CHAPTER

11

organic Chemistry

Organic Compounds

- Chemistry of hydrocarbons and their derivatives is dealt with in organic chemistry.
- **Urea was the first organic compound prepared in laboratory.** It was prepared by **Wohlar**.
- Acetic acid was the first organic compound synthesised from its elements by Kolbe.
- Main sources of organic compounds are plants and animals, coal and petroleum.

Hydrocarbons

- Hydrocarbons are the compounds made up of carbon and hydrogen only. It is two types
  (a) Saturated hydrocarbons
  (b) Unsaturated hydrocarbons

Saturated Hydrocarbons or Paraffins or Alkanes

(Contain C—C bond)

- General formula : C_nH_{2n+2}
- All the carbon atoms in alkanes are sp^3 hybridised. They show chain is omerism.
- Methane, CH_4 is the first and least reactive member of the series. Its source is marshy land.
- It is used as a gaseous fuel, for preparing carbon black, in the preparation of variety of organic compounds.

Unsaturated Hydrocarbons

Contains $>C=C<$ or $-C\equiv C-$ bond

These further are of two types

Alkenes or Olefins

$>C=C<$

General formula : C_nH_{2n}

Type formula : $R-CH=CH_2$

- **Common name** Alkylene, **IUPAC name** Alkenes.
- First member is C_2H_4, $CH_2=CH_2$, known as ethylene or ethene.
- Ethene is used in the manufacture of plastics, for artificial ripening of fruits (banana, apple and oranges).

Alkynes or Acetylenes ($-C\equiv C-$)

- General formula : C_nH_{2n-2}

  Type formula ($R-C\equiv C-H$)
- **Common name** Acetylene, **IUPAC name** Alkynes.
- Acetylene C_2H_2 is the first member of the series.
  (i) Alkynes can be distinguished from alkenes by the reaction with Tollen's reagent (ammoniacal silver nitrate).
- It is used in oxy-acetylene torch and for welding in acetylene lamps.

Halo-alkanes

- **General formula** $C_nH_{2n+1}X$ (where, X = Cl, Br, I)

  Type formula : These are of three type

  Primary alkyl halide, $R-CH_2-X$

  Secondary alkyl halide, $R_1-\underset{R_2}{\underset{|}{CH}}-X$

  Tertiary alkyl halide, $R_1-\underset{R_3}{\overset{R_2}{\overset{|}{\underset{|}{C}}}}-X$
- **Common name** Alkyl halide
- **IUPAC name** Halo-alkane
- Tri-halo methane are called **haloforms**.
- Chloroform oxidises to $COCl_2$ (carbonyl chloride) in the presence of air and light. So it is kept in dark coloured bottles.
- Chloroform is used as a general anaesthetic.
- Chloropicrin ($CCl_3 \cdot NO_2$) is used as an insecticide and also called **tear gas**. Carbon tetrachloride is used for extinguishing fire under the name **pyrene**.

- Chloroflurocarbons (freons) are used as refrigerants. They destroy the ozone layers.
- CFC contains carbon, chlorine hydrogen and fluorine.

Alcohols

- **General formula** $C_nH_{2n+1}OH$
- **Common name** Alkyl alcohol
- **IUPAC name** Alkanol.
- Primary alcohol is $R—CH_2OH$, secondary alcohol is $R_2CH—OH$, tertiary alcohol is $R_3C—OH$.
- **Lucas reagent is used to distinguish between *p*, *s* and *t*-alcohols.**
- **CH_3OH is wood spirit,** methyl alcohol, methanol, or carbinol.
- Methanol is used as a solvent for paints and varnishes, in making dyes, drugs, perfumes and also used as motor fuel with petrol.
- **CH_3CH_2OH is ethyl alcohol or ethanol or grain alcohol.** It is made unfit for drinking purposes by adding methanol or pyridine. Such alcohol is called methylated spirit or denatured alcohol.
- Ethanol changes the colour of sodium dichromate from orange to green. It is also used in the manufacture of paints, varnishes, in the preparation of chloroform, as a fuel in internal combustion engines. It is used in alcoholic drinks, whisky, wine, beer etc.

Ethers

- General formula $C_nH_{2n+2}O$
- **Common name** Dialkyl ether
- **IUPAC name** Alkoxy alkane
- Ethers behave like Lewis bases.
- Diethyl ether is used as an industrial solvent and also as an anaesthetic.

Aldehydes

- **General formula** $C_nH_{2n+1}CHO$
- **IUPAC name** Alkanal
- **40% solution of formaldehyde is called formalin** and used in the preservation of dead animals.
- Aldehydes and ketones having α–hydrogen atom give aldol condensation. Such carbonyl compounds as have α–hydrogen atom undergo condensation in the presence of dilute base to form aldol.
- Benzaldehyde is an almond extract.

Ketones

- **General formula** $C_nH_{2n}O$
- **IUPAC name** Alkanone
- Ketones containing—$COCH_3$ (methyl ketonic group) gives yellow colour iodoform in iodoform test.
- Acetone (CH_3COCH_3) is the first member of this class.
- Acetone is used as nail polish remover.
- Methyl ethyl ketone (MEK) is used as paint stripper.

Carboxylic Acids

- **General formula** $C_nH_{2n+1}COOH$
- **IUPAC name** Alkanoic acid.
- First member of the carboxylic acid series is formic acid H—COOH, which is present in ant's or bee's sting.
- HCOOH is the strongest acid among the carboxylic acids.
- CH_3COOH is the ethanoic acid. (Vineger)
- Vinegar contains 6-10% acetic acid.
- CH_3COOH is used in the manufacture of rubber from latex and casein from milk. It is used for coagulation.
- Lactic acid is α—hydroxy propanic acid. It is present in milk.
- Critic acid is a hydroxy tri-carboxylic acid. It is present in citrus fruit.
- Oxalic acid removes rust stains.
- Salicylic acid is used to prepare aspirin.

Esters

- **General formula** $C_nH_{2n+1}COOR$
- **IUPAC name** Alkyl alkanoate
- They have characteristic sweet fruity smell.

Ester	Flavour
Amyl acetate	Banana
Octyl acetate	Orange
Isoamyl valerate	Apple
Methyl butyrate	Pine-apple

- These are used in making artificial perfumes, flavours and essence used in cold drinks, ice-creams etc.
- Sodium benzoate is used as a food preservative.

Exercise

1. The first orga nic compound synthesised in the laboratory from its element is
   (a) urea (b) methane
   (c) ethylene (d) acetic acid

2. Which one is not an organic compound?
   (a) Ammonium cyanate (b) Marsh gas
   (c) Urea (d) Cane sugar

3. Which of the following is used as a hypnotic?
   (a) Paraldehyde (b) Metaldehyde
   (c) Acetaldehyde (d) Formaldehyde

4. Which of the following is the best scientific method to test presence of water in a liquid?
   (a) Smell
   (b) Taste
   (c) Use of the litmus paper
   (d) Use of anhydrous copper sulphate

5. What is the name of the following alkyl group?
   $(CH_3)_2CH—$
   (a) Normal propyl (b) Isopropyl
   (c) Sec-propyl (d) *Tert*-propyl

6. The isomerism observed in alkanes is
   (a) metamerism (b) chain isomerism
   (c) position isomerism (d) geometrical isomerism

7. General formula for the alkenes is
   (a) C_nH_{2n} (b) C_nH_{2n+2}
   (c) C_nH_{2n-2} (d) $C_{2n}H_{2n+1}$

8. The offending substance in the liquor tragedies leading to blindness etc., is
   (a) ethyl alcohol
   (b) amyl alcohol
   (c) benzyl alcohol
   (d) methyl alcohol

9. Which of the following is an active component of oil of clove?
   (a) Menthol (b) Eugenol
   (c) Methanol (d) Benzaldehyde

10. In cold countries, ethylene glycol is added in the water used in the radiators of cars during winter. This results in
    (a) lowering in freezing point
    (b) reducing the viscosity
    (c) reducing the specific heat
    (d) making water a better conductor of electricity

11. Match Column I with Column II and pick the correct matching from the codes given below.

Column I (Haloalkane /arene)	Column II (Application)
A. Iodoform	1. CF_4
B. BHC	2. Antiseptic
C. Freon-14	3. Moth repellent
D. Halothanes	4. Inhalative anaesthetic
E. *p*-dichlorobenzene	5. Termite pesticide

Codes

	A	B	C	D	E		A	B	C	D	E
(a)	2	4	5	3	1	(b)	2	5	1	4	3
(c)	3	4	2	1	5	(d)	1	3	5	2	4

12. The most important ingredient of dynamite is
    (a) nitrobenzene (b) picric acid
    (c) nitroglycerine (d) TNT

13. Denatured spirit is mainly used as a
    (a) drug
    (b) good fuel
    (c) material in preparing
    (d) solvent in preparing varnishes

14. Which of the following is generally present in tonics?
    (a) Ethanol (b) Ether
    (c) Ethanal (d) Chloral

15. Dynamite is prepared by mixing nitroglycerine with
    (a) saw dust and ammonium nitrate
    (b) cellulose nitrate
    (c) saw dust alone
    (d) conc sulphuric acid

16. Lemon is sour due to
    (a) citric acid (b) tartaric acid
    (c) oxalic acid (d) acetic acid

17. Denatured spirit is a mixture of ethyl alcohol, methyl alcohol and
    (a) acetic acid (b) pyridine
    (c) acetone (d) water

18. The law enforcement agencies use a chemical test to approximate a person's blood alcohol level. The person undergoing the test blows into the mouthpiece of a bag containing sodium dichromate solution in acidic medium. A chemical reaction with ethanol changes the colour of the solution from **(CDS 2010 II)**
    (a) orange to green (b) orange to colourless
    (c) yellow to orange (d) colourless to orange

19. Wine contains
    (a) CH_3OH (b) C_2H_5OH
    (c) C_6H_5OH (d) glucose

20. Chloroform is used as
    (a) antiseptic (b) insecticides
    (c) antipyretic (d) anaesthetic

21. A sample of chloroform before using as an anaesthetic is tested by
    (a) Fehling's solution
    (b) ammoniacal cuprous chloride
    (c) ammoniacal silver nitrate solution
    (d) silver nitrate solution after boiling with alcoholic KOH

22. The name fire damp is given to
    (a) methane (b) ethane
    (c) propane (d) butane

23. Vinegar contains acetic acid
    (a) 10-20% (b) 100%
    (c) 7-8% (d) 25%

24. Petroleum consists of
(a) aliphatic hydrocarbons (b) aliphatic alcohols
(c) aromatic derivatives (d) None of these

25. By-product of fermentation of sugar is
(a) H_2 (b) O_2
(c) CO_2 (d) N_2

26. The chemical name of tear gas is
(a) acetopnenone (b) benzophenone
(c) bromoacetophenone (d) chloroacetophenone

27. Liquor poisoning is due to the presence of
(a) methyl alcohol (b) ethyl alcohol
(c) carbonic acid (d) bad compound in liquor

28. Petroleum is found
(a) on the surface of the earth
(b) in the atmosphere
(c) in arctic ocean
(d) deep under the surface of the earth

29. Which of the following has maximum density?
(a) Chloroform (b) Water **(CDS 2009 I)**
(c) Benzene (d) Ice

30. Match the following.

Chemical name	Molecular formula
A. Ammonia	1. C_6H_6
B. Benzene	2. NH_3
C. Ethyl alcohol	3. CH_3OH
D. Methyl alcohol	4. C_2H_5OH

Codes

	A	B	C	D		A	B	C	D
(a)	1	2	3	4	(b)	2	1	4	3
(c)	4	3	2	1	(d)	1	4	3	2

31. Lucas test is performed for
(a) amines (b) alkyl halides
(c) ethers (d) alcohols

32. Which one of the following petroleum refinary products has the lowest boiling point? **(CDS 2009 I)**
(a) Kerosene (b) Diesel
(c) Gasoline (d) Lubricating oil

33. **Assertion (A)** Large cold storage plants use ammonia as refrigerant while domestic refrigerators use chlorofluorocarbons.
Reason (R) Ammonia can be liquefied at ambient temperature and low pressure.
(a) Both A and R are true and R is the correct explanation of A.
(b) Both A and R are true but R is not the correct explanation of A.
(c) A is true but R is false.
(d) A is false but R is true.

34. CaC_2 react with water to give
(a) C_2H_4 (b) CH_4 (c) C_2H_2 (d) CO_2

35. Which one of the following is used in welding industry?
(a) Methane (b) Ethane
(c) Acetylene (d) Benzene

36. Nail polish remover contains **(CDS 2009 I)**
(a) acetone (b) benzene
(c) formaldehyde (d) acetic acid

37. Which one of the following is likely to be a pollutant free alternative to petrol for automobiles?
(a) Ethanol (b) Acetylene
(c) Butane (d) Propane

38. The fuel used in spirit lamp is
(a) ethanol (b) methanol
(c) propanol (d) butanol

39. Grain alcohol is common name of
(a) amyl alcohol (b) ethyl alcohol
(c) methanol (d) None of these

40. Wood spirit is known as
(a) ethanol (b) methanol
(c) acetone (d) benzene

41. Ethanol containing some methanol is called
(a) methylated spirit (b) rectified spirit
(c) absolute spirit (d) None of these

42. The tracking of people by trained dogs is based on the recognisation of which of the following compounds, in the sweat from feet? **(CDS 2007 I)**
(a) Carboxylic acids (b) Uric acid
(c) Sugar (d) Salt

43. Petroleum is a mixture of
(a) alkenes (b) cycloalkanes
(c) aromatic hydrocarbons (d) All of these

Answers

1. (d)	**2.** (a)	**3.** (a)	**4.** (d)	**5.** (b)	**6.** (b)	**7.** (a)	**8.** (d)	**9.** (b)	**10.** (a)
11. (b)	**12.** (c)	**13.** (d)	**14.** (a)	**15.** (a)	**16.** (a)	**17.** (b)	**18.** (a)	**19.** (b)	**20.** (d)
21. (c)	**22.** (a)	**23.** (c)	**24.** (a)	**25.** (c)	**26.** (d)	**27.** (a)	**28.** (d)	**29.** (b)	**30.** (b)
31. (d)	**32.** (d)	**33.** (a)	**34.** (c)	**35.** (c)	**36.** (a)	**37.** (a)	**38.** (a)	**39.** (b)	**40.** (b)
41. (a)	**42.** (a)	**43.** (d)							