CARBON AND ITS COMPOUND

1.Write the atomic number and electronic configuration of carbon.
Atomic number:Z=6
Electronic configuration: $1S^2 2S^2 2P^2$ K L M N
2 4 - -
Valence electrons of carbon is :4
Valency of carbon is :+4

2.Why carbon is unique? Or Why carbon is versatile in nature?
The main 2 reasons are a)Tetravalency b)Catenation

3.What is tetravalency?
Tetra means 4 and valency means having 4 electrons.

4.Why we think carbon is special in a 14^{th} group of a periodic table?
Elements that belongs to 14^{th} group has valency 4 eventhouh carbon is special because due to smaller size than remaining elements in that group and also 4 valence electrons.

5.What is covalent bond?
The bond formed due to the sharing of electrons is called covalent bond.

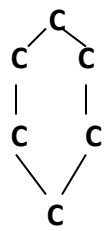
6.Why the elements gain or lose electrons?
Because to attain noble gas configuration.

7.Why carbon forms covalent bond?
Reason 1:It cannot gain four electrons because 6 protons cannot hold 10 electrons.
Reason 2: It cannot lose 4 electrons because it size is small so nucleus holds the valence electrons so it can't lose 4 electrons.
So C^{+4} or C^{-4} is not possible. Hence no ions are not formed and so no ionic bonds.
Here the carbon shares the electrons with other element so it forms covalent bond.

8.What is catenation?
The interconnecting bond between carbon- carbon and other atoms in the from of chain is called catenation.
a)Straight chain: -C – C – C – C –

b)Branched chain:

C)Closed chain:



9.Name two elements that exhibit catenation.
Carbon(long chain upto 60 carbon atoms) and silicon(chain upto 7 silicon atoms).

10.Why does carbon exist in large number of compounds?
Due to nature of covalent bond.

11.Wrtite the properties of covalent compound.
a)Covalent bonded molecules have strong bonds with in the molecule.
b)They have small inter molecular forces.
c)They have low MP and BP
d)They do not form charged particles.
e)They are generally poor conductor of electricity.

12.Why covalent compounds have low MP and BP?
Because due to small inter molecular forces.

13.Why covalent compounds do not form charged particles?
Because electrons are shared between atoms.

14.Explain the formation of hydrogen molecule.
The atomic number of hydrogen is 1.It has one electron in its K shell and requires one more electron to fill the K shell.Two hydrogen atoms share their electrons to form a molecule of hydrogen.

15. Explain the formation of Chlorine molecule.
The atomic number of hydrogen is 17.It has seven electrons in its L shell and requires one more electron to fill the L shell.Two chlorine atoms share their electrons to form a molecule of chlorine.

16.Write the formation of Flourine molecule.

17.Write the formation of Oxygen molecule.

18.Write the formation of Nitrogen molecule.

19.Write the electron dot structure of NH_3 molecule.

20.Write the electron dot structure of Methane.

21. Write the electron dot structure of CO_2.

22. Write the electron dot structure of Ethane.

23. Write the electron dot structure of Ethene.

24.What are hydrocarbons?
The organic compounds having only carbon and hydrogen are called hydrocarbons.

25.What are saturated hydrocarbons?
The organic compounds which contains single covalent bonds between carbon atoms are called saturated hydrocarbon.
Eg:Alkane

25. What are Unsaturated hydrocarbons?
The organic compounds which contains double or triple covalent bonds between carbon atoms are called unsaturated hydrocarbon.
Eg:Alkene and Alkyne.

26.What are alkanes?

The hydrocarbon which is saturated are called alkanes.

"ane" means single bond.

Between carbon atoms there will be a single bond.

Their general formula is C_nH_{2n+2}.

27.Complete the following.

Sl No	Name	Formula	Structure
1	Methane	CH_4	
2	Ethane	C_2H_6	
3	Propane	C_3H_8	
4	Butane	C_4H_{10}	
5	Pentane	C_5H_{12}	
6	Hexane	C_6H_{14}	

28.Which is the simplest form of hydrocarbon?Why?
Methane
Because it has least number of carbon atoms.

29. What are alkenes?
The hydrocarbon which is unsaturated are called alkenes.
"ene" means double bond.
Between any 2 carbon atoms there will be a double bond.
Their general formula is C_nH_{2n}.

30. Complete the following.

Sl No	Name	Formula	Structure
1	Ethene	C_2H_4	
2	Propene	C_3H_6	
3	Butene	C_4H_8	
4	Pentene	C_5H_{10}	

31.Why the first member of alkene is Ethene not methene?
Because since meth contains only one carbon atom we cannot write double between carbon and hydrogen atom.

32. What are alkynes?
The hydrocarbon which is unsaturated are called alkynes.
"yne" means triple bond.
Between any 2 carbon atoms there will be a triple bond.
Their general formula is C_nH_{2n-2}.

33.What are cyclic hydrocarbon or cycloalkane?

Alkanes in which carbon atoms are connected with each other in the form of a ring.

Eg:Cyclopropane , Cyclobutane , Cyclopentane , Cyclohexane.

34.Write the structure of :

Cyclopropane	Cyclobutane
Cyclopentane	Cyclohexane

35. Complete the following.

Sl No	Name	Formula	Structure
1	Ethyne	C_2H_2	
2	Propyne	C_3H_4	
3	Butyne	C_4H_6	

36.Write the differences between saturated and unsaturated hydrcarbons

Saturated	Unsaturated
1.They have single bond	1.They have double or triple bond
2.They are less reactive	2.They are more reactive

37.What are aromatic hydrocarbon?

The hydrocarbon which gives plesant smell are called aromatic hydrocarbon.

Eg: Benzene- C_6H_6

38.What are structural isomers?

The organic compound having same molecular formula but different structural formula are called structural isomers.

Eg1: Butane – 2 isomers

a)Normal butane –C_4H_{10} **b)Isobutane - C_4H_{10}**

Eg2:Pentane-3 isomers

a)Normal pentane –C_5H_{12} **b)Isopentane- C_5H_{12}**

c)Neopentane- C_5H_{12}

39.What are functional groups?

Hydrocarbons in which one or more hydrogen atoms have been replaced by atoms or group of atoms of other elements are called functional groups.

These functional groups decides the chemical properties of organic compound.

40.Name the five functional groups.
a)Haloalkanes b)Alcohol c)Aldehyde d)Carboxylic acid e)Ketone

41.What are heteroatoms?
The organic compound along with carbon and hydrogen other elements are also present .Those are called

heteroatoms.
Eg: N_2 , O_2 , F , Cl etc.

42.Write groups , groups name , class of organic compound and heteroatoms.

Groups	Groups name	Class of organic compound	Heteroatoms
-Cl -Br	Chloro group Bromogroup	Haloalkane	Cl Br
-OH	Alcoholic group	Alcohols	Oxygen
-CHO	Aldehydic group	Aldehydes	Oxygen
-COOH	Carboxylic group	Carboxylic acids	Oxygen
-CO	Ketonic group	Ketones	Oxygen

43.What are homologous series?
A series of same organic compound having a difference of $-CH_2$ between successive members are called homologous series.

Eg:Methane- CH_4	**Ethene-C_2H_4**
Ethane $-C_2H_6$	**Propene- C_3H_6**
Propane-C_3H_8	**Butene $-C_4H_8$**
Butane – C_4H_{10}	**pentene- C_5H_{10}**

44.Write the molecular and structural formula of members of alcohol.
a)Methnol or Methyl alcohol **b)Ethanol or Ethyl alcohol**

c)Propanol or propyl alcohol **d)Butanol or Butyl alcohol**

45. Write the molecular and structural formula of members of aldehyde.

a)Methanal or methanaldehyde **b)Propanal or propanaldehyde**

c)Butanal or butanaldehyde **d)Pentanal or pentanaldehyde**

46. Write the molecular and structural formula of members of carboxylic acid.

a)Methanoic acid **b)Propanoic acid**

c)Butanoic acid **d)Pentanoic acid**

47.Write the structure of the following:

a)Bromopentane

b)Butanone

c)Hexanal

d) Propanone

e)Bromopropane

f) Chloropropane

48.How would name the following compounds?

a)CH_3- CH_2- CH_3- Br

b)CH_3 –CH_2- CH_2-OH

c) CH_3-CH_2-CHO

d) CH_3-CH_2-CH_2-COOH

e) CH_3-C –CH_2-CH_3

f)CH_3-CH = CH_2

49.What is combustion reaction?Give example.

The reaction of burning of organic compound in presence of oxygen to get CO_2 , water vapour , heat and light is called combustion reaction.

Eg1: $CH_4 + O_2 \rightarrow CO_2 + H_2O$ + heat + light

Eg2: $C_2H_5OH + O_2 \rightarrow CO_2 + H_2O$ + heat + light

*** Whenever sataurated hydrocarbon undergoes combustion it produces a blue flame**

*** Whenever Unsataurated hydrocarbon undergoes combustion(incmplete) it produces a yellow sooty flame.**

50.What is Oxidation reaction?Give example.

A reaction of adding of oxygen or removal of hdrogen by using a oxidising agent is called oxidation.

Eg: Conversion of ethanol into ethanoic acid

Ethanol is converted into ethanoic acid by using alkaline potassium permogonate or alkaline potassium dichromate as a oxidising agent to get ethanoic acid is called oxidation.

$$CH_3CH_2OH \xrightarrow{\text{Alk KMnO4/Alk } K_2Cr_2O_7} CH_3COOH$$

In this reaction hydrogen is removed and oxygen is added.

51.Is combustion reaction can be called as oxidation reaction?

Yes , because combustion reaction takes place in presence of oxygen.

52.What is oxidising agent?

The substance which help for oxidation to occur is called oxidising agent

53.What is Addition reaction?Give example.

It always takes place for unsaturated hydrocarbon.

When hydrogen is passed through unsaturated hydrocarbon in presence of Nickel as catalyst to get saturated hydrocarbon is called addition reaction. Only Unsaturated hydrocarbon undergoes Addition reaction

$$\underset{\text{(Ethene)}}{C_2H_4} + H_2 \xrightarrow{\text{Ni as Catalyst}} \underset{\text{(Ethane)}}{C_2H_6}$$

54.What is catalyst?

The substance that increases the speed of the reaction.

55.What is hydrogenation of oil?

The process of passing of hydrogen through unsaturated vegetable oil in presence of Nickel as catalyst to get saturated hydrocarbon vanaspathi(dalda) is called hydrogenation of oil.

It is done to increase the shelf life of oil.

But saturated hydrocarbon is not good for health.

56.What is substituition reaction?Give example.

The reaction in which one atom is replaced by another atom or one element is replaced by another element is called substituition reaction.Only saturated hydrocarbon undergoes substituition reaction.

$$CH_4 + Cl_2 \xrightarrow{\text{Sunlight}} CH_3Cl + HCl$$

When methane reacts with chlorine in presence of sunlight to chloromethane and hydrochloric acid.

Here hydrogen is replaced by chlorine.

57.Write some physical properties of ethanol.

a)It is liquid at room temperature. b)It is commonly called as alcohol(Used in medicine , cough syrup, cold syrup, drinking purpose) c)pure ethanol are called as absolute alcohol.

58.What happens when Ethanol reacts with Sodium?

When Ethanol reacts with sodium it forms Sodium Ethoxide and hydrogen.

$$2C_2H_5OH + 2Na \longrightarrow 2C_2H_5ONa + H_2$$

(Sodium Ethoxide)

59.Explain dehydration of alcohols.

A reaction in which Ethanol is heated to a temperature of 443K in presence of conc H_2SO_4 as dehydration agent to get unsaturated hydrocarbon and water is called dehydration of alcohols.

$$CH_3CH_2OH \xrightarrow[443K]{Conc H_2SO_4} C_2H_4 + H_2O$$

60.What is dehydrating agent?

The substance which removes water from ethanol to form ethene is called dehydrating agnet.

61.Write some physical properties of Ethanoic acid.

a)The MP of pure Ethanoic acid is 290K.

b)Adding 5 – 8% of ethanoic acid to water is called vinegar(used as preservatives).

c)At 290K Ethanoic acid freezes during winter due to cold climate so it is called as glacial acetic acid.

62.What happens Ethanoic acid reacts with base?

Ethanoic acid reacts with sodium hydroxide to form sodium acetate and water.

$$CH_3COOH + NaOH \longrightarrow CH_3COONa + H_2O.$$

63.What happens when Ethanoic acid reacts with metal carbonate?

Ethanoic acid reacts with metal carbonate to form salt , water and CO_2.

$$2CH_3COOH + Na_2CO_3 \longrightarrow 2CH_3COONa + H_2O + CO_2$$

64. What happens when Ethanoic acid reacts with metal bicarbonate?

Ethanoic acid reacts with metal bicarbonate to form salt , water and CO_2.

$$CH_3COOH + NaHCO_3 \longrightarrow CH_3COONa + H_2O + CO_2$$

65.What is Esterification?

A reaction between Ethanol and Ethanoic acid in presence of Conc H_2SO_4 to form esters and water.

$$CH_3COOH + C_2H_5OH \longrightarrow CH_3COOCH_2CH_3 + H_2O$$

(Esters)

Uses:Used in making perfumes and used as flavouring agent.

66.What is Saponification?

The reaction opposite to esterification is called saponifiction.It is used in making soaps.

$$CH_3COOCH_2CH_3 \xrightarrow{NaOH} CH_3COONa + CH_3CH_2OH$$

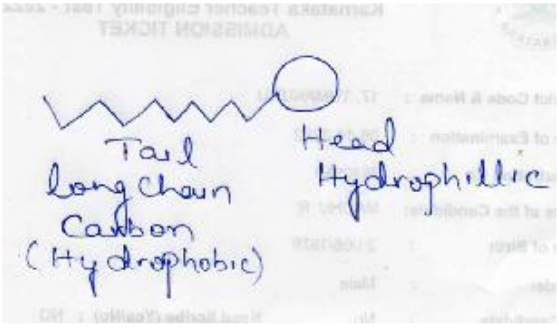
67.What are Soaps?

The organic compounds of sodium or potassium salts of long chain Carboxylic acids is called soaps.

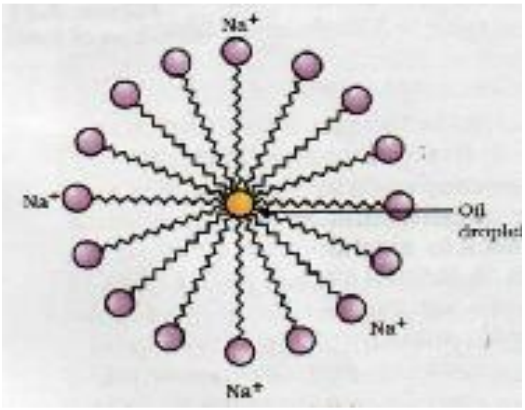
Eg:$C_{17}H_{35}COONa$

68.Explain the Cleansing action of soap.

a) Soap molecule:



b)Soaps molecules are arranged in one pattern such a way that all tails gets attached to dirt and all heads faces outwards called micelle.



c)Again when micelle containing cloth flushed with water.Since head has more attraction with water , water takes away head , head takes away tail , tail finally takes away dirt from clothes.

69.Why soaps donot work in hard water?

Because hard water contains Ca and Mg ions.So soap form scum with Ca and Mg ions.

$C_{17}H_{35}COONa + Ca^{2+} \longrightarrow (C_{17}H_{35}COO)Ca + Na^{+}$

Scum

70.What is detergent?

A powder sodium salt of sulphonic acid.

Detergent can be used in both hard and soft water because they do not form scum with hard water.

71.Even though detergent has more advantage than sopa use of detergent is not recommended?

Because detergents are non biodegradable and hence it pollute land and water.

72.Does methane undergo addition reaction?

No , because methane is saturated hydrocarbon.Only unsatuarted hydrocarbon undergoes addition reaction.

73. Write the chemical difference between ethanol and ethanoic acid.

Ethanol	Ethanoic acid
1.It shows no reaction with sodium bicarbonate	1.It gives brisk effervesence with sodium bicarbonate and produce CO_2

74.Write the differences between saponification and esterification

Saponification	Esterification
1.A process of preperation of soap	1.A process of preparation of ester from a carboxylic acid and an alcohol
2.End products are carboxylate ions and alcohol	2.End products are ester and water
3.The reaction doesnot requires heat energy	3.The reaction requires heat energy
4.The catalyst involved here is base(NaOH)	4.The catalyst involved here is acid(H_2SO_4)

75.Even though detergent is more advantegeous than soap , but use of detergent is not recommended.Why?
Because detergent is non biodegradable substance so it causes both land and water pollution.

76. Write the differences between soaps and detergents.

Soaps	Detergents
1.Soap is a sodium or potassium salts of long chain carboxylic acids	1.Detergent is a sodium or potassium salts of long chain of sulphonic or benzoic acids
2.It causes less pollution	2.It causes more pollution
3.It gives lather only with soft water	3.It gives lather with both soft and hard water
4.It forms an insoluble scum with hard water	4.They donot form insoluble scum with hard water

77.Give a test which is used to differentiate chemically between butter and cooking oil.
Take small amount of butter and cooking oil in different test tubes and addd bromine water to both test tubes.
a)Cooking oil decolourises bromine water, so it is unsaturated compound
b)Butter doesnot decolurises bromine water , so it is saturated compound.

78.Give examples for the following :
a)Catalyst: Nickel and Palladium b)Dehydrating agent: Concentrated H_2SO_4

b)Oxidising agnet:Alkaline potassium permogonate($KmnO_4$) or Acidified potassium dichromate.

79.The molecular formula of three fatty acids A, B and C present in oil and fat is $C_{14}H_{29}COOH$, $C_{15}H_{29}COOH$ and $C_{16}H_{29}COOH$.(i)Which of these is derived from alkane , alkene and alkyne?(ii)Which of them becomes rancid earlier?(iii)How can we increase its shelf life?
(i)$C_{14}H_{29}COOH$: A is alkane bcz its general formula is C_nH_{2n+2}
$C_{15}H_{29}COOH$: B is alkene bcz its general formula is C_nH_{2n}
$C_{16}H_{29}COOH$: Cis alkyne bcz its general formula is C_nH_{2n-2}
(ii) Fatty acid C becomese rancid earlier
(iii) By a process called hydrogenation we can increase its shelf life.

80.Can detergent be used to test hardness of wtaer?Give reason.
No , because idetergent gives lather with both soft and hard wtaer.

81.Find the number of
a)single bonds found in the molecular structure of propanal is 8
b)Number of single and double bonds present in the C_2H_5COOH is 9 and 1 .

82.Write the physical differences between ethanol and ethanoic acid.

Ethanol	Ethanoic acid
1.It is commonly called as alcohol	1.It is commonly called as glacial acetic acid
2.It is always present in liquid state	2.It is found as liquid but freezes at winter
3.Its MP is 156K and BP is 351K	3.Its MP is 290K and BP is 391K
4.It has a pleasant smell	4.It has a pungent smell