EXERCISE

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

1) The molecule of ethane possesses which hybridization.

a) Sp^3 b) Sp^2

c) Sp d) Sp^2d

2) The Sp^3 hybrid orbitals are oriented in space at one angle.

a) 109.5^0 b) 180^0

c) 100^0 d) 120°

3) The geometry of acetylene is,

a) angular b) bent

c) triangular d) linear

4) Which reaction is used as test for the presence of alkane;

a) reaction of cold diluted alkaline KMn04 b) combustion

c) polymerization d) catalytic hydrogenation

5) The general formula of alkane is

a) CnH2n42 b) CnHn

c) CnH2n d) CnH2n-2

6) Soda lime is:

a) NaOH b) KOH

c) Mixture of Na & Ca hydroxide d) CaO and NaOH

7) The marsh gas is:

a) Ethane b) Methane

c) Propane d) Butane

8) Acidic hydrogen is present:

a) Acetylene b) Ethane

c) Benzene d) Ethene

9) The benzene molecule contains:

a) three double bonds b) two double bonds

c) one double bond d) delocalized

10) **The electrophile in aromatic sulphonation is:**

a) H_2SO_4 b) HSO_4

c) S03 d) SO-4

11) **The conversion of n — hexane into benzene by heating in the presence of pt is called:**

a) isomerization b) aromatization

c) dealkylation d) rearrangement

12) **Catalyst used for Friedel Craft's reaction is:**

a) HNO_3 b) $AlC1_3$

c) $BeC1_3$ d) NaCl

13) **Benzene cannot undergo:**

a) Elimination b) Substitution

c) Oxidation d) Addition

14) **Shape of benzene molecule is:**

a) pyramidal b) linear planer

c) trigonal d) hexagonal planer

15) **In which one of the following compounds the benzene ring is isolated:**

a) Naphthalene b) Anthracene

c) Phenanthrene d) Diphenyl methane

16) **Two compounds have the Same composition and also have the same atoms attached to the same atoms, although with different orientations in space. These compounds are:**

a) Identical b) position isomer

c) structural d) stereoisomerism

17) **The isomers of a substance must have:**

a) same chemical properties b) same molecular weight

c) same structural formula d) same functional groups

18) **Ethanol and dimethyl ether are best considered.**

a) structural isomers b) stereoisomers

c) enantiomers d) Diastregronus

19) **Alkanes show geo-metrical isomers due to:**

a) Asymmetry b) Rotation around a single bond c)Resonance d) Restricted rotation around a double bond

20) A molecule is said to be chiral:

a) If is contains plane of symmetry

b) If it contains center of symmetry

c) If it cannot be superimposed to its mirror image

d) If it can be superimposed on its mirror image

21) Geometrical isomerism is shown by:

a) Lactic acid b) maleic acid

c) I – butene d) 1, 1 dichotomy ionic

22) Which of the following statements is false regarding compound?

a) rotate the plane of polarized light b) have cis and trans isomers

c) exist as enantiomers d) can be detected with a polarimeter

23) An optically active compound:

a) must contain at least four carbon

b) when in soluble rotate the plane of polarized light

c) must always contains an asymmetric carbon atom

d) in solution always give a negative reading in polarimeter

24) Plane polarized light is affected by:

a) identical molecules b) all polymers

c) chiral molecule d) all biomolecules

25) It is possible to distinguish between optical isomers.

a) by using chemical tests b) by mass spectrometry

c) by I R spectroscope d) by polarimetry

Answer

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

21)	b)	22)	b)	23)	d)	24)	c)	25)	d)

Q2. Give short answers of the following questions.

Q1. Why carbon is sp³ hybridized in the compounds?

Answer

The electronic configuration of c in ground state is

C = 6 - $\overset{\uparrow\downarrow}{1s}\ \overset{\uparrow\downarrow}{2s}\ \overset{\uparrow}{2px}\ \overset{\uparrow}{2py}$ 2pz and in excited state, it is

C = 6 = $\overset{\uparrow\downarrow}{1s}\ \overset{\uparrow}{2s}\ \overset{\uparrow}{2px}\ \overset{\uparrow}{2py}\ \overset{\uparrow}{2pz}$

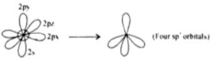
In alkanes and in single bonded carbon compounds every carbon atom in its second shell i.e in 2s. 2p. 2py. 2pz contains one unpaired electron in each orbital when hydrogen atoms or other atoms which one more than carbon atoms surrounds the central atom these four orbitals of 2nd shell mix with each other and produce four equal energy sp3 orbitals. These orbitals stay at equal positions and form tetrahedral shaped compounds.

i.e.

$$C = 6 = \overset{\uparrow\downarrow}{1s}\ \boxed{\overset{\uparrow}{2s}\ \overset{\uparrow}{2px}\ \overset{\uparrow}{2py}\ \overset{\uparrow}{2pz}}$$

Four, sp$_3$ hybrid orbitals

or



Q2. How is pi-bond formed in alkenes and alkynes?

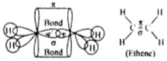
Answer

In alkenes one s and two p-orbitals mix and produce there sp2 hybridized orbitals — leaving one p — orbital unhybridized two such atoms having one unhybridized p-orbital when some closer to each other two sp2 orbitals of two carbon atoms overlap each other and form a sigma bond. Then unhybridized two p — orbitals of two carbon atom overlap over each other and form a pi-bond.

i.e in ground state $C = 6 = \overset{\uparrow\downarrow}{1s}\ \overset{\uparrow\downarrow}{2s}\ \overset{\uparrow}{2px}\ \overset{\uparrow}{2py}\ \overset{\uparrow}{2pz}$

In excited state $C = 6 = \overset{\uparrow\downarrow}{1s}\ \boxed{\overset{\uparrow}{2s}\ \overset{\uparrow}{2px}\ \overset{\uparrow}{2py}}\ \overset{\uparrow}{2pz}$

Three sp^2



In alkynes

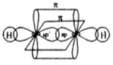
In alkynes in 2nd — shell of carbon (initsexted — state) one exited atom mixes with one — p orbital and produce two sp hybridized orbitals leaving two p — orbitals unhybridized in each carbon. When these two carbon atoms come closer to each other sp of one atom overlaps on sp of other atom and there is formed one — sigma bond than two p- orbitals of one atom overlap on two p-orbitals other carbon atom and form two pi-bonds. As a result an alkyne is formed. For example, ethyne (C_2H_2)

i.e in ground state

i.e in ground state $C = 6 = \overset{\uparrow\downarrow}{1s}\ \overset{\uparrow\downarrow}{2s}\ \overset{\uparrow}{2px}\ \overset{\uparrow}{2py}\ 2pz$

and in excited state $C = 6 = \overset{\uparrow\downarrow}{1s}\ \boxed{\overset{\uparrow}{2s}\ \overset{\uparrow}{2px}}\ \overset{\uparrow}{2py}\ \overset{\uparrow}{2pz}$

Two sp



$H - C \equiv C - H$

(one σ and two π - bonds)

Q3. What is cis-trans isomerism?

Answer

Please see answer of Q42 of chapter notes.

Q4. Why alkanes are relatively chemically inert?

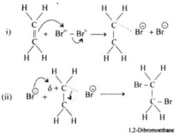
Answer

In alkanes there is sp^3 orbital hybridization in each carbon. One sp3 orbital of when overlaps on sp^3 orbitals of adjacent atom there is formed a very strong sigma bond of very low energy such a sigma bond is very strong and may only be decomposed at very high energy. That is why alkanes one very stable and least reactive at room temperature.

Q5. Alkenes usually undergo addition reactions while alkanes do not why?

Answer

In alkenes there is one exposed pi-bond which is very reactive. Because this exposed pi-bond may attack at positive or partial positive charge of an electrophile



Whereas in alkanes there are strong low energy sigma bonds which are nearly inert and do not take part in any reactions easily.

Q6. What is stereoisomerism?

Answer

Please see answer of short questions of Q44 (b) of chapter notes.

Q7. How optical isomers arise?

Answer

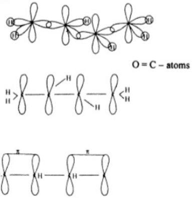
Please see answer of short questions of Q44 (d) of chapter notes.

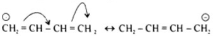
Q8. How are conjugated bonds formed?

Answer

In a molecule in which there are left unhybridized p — orbitals on adjacent at least three c — atoms the molecule is called a conjugated molecule. These adjacent p — orbitals are responsible for resonance.

For example; 1,3-Butadiene





$$\overset{\circ}{C}H_2 = CH - CH = CH_2 \leftrightarrow CH_2 - CH = CH - \overset{\ominus}{C}H_2$$

Q9. Why alkenes are more reactive than alkynes?

Answer

In alkenes there is one pi-bond which is exposed and may attack at any positive or partial positive charge therefore very reactive.

Whereas i alkynes there are two pi-bonds which form a new cylindrical shaped orbital which is lesser reactive as compared to alkenes.

Q10. Justify the given order of reactivity?

Answer

Alkenes have exposed pi-bond which may attack at any electrophilic center. Therefore, it is most reactive.

In alkynes there are two pi-bonds around one sigma bond these two pi-bonds form a cylindrical shaped orbital which is stable and lesser reactive.

Whereas in alkanes there are c — c very stable low energy sigma — bonds which are least reactive.

Q11. What is meant by dehydration?

Answer

Dehydration means removal of water dehydration of alcohols is a temperature dependent reaction which gives different products

For Example

$$2CH_3 - CH_2 - OH \xrightarrow[H_2SO_4]{140^0C} CH_3 - CH_1 - O - CH_2 - CH_3 + H_2O$$

(Ethen)

$$2CH_3 - CH_2 \xrightarrow[H_2SO_4]{180^0C} CH_2 = CH_2 + H_2O$$

|

OH

(Alekene)

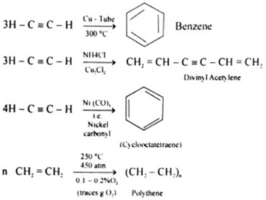
Q12. What are polymerization reactions?

Answer

(Poly = more than one f meros = pieces)

Attachment of large number of small molecules to give a bigger molecule is called polymerization type of product of a polymerization of alkenes and alkynes depend upon the condition of the reaction like temperature, pressure and catalyst.

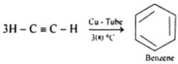
For Example



Q13. How will you convert acetylene into benzene?

Answer

Conversion of acetylene into benzene

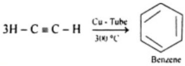


Q14.What is resonance?

Answer

Shifting of pi-electrons from one position to another position is called resonance.

For example: In I, 3 — butadiene



Q15. What is resonance energy?

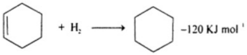
Answer

Resonance Energy

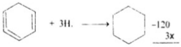
On hydrogenation of a conjugated molecule the difference between obtained actual energy and expected energy is called resonance energy.

For Example: heat of hydrogenation of cyclohexene is — 120 KJ mole-

i.e.



Now, of we consider benzene as cvclohexatriene, and calculate expected energy.



Expected Energy = -360

But actual obtained energy = -208

Difference of Energy (Resonance Energy) = -152

The difference of these two energies i.e. — 152KJ mole-l is called resonance energy.

Q3. Give detail answers of the following questions.

Q1 What is isomerism? Explain different types of isomerism?

Answer

Please see answer of question 38 and 39 of this chapter.

Q2a) How will you prepare 1 — butane from?

i) An alkylhalide **ii) Alcohols**

iii) Electrolysis of salt **iv) Vic - dihalides**

b) What products is formed when n-propane undergo following reactions?

i) Combustion **ii) Nitration**

Answer a)

i) Preparation of I — butane from alkyl halide

$CH_2 - CH_2 - CH_2 - CH_3 + KOH \rightarrow CH_2 = CH - CH - CH_2 - CH_3 + Kbr + H_2O$

|

Br

1 — butene from an alcohol

$CH_2 - CH_2 - CH_2 - CH_3 \xrightarrow{75\%\ H_2SO_4} CH_2 = CH - CH - CH_2 - CH_3 + H_2O$

|

175⁰C

OH

iii) 1 — butene from Electrolysis of salt

$CH2 - COONa$ CH_2

| $+2HO \xrightarrow{Elec}$ | |

$CH - COONa$ $CH + 2NaOH$

| |

CH_2 $CH_2 + 2CO_2$

| |

CH_3 $CH_3 + H_2$

iv) 1 — butane from vic — dihalide

$CH_2 - CH_2 - CH_3 - CH_3$

| | $+2KOH \rightarrow CH_2 = CH - CH_2 - CH_3$

C C (alc)

$+2KCL$

$+2H_2O$

Answer b)

i — Combustion of n — propane

$CH_3 - CH_2 - CH_3 + HNO_3 \xrightarrow{H_2SO_4}$

$CH_3 - CH_2 - CH_2 - NO_2$

$+CH_3 - CH_2 - NO_2$

$+CH_3 - NO_2 + H_2O$

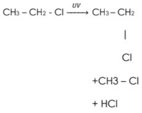
These all are possible products present as mixture

Q3.a) When ethane reacts with C12 in UV light the mixture of products is formed. Give the detail of reaction with mechanism and all types of products.

b) A compound when treated with Zn in methanol, the alkene is formed. When alkene is ozonolysed the acetaldehyde is formed as the major products. Explain reactions, give name and structure of the compound.

Answer a)

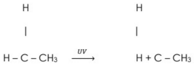
Reactions of ethane with Cl_2 in presence of UV light



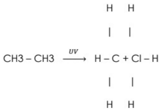
$$CH_3 - CH_2 - Cl \xrightarrow{UV} \underset{\displaystyle Cl}{\underset{|}{CH_3 - CH_2}} + CH3 - Cl + HCl$$

Reaction Mechanism

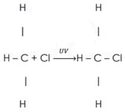
$Cl - Cl \xrightarrow{UV} Cl - Cl$



$$H - \overset{\displaystyle H}{\overset{|}{C}} - CH_3 \xrightarrow{UV} H + \overset{\displaystyle H}{\overset{|}{C}} - CH_3$$



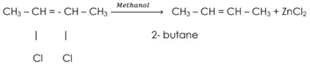
$$CH3 - CH3 \xrightarrow{UV} H - \underset{\displaystyle H}{\underset{|}{\overset{\displaystyle H}{\overset{|}{C}}}} + \underset{\displaystyle H}{\underset{|}{\overset{\displaystyle H}{\overset{|}{Cl}}}} - H$$



$$H - \underset{\displaystyle H}{\underset{|}{\overset{\displaystyle H}{\overset{|}{C}}}} + Cl \xrightarrow{UV} H - \underset{\displaystyle H}{\underset{|}{\overset{\displaystyle H}{\overset{|}{C}}}} - Cl$$

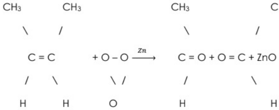
$H_3 - Cl \xrightarrow{UV} H - Cl$

Answer b)



$$CH_3-\underset{Cl}{CH}=-\underset{Cl}{CH}-CH_3 \xrightarrow{Methanol} \underset{\text{2- butane}}{CH_3-CH=CH-CH_3} + ZnCl_2$$

2,3 – dechlorobutane



Q4.a) How will you prove that benzene has cyclic structure?

b) Explain the structure of benzene according to atomic orbital structure.

Answer

a) Please see answer of question 69 and of this chapter.

b) Please see answer of question 79 and of this chapter,

Q5. Explain Friedel Craft acylation and alkylation with complete mechanism.

Answer

For Friedel Craft acylation please see answer of Q80 of this chapter.

For Friedel Craft alkylation please see answer ofQ79 of this chapter.

Q6. Explain the following electrophilic substitution reactions of benzene with mechanism.

i) Halogenation **ii) Nitration** **iii) Sulphonation**

Answer

I) Halogenation

Please see answer of question 73 of this chapter.

II) Nitration

Please see answer of question 76 of this chapter.

III) Sulphonation

Please see answer of question 77 of this chapter.

Q7. Write the structural formulas for the following benzene derivatives:

a) 2, 4, 6 — trinitrophenol

b) 1, 4 — dichlorobenzene

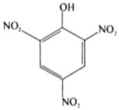
c) 2 — methylbenzene sulphonic acid

d) 2 — hydroxybenzoic acid

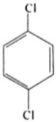
f) 2 — chlorophenylamine

Answer

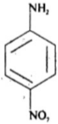
a) 2, 4, 6 – trinitriphenol



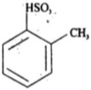
b) 1, 4 – dichlorobenzene



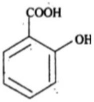
c) 4 – nitrophenylamine



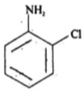
d) 2 — methyl benzene sulphuric acid



e) 2 – hydroxybenzoic acid

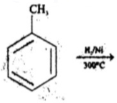


f) 2 – chlorophenylamine

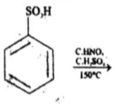


Q8. Predict the major products of the following reactions

a)

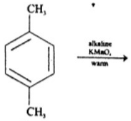


b)

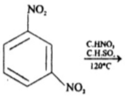


---

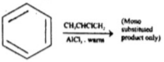
c)



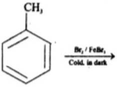
d)



e)

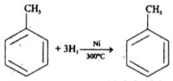


f)



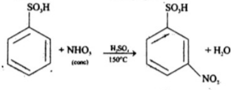
Answers

a)



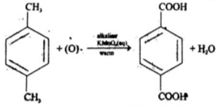
Toluene Methylcyclohexane

b)



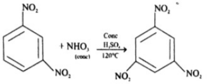
(m - nitro sulphonic benzene)

c)

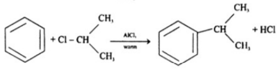


(Terephthalic acid)

d)

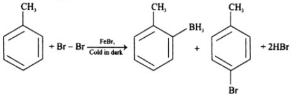


e)



Propane Isoprophyl benzene

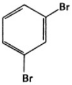
f)



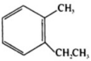
0 - bromo toluene P - bromo toluene

Q9. Name the following benzene derivatives.

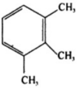
a)



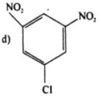
b)



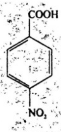
c)



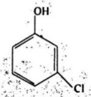
d)



e)

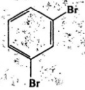


f)



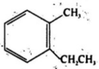
Answer

a)



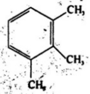
1, 3 – dibromobenzene

b)



2 – ethyltoluene

c)

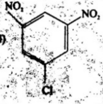


1, 2, 3 – trimethyl benzene

Or

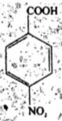
2, 3 – dimethyl toluene

d)



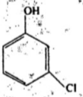
5 – bromo – 3 – chloronitrobenzene

e)



3 – nitrobenzoic acid

f)



Meta – chlorophenol

Multiple Choice Questions

1) Organic compounds which contain carbon and hydrogen only are called:

a) Hydrocarbons
b) Alkanes
c) Olefins
d) Paraffins

2) Those hydrocarbons in which each carbon atom is sp^3 hybridized are called:

a) Unsaturated hydrocarbons
b) Saturated hydrocarbons
c) Both a & b
d) Olefins

3) Those hydrocarbons in which each carbon atom is sp^2 or sp hybridized are called:

a) Saturated hydrocarbons
b) Olefins
c) Unsaturated hydrocarbons
d) none of these

4) Non-benzenoid cyclic hydrocarbons are called:

a) alicyclic hydrocarbons
b) cyclopentene
c) Aromatic hydrocarbons
d) All of these

5) Benzenoid cyclic hydrocarbons are called:

a) alicyclic hydrocarbons
b) cyclopentene
c) Aromatic hydrocarbons
d) none of these

6) The substances which have carbon atoms C 18 to onward are:

a) Waxy solids
b) liquids
c) Semi-solids
d) both bands

7) Non-polar, insoluble in water and contains single bond between C-C are called:

a) Alkenes
b) Alkanes
c) Alkynes
d) both a & b

8) Which are inert toward acids, alkalis, oxidizing and reducing agents under normal condition:

a) Alkenes
b) Paraffins
c) Alkanes
d) both a & b

9) In which bond the electrons are very tightly held between the nuclei:

a) a-bond
b) π-bond
c) ionic-bond
d) both a & b

10) Those alkanes containing sp^3 hybridized C and H atoms connected by s bond is possible with a ring of 3 or more C atoms are called:

a) Aromatic hydrocarbons
b) cycloalkanes
c) alicyclic hydrocarbons
d) All of the above

11) The general formula of cycloalkanes is:

a) C_nH_{2n}
b) C_nH_{2n+n}

c) C_nHn_{2n-n}
d) $C_{n-1}H_{2n}$

12) As canal H atoms have very similar electronegativities and both the C-H and C-C bonds are non-polar thus cycloalkanes are:

a) Reactive
b) Very reactive
c) Not reactive
d) both a & b

13) Those substances which are soluble in water are called:

a) Polar compounds
b) Non-polar compounds
c) Inert compounds
d) isomers

14) Those substances which are not soluble in water are called:

a) Polar compounds
b) Non-polar compounds
c) Inert compounds
d) none of the above

15) Those compounds which are not reactive are called:

a) Inert compounds
b) metallic compounds
c) Ionic compounds
d) covalent compounds

16) The order of Halogen reactivity is:

a) F > Cl > I > Br
b) F > Cl > Br > I
c) Cl > F > I > Br
d) F > Br > Cl > I

17) The half arrow in the reaction mechanism shows the movement of:

a) Single electron
b) Double electron
c) Multiple electron
d) both a & b

18) The reaction in which there is loss of electrons or addition of oxygen is called:

a) Oxidation
b) Reduction
c) both a & b
d) None of the above

19) The reaction in which there is gain of electrons and loss of oxygen is called:

a) Oxidation
b) Reduction
c) Oxidation-reduction
d) both a & b

20) The compounds in which carbon atom is sp^2 hybridized and there is double bond between C-C are called:

a) Alkenes b) Alkanes

c) Alkynes d) Metalloids

21) A process in which a molecule of hydrogen is added to an alkene is called:

a) Acylation b) Hydrogenation

c) Alkylation d) both a& b

22) The removal of hydrogen halide is called:

a) Dehydrohalogenation b) Dehydration

c) Hydration d) Hydrogenation

23) The removal of water from a substance is called:

a) Hydration b) oxidation

c) Dehydration d) both a & b

24) Raney Nickel is prepared by treating a Ni-Al alloy with:

a) Caustic soda b) Soda ash

c) Caustic potash d) NaCl

25) The amount of heat evolved when one of an alkane is hydrogenated is called heat of:

a) Fusion b) Hydrogenation

c) Hydration d) None of these

26) Which process is used for the manufacture of vegetable ghee from vegetable oil.

a) Catalytic hydrogenation b) Halogenation

c) Hydration d) Hydrogenation

27) Markowinkov's rule is the addition of hydrogen halide in which alkene:

a) Symmetrical b) Unsymmetrical

c) Hydrated d) both a & b

28) In Markowinkov's rule the negative part of the adding reagent goes to that carbon which consist:

a) double bond b) least number of hydrogen atoms

c) both a & b

d) None of these

29) The heat of hydrogenation of most alkene is about:

a) 160 KJ mole-l

b) 120 KJ mole-^{1} .

c) 170 KJ mole- l

d) 1 10 KJ mole-l

30) Addition of water. to any substance is called:

a) Hydration

b) Oxidation

c) Halogenation

d) None of these

31) Adding of halogen to alkane, alkynes and alkenes is called:

a) Reduction

b) Esterification

c) Hydration

d)Halogenation

32) Adding of hypohalous acid (HOX) is called:

a) Halohydration

b) Hydration

c) Halogenation

d)None of these

33) The formation of epoxides is called:

a) Ozonolysis

b) epoxidation

c) Hydration

d) Halogenation

34) Which are unstable compounds and are reduced directly on treatment with zinc and H_2O:

a) Ozonide

b) Halide

c) Ketones

d)Aldehydes

35) The process in which small molecules combine together to form large molecules is called:

a) Ozonolysis

b) Polymerization

c) Conjugation

d) Esterification

36) The phenomenon in which compounds have same molecular formula but different chemical structures is called:

a) Isomerism

b) Polymerization

c) Catalysis

d) both a & b

37) A carbon atom which is bonded to four different groups is called an:

a) Symmetric carbon

b) Asymmetric carbon

c) both a & b

d) None of these

38) The compounds in which the carbon atom is sp-hybridized and there is triple bond between C-C are:

a) Alkynes b) Alkanes

c) Alkenes d) both a & b

39) Kekule's structure failed to explain as to why:

a) Benzene is less reactive

b) It has less heat of formation

c) It has equal C-C bonds

d) It shows duel character i.e addition as well as substitution

e) All of the above

40) The possibility of different pairing schemes of valence electrons of atom is called:

a) Resonance structures b) Conjugation

c) Resonance energy d) both a & b

41) Those group which donate electrons toward the benzene ring at other and para positions are called:

a) Ortho and para directing groups b) Meta directing groups

c) both a & b d) None of the these

Answer

1)	a)	2)	b)	3)	c)	4)	a)
5)	c)	6)	a)	7)	b)	8)	d)
9)	a)	10)	b)	11)	a)	12)	c)
13)	a)	14)	b)	15)	a)	16)	b)
17)	a)	18)	a)	19)	b)	20)	a)
21)	b)	22)	a)	23)	c)	24)	a)

25)	b)	26)	a)	27)	b)	28)	c)
29)	b)	30)	a)	31)	d)	32)	a)
33)	b)	34)	a)	35)	b)	36)	a)
37)	b)	38)	a)	39)	e)	40)	a)
41)	a)						

Short Questions & Answers

Q1: What are organic compounds? Give examples.

Answer

The compounds in which basic skeleton is made up of carbon atom and there is C — C chain are called organic: Compounds.

For example, ethyl alcohol, glucose, sugar starch.

Q2: What is difference between saturated and unsaturated hydrocarbons?

Answer

Saturated Hydrocarbons	**Unsaturated Hydrocarbons**
These are the hydrocarbons in which carbon atoms are attach with each other through single bonds. Each carbon atom is Sp^3 hybridized. Alkanes have straight or branched chain.	These are the hydrocarbons in which at least two carbon atoms are attached through double or triple bonds, and sp2 or sp hybridized. For example, alkenes and alkynes.
For Example:	**i) Alkenes or Olefins:**
Pentane (n — chain) $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$	These are the unsaturated hydrocarbons in which at least two carbon atoms are sp2 hybridized, which cause to form a double bond between these carbon atoms. E.g. CH2 = CH2 ethane
Pentane (iso — chain) $CH_{23} – CH – CH_2 - CH_3$ | CH_3	**ii) Alkynes** These are unsaturated hydrocarbons in which at least two carbon atoms are hybridized

Q3: Indicate what is wrong with each of the following names. Give the correct IUPAC names if possible.

a) **2 — Dimethyl Propane**

b) **2,2,3 — Methyl Butane**

c) **3, 3 — Dimethyl —5,5 — Dimethyl Heplane**

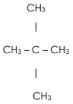
d) **2, 3 — Di ethyl —4, 4-Dimethyl Pentane**

e) **2, 4 — Diethyl Pentane**

f) **3 - Etnyl – 4 - Methyl Pentane**

Answer

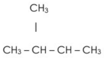
a)



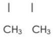
$$CH_3 - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_3$$

Correct name is 2,2 – dimethyl propane

b)



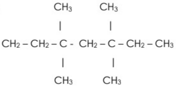
$$\begin{array}{cccc} & CH_3 & & \\ & | & & \\ CH_3 - & CH - & CH - & CH_3 \end{array}$$



$$\begin{array}{cc} | & | \\ CH_3 & CH_3 \end{array}$$

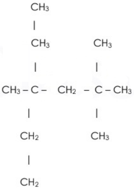
Correct name is 2,2,3 - trimethylbutane

c)



$$\begin{array}{ccccccc} & & CH_3 & & CH_3 & & \\ & & | & & | & & \\ CH_2 - & CH_2 - & C - & CH_2 - & C - & CH_2 - & CH_3 \\ & & | & & | & & \\ & & CH_3 & & CH_3 & & \end{array}$$

d)

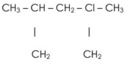


$$\begin{array}{ccccc} & CH_3 & & & \\ & | & & & \\ & CH_3 & & CH_3 & \\ & | & & | & \\ CH_3 - & C - & CH_2 & - C - & CH_3 \\ & | & & | & \\ & CH_2 & & CH_3 & \\ & | & & & \\ & CH_2 & & & \end{array}$$

Correct name is

4 – ethyl – 2,2,4 – trimethyl hexane

e)



$$\begin{array}{ccccc} CH_3 - & CH - & CH_2 - & Cl - & CH_3 \\ & | & & | & \\ & CH_2 & & CH_2 & \end{array}$$

$$\begin{array}{cc} | & | \\ CH_3 & CH_3 \end{array}$$

Q4: Write the structures of the following compounds.

a) Neo heptane

b) Iso heptane

c) Trimethyl Ethyl Methane

d) Dimethyl Ethyl Isopropyl Methane

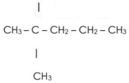
e) Dimethyl Propyl Ethyl Methane

f) 3 — Ethyl Hexane

Answer

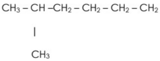
a) Neo heptanes

CH_3



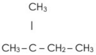
$CH_3-\underset{CH_3}{\underset{|}{\overset{|}{C}}}-CH_2-CH_2-CH_3$

b) Iso-heptane



$CH_3-\underset{CH_3}{\underset{|}{CH}}-CH_2-CH_2-CH_2-CH_2$

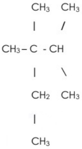
c) Trimethyl methane



$CH_3-\overset{CH_3}{\overset{|}{C}}-CH_2-CH_3$

$\underset{CH_3}{|}$

d) Dimethyl ethyl iso – prophylmethane



$CH_3-\overset{CH_3}{\overset{|}{\underset{\underset{\underset{CH_3}{|}}{CH_2}}{\underset{|}{C}}}}-CH\genfrac{}{}{0pt}{}{/\,CH_3}{\backslash\,CH_3}$

e) Dimethyl propyl ethyl methane

ANSWERS OF QUICK QUIZ (Q5: TO Q9)

Q5: What are polar, non-polar and weekly polar compounds?

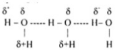
Answer

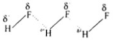
a) **Polar Compounds**

The molecules having high partial positive charge and partial negative charge at different parts of a molecule are called strongly polar or polar compounds.

Such molecules have high boiling. Point due to strong intermolecular forces of attractions.

For example, H_2O, HF





b) Non-Polar Compounds

The compounds in which arrangement of atoms in such a way that they cancel the effect of each other and no charges are created at different parts of molecule.

As a result, molecule remains neutral. Such molecules have vander walls force among these molecules and have low boiling points.

For example:

Carbontetrachloride (CCl_4),

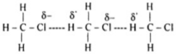
Carbondisulphide (CS_2)

c) Weekly Polar Compounds

There are some molecules in which there are low charges at different parts of molecule.

Such molecules are volatile and have low boiling points.

For example: Chloroform (CHC13)



$$H-\overset{H}{\underset{H}{C}}-\overset{\delta-}{Cl}\cdots\cdots\overset{\delta^{\cdot}}{H}-\overset{H}{\underset{H}{C}}-\overset{\delta-}{Cl}\cdots\cdots\overset{\delta^{\cdot}}{H}-\overset{H}{\underset{H}{C}}-Cl$$

Q6: What are isomers?

Answer

Compounds having same molecular formulas but different structural formulas are called isomers.

For example

C_2H_6O has following isomers

CH_3-CH_2-O-H	CH_3-O-CH_3
Fthul alcohal	Dimethyl ethen

Q7: What are inert compounds?

Answer

There arc same compounds which don't react easily such compounds are offent called inert compounds.

These compounds are offently non-polar in nature.

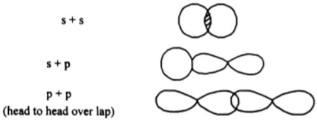
For Example: Carbonterachloride (CClu),

Benzene (C_6H_6)

Q8: What is sigma bond?

Answer

Any first bond formed between two atoms is a sigma bond it is form by the overlap of following orbitals:



A sigma bond is of very low in energy and least reactive.

Q9: What are intermolecular and intermolecular forces?

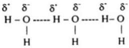
Answer

Intermolecular Forces

The forces of among the different molecules of a compound are called intermolecular forces liquids having strong intermolecular have high boiling points.

For Example.

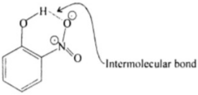
Forces among H_2O molecules



Intermolecular Forces

The forces of attractions among the atoms of a molecule are called intramolecular forces.

Molecules having intramolecular forces offently have low boiling points. For example: Orthonibophenol

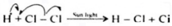


Q10: What are Radical Substitution Reactions?

Answer

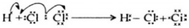
The reactions in which one radical displace an atom with one electron from a molecule are called radical substitution reactions.

Such reactions are show using half arrow or single head curly arrow:



$$H + Cl - Cl \xrightarrow{\text{Sun light}} H - Cl + Cl$$

Such reactions with bonding electrons may also shown as follows:

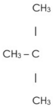


Such reactions take place in presence of heat or sunlight. In case of alkyl halides, the reactivity of alkyl group is in the following order.

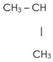
3^0 > 2^0 > 1^0

Tertiary Secondry Primary

Like



$$CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}$$



$$CH_3-\underset{\underset{CH_3}{|}}{CH}$$

CH_3

In case of reactivity of halogens the reactivity order is as follows:

F > Cl > Br > I

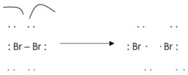
Q11: Give the radical chain mechanism for reaction of methane and Br2.

Answer

This reaction involves three steps.

Step 1 (Initiation)

Heat or UV light causes undergo homolytic cleavage to generate two bromine radials and starting the chain process

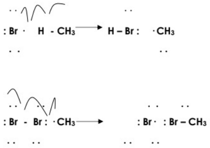


$$:\ddot{\underset{..}{Br}}-\ddot{\underset{..}{Br}}: \longrightarrow :\ddot{\underset{..}{Br}}\cdot \quad \cdot\ddot{\underset{..}{Br}}:$$

Step 2 (Propagation)

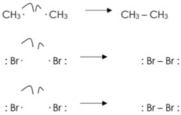
(a) A bromine radical abstracts a hydrogen to form HBr and a methyl radicle, then (b)

the methyl radical abstracts a bromine atom from another molecule of Br2 to form the methyl bromide product and another bromine radical, which can then itself undergo reaction 2 (b) creating a cycle that can repeat.


: Br · H - CH3 → H – Br : ·CH3
: Br - Br : ·CH3 → : Br · : Br – CH3

Step 3 (Termination)

Various reactions between the possible pairs of radicals allow for the formation of ethane, Br2 or the product, methyl bromide. These reactions remove radicals and do not perpetuate the cycle.



Q12: What is difference between oxidation and reduction in organic compounds? Answer

Oxidation		Reduction	
i.	More C — O bonds (or other atoms are more electronegative than C)	i.	Less C — O bonds (or the atoms are more electronegative than C)
ii.	Less C — H bonds.	ii.	More C — H bonds.
iii.	Loss of electrons.	iii.	Gain of electrons.
iv.	Increased oxidation state, like +1 to +4.	iv.	Decreased oxidation state, like +1 to -I.
	e.g. $CO + \frac{1}{2} O_2 \rightarrow CO_2$		e.g $CH_2 = CH_2 + H2 \rightarrow CH_3 - CH_3$

SOLUTION OF ACTIVITY (Q13: TO Q15)

Q13: Name the following olefins by the IUPAC system.

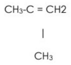
Answer

a) $CH_2 = CH_2$ Ethene

b) $CH_3 - CH = CH_2$ Propene

c) $CH_3 -CH - CH = CH - CH_2 - CH_3$ 3-hexane

d)



$$\underset{\displaystyle CH_3}{CH_3\text{-}\overset{}{C}} = CH2$$

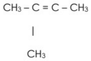
2 — methyl propene

e) $CH_2 = CH - CH = CH - CH_3$ I, 2, 3, — hexa triene

g)

CH_3

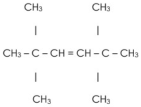
$|$



$$\begin{array}{l} CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}} = C - CH_3 \end{array}$$

2, 3, dimethyl – 2 - butane

h)

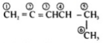


$$CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\underset{|}{\overset{|}{C}}}} - CH = CH - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{\underset{|}{\overset{|}{C}}}} - CH_3$$

2,2.5, 5 – tetramethyl – 3 hexene

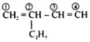
Q14: Name the compounds by IUPAC system.

Answer

a) 

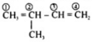
$$\overset{①}{C}H_2 = \overset{②}{C} = \overset{③}{C}H\overset{④}{C}H - \underset{\overset{|}{⑥CH_3}}{\overset{⑤}{C}H_2}$$

1, 2 – hexadiene

b) 

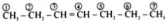
$$\overset{①}{C}H_2 = \underset{\overset{|}{C_2H_5}}{\overset{②}{C}H} - \overset{③}{C}H = \overset{④}{C}H$$

2 – ethyl – 1 , 3 – butadiene

c) 

$$\overset{①}{C}H_2 = \underset{\overset{|}{CH_3}}{\overset{②}{C}H} - \overset{③}{C}H = \overset{④}{C}H_2$$

3 – methyl – 1 – butane

d) 

$$\overset{①}{C}H_3 - \overset{②}{C}H_2 - \overset{③}{C}H = \overset{④}{C}H - \overset{⑤}{C}H_2 - \overset{⑥}{C}H_2 - \overset{⑦}{C}H_3$$

3 – Propene

e) $CH_2 = CH - CH_3$

Propene

Q15: Write structural formulas for the following compounds and discuss the geometric isomerism in each case.

a)— Buta diene

b) 1, 2 — penta diene

c) 2, 4 — Hexa diene

d) 2 — Methyl —1, 3 —Butadiene

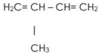
e) 3 Methyl —1, 3 — Pentadiene.

Answer

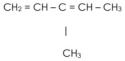
a) $CH_2 = CH - CH = CH_2$

b) $CH_2 = C = CH – CH_2 - CH_3$

c) $CH_3 - CH = CH – CH = CH – CH_3$

d) 

$$H_2C=\underset{\underset{CH_3}{|}}{CH}-CH=CH_2$$

e) 

$$CH_2=CH-\underset{\underset{CH_3}{|}}{C}=CH-CH_3$$

Q16: Give preparation of alkanes from:

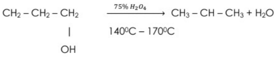
a) Primary alcohol **b) Secondary alcohol** **c) Tertiary alcohol**

Also give the order of dehydration.

Answer

Alcohols are dehydrated in following order tertiary alcohol > secondary alcohol > primary alcohol Examples:

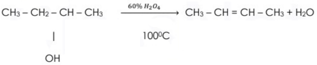
a) Primary Alcohol:



$$CH_2-CH_2-\underset{\underset{OH}{|}}{CH_2}\xrightarrow[140^0C-170^0C]{75\%\ H_2O_4}CH_3-CH-CH_3+H_2O$$

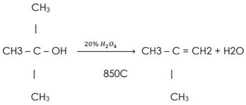
Primary Alcohol

b) Secondary Alcohol



$$CH_3-CH_2-\underset{\underset{OH}{|}}{CH}-CH_3\xrightarrow[100^0C]{60\%\ H_2O_4}CH_3-CH=CH-CH_3+H_2O$$

Secondary Alcohol

c) 

$$CH3-\overset{\overset{CH_3}{|}}{\underset{\underset{CH_3}{|}}{C}}-OH\xrightarrow[850C]{20\%\ H_2O_4}CH3-\underset{\underset{CH_3}{|}}{C}=CH2+H2O$$

Tertiary Alcohol

Q17: What is Raney Nickle give its role in hydrogenation of alkanes.

Answer

When Ni — Al alloy is added to caustic soda (NaOH) solution. Aluminium reacts and dissolve in NaOH solution as per following reaction.

$$Ni - Al + Na\ (OH + H_2O \rightarrow Ni + NiaAlO2 + H2$$

(sodium aluminate)

Ni particles remains suspended in NaOH solution these suspended Ni particles in NaOH solution is called Raney Nickle. For Example:

$$H_3C - CH_2 - CH = CH_2 + H_2 \xrightarrow[250^{\circ}C]{Ni} H_3C - CH_2 - CH_2 - CH_2 - CH_3$$

I — butane Butane

Q18: In which state pt and pd are used as hydrogenolysis catalyst.

Answer

Pt as catalyst:

i) pt is used as platinum oxide (Pt_2O_3)

ii) pt functions at room temperature for example

$$CH_2 = CH_2 + H_2 \xrightarrow{pd} CH_3 — CH_3$$

Pd as catalyst:

i) pd is used as pd dust adsorbed on charcoal and pieces of such charcoal are used as catalyst.

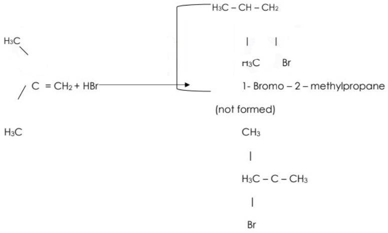
ii) pd also functions at room temperature for example

$$CH3 - CH = CH_2 + H_2 \xrightarrow[\text{(room temp)}]{pd} CH3 – CH_2 - CH_3$$

Q19: What is Markowinkov's Rule? Explain with example.

Answer

According to this rule, "in the addition of an unsymmetrical reagent to an unsymmetrical alkene he negative part of the adding reagent goes to hat carbon, consisting the double bond, which has least number of hydrogen atoms.



2- Bromo – 2 – methylpropane

(Actual product – According

to

Marlownikov's Rule)

Q20: What is meant by hydration of alkenes? Explain with example.

Answer

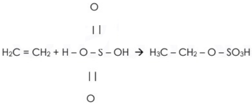
Addition of water to an alkene is called hydration of alkenes.

For example

$$CH_2 = CH_2 + H_2O \xrightarrow[100^0C]{H_2SO_4} CH_3 - CH_2 - OH$$

Mechanism

Step I:



$$H_2C = CH_2 + H - O - \overset{\overset{O}{||}}{\underset{\underset{O}{||}}{S}} - OH \rightarrow H_3C - CH_2 - O - SO_3H$$

Step II

$$H_2C = CH_2 - O\ SO_3\ H + H_2O \xrightarrow{100^0C} H_3C - CH_2 - OH + H_2SO_4$$

Q21: Give Bromination of ethane with mechanism. (A test to check alkenes).

Answer

Alkenes decolorize a reddish colour of bromine water as per reaction.

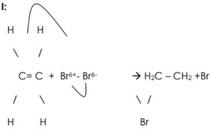
CH2 = CH2 + Br → CH2 – CH2

(reddish brown) | | (colour less)

Br Br

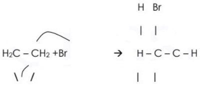
Mechanism of Reaction:

Step I:



$$\mathrm{C=C + Br^{\delta+}\text{-}\ Br^{\delta-} \rightarrow H_2C - CH_2 + Br}$$

step II:



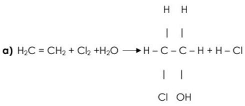
$$\mathrm{H_2C - CH_2 + Br \rightarrow H - C - C - H}$$

Br Br H

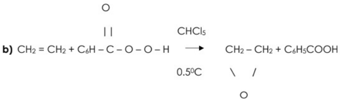
Q22. How can you prepare from ethane?

a) Ethylene chlorohydrin **b) 1,2 – epoxy ethane.**

Answer



a) $H_2C = CH_2 + Cl_2 + H_2O \longrightarrow H-\underset{Cl}{\overset{H}{\underset{|}{\overset{|}{C}}}}-\underset{OH}{\overset{H}{\underset{|}{\overset{|}{C}}}}-H + H-Cl$

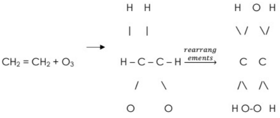


b) $CH_2 = CH_2 + C_6H-\overset{O}{\overset{||}{C}}-O-O-H \xrightarrow[0.5^0C]{CHCl_5} \underset{O}{\underset{\setminus\quad /}{CH_2 - CH_2}} + C_6H_5COOH$

Q23: Give reaction of ozone (O_3) with ethane (ozonolysis). Also give the reduction of ozonide with zinc.

Answer

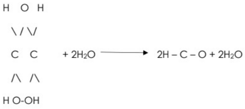
a) Ozonolysis



$CH_2 = CH_2 + O_3 \longrightarrow H-\underset{O}{\underset{/}{\overset{H}{\overset{|}{C}}}}-\underset{O}{\underset{\setminus}{\overset{H}{\overset{|}{C}}}}-H \xrightarrow{rearrang\ ements} \underset{H\ O\text{-}O\ H}{\underset{/\setminus\ /\setminus}{\overset{H\ O\ H}{\overset{\setminus/\ \setminus/}{C\quad C}}}}$

Molozonide Ozonide

b) Reduction of Ozonide



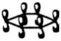
$\underset{H\ O\text{-}OH}{\underset{/\setminus\ /\setminus}{\overset{H\ O\ H}{\overset{\setminus/\setminus/}{C\quad C}}}} + 2H_2O \longrightarrow 2H-C-O + 2H_2O$

ii) $H_2O_2 + Zn \longrightarrow ZnO + H_2O$

Q24: Write a note on conjugation. Also explain isolated "p" system and extended 'p system.

Answer

The word "conjugation" is derived from Latin word that means "to link together". In organic chemistry it is used to describe the situation which is present in a molecule in which p-orbitals are present on at least 3 adjacent carbon atoms. In a conjugated system there is a continuous array of p-orbitals that can aline to produce a bonding overlap along the whole system (whole molecule).



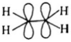
e.g. Benzene

For Example:

$CH_2 = CH - CH = CH_2$ (I, 3- butadiene)

Isolated "P" system

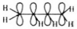
An isolated "p" system is a system which exists only between a pair of adjacent atoms. For example, C = C i.e. $H_2C = CH_2$.



Extended "p" system

An extended "p" system is the system which exists over a longer series of atoms.

For example. C = C - C = C or C = - C = O.



An extended "p" system results in an extension of the chemical reactivity.

Answer of quick quiz (Q25: to Q37)

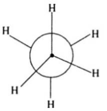
Q25: What is stereochemistry?

Answer

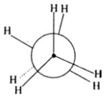
The branch of chemistry in which we study the different conformation of a molecule i.e. arrangement of an atom in a molecule in a space in which we can arise by rotation of one group on another group or an atom on another atom about a single bond is called stereochemistry.

For Example

C — C rotation in ethane



Trans on staggered form



cis or Eclipsed form

Q26: What are conjugated alkenes?

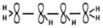
Answer

The alkenes in which there are arrays of p-orbitals that can align the whole molecule are called conjugated alkenes.

For example

I, 3, - butadiene

$CH_2=CH-CH=CH_2$



Q27: What is a pi-bond?

Answer

i) The bond form by the parallel overlap of two p orbitals present at adjacent atoms.

ii) A pi-bon depends upon sigma bond i.e. in a molecule first sigma bond is form then pi bond is form.

iii) It is high energy exposed bond and reacts fast. iv) It is present in double and triple bond only.

e.g.

H H

\ /

$C \xrightarrow{\pi} C$ H – C = C – H

/ \

H H

(one & one bond) (one sigma & 2 bonds)

(Ethyne) (Ethyne)

Q28: What are s and p orbitals?

Answer

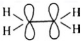
a — orbital

It is spherically symmetrical orbital present around a single nucleus in every shell in every atom. For example, Is, 2s, 3s

p — orbital

It is dump bell shaped

Orbital present in every shell except first sheet. These are of three types i.e. PX, py, pz.



Two p-orbitals in ethene

Q29: What is dehydration?

Answer

Removal of water from a substance is called dehydration.

For example

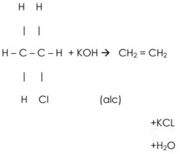
Alcohols on heating loose water (dehydrated) and are converted into alkanes.

Q30: What is dehydrohalogenation?

Answer

Removal of hydrogen and halogens from an alkyl halide is called dehydrohalogenation

e.g. Reacting Ethyl with alcoholic



$$H-\underset{H}{\overset{H}{C}}-\underset{Cl}{\overset{H}{C}}-H + \underset{(alc)}{KOH} \rightarrow CH_2 = CH_2 + KCL + H_2O$$

Q31: What is hydrogenation?

Answer

Addition of hydrogen to a substance is called hydrogenation.

When hydrogenation is done in the presence of a catalysts it is called catalytic hydrogenation.

For example

$$CH_2 = CH_2 + H_2O \xrightarrow{pt} CH_3 - CH_3$$

Q32: What is carbocation?

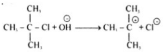
Answer

An ion in which there is positive charge on carbon atom is called carbocation.

For Example

Reaction of tertiary butylchloride with OH ions.

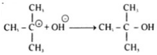
Step i)



$$CH_3-\underset{CH_3}{\overset{CH_3}{C}}-Cl + \overset{\ominus}{OH} \longrightarrow CH_3-\underset{CH_3}{\overset{CH_3}{C^{\oplus}}} + Cl^{\ominus}$$

(Carbocation)

Step ii)



$$CH_3-\underset{CH_3}{\overset{CH_3}{C^{\oplus}}} + \overset{\ominus}{OH} \longrightarrow CH_3-\underset{CH_3}{\overset{CH_3}{C}}-OH$$

Q33: What is Markowinkov's rule?

Answer

Please see answer of Q 19 of chapter notes.

Q34: What is electrophilic reagent?

Answer

The substance having positive charge on it or partial positive charge at any part of molecule may act as electrophile, therefore is called electrophilic reagent.

For example $CH_3^{\delta+}Cl$, $C2H_5^{\delta+}BR$

Q35: What is nucleophilic reagent?

Answer

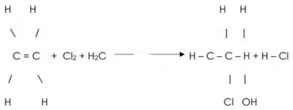
A substance having ionic pair on it, negative charge on it or C —C = is called nucleophile or nucleophilic reagent.

For example: NH_3, PH_3 (phosphine), $CH_2 = CH_2$

Q36: What is halohydration?

Answer

Addition of hypoholous acid (HOX) to an alkene is called halohydration.



$$H_2C=CH_2 + Cl_2 + H_2C \longrightarrow H-\underset{Cl}{\overset{H}{C}}-\underset{OH}{\overset{H}{C}}-H + H-Cl$$

Q37: What is polymerization?

Answer

(Poly = more than one Meros = pieces)

Addition of two or more than two molecules to give a long chain is called polymerization. For example:

Poly these used to make shopping bags

Q38: What is isomerism? Give its different types.

Answer

Compounds having same molecular formulas but different structural formulas are called isomers.

There are two main types of isomerism.

a) Structural isomerism **b)** Stereo isomerism

Structural isomerism are again 6/5 types.

i) Chain Isomerism

ii) Position Isomerism

iii) Functional Isomerism

iv) Mesmerism

v) Tautomerism

Q39: Explain the following terms.

i) Chain Isomerism I **i) Position Isomerism**

iii) Functional Isomerism **iv) Metamerism**

v) Tautomerism

Answer

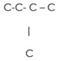
i) Chain Isomerism

The isomerism in which there comes a change in carbon chain is called chain isomerism.

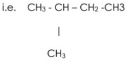
For example

C - C-C-C-C i.e $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

n — chain n — pentane



$C-\underset{\underset{C}{|}}{C}-C-C$



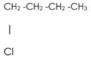
i.e. $CH_3 - \underset{\underset{CH_3}{|}}{CH} - CH_2 - CH3$

Iso chain Iso pentane

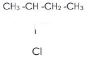
ii) Position Isomerism

The isomerism in which there comes a change in position of group on a carbon chain or position of double or triple bond on a carbon chain is called position isomerism

For example



$\underset{\underset{Cl}{|}}{CH_2} -CH_2 -CH_2 -CH_3$



$CH_3 -\underset{\underset{Cl}{|}}{CH} -CH_2 -CH_3$

I- chlorobutane 2- chloributane

$CH_2 = CH - CH_2 - CH_3$ $CH_3 - CH = CH - CH_3$

I — butane 2 — butane

iii) Functional Isomerism

The isomerism in which there comes a change in functional group of a compound is called functional group isomerism.

For Example

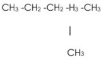
C_2H_6O has following isomers

CH_3-CH_2-OH CH_3-O-CH_3

Ethyl alcohol Dimethyl ethene

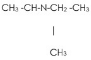
iv) Metamerism

The change in position of attachment of alkyl group around a center is called a metamerism. For Example



$CH_3-CH_2-CH_2-\underset{\underset{CH_3}{|}}{H_3}-CH_3$

and



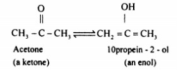
$CH_3-CH-\underset{\underset{CH_3}{|}}{N}-CH_2-CH_3$

Dimethyl Propyl Amine Diethyl methyl amine

v) Tautomerism

The isomerism in which there comes a change in position of one hydrogen atom only is called tautomerism

For Example



$$CH_3-\overset{\overset{O}{\|}}{C}-CH_3 \rightleftharpoons CH_2=\overset{\overset{OH}{|}}{C}=CH_3$$

Acetone
(a ketone)

10propein - 2 - ol
(an enol)

Q40: What is chiral and achiral molecule?

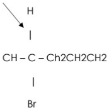
Answer

Chiral Molecule

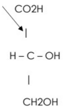
The molecule in which four different groups are attached to a central carbon is called chiral molecule. And its central carbon is called chiral carbon or chiral center. The mirror image of such a molecule is host a super imposable on the object. Such molecules are optically active.

For Example

A symmetrical carbon A symetrical carbon



$CH-\underset{\underset{Br}{|}}{\overset{\overset{H}{|}}{C}}-Ch2CH2CH2$



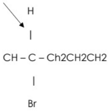
$H-\underset{\underset{CH2OH}{|}}{\overset{\overset{CO2H}{|}}{C}}-OH$

Achiral Molecule

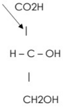
When similar groups are attached to a central carbon of a molecule and mirror image of such a molecule is super imposable on the object the molecule is called achiral molecule. Such molecules are optically inactive.

For Example

A symmetrical carbon A symetrical carbon



$$\begin{array}{c} H \\ | \\ CH-C-Ch_2CH_2CH_2 \\ | \\ Br \end{array}$$



$$\begin{array}{c} CO_2H \\ | \\ H-C-OH \\ | \\ CH_2OH \end{array}$$

Q41: Define the following terms?

i) Plane Polarized Light.

ii) Optical Activity

iii) Dextrorotatory Compounds

iv) Laevorotatory Compounds

Answer

i) Plane Polarized Light

A light obtained from ordinary electric lamp is composed of waves vibrating in many different planes. When it is passed through Nicol prism (made of calcite, Ca C03) or Polaroid lens, light is found to vibrate in only one plane and is said to be simply polarized or plane-polarized light.

ii) Optical Activity

The compounds which rotate the plane of a polarized light are called optical active compound and this property of a compound is called optically activity.

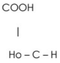
The mirror image of an optical active compound is not superimposable on its object. The optical activity of a compound is detected and measure by means of a polarimeter.

iii) Dextrorotary Compounds

The compounds which rotate the plane of polarized light forwards right side (in clock wise direction) is known as dextrorotary or (+) isomer.

For Example

d-lactic acid or (+) lactic acid)



$$\begin{array}{c} COOH \\ | \\ Ho-C-H \end{array}$$

(+) Acid

|

CH_3

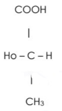
iv) **Levorotatory Compounds**

The compounds which rotate the plane of polarized light towards left side (in anticlock wise direction) is known as levorotatory.

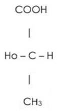
For Example

I — ladic acid or (—) Laetic acid

d and I isomers are mirror images of each other.



$$\begin{array}{c} COOH \\ | \\ Ho-C-H \\ | \\ CH_3 \end{array}$$



$$\begin{array}{c} COOH \\ | \\ Ho-C-H \\ | \\ CH_3 \end{array}$$

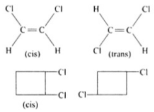
Q42: What are Geometric isomers?

Answer The isomers in which similar groups are attached at one side of a double bond or a cyclic ring or at opposite side of a double bond are called geometric isomers.

Geometric isomers are of 2 - types

i) Cis — isomers **ii)** Trans — isomers

For Example



Q43: What are hydrocarbons?

Answer

Organic compounds which contain carbon and hydrogen only are called hydrocarbons. Example: Alkenes and Alkynes.

Q44: What are open chain hydrocarbons?

Answer

The hydrocarbons in which carbon atoms attached with each other to form open chains are called open chain hydrocarbons. Example: Alkanes.

Q45: What are saturated hydro-carbons? Gives example.

Answer

These are the hydrocarbons in which carbon atoms are attached with each other through single bonds.

Example: $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$ pentane.

Q46: What are unsaturated hydrocarbons? Gives example.

Answer

These are the hydrocarbons in which at least two carbon atoms are attached through double or triple bonds.

Example: CH = CH, alkenes acetylene.

Q47: What are closed chain hydro-carbons? Give example.

Answer

These are the hydrocarbons in which carbon atoms attach with each other to form rings.

Example: cyclobutane, cyclopentane.

Q48: What are Alicyclic hydrocarbons? Give example.

Answer

Non-benzoid cyclic hydrocarbons.

Example:

CH2

/\

CH3 – CH3

Q49: What are intermolecular forces?

Answer

The forces of attraction which are present between the atoms of two molecules are called intermolecular forces e.g induced dipole forces.

Q50: What are putramolecular forces?

Answer

The forces of attraction which are present between the atoms of the same molecule are called intramolecular forces e.g Hydrophobic interactions.

Q51: Why cycloalkanes have low melting & boiling points?

Answer

Because there are very weak induced dipole-induced dipole forces between molecules that is why cycloalkanes have low melting and boiling points.

Q52: What does half-arrow show in the reaction mechanism? And which reactions it is used?

Answer

A half-arrow is used to show the movement of a single electron in reactions involving free radicles.

Q53: What do you mean by redox reactions?

Answer

Those reactions in which the oxidation and reduction are occurring simultaneously are called redox-reactions.

Example: $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

Q54: What is Oxidation?

Answer

The loss of electrons, increase in oxidation state, less C—H bonds and more e-o bonds is called oxidation.

Example: $CO_2 + \frac{1}{2} O_2 \rightarrow CO_2$

Q55: What do you mean by reduction?

Answer

The loss of C-O bonds, gain of electrons and decrease in the oxidation state of a substance is called reduction. Like +1 to -I.

Example. $2Mg + O_2 \rightarrow 2M^{2+}gO^{2-}$

Q56: What is the heat of hydrogenation of alkene?

Answer

The heat of hydrogenation of most alkene is 120 KJ mole-I.

Q57: What is Raney Nickel?

Answer

Raney Nickel is a catalyst which is obtained by treating Ni-Al alloy with caustic soda.

Q58: What is the benefit of catalytic hydrogenation?

Answer

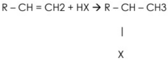
Catalytic hydrogenation of alkenes is used in industry for the manufacturing of vegetable ghee and vegetable oil.

Q59: What is hydrohalogenation? Give example.

Answer

The addition of hydrogen to halogens is called hydrohalogenation.

Example:

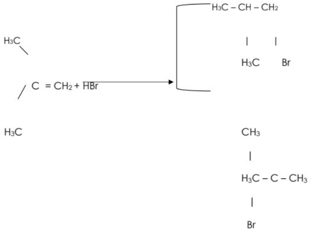


$$R - CH = CH2 + HX \rightarrow R - \underset{\underset{X}{|}}{CH} - CH3$$

Q60: What is Markowinkov's rule?

Answer

It states that in the addition of an unsymmetrical reagent to an unsymmetrical alkene, the negative part of the adding reagent goes to that carbon which has double bond and have least number of hydrogen atoms.



Q61: What is hydration? Give example.

Answer

Addition of water to a substance is called hydration.

Example:

$$H_2C - CH_2 - O - SO_3H + H_2O \rightarrow H_2 - CH_2 - OH + H_2SO_4$$

Answer

An "isolated" p-system exists between a single pair of adjacent atoms

C = C or $H_2C= CH_2$

An "extended" p-system exist ever a longer series atom. Example:

$$CH = CH - CH = CH$$

Q62: What is Isomerism? Name its type.

Answer

The phenomenon in which the substances have same molecular formula but different chemical structures is called isomerism.

Types:

a — Chain isomerism

b — Position isomerism

c — Functional isomerism

d — Metamerism

e — Tautomerism

Q63: What do you mean by Chiral and Achiral objects?

Answer

Those objects which lake plane of symmetry are called chiral objects. Those objects which are symmetrical are called Achiral objects.

Q64: What is Optical isomerism?

Answer

The phenomenon in which the optically active compounds exist in two isomeric forms rotate the plane polarized light in opposite directions is called optical isomerism.

Q65: What are dextrorotatory isomers?

Answer

Those isomers which rotate the plane polarized light in clockwise direction are called dextrorotatory isomers.

Example: Tartaric acid

Q66: What are Laevorotatory isomers?

Answer

The isomers which rotate the plane polarized light in anti-clockwise direction are called laevorotatory isomers.

Example: la-amino acids

Q67: Why alkynes are more stable than alkenes?

Answe

The alkynes are more stable than alkenes due to the presences of extra pi-bond.

Q68: What is resonance?

Answer

The possibility of different pairing schemes of valence electrons of atoms is called resonance.

Q69: Enlist some uses of hydrocarbons?

Answer

These are as follows:

i — Butane is used as a fuel in lighter.

ii— Butane is also used in same camping stores.

iii— Crude petroleum's lighter than water.

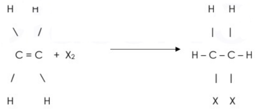
iv — Oxyacetylene torch is used for cutting of metals.

v — Methane is used to manufacture area fertilizer.

Q70: What is halogenation? Give Example

Answer

The addition of halogens to any substance is called halogenation



$$\begin{array}{c}H\quad H\\ \backslash\quad /\\ C=C\\ /\quad \backslash\\ H\quad H\end{array} + X_2 \longrightarrow \begin{array}{c}H\;\;H\\ |\;\;\;|\\ H-C-C-H\\ |\;\;\;|\\ X\;\;X\end{array}$$

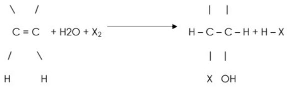
Q71: What is halohydration? Give example.

Answer

Addition of hypohalous acid (HOX) to a substance is called halohydration.

Example:

H H   H H

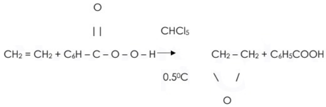


$$\begin{matrix} \backslash & & / \\ & C=C & \\ / & & \backslash \\ H & & H \end{matrix} + H2O + X_2 \longrightarrow \begin{matrix} & | & | & \\ H- & C- & C- & H \\ & | & | & \\ & X & OH & \end{matrix} + H-X$$

Q72: What is epoxidation? Give example.

Answer

Addition of epoxides to any substance is called epoxidation. Example:



$$CH_2 = CH_2 + C_6H - \overset{\overset{O}{||}}{C} - O - O - H \xrightarrow[0.5^0C]{CHCl_5} \underset{\underset{O}{\backslash\ \ /}}{CH_2 - CH_2} + C_6H_5COOH$$

Q73: What is polymerization? Give example.

Answer

Polymerization is a process in which small organic molecules combine together to form large molecules.

$$nCH2 = CH2 \xrightarrow{400^0C} (CH2 - CH2)n$$

Polythene

Q74: What is conjugation?

Answer

The linkage which established due to bonds is called conjugation. Example:

$$CH2 = CH2 \rightarrow (CH2 - CH)n$$

polythene

Q75: What are isolated and extended P system?

Answer

Missing Answer

Q76: Name the factors which influence alkene stability?

Answer

There are three factors which influence alkene stability.

i Degree of substation.

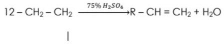
ii Stereochemistry: trans > cis

iii Conjugated alkenes are more stable than isolated alkenes.

Q77: What is dehydration?

Answer

Removal of water molecule from a substance is called dehydration. Example:



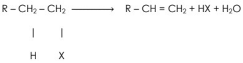
$$12 - CH_2 - \underset{|}{CH_2} \xrightarrow{75\%\ H_2SO_4} R - CH = CH_2 + H_2O$$

OH

Q78: What is dehydrohalogenation?

Answer

Removal of hydrogen halide (HX) from alkyl halides is called dehydrohalogenation. Example:



$$R - \underset{H}{CH_2} - \underset{X}{CH_2} \longrightarrow R - CH = CH_2 + HX + H_2O$$

Q79: What is hydrogenation?

Answer

A process in which a molecule of hydrogen is added to an alkene, alkane, alkynes or any other substance is called hydrogenation. Example:

$$N \equiv N + 3H_2 \xrightarrow{200\ Atom} 2NH$$

Q80: What is catalytic hydrogenation?

Answer

Addition of hydrogen to any substance in the presence of catalyst and at I — 5 atom pressure is called catalytic hydrogenation.

Example:

$$H_2C \equiv CH_2 + H_2 \rightarrow H_2C - CH_3$$

Q81: What is heat of hydrogenation?

Answer

The amount of heat evolved when one mole of an alkene is hydrogenated is called heat of hydrogenation.

Q82: What are aromatic hydrocarbons? Give example.

Answer

Benzoid cyclic hydrocarbons are known as aromatic hydrocarbons.

Example:

Benzene

Q83: Why the alkanes are unreactive?

Answer

The alkanes are unreactive due to the two reasons:

i Inertness of o bond.

ii None polar bond.

Q84: Names two reactions which alkanes give at high temperature or highly reactive radical observed through light?

Answer

These are:

- **i.** Thermal and catalytic reactions.
- ii. Substitutional reactions.

Q85: What are cycloalkanes?

Answer

Those alkanes which contains sp^3 hybridized C and H atoms connected by s bonds with a ring of 3 or more C atoms are called cycloalkanes. Example: Cyclopropane, cyclobutane.

Q86: What are polar and non-polar compounds?

Answer

Those compounds which are soluble in water are called polar compounds eg Naoh, Nacl etc. Those compounds which are not soluble in water are called non-polar compounds. e.g Ether, Kerosine oil etc.

Q87: What are inert compounds?

Answer

Those compounds which are not readily reactive or those compounds which have completely filled their outermost orbital are called inert compounds e-g Xe, Ne etc..