydration of ethanol to give ethene.

$$CH_3CH_2OH \xrightarrow[443K]{\text{Hot conc. } H_2SO_4} CH_2 = CH_2 + H_2O$$

37. Methanol is oxidised to methanal in the liver. Methanal reacts rapidly with the components of cells. It causes the protoplasm to coagulate. It also affects the optic nerve, causing blindness.

38. Gas evolved is hydrogen.

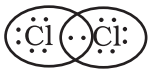
$2CH_3CH_2OH + 2Na \rightarrow 2CH_3CH_2O^-Na^+ + H_2$

39. Sulphuric acid acts as a dehydrating agent.

$$CH_3CH_2OH \xrightarrow[443K]{\text{Hot conc. } H_2SO_4} CH_2 = CH_2 + H_2O$$

40. (a) Carbon tetrachloride (CCl_4)
(b) Carbon dioxide (CO_2)

41. (a) K, L, M
2, 8, 7

(b) 

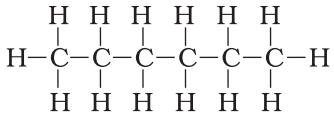
42. Carbon exhibits catenation much more than silicon or any other element due to its smaller size which makes the C–C bonds strong while the Si–Si bonds are comparatively weaker due to its large size.

43. **Hint—** The two can be distinguished by subjecting them to the flame. Saturated hydrocarbons generally give a clear flame while unsaturated hydrocarbons give a yellow flame with lots of black smoke.

44. (a) —(iv) (b) — (i)

(c) — (ii) (d) — (iii)

45. (a)



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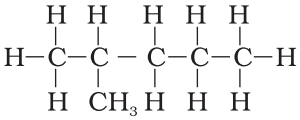
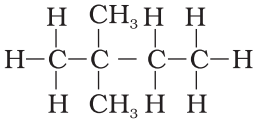
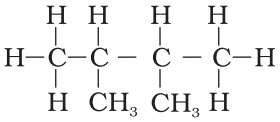


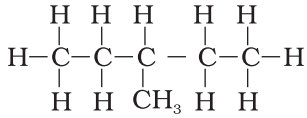
(c)



(d)



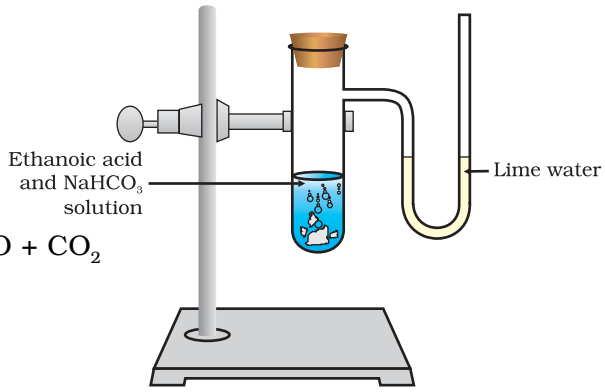
(e)



46. **Hint—** (a) Ni acts as a catalyst

(b) Concentrated H_2SO_4 acts as a catalyst

(c) Alkaline $KMnO_4$ acts as an oxidising agent



Long Answer Questions

47. $CH_3COOH + NaHCO_3 \rightarrow CH_3COO\ Na + H_2O + CO_2$

X is sodium ethanoate

Gas evolved is carbon dioxide

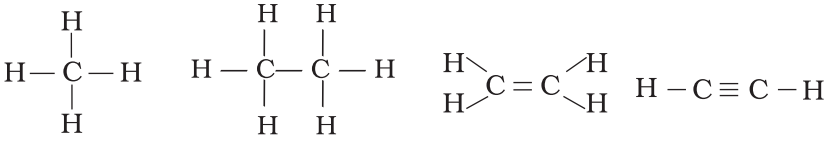
Hint— Activity

Lime water will turn milky, a characteristic property of CO_2 gas

48. (a) Compounds of carbon and hydrogen are called hydrocarbons. Example, methane, ethane etc.

(b) Saturated hydrocarbons contain carbon- carbon single bonds.

Unsaturated hydrocarbons contain atleast one carbon - carbon double or triple bond.

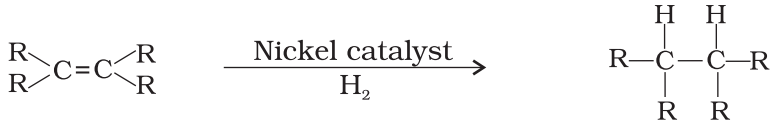


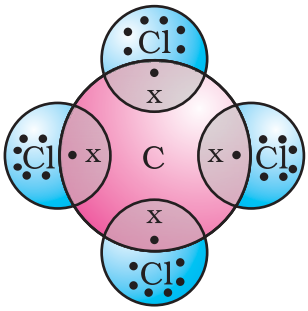
Methane Ethane Ethene Ethyne

Saturated hydrocarbons Unsaturated hydrocarbons

(c) Functional group – An atom/group of atoms joined in a specific manner which is responsible for the characteristic chemical properties of the organic compunds. Examples are hydroxyl group (– OH), aldehyde group (– CHO), carboxylic group (– COOH) etc.

49. **Hint—** Hydrogenation reaction



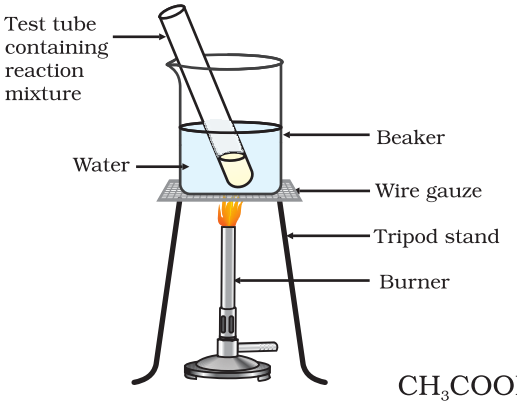


50. a) CCl_4

(b) Saponification is the process of converting esters into salts of carboxylic acids and ethanol by treating them with a base.

$CH_3COO\,C_2H_5 \xrightarrow{NaOH} CH_3COO\,Na + C_2H_5OH$

51. Activity



- Take 1 mL ethanol (absolute alcohol) and 1 mL glacial acetic acid along with a few drops of concentrated sulphuric acid in a test tube.
- Warm in a water-bath at about 60°C for at least 15 minutes as shown in the Figure (It should not be heated directly on flame as the vapours of ethanol catch fire)
- Pour into a beaker containing 20-50 mL of water and smell the resulting mixture.

$CH_3COOH + CH_3CH_2OH \xrightarrow{Conc.\,H_2SO_4} CH_3COOCH_2CH_3 + H_2O$

Ethanoic acid Ethanol Ester

52. C — Ethanoic acid

R — Sodium salt of ethanoic acid (sodium acetate) and gas evolved is hydrogen

A — Methanol

S — Ester (Methyl acetete)

(a) $2CH_3COOH + 2Na \rightarrow 2CH_3COO\,Na + H_2$
(C) (R)

(b) $CH_3COOH + CH_3OH \xrightarrow{Conc.\,H_2SO_4} CH_3COOCH_3 + H_2O$
(C) (A) (S)

(c) $CH_3COOH + NaOH \rightarrow CH_3COO\,Na + H_2O$
(R)

(d) $CH_3COOCH_3 + NaOH \rightarrow CH_3COO\,Na + CH_3OH$
(R) (A)

53. (a) It will turn milky

(b) $2CH_3COOH + Na_2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$ (Test tube A)

$Ca(OH)_2 + CO_2 \rightarrow CaCO_3 + H_2O$ (Test tube B)

With excess CO_2, milkiness disappears.

$CaCO_3 + H_2O + CO_2 \rightarrow Ca(HCO_3)_2$

(c) As C_2H_5OH and Na_2CO_3 do not react, a similar change is not expected

$C_2H_5OH + Na_2CO_3 \rightarrow$ No change

(d) The lime water is prepared by dissolving calcium oxide in water and decanting the supernatent liquid.

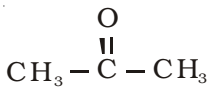
54. **Hint—** (a) By the dehydration of ethanol in the presence of concentrated H_2SO_4.

$$CH_3\ CH_2\ OH \xrightarrow[\text{conc. } H_2SO_4]{\text{Hot}} CH_2 = CH_2 + H_2O$$

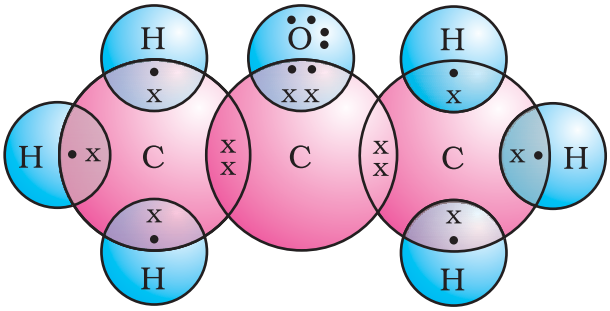
(b) By the oxidation of propanol using oxidising agent such as alkaline $KMnO_4$.

$$CH_3\ CH_2\ CH_2\ OH \xrightarrow[\text{Heat}]{\text{Alk. } KMnO_4} CH_3\ CH_2\ COOH$$

55.



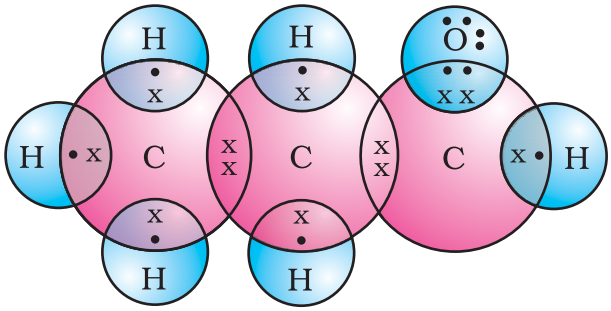
Propanone



Electron dot structure of propanone

$CH_3–CH_2–CHO$

Propanal



Electron dot structure of propanal

56. Hint— (a) Unsaturated hydrocarbons add hydrogen in the presence of nickel catalyst to give saturated hydrocarbons.

$$R_2C = CR_2 + H_2 \xrightarrow{Ni} \begin{matrix} R_2 & C & - & C & R_2 \\ & | & & | & \\ & H & & H & \end{matrix}$$

(b) Ethanol is oxidised to ethanoic acid in the presence of alkaline $KMnO_4$ on heating.

$$CH_3\ CH_2OH \xrightarrow[\text{Heat}]{\text{Alk. } KMnO_4} CH_3COOH$$

(c) In the presence of sunlight, chlorine is added to hydrocarbons.

$$CH_4 + Cl_2 \xrightarrow{h\upsilon} CH_3Cl + HCl$$

(d) $CH_3COOC_2\ H_5 + NaOH \rightarrow CH_3\ COO\ Na\ + C_2H_5OH$

Ester

Used in the preparation of soap

(e) Most carbon compounds release a large amount of heat and light on burning

$$CH_4 + 2O_2 \rightarrow\ CO_2 + 2H_2O + \text{Heat and light}$$

57. Since compound C gives 2 moles of CO_2 and 3 moles of H_2O, it shows that it has the molecular formula C_2H_6 (Ethane). C is obtained by the addition of one mole of hydrogen to compound B so the molecular formula of B should be C_2H_4 (Ethene). Compound B is obtained by heating compound A with concentrated H_2SO_4 which shows it to be an alcohol. So compound A could be C_2H_5OH (Ethanol)

$$\underset{A}{C_2H_5OH} \xrightarrow{\text{Hot conc. } H_2SO_4} \underset{B}{C_2H_4} + H_2O$$

$$\underset{B}{C_2H_4} + H_2 \xrightarrow{Ni} \underset{C}{C_2H_6}$$

$$\underset{C}{2C_2H_6} + 7O_2 \longrightarrow 4CO_2 + 6H_2O + \text{Heat and light}$$