CHAPTER 15
ORGANIC COMPOUNDS

Ellis considering the following, very attributes which:

1. Carbon atoms have a tendency to form long chains or rings.
2. Compounds with the same molecular formula but different structures.
3. Compounds with the same functional group.
4. Compounds that differ from one another by a CH2 group, the homologous series.
5. Compounds that have the same functional group but different properties, the isomers.

Q. What is the carbon source of Organic Compounds?

Answer

Carbon Dioxide

Carbon dioxide is a source of organic compounds and very substances carbon dioxide gas.

Carbon Dioxide

Carbon dioxide have equal amounts of oxygen and carbon. It carbon dioxide and carbon dioxide is a colorless, odorless, and tasteless gas. Carbon dioxide is a gas that is made of one carbon atom and two oxygen atoms. Carbon dioxide is made from the burning of carbon. Carbon dioxide is also made by the breathing of animals, plants, and microorganisms. Carbon dioxide is also made by the burning of wood, coal, and petroleum products, and also by the breaking down of organic matter. Carbon dioxide is used in the manufacture of soda water, dry ice, and carbonated beverages, and also in fire extinguishers.

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Methane or Natural Gas

Methane is a colorless, odorless, and tasteless gas. Methane is made of one carbon atom and four hydrogen atoms. Methane is made from the breaking down of organic matter. Methane is also made by the burning of wood, coal, and petroleum products. Methane is used in the manufacture of methanol, and also in the production of electricity and heat. Methane is also used in the manufacture of hydrogen, and also in the production of electricity and heat. Methane is also used in the manufacture of hydrogen, and also in the production of electricity and heat.

Origin of Hydrocarbon

Carbon dioxide and oxygen are the main ingredients of hydrocarbon. Carbon dioxide and oxygen are the main ingredients of hydrocarbon. Carbon dioxide and oxygen are the main ingredients of hydrocarbon.

EXERCISE

Q1. Select the right answer from the choices given with each question.

1) The major portion of natural gas is:
a) Ethane b) Propane c) Butane d) Methane

2) In organic compounds carbon atoms form:
a) Ionic bond b) Metallic bond c) Covalent bond d) None of these

3) Which of the following is an aromatic compound?
a) Propanol b) Cyclohexane c) Acetone d) Benzene

4) There are few homologous series of compounds. The existence of homologous series is due to:
a) Functional group b) Cracking
c) Isomerism d) Polymerization

5) Which of the following compound is heterocyclic?
a) Pyridine b) Pyrole c) Thiphene d) All of the above

6) Select from the following the one, which is alcohol:
a) $CH_3 - CH_2 - OH$ b) CH_3-O-CH_3
c) CH_3 COOH d) CH_3-CH_2-Br

7) Lassaignes' solution is prepared in the detection of elements of organic compound. Which metal is used for the reaction with organic compound?
a) Aluminium b) Sodium c) Iron d) Copper

8) When AgN03 is added to the Lassaignes' solution which colour is formed for Iodine:
a) Blue b) Violet c) Green d) Deep yellow

9) When water vapours are passed over, white anhydrous copper sulphate, which colour is formed?
a) White b) Deep blue c) Yellow d) Brown

10) The Simplest molecule of Bucky Ball contain carbon atoms:
a) 20 b) 8 c) 60 d) IOO

11) If a molecule contains more than one functional group it is known as:
a) Derivative b) Poly functional
c) Heterocyclic d) Isomer

Answers

1)	a	**2)**	C	**3)**	d	**4)**	a	**5)**	d
6)	a	**7)**	b	**8)**	d	**9)**	b	**10)**	c
11)	b								

Q2. Give brief answers for the following questions.

Q1: What is functional group?

Answer

Please see Answer of Q1 7 of Chapter Notes.

Q2: What is the Difference between partial and total synthesis of organic compounds?

Answer

Total Synthesis

In an organic chemistry a total synthesis is in principle, the complete chemical synthesis of complex organic male cubes from simpler pieces, usually without the aid of biological processes. In practice these simpler pieces are commercially available in bulk and semi — bulk quantities and are often petrochemicals precursors.

Sometimes bulk natural products (e.g sugar) are used as starting materials and it assumed that these have been or can be synthesized from constituent elements. The target molecules can be natural products, medicinally important active ingredients or organic compounds of the oratical in chemistry or biology. A new route for synthesis is developed in the course of the investigation, and the route may be the first one to developed for the substance.

Examples:

Cholesterol, cortisone, strychnine, lysergic acid, chlorophyll, vitamin B and quinine etc.

Partial Synthesis

Partial synthesis is a type of chemical synthesis that uses compounds isolated from natural sources (e.g plant material or bacterial or cell cultures) as a starting material. These natural biomolecules are usually large and complex molecules.

This is opposed to a total synthesis where large molecules are synthesized from a stepwise combination of small and cheap (Usually petrochemicals) building blocks.

Partial synthesis is usually used when precursor molecule is too structurally complex. For example, artemether.

Q3: How organic compounds are derived by fermentation process?

Answer

In fermentation process some enzymes are used to decompose naturally occurring substances into some other useful substances.

For example, to get ethyl alcohol there are added diastase, invertase and zymase enzymes in starch. Reactions involving process of fermentation of starch are as follows

Q4: What is coal? How is coal used as a source of organic compound?

Answer

Please see Answer ofQ9 of Chapter Notes.

Q5: What is the name of new allotropic from of carbon? Give is definition?

Answer

Please see Answer of Q 14 of Chapter Notes.

Q6: What is Homologous series?

Answer

Please see Answer of Q1 5 of Chapter Notes.

Q7: How metals can be detected in organic compounds?

Answer

The substance in a crucible preferably of platinum, till all reaction ceases. An incombustible residue indicated the presence of a metal in a substance. The residue is extracted with dilute acid and the solution is test for the presence of metallic radical by the usual scheme employed for inorganic salts.

Q3. Give detailed answers for the following questions.

Q1. What are the main sources of organic compounds? Also give the fractions of petroleum.

Answer

Please see Answer of Q1 and Q2 of Chapter Notes

Q2: Write down the characteristics of organic compounds from inorganic compounds.

Answer

Please see Answer of Q 1 0 of Chapter Notes.

Q3: How organic compounds are used in our daily life?

Answer

Food, vitamins, clothes etc are all organic compounds.

Q4: Write down any ten functional groups of organic compounds? Give reasons for the importance of organic chemistry.

Answer

Please see Answer of Q1 7 of Chapter Notes.

Q5: Give the chemical tests for the detection of elements in organic compounds?

Answer

Please see Answer ofQ20 of Chapter Notes.

Multiple Choice Questions

1) The unsaturated hydrocarbons are called:
(a) Paraffins (b) Olefins (c) Acetylenes (d) Vinylenes

2) The valence of carbon in its group state is:
(a) 1 (b) 2 (c) 3 (d) 6

3) In methane molecule, the 4 bonds of carbon form a shape of:
(a) Cube (b) Tetra hederon
(c) Square Prism (d) Octa hederon

4) One of Characteristics of alkanes is that they have:
(a) Planar shape (b) Linear snape
(c) tetrahedera shape (d) Cycle of C atoms

5) The smallest cycloalkane known is:
(a) cyclo pentane (b) cyclo butane
(c) cyclo propane (d) cyclo ethane

6) A gas which is colourless, odorless, insoluble but found in natural gas is:
(a) Propane (b) Hexane
(c) Cyclohexane (d) None of these

7) Methane can react with halogens under catalyzed conditions of sunlight. Such reactions are called:
(a) Addition (b) Substitution
(c) Displacement (d) Photo chemical

8) To prepare ammonia industrially through Haber's process, Hydrogen is obtained from:
(a) Water (b) Propane
(c) Methane (d) Polymerization

9) Polyethylene is produced from ethylene at high tem. & pressure. This is an example of reactions:
(a) Addition (b) Hydroxylation
(c) -hydrogenation (d) Polymerization

10) The Hydrocarbon gas that is applied as general anesthesia is:
(a) Ethyne (b) Ethane (c) Ethylene (d) Natural gas

11) If we heat sodium propionate with soda lime we'll get the gas:
(a) Methane (b) Ethane (c) Propane (d) Butane
(b)

12) The gas obtained by a reaction of CaC_2 and water is:
(a) Ethane (b) Ethene (c) Propane (d) Methane

13) The name of

is

(a) α - Naphthol (b) β- Naphthol
(c) Naphthalene (d) Anthracene

14) When methane is burnt and obtained gases are passed through aqueous solution of $Ca(OH)_2$, the ppt. Obtained are:
(a) Cao (b) $CaCO_3$ (c) $CaCO_3$ (d) None of these

15) CH_4 on reaction with atomic oxygen at 400°C, 200 atm. And Cu catalyst gives.
(a) Acetaldehyde (b) Acetylene
(c) Methanol (d) Water gas

16) Electricity was passed through an aqueous solution of sodium acetate. The hydrocarbon gas obtained is:
(a) Methane (b) Ethane (c) Ethene (d) Ethyne

17) Ethane was heated with conc. H_2SO_4 at 180°C. Then the product obtained was hydrogenation in presence of pt at room temp. The final product is:
(a) Ethane (b) Methane (c) Dimethyl ether (d) Acetylene

18) Ethylene was heated with an aqueous solution of H_2SO_4 (10%) along with $HgSO_4$. The product obtained is:
(a) Ethane (b) Ethene (c) Ethanol (d) None of these

19) Ethene was reacted with atomic oxygen in presence of Ag as Catalyst. The product obtained was hydrolyzed with water. Final product is:
(a) Ethanol. (b) Ethane (c) Ethyne (d) Ethanal

20) Ethylene was heated with an aqueous solution of H_2SO_4 (10%) along with $HgSO_4$. The product obtained is:
(a) 1,2 — Dibromo ethane (b)1 , 1 — Dibromo ethane
(c) Bromo ethane (d)None of these is correct

21) Chemically Baeyer's reagent is:
(a) 1% alkaline $KmnO_4$ (b) 10% alkaline $KmnO_4$
(c) 15% alkaline $KmnO_4$ (d)30% alkaline $KmnO_4$

22) Which alcohol is dehydrated first:
(a) Prime. Alcohol (b) Sec. Alcohol
(c)Tert. Alcohol (d) None of these

23) Reaction of chlorine with methane is called:
(a) Substitution reaction (b) Addition reaction
(c) Displacement reaction (d) Double displacement reaction

24) Carbon black is obtained from:
(a) Alkanes (b) Alkenes (c) Alkynes (d) Benzene

25) Catalytic oxidation of CH_4 gives:
(a) Formic acid (b) Acetic acid (c) Carbolic acid (d) Carbonic acid

26) Sodium propionate on reaction with NaOH gives:

(a) CH_4 (b) C_2H_6 (c) C_2H_4 (d) C_2H_2
(b)

27) The correct chemical name for CH_3 — CH (CH_3) — CH_3 is:
(a) Butane (b) 2 — methyl propane
(c) Isopropyl methane (d) Dimethyl ethane

28) Which of the following reagent distinguishes ethylene from acetylene?
(a) Aq. Alk. $KMnO_4$ (b) Chlorine dissolved in CCl4
(c) Ammoniacal cuprous chloride (d) Conc. H2S04

29) Synthetic rubbers are made by polymerization of:
(a) Chloroform (b) Acetylene (c) Divinyl acetylene (d) Butene

30) Type of orbital hybridization in acetylene is:
(a) sp^3 (b) sp^2 (c) sp (d) none of these

31) Soda lime on reaction with sodium propionate yields:
(a) $C_2H_6 + Na_2CO_3$ (b) $CH_4 + Na_2CO_3$
(c) $C_3H_8 + Na_2CO_3$ (d) $C_4H_{10} + Na_2CO_3$

32) Ethyl bromide on reaction with alcoholic KOH produces:
(a) Ethanol (b) Ethene (c) Ethyne (d) Ethane

33) When air is passed over ethane in presence of heated silver. Product is:
(a) Epoxy ethane (b) $CO_2 + H_2O$ (c) C+ H_2 (d) Ethyne

34) Ozonolysis of ethane in presence of O_3 + H_2O + Heat yields:
(a) Methanol (b) Ethanal (c) Ethanol (d) Methanal

35) The temperature of oxy-acetylene flame is:
(a) 1000 - 1100 °C (b)1000-3000 °C (c) 400 – 500°C (d) 500 -600 °C

36) Vinyl bromide on reaction with HBr in presence of R_2O_2 give the proct.
(a) 1, 2-dibromo ethane (b) 1,1 — dibromo ethane
(c) 1 , 1,1 -tribromo ethane (d) None of these is correct

37) Which of the following is an unsaturated hydrocarbon:
(a) Cyclo alkane (b) CH_3 $CH(Cl)$ CH_3
(c) CH_3 CH $(CH_3)_2$ (d) CH_3 $CHCH$ CH_3

38) Electrolysis of aqueous sodium succinate yields.
(a) ethane (b) ethene (c) ethyne (d) None of these
(b)

39) Calcium oxide was heated with carbon at 3000°C, and the obtained product was reacted with water, final product is:
(a) ethane (b) ethene (c) ethyne (d) C + H_2O

Answer:

1)	b)	**2)**	b)	**3)**	b)	**4)**	c)	**5)**	c)
6)	a)	**7)**	d)	**8)**	c)	**9)**	d)	**10)**	c)
11)	b)	**12)**	c)	**13)**	b)	**14)**	c)	**15)**	c)
16)	b)	**17)**	a)	**18)**	d)	**19)**	a)	**20)**	a)

21)	a)	**22)**	c)	**23)**	a)	**24)**	a)	**25)**	a)
26)	b)	**27)**	b)	**28)**	c)	**29)**	b)	**30)**	c)
31)	a)	**32)**	b)	**33)**	a)	**34)**	d)	**35)**	
36)	a)	**37)**	d)	**38)**	b)	**39)**	c)		

Short Questions & Answers

Q1: What is modern definition of organic chemistry?

Answer

Organic chemistry is the branch of chemistry which deals with the study of compounds of carbon and hydrogen and their derivatives.

Q2.a) What is Petroleum?

A black thick oily liquid seeps out of the ground is called petroleum.

b) What is coal?

Answer

Coal is an organic compound which yields coke and coal tar on destructive distillation.

Q3: What do you know about the origin of petroleum?

Answer

Nothing definite can be said about the origin of petroleum. The word petroleum is derived from the Latin words 'petra' meaning rock and 'oleum' meaning oil. It is also called mineral oil. It formed millions of years ago when large seas of years earth was covered by sea water they said creatures died and sank to the sea and decay and decaying result in formation of petroleum.

Q4. What are plankton?

Answer

Plankton are the tiny sea creatures includes phytoplankton meaning drifting plants and ZOO plankton meaning drifting animals.

Q5: Which countries have biggest deposits of petroleum name them.

Answer

These include Saudi Arabia, Iran, Iraq, Kuwait, Libya, Russia, Mexico's, Nigeria, USA and Venezuela.

Q6. What is refining?

Answer

I.e process of separating petroleum into useful fractions and removal of undesirable impurities is called refining.

Q7. What is fractional distillation?

Answer

The process in which various fractions are separated according to the difference in their boiling points and it comprises evaporation and condensation is called fractional distillation.

Q8. What is Neutralization?

Answer

It is the first step in the refining process in which crude oil is washed with acidic or basic solution then oil is heated in an electrical furnace above 400o° and the vapour are fed in to a trial fractionation tower.

Q9 a)Give uses of petroleum gas?

Answer

Petroleum gases are liquefied and sold as bottled gas for cookers and stoves.

b) Give the names of refineries of Pakistan.

Answer

These are:

i) Attock oil refinery. ii) Pakistan oil refinery.

iii) National oil refinery iv) NPL – Arab refinery

Q10: What is natural gas?

Answer

It is a mixture of low boiling hydrocarbons major portion of the natural gas is methane (CH4 about 80%). In Pakistan vast reserves of gas at Sui in Baluchistan, Sindh and Punjab.

Q11: Define fermentation.

Answer

The production of chemicals by the action of microorganisms is called fermentation.

Q12: Briefly describe destructive distillation of Coal.

Answer

Organic chemistry is the branch of chemistry which deals with the study of compounds of carbon and hydrogen and their derivatives.

Q13: Briefly discuss the uses of organic compounds.

Answer

They are used as food i.e. proteins, fats, clothing i.e. paints, power and transportation.

i.e. natural gas, petroleum products etc.,

Q14. Briefly explain Bucky balls.

Answer

Bucky balls named it after an architect Buckminster, who designed a Bucky balls shaped building in Manhattan. Bucky balls are used as semi-conductor and lubricants. They have carbon atom ranging from forty to hundred. The carbon atoms are arranged in a hollow cage like structure.

Q15: Define functional group. Give example.

Answer

A functional group is an atom or group of atoms in a molecule that gives the molecule its characteristic chemical properties. Example: –Cl, –Br, –OH.

Q 16 Define sublimation.

Answer

The process in which the solids directly changes into vapours without undergoing liquid phase is called sublimation.

Q17: What are terpenoids?

Answer

A large class of natural products consisting of isoprene units are called terpenoids.

Q18: Define homologous series.

Answer

A homologous series is the series of compound in which adjacent members differ by CH2 group and molecular mass 14.

CH_4 – CH_3	(Ethane)
CH_3 – CH_2 – CH_3	(Propane)
CH_3 – CH_2 – CH_2 – CH_3	(Propane)
CH_3 – CH_2 – CH_2 – CH_2 – CH_3	(Propane)

Q20: How carbon and hydrogen are detected in organic compounds?

Answer

Carbon and hydrogen can be detected by heating small amount of organic compound with CuO in a glass test tube and then passing obtained gases through dry $CuSO_4$ & lime water.

Q21: How nitrogen is detected in organic compound?

Answer

Take one portion of Lassaigne's filtrate, a few drops of NaOH is added to make it alkaline, then freshly prepared ferrous sulphate is added to it. The solution is boiled to 5 ml. The solution is boiled and a few drops of ferrous sulphate and HCl are added to it. The appearance of blue or greenish blue (Prussian blue) colour or ppt proves the presence of nitrogen in organic compound.

Q22: Give sulphur test for the identification of sulphur

Answer

The second portion of Lassaigne's filtrate is acidified with acetic acid and boiled for equal H2S gas which turns lead acetate the presence of sulphur in the compound.

Q23: Give sodium test for the identification of halogens.

Answer

A third portion of Lassaigne's solution is boiled with nitric acid to expel carbonate and sulphide ion and the Ag NO3 solution is added. The formation of precipitate shows the presence of the halogen. a white ppt. Soluble in NH4OH shows the presence of chlorine a pale yellow ppt partially soluble in NH4OH shows the

presence of chlorine a pale yellow ppt partially soluble in NH4OH shows the presence of bromide and a deep yellow ppt insoluble in NH4OH indicates iodine.

Q24: Give copper wire test (Beilstein's Test)

Answer

The copper wire flattened at one end heated in the oxidizing burner flame till it ceases to impart any green colour to the flame. A small quantity of substance under investigation is now taken on the flattened end of the wire which is re-inserted in the Bunsen flame, upon heating for a while, the halogen present in the substance is converted to a volatile copper halide which imparts blue or green color to the flame. A substance like urea which contains no halogen also colors the flame green.

Q25: How oxygen is detected in the inorganic compound?

Answer

The substance is heated alone in a dry test tube, preferably in an atmosphere of nitrogen. Formation of droplets of water on cooler parts of the tube obviously shows the presence of oxygen.

Q26: How phosphorus is detected in the organic compound?

Answer

The solid substance is heated strongly with an oxidizing agent such as concentrated nitric acid and mixture of sodium carbonate and potassium nitrate. The residue is extracted with water, boiled with some nitric acid, and then a hot

solution of ammonium molybdate is added to it in excess. A yellow coloration of precipitate indicated the presence of phosphorus.

Q27: How metals are detected in organic compounds?

Answer

The substance is strongly heated in a crucible, preferably of platinum. till all reaction ceases. An incombustible residue indicated the presence of a metal in the substance. The residue is extracted with dilute acid and the solution is tied for the presence of metals. radical by the usual scheme employed for inorganic salts.

Q28: What is oxidation?

Answer

The loss of electrons or the gain of oxygen to a compound is called oxidation.

For Example:

$$Fe^{2+} \longrightarrow Fe^{3+} \text{ and } Fe + O_2 \longrightarrow FeO$$

Q29: What is reduction?

Answer

The gain of protons or hydrogen and the loss of oxygen to a substance is called reduction.

Q30: What are volatile substances?

Answer

Those substances which have very low boiling or melting point are called volatile substances. E.g. ether, petrol etc.

Q31: What are precipitates?

Answer

The solid crystals which are left when the substance is extensively boiled.

Q32: What is oxidizing agent?

Answer

Those substances which add electrons or oxygen to a substance are called oxidizing agent. Examples are KMnO4, K2Cr2O7 etc.

Q33: What is reducing agent?

Answer

Those substances which added protons or hydrogen or remove oxygen from a substance are called reducing agents. Example: H2C2O, NH3, NH2Cl etc.

Q34: What are anhydrous compounds?

Answer

Those compounds which remove are called anhydrous compounds.

Q35: What is Whole?

Answer

The residue which left when the substance or liquid is passing through the filter paper is called filtrate.

Q36a) What is use of Quinine? And how it is obtained.

Answer

Quinine is used as antimalarial and antipyretic medicine. It is obtained from the quinine tree.

b) What is use of Nicotine? And how it is obtained?

Answer

Nicotine is used as insecticide. It is obtained from tobacco.

Q37: What is use of Menthol? And how it is obtained?

Answer

It is used as dilation of the capillaries and an increase in blood circulation. It is obtained from the mint i.e. Mentha species.

Q38: What is Rutin? And how it is obtained?

Answer

Rutin is used for the treatment of capillary fragility. It is obtained from citrus species

e.g. orange, grapefruit etc.

Q39: What is use of cocaine? And how it is obtained?

Answer

Cocaine is used as an anesthetic. It is obtained from coca plant.

Q40: What is use of caffeine? And how it is obtained?

Answer

Caffeine is CNS stimulant. It is obtained from tea, coffee and coca.

Q41: What is use of Bromelain? And how it is obtained?

Answer

Bromelain is anti-inflammatory drug. It is obtained from pineapple.