

Short Questions & Answers

Q1: What are organic compounds? Give there examples.

Answer

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

For example, ethyl alcohol, glucose, sugar starch.

Q2: What is difference between saturated and unsaturated hydrocarbons?

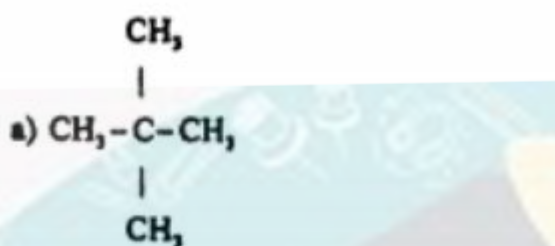
Answer

Saturated Hydrocarbons	Unsaturated Hydrocarbons
These are the hydrocarbons in which carbon atoms are attach with each other trthrough single bonds. Each carbon atom is Sp^3 hybridized. Alkanes have straight or branched chain. For Example: Pentane (n – chain) $CH_3 - CH_2 - CH_2 - CH_2 - CH_3$ Pentane (iso – chain) $CH_2_3 - CH - CH_2 - CH_3$ CH_3	These are the hydrocarbons in which at least two carbon atoms are attached through double or triple bonds, and sp^2 or sp hybridized. For example alkenes and alkynes. i) Alkenes or Olefins: These are the unsaturated hydrocarbons in which at least two carbon atoms are sp^2 hybridized, which cause to form a double bond between these carbon atoms. E.g. $CH_2 = CH_2$ ethane ii) Alkynes These are unsaturated hydrocarbons in which at least two carbon atoms are sp -hybridized which

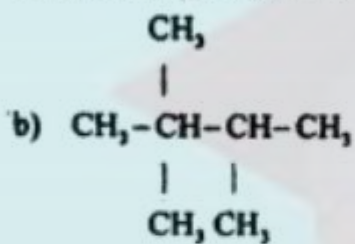
Q3: Indicate what is wring with each of the following names. Give the correct IUPAC names if possible.

- 2 – Dimethyl Propane
- 2,2,3 – Methyl Butane
- 3, 3 – Dimethyl –5,5 – Dimethyl Heplane
- 2, 3 – Di ethyl –4, 4-Dimethyl Pentane
- 2, 4 – Diethyl Pentane
- 3 – Etnyl – 4- Methyl Pentane

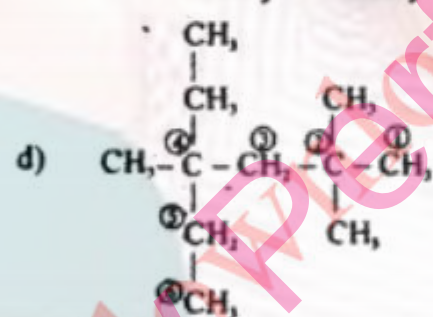
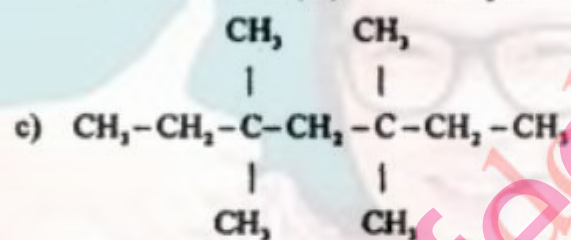
Answer



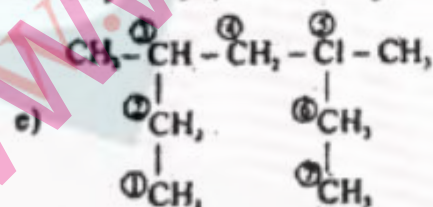
Correct Name is 2, 2 - dim ethyl propane



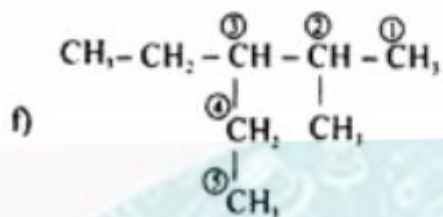
Correct name is 2, 2, 3 - trimethylbutane



Correct Name is
4 - ethyl - 2, 2, 4 - trimethyl hexane



Correct name is
3, 5 - dimethyl heptanes



Correct name is,

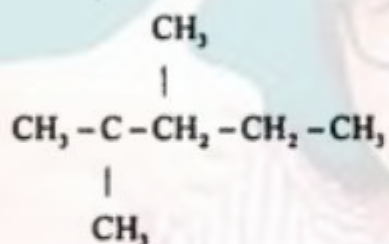
3 - ethyl - 2 - methyl pentane

Q4: Write the structures of the following compounds.

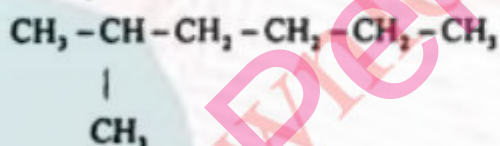
- Neo heptane
- Iso heptane
- Trimethyl Ethyl Methane
- Dimethyl Ethyl Isopropyl Methane
- Dimethyl Propyl Ethyl Methane
- 3 - Ethyl Hexane

Answer

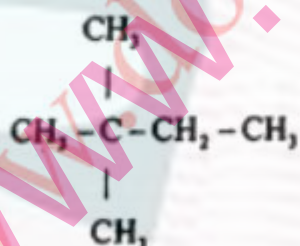
- a) Neo heptanes



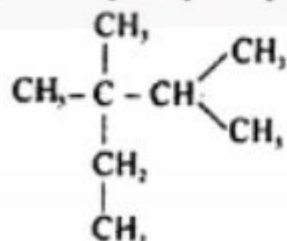
- b) Iso heptane



- c) Trimethyl methane



- d) Dimethyl ethyl iso-propyl methane



e) Dimethyl prophy ethyl methane

ANSWERS OF QUICK QUIZ (Q5: TO Q9)

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

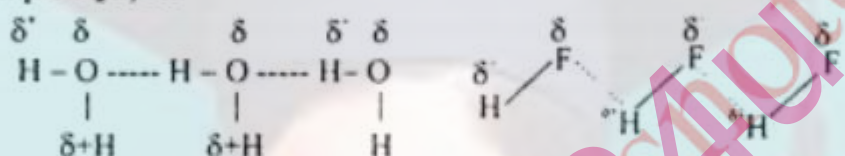
Answer

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 there molecules and have low boiling points.

For example:

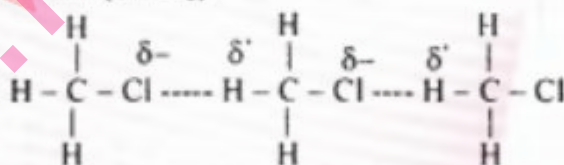
Carbontetrachloride (CCl_4),

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 (CHCl_3)



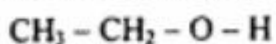
Q6: What are isomers?

Answer

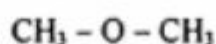
Compounds having same molecular formulas but different structural formulas are called isomers.

For example

$\text{C}_2\text{H}_6\text{O}$ has following isomers



Ethyl alcohol



Dimethyl ether

Q7: What are inert compounds?

Answer

There are some compounds which don't react easily such compounds are often called inert compounds.

These compounds are often non-polar in nature.

For Example: Carbon tetrachloride (CCl_4),

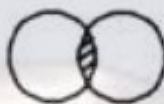
Benzene (C_6H_6)

Q8: What is sigma bond?

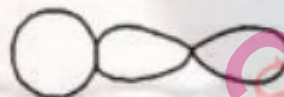
Answer

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

$s + s$



$s + p$



$p + p$



(head to head overlap)

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

Q9: What are intramolecular and intermolecular forces?

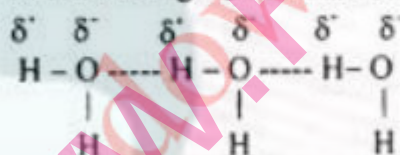
Answer

Intermolecular Forces

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

For Example:

Forces among H_2O molecules



Intramolecular Forces

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

Molecules having intramolecular forces often have low boiling points.

For example: Ortho-nitrophenol

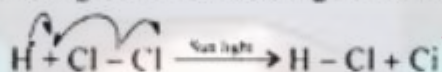


Q10: What are Radical Substitution Reactions?

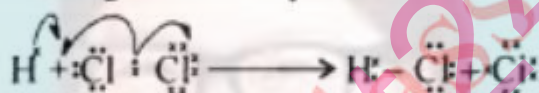
Answer

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

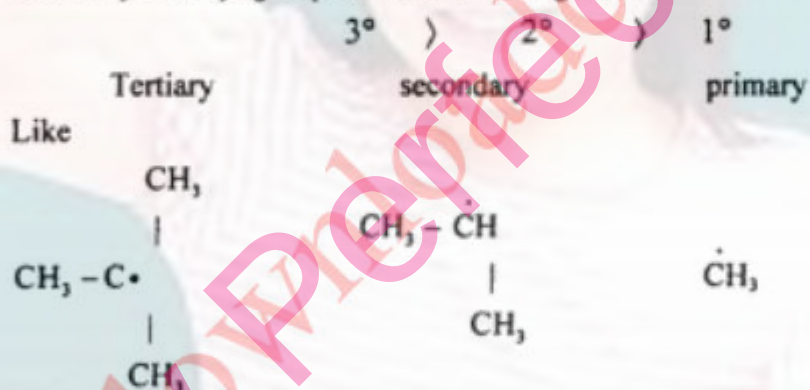
Such reactions are shown using half arrow or single head curly arrow:



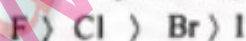
Such reactions with bonding electrons may also be shown as follows:



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



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



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

Answer

This reaction involves three steps.

Step 1 (Initiation)

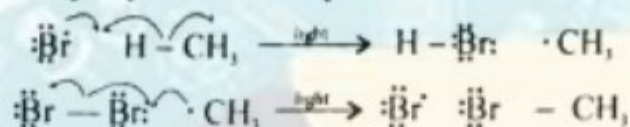
Heat or UV light causes Br₂ to undergo homolytic cleavage to generate two bromine radicals and start the chain process



Step 2 (Propagation)

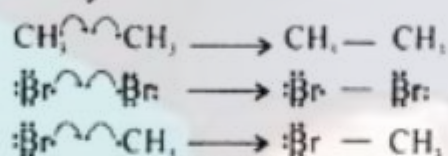
(a) A bromine radical abstracts a hydrogen to form HBr and a methyl radical, then (b)

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.



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.	vi.	Decreased oxidation state, like +1 to -1.
e.g. $\text{CO} + \frac{1}{2} \text{O}_2 \rightarrow \text{CO}_2$		e.g. $\text{CH}_2 = \text{CH}_2 + \text{H}_2 \rightarrow \text{CH}_3 - \text{CH}_3$	

SOLUTION OF ACTIVITY (Q13: TO Q15)

Q13: Name the following olefins by the IUPAC system.

Answer

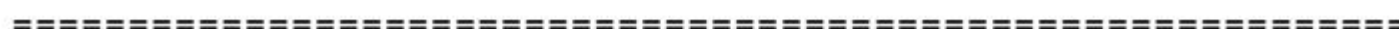
a) $\text{CH}_2 = \text{CH}_2$ Ethene

b) $\text{CH}_3 - \text{CH} = \text{CH}_2$ Propene

c) $\text{CH}_3 - \text{CH}_2 - \text{CH} = \text{CH} - \text{CH}_2 - \text{CH}_3$ 3 – hexene

d) $\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3 - \text{C} = \text{CH}_2 \end{array}$ 2 – methyl propene

e) $\overset{\textcircled{1}}{\text{CH}_2} = \overset{\textcircled{2}}{\text{CH}} - \overset{\textcircled{3}}{\text{CH}} = \overset{\textcircled{4}}{\text{CH}} - \overset{\textcircled{5}}{\text{CH}_2}$
1, 2, 3, – hexatriene



Answer

- a) $\text{CH}_2 = \text{CH} - \text{CH} = \text{CH}_2$
 b) $\text{CH}_2 = \text{C} = \text{CH} - \text{CH}_2 - \text{CH}_3$
 c) $\text{CH}_3 - \text{CH} = \text{CH} - \text{CH} = \text{CH} - \text{CH}_3$
 $\text{H}_2\text{C} = \text{C} - \text{CH} = \text{CH}_2$
 d) $\begin{array}{c} | \\ \text{CH}_3 \\ \text{CH}_2 = \text{CH} - \text{C} = \text{CH} - \text{CH}_3 \end{array}$
 e) $\begin{array}{c} | \\ \text{CH}_3 \end{array}$

Q16: Give preparation of alkanes from:

- a) Primar alcohol b) Secondary alcohol c) Tertiary alcohol

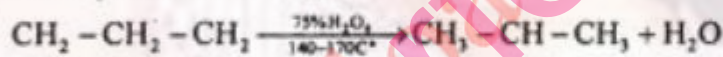
Also give the order of dehydration.

Answer

Alcoholas are dehyolrated in following order tertiary alcohol > secondary alcohol > primary alcohol

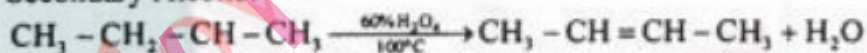
Examples:

- a) Primary Alcohol:

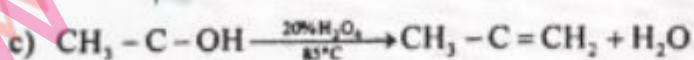


Primary Alcohol

- b) Secondary Alcohol



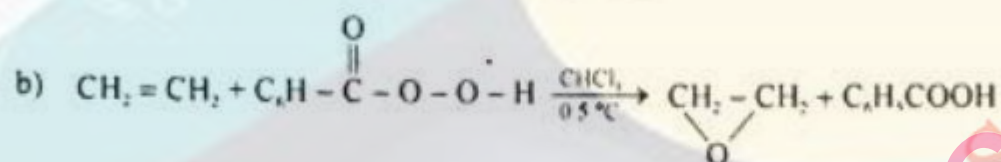
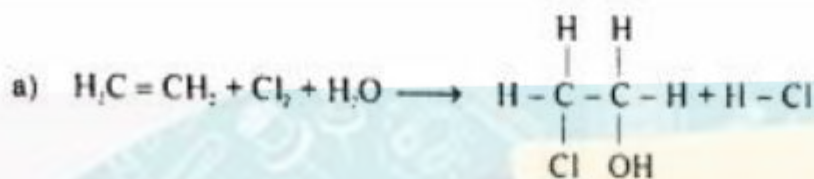
Secondary Alcohol



Tertiary alcohol

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

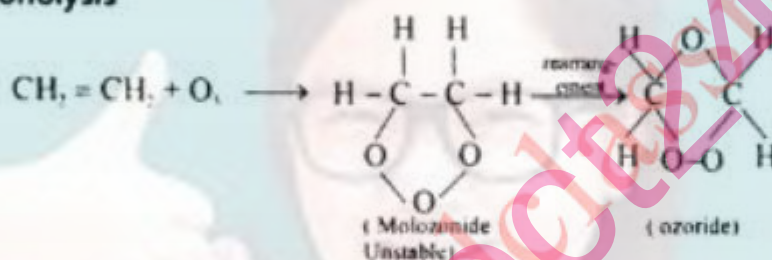
Answer



Q23: Give reaction of ozone (O₃) with ethane (ozonolysis). Also give the reduction of ozonide with zinc.

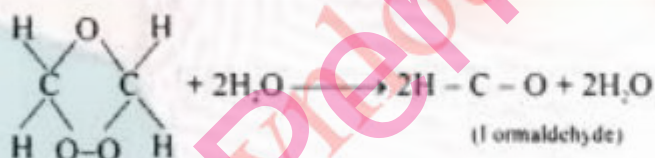
Answer

a) Ozonolysis



b) Reduction of Ozonide

i)



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 align to produce a bonding overlap along the whole system (whole molecule).



e.g. Benzene

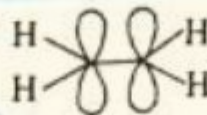
For Example:



Isolated "P" system

An isolated "p" system is a system which exists only between a pair of adjacent atoms.

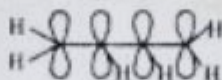
For example $C = C$ i.e. $H_2C = CH_2$.



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 $C \equiv C - O$.



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

Answers of quick quiz (Q25: to Q37)

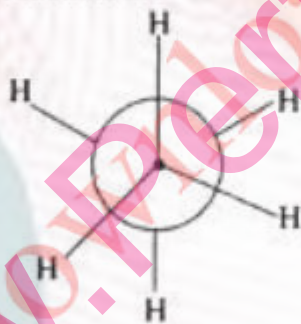
Q25: What is stereochemistry?

Answer

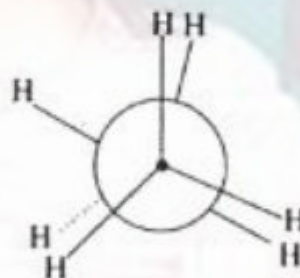
The branch of chemistry in which we study the different conformation of a molecule i.e. arrangement of an atom in a molecule in a space in which we can arise by rotation of one group on another group or an atom on another atom about a single bond is called stereochemistry.

For Example

C - C rotation in ethane



Trans on staggered form



cis or Eclipsed form

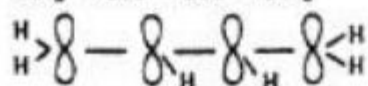
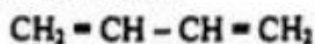
Q26: What are conjugated alkenes?

Answer

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

For example

1, 3, - butadiene

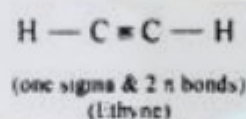
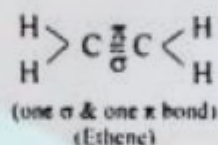


Q27: What is a pi-bond?

Answer

- The bond form by the parallel overlap of two p-orbitals present at adjacent atoms.
- A pi-bond depends upon sigma bond i.e. in a molecule first sigma bond is form ϕ then pi-bond is form.
- It is high energy exposed bond and reacts fast.
- It is present in double and triple bond only.

e.g.



Q28: What are s and p orbitals?

Answer

s – orbital

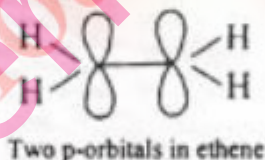
It is spherically symmetrical orbital present around a single nucleus in every shell in every atom.

For example 1s, 2s, 3s

p – orbital

It is dumb bell shaped

Orbital present in every shell except first shell. These are of three types i.e. p_x , p_y , p_z .



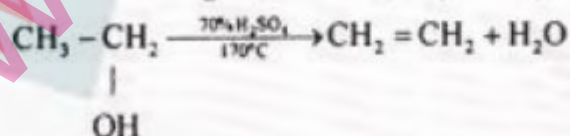
Q29: What is dehydration?

Answer

Removal of water from a substance is called dehydration.

For example

Alcohols on heating lose water (dehydrated) and are converted into alkenes.



Q30: What is dehydrohalogenation?

Answer

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

e.g. Reacting Ethyl with alcoholic

e.g

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, CaCO_3) 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.

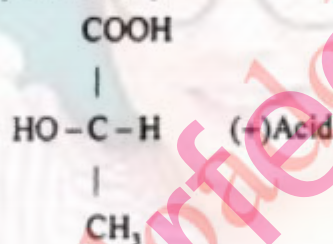
The mirror image of an optical active compound is not superimposable on its object. The optical activity of a compound is detected and measure by means of a polarimeter.

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)



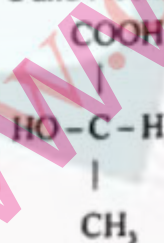
iv) Levorotatory Compounds

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

For Example

l - lactic acid or (-) Laetic acid

d and l isomers are mirror images of each other.



Object (+) Acid d – rotator

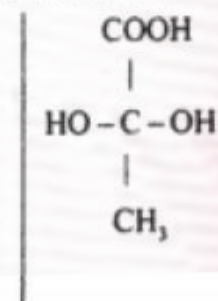


Image (-) Acid

l – rotator

mirror

Q42: What are Geomatic Isomers?

Answer

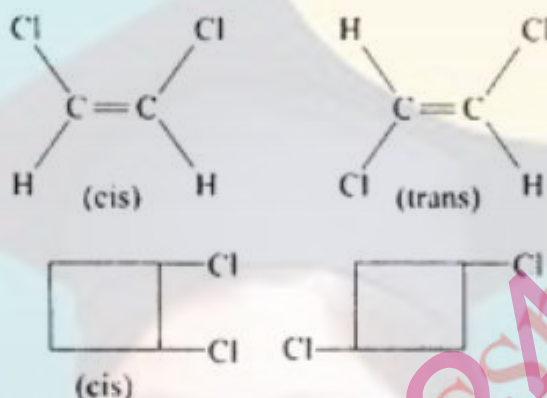
The isomers in which similar groups are attached at one side of a double bond or a cyclic ring or at opposite side of a double bond are called geometric isomers.

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: $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$ 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: $\text{CH} \equiv \text{CH}$, 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.

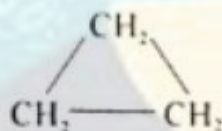
=====

Q48: What are Alicyclic hydrocarbons? Give example.

Answer

Non-benzoid cyclic hydrocarbons.

Example:



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 radicals.

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: $\text{CH}_4 + 2\text{O}_2 \longrightarrow \text{CO}_2 + 2\text{H}_2\text{O}$

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: $\text{CO}_2 + \frac{1}{2}\text{O}_2 \longrightarrow \text{CO}_2$

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 -1.

=====



Q56: What is the heat of hydrogenation of alkene?

Answer

The heat of hydrogenation of most alkene is 120 KJmole.⁻¹.

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

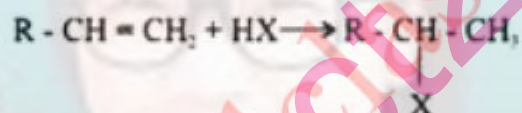
Catalytic hydrogenation of alkenes is used in industry for the manufacturing of vegetable ghee and vegetable oil.

Q59: What is hydrohalogenation? Give example.

Answer

The addition of hydrogen to halogens is called hydrohalogenation.

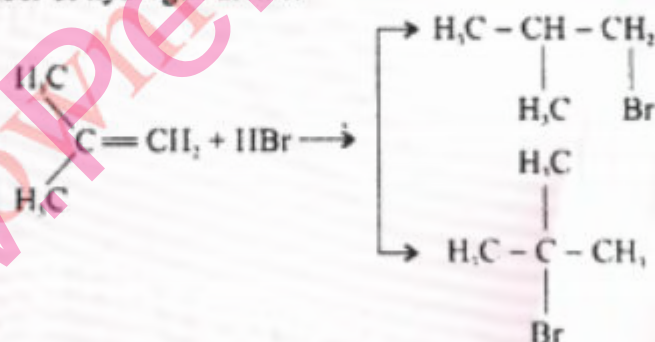
Example:



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.

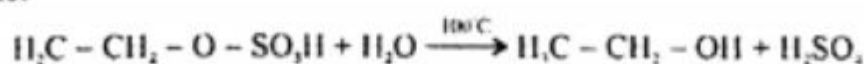


Q61: What is hydration? Give example.

Answer

Addition of water to a substance is called hydration.

Example:



Answer

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

Example:



An "extended" p-system exist over a longer series atoms.

Example:



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 lack 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: L-amino acids

Q67: Why alkynes are more stable than alkenes?

Answer

The alkynes are more stable than alkenes due to the presence 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

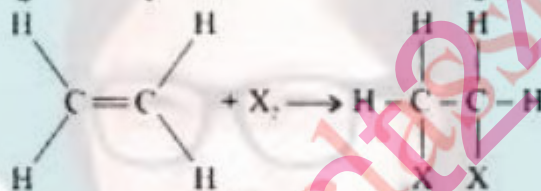
These are as follows:

- i — Butane is used as a fuel in lighter.
- ii — Butane is also used in some camping stores.
- iii — Crude petroleum's lighter than water.
- iv — Oxyacetylene torch is used for cutting of metals.
- v — Methane is used to manufacture urea fertilizer.

Q70: What is halogenation? Give Example

Answer

The addition of halogens to any substance is called halogenation.

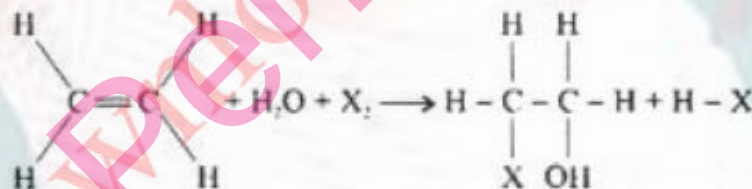


Q71: What is halohydration? Give example.

Answer

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

Example:

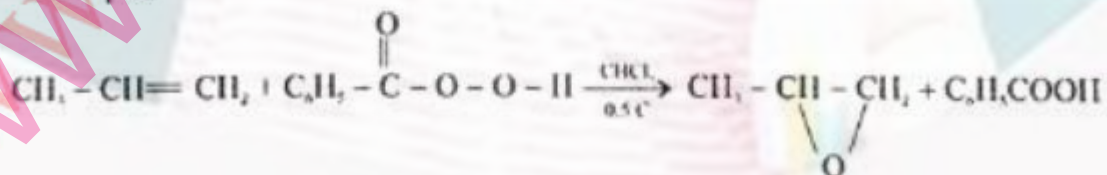


Q72: What is epoxidation? Give example.

Answer

Addition of epoxides to any substance is called epoxidation.

Example:

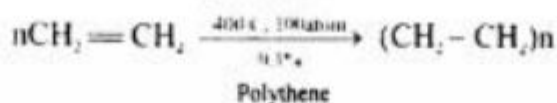


Q73: What is polymerization? Give example.

Answer

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

Example:

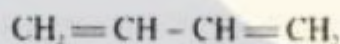


Q74: What is conjugation?

Answer

The linkage which established due to bonds is called conjugation.

Example:



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.

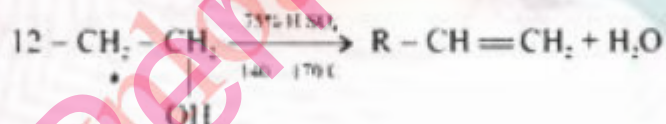
- Degree of substitution.
- Stereochemistry: trans > cis
- Conjugated alkenes are more stable than isolated alkenes.

Q77: What is dehydration?

Answer

Removal of water molecule from a substance is called dehydration.

Example:

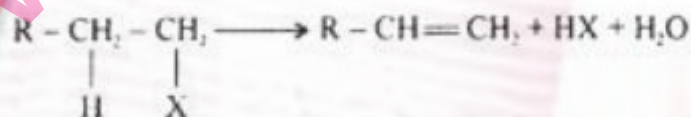


Q78: What is dehydrohalogenation?

Answer

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

Example:

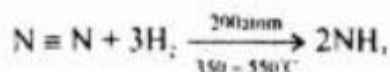


Q79: What is hydrogenation?

Answer

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

Example:



Q80: What is catalytic hydrogenation?

Answer

Addition of hydrogen to any substance in the presence of catalyst and at 1 – 5 atm pressure is called catalytic hydrogenation.

Example: $\text{H}_2\text{C}=\text{CH}_2 + \text{H}_2 \xrightarrow{\text{Pt}} \text{H}_3\text{C}-\text{CH}_3$

Q81: What is heat of hydrogenation?

Answer

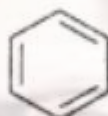
The amount of heat evolved when one mole of an alkene is hydrogenated is called heat of hydrogenation.

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 σ 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 σ 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..

