PRAADIS EDUCATION
CHEMISTRY-XII
SOME BASICS CONCEPTS OF ORGANIC CHEMISTRY
OBJECTIVES

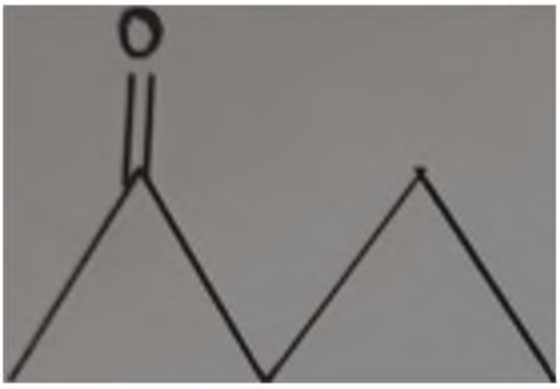
1. What is the hybridization of $CH_3CH_2CH_2CN$?
a) sp, sp^3
b) sp^2, sp^3
c) sp
d) sp, sp^2
Answer: a
Explanation: The complete structure of the compound mentioned is → CH_3-CH_2-CH_2-C≡N. When carbon forms only single bonds, then it is sp^3 hybridized. When it forms triple bond with nitrogen, then it is sp hybridized. So $CH_3CH_2CH_2CN$ is sp and sp^3 hybridized.
2. What is the valency of carbon?
a) Pentavalent
b) Divalent
c) Trivalent
d) Tetravalent
Answer: d
Explanation: The atomic number of carbon is 6 and thus it has 4 valence electrons. So, it can either accept 4 electrons or donate 4 electrons in order to become stable. But it is difficult for carbon to neither lose 4 electrons due to its strong force of attraction with the nucleus nor gain 4 electrons since the protons in the nucleus are not sufficient to hold 8 electrons in them. Therefore, carbon forms 4 covalent bonds with other atoms, thereby, exhibiting tetravalency.
3. How many σ and π bonds are present in the following molecule?
N≡C-CH-C≡N

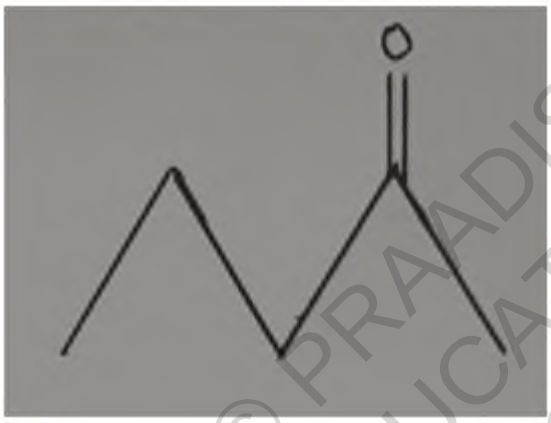
a) σ = 5; π = 4
b) σ = 6; π = 3
c) σ = 4; π = 2
d) σ = 3; π = 5
Answer: a
Explanation: Firstly, you have to draw the complete Lewis structure of the molecule. Make sure the valencies of all atoms are satisfied and then you have to count the total number of bonds present. In a triple bond, one of the bonds is a sigma (σ) bond and the other two are π bonds. In a double bond, one is σ bond and the other is a π bond. All the single bonds are σ bonds.
4. σ bonds are stronger than π bonds.
a) True
b) False
Answer: a
Explanation: In a σ bond, linear overlapping takes place whereas in a π bond, parallel overlapping takes place. Linear overlapping results in greater extent of overlapping which makes σ bond stronger than the π bond.
5. Identify the condensed formula of ethane from the following.
a) CH_3-CH_3
b) HC-H_2-C-H_3
c) CH_2=CH_2
d) CH_3CH_3
Answer: d
Explanation: In condensed formula, all the atoms are represented but single bonds are not shown. Only double and triple bonds will be represented. CH_2=CH_2 is not ethane; it is ethene.
6. Which is not a heteroatom?
a) Oxygen

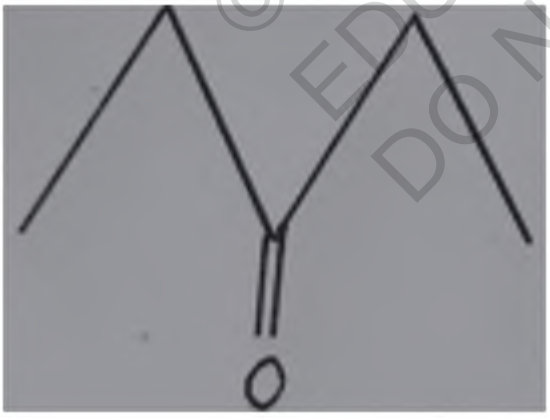
b) Nitrogen
c) Carbon
d) Sulphur
Answer: c
Explanation: A heteroatom is any atom other than carbon or hydrogen atom. All the others apart from carbon mentioned above are heteroatoms. In other words, a heteroatom is a non-carbon atom present in a carbon structure.
7. No atoms are shown while representing structures in bond-line formula.
a) True
b) False
Answer: b
Explanation: Only carbon and hydrogen atoms are not shown in bond-line representation. But other atoms like oxygen, nitrogen, chlorine, etc. are shown. Bond-line representation of molecules is a skeletal representation in which the bonds are shown as single lines according to the bond order, i.e. one line for a single bond, two lines for a double bond and so on.
8. Identify the condensed formula of the given compound from the following.
$ClCH_2CH_2CH_2CH_2CHCH_2CH_2CH_2CHCH_2CH_3$
a) Cl $(CH_2)_2$ $(CH_2)_2CH$ $(CH_2)_2CH_2CH_2CH_3$
b) Cl $(CH_2)_3CH_2CHCH_2CH_2CH_2CH$ $(CH_3)_2$
c) Cl $(CH_2)_4CH$ $(CH_2)_3CH$ (CH_2) CH_3
d) Cl $(CH_2)_3CH_2CH_2CH$ $(CH_3)_2CH_3CHCH_2CH_3$
Answer: c
Explanation: For determining the condensed formula, combine all the CH_2 terms together and assign the appropriate number to them, each time checking that carbon only forms four bonds with the other atoms. Here, in the first part, i.e. $ClCH_2CH_2CH_2CH_2CHCH_2CH_2CH_2CHCH_2CH_3$, there are four CH_2 terms; so we group all these terms and represent them as

$(CH_2)4$. Similarly, combine the CH_2 terms in the other parts and eventually we get the condensed formula of the above mentioned molecule.

9 . Determine the bond-line formula of $CH_3CH_2COCH_2CH_3$.

a) 

b) 

c) 

d) 

Answer: c

Explanation: In $CH_3CH_2COCH_2CH_3$, the ketone group(C=O) is attached to the third carbon and therefore the double bond should be represented at the end of the second line

10. What is the other name for acyclic compounds?

a) Aliphatic

b) Aromatic

c) Heterocyclic

d) Alicyclic

Answer: a

Explanation: Acyclic or open chain compounds are also called as aliphatic compounds as they consist of straight or branched chain compounds. Aromatic, heterocyclic and alicyclic compounds are closed chain or ring compounds.

11. The successive members of a homologous series differ by an unit of which of the following?

a) –CH3

b) CH3CH3

c) –CH2

d) –CH2CH3

Answer: c

Explanation: The successive members of a homologous series differ by a CH2 unit. Taking, methanol (CH3OH), ethanol (CH3CH2OH), and propanol (CH3CH2CH2OH) as examples. From this, we clearly understand that as the series progresses, the difference between each successive member is a CH2 unit.

12. Tropolone is a benzenoid compound.

a) True

b) False

Answer: b

Explanation: Tropolone is a non-benzenoid compound. It does not have a benzene ring and hence, not a benzenoid compound. Benzenoid compounds are the compounds that include benzene rings. For example: Benzene, Aniline, Naphthalene, etc.

13. Which of these is not an aliphatic compound?

a) Acetic acid

b) Acetaldehyde

c) Ethane

d) Tetrahydrofuran

Answer: d

Explanation: Tetrahydrofuran is a closed chain or a ring compound. Acetic acid, acetaldehyde, and ethane are open chain compounds, thereby, making them aliphatic compounds. Tetrahydrofuran is an organic compound with the formula (CH2)4O.

14. Pick out the option that is not a functional group from the following.

a) Hydroxyl group

b) Benzene group

c) Aldehyde group

d) Carboxylic acid group

Answer: b

Explanation: Benzene group is not a functional group. Functional groups can be defined as an atom or group of

atoms joined in a specified manner which is responsible for the characteristic chemical properties of the organic compound. Hydroxyl group (-OH), aldehyde group (-CHO), and carboxylic acid group (-COOH), all cause changes in chemical properties when attached to the hydrocarbon chains., i.e. at the position of the third carbon. In all the other options, the ketone group is not attached to the third carbon, thereby, making them incorrect.

15. 2-chloropropane and 1-chloropropane exhibit _____ isomerism.
a) chain
b) position
c) functional
d) metamerism
Answer: b
Explanation: When two or more compounds have the same molecular formula but the different position of functional groups are substituents, they are called positional isomers and the phenomenon is called position isomerism. Here 2-chloropropane and 1-chloropropane differ in position so they exhibit position isomerism.

16. Which of the following is not a type of structural isomerism?
a) geometric isomerism
b) chain isomerism
c) metamerism
d) tautomerism
Answer: a
Explanation: Structural isomerism is a type of isomerism, compounds have the same molecular formula but different structures there can be further divided into types: chain isomerism, position isomerism, functional isomerism,

metamerism, and tautomerism. Therefore geometric isomerism is not a type of structural isomerism.
17. Optical isomerism is a type of _____
a) metamerism
b) stereoisomerism
c) geometrical isomerism
d) tautomerism
Answer: b
Explanation: The compounds having the same molecular formula but the different spatial arrangement of atoms or groups are stereoisomers and the phenomenon is called stereoisomerism. it is of three types namely optical isomerism, geometrical isomerism, and conformations.
18. The d-form is also known as _____
a) rotatory
b) laevorotatory
c) dextrorotatory
d) l-form
Answer: c
Explanation: The isomer which rotates the plane of polarized light towards the right that is clockwise, is known as a dextrorotatory or d form while that which rotates towards the left that is anti-clockwise, is known as laevorotatory or l-form.
19. Enantiomers are same as diastereomers.
a) true
b) false
Answer: b
Explanation: In optical isomerism, enantiomers are nonsuperimposable mirror images while diastereomers are the isomers which are nonsuperimposable and not related to each other as mirror images, they also have different physical and chemical properties.

20. How many planes of symmetry does a meso compound have?
a) 2
b) 1
c) 3
d) 4
Answer: b
Explanation: The compound whose half part of a molecule is a mirror image of the other half, is called meso form. Generally, a meso compound has two or more chiral centers and one plane of symmetry. the compound in meso form is optically inactive due to internal compensation.
21. If a compound has 3 chiral carbons What is the number of optically active isomers?
a) 9
b) 3
c) 4
d) 8
Answer: d
Explanation: The number of optically active isomers for a compound is given as 2^n where, n represents the number of chiral carbons in that particular carbon, here as the compound has 3 chiral carbons n = 3, so the number of optically active isomers equals $2^3 = 8$.
22. A compound with the same molecular formula exists in two forms one is alcohol and the other is Ether, what type of isomerism does it show?
a) metamerism
b) positional isomerism
c) functional isomerism
d) chain isomerism
Answer: c
Explanation: Functional isomerism arises when two or more

compounds having the same molecular formula but the different functional group. An example is that C_3H_6O represents an aldehyde as well as a Ketone, therefore we can say that the above compound which is alcohol, as well as Ether, shows functional isomerism.

23. What is the specific rotation if its observed rotation is given as 3x, its length is given as x and density is given as 3/y?

a) 2y
b) 3y
c) y
d) 4y

Answer: c

Explanation: The specific rotation is given by the expression observed rotation/length X density, here as observed rotation is given as 3x and its length is given as x, while the density is 3/y, the specific rotation equals 3x/x(y/3) = y.

24. Free radicals are formed during homolytic fission.

a) true
b) false

Answer: a

Explanation: In homolytic fission, one of the electrons of the shared pair in covalent bond goes with each of the bonded atoms, the neutral chemical species such formed, is called free radical. Generally, homolytic fission takes place in non-polar, covalent molecules in the presence of Sunlight or high-temperature free radicals are highly reactive, neutral and electron deficient species which are formed here.

25. Nucleophilic reagents behave as _____

a) water
b) lewis base
c) lewis acid
d) salt

Answer: b
Explanation: Nucleophilic reagents are electron rich species,s they behave as Lewis bases. They attack at electron deficient area and in case of the same nucleophilic site, nucleophilicity parallels basicity that is as well as a city increases nucleophilicity also increases.
26. Carbocations bear a _____ charge.
a) no
b) negative
c) positive
d) 0
Answer: c
Explanation: Carbocations are the product of hydrolysis and contain a carbon bearing positive charge, these are electron deficient species. Carbocations contain 6 electrons in their valence shell, these are also planner chemical species with sp^2 hybridization and an Empty p-orbital.
27. What is the hybridization of singlet carbene?
a) sp
b) sp^3
c) sp^3d
d) sp^2
Answer: d
Explanation: In a singlet carbon, the carbon atom is sp^2 hybridized, the unhybridized orbitals contain no electrons and a hybridized orbital contains two electrons. Singlet carbene has a brain structure and is less stable than a triplet carbine.
28. Which of the following is false regarding inductive effect?
a) temporary effect
b) propagates through a carbon chain
c) permanent effect
d) groups having high electron affinity than hydrogen show

the negative inductive effect
Answer: a
Explanation: Inductive effect is a permanent effect and it propagates through carbon chain atoms or group having greater electron affinity than hydrogen, are said to have electronic track thing or negative inductive effect and vice versa. Inductive effect is just like shifting of shared pair of electrons in polar covalent molecules.
29. In a molecule, when displacement of electron pair is away from the group it is _____ electromeric effect.
a) zero
b) negative
c) positive
d) no
Answer: c
Explanation: Electromeric effect is defined as the polarity produced in a multiple bonded compounds as a reagent approaches it in the presence of attacking agent, the 2 π electrons are completely transferred to any one of them and this effect is temporary. It is positive electromeric effect to when the displacement of electron pair is away from the atom or group and vice versa.
30. Baker Nathan effect is related to _____
a) inductive effect
b) electromeric effect
c) hyperconjugation
d) resonance
Answer: c
Explanation: Hyperconjugation involves delocalization of Sigma electrons of a carbon-hydrogen bond of an alkyl group attached directly to an atom of unsaturated system or to an atom with an ancient π orbital. It is calso called no Bond formation or Baker Nathan effect.

31. Resonating structures are also known as _____ forms.
a) canonical
b) inductor
c) electromeric
d) nucleophilic
Answer: a
Explanation: When all the properties of a molecule cannot be shown by a single structure and two or more structures are required to show all the properties of that molecule, then the structures are called resonating structures are canonical forms and the molecule is referred to as resonance hybrid.
32. What is obtained by thermolysis of azides?
a) free radicals
b) carbocation
c) arene
d) nitrene
Answer: d
Explanation: Nitrenes are obtained by the thermolysis of azides. They are neutral monovalent nitrogen species in which nitrogen atom has 2 and shared pair of electrons with a monovalent atom or group attached and they are as reactive as carbenes.
33. If the total number of bonds between two atoms is 3 the total number of resonating structures is 2 what is the bond order?
a) 0.5
b) 1.5
c) 2.5
d) 3.5
Answer: b
Explanation: Bond order is given by the formula that the total number of bonds between two atoms / the total number of

resonating structures, the bond order = 3/2 = 1.5, we can say that there is a relation between resonance and bond order through this equation.

34. The purification method where solid substances change from solid to vapor state without passing through the liquid state is called as which of the following?

a) Sublimation

b) Crystallization

c) Distillation

d) Differential extraction

Answer: a

Explanation: In sublimation, the solid substance transforms directly to the vapor state without entering into the liquid state. This helps in separating sublimable compounds from non-sublimable ones. Whereas the other three, i.e. crystallization, distillation and differential extraction are used when a suitable solvent is involved. In other words, they deal with mainly liquids and not solids alone.

35. In crystallization, the compound dissolved in a solvent is more soluble in what temperature?

a) Room temperature

b) Lower temperature

c) Higher temperature

d) Very low temperature

Answer: c

Explanation: When a compound is dissolved in water, solubility increases with increase in temperature. This is because, when the temperature increases, the kinetic energy also increases which in turn helps the solvent molecules to break apart the solute molecules more efficiently than in other cases. These solute molecules are held together by intermolecular interactions which requires greater energy to be broken off and hence, higher temperature.

36 What is the basis for the process of distillation?
a) Difference in melting point
b) Difference in temperature
c) Difference in pressure
d) Difference in boiling point
Answer: d
Explanation: The process of distillation is based on the difference in the boiling points of the liquids. This is because, liquids having different boiling points vaporize at different temperatures. In this way, the vapors cooled can be collected separately from the liquid formed. Crystallization is used to separate volatile liquids from non-volatile liquids as well.
37. In fractional distillation, vapors of low boiling point component ascend to the top of the column.
a) True
b) False
Answer: a
Explanation: Fractional distillation, like normal distillation is also based on the difference in boiling point of the liquids. The only difference in fractional distillation is that, the liquids associated with this method have lesser difference in boiling point than the liquids involved in normal distillation. So, the high boiling point liquids condense at the bottom while the low boiling point liquid condense all the way to the top of the distillation column.

38. Identify the example of compounds separated by steam distillation method.
a) Glycerol-spent lye mixture in soap industry
b) Aniline-water mixture
c) Chloroform and aniline mixture
d) Different fractions of crude oil in petroleum industry
Answer: b
Explanation: Aniline and water mixture is separated by

employing the process of steam distillation. Steam distillation method is used when the substances involved are steam volatile and immiscible in water. Aniline satisfies both these conditions and, hence, this method is used to separate aniline from aniline-water mixture. Glycerol-spent lye mixture is an example of distillation under reduced pressure, chloroform and aniline mixture employs simple distillation, and crude oil separation involves fractional distillation method.

39. Which of the following is the apparatus for differential extraction?

a) Separatory funnel

b) Porous sheet

c) Packed column

d) Electric motor

Answer: a

Explanation: A seperatory funnel is used in differential extraction. Differential extraction involves separating the immiscible organic compound from the aqueous solvent. The separating funnel aids in this process of separating immiscible liquids. It also helps in layer formation, with the denser solvent at the bottom and the other on top. This layer formation is important for the process, and thus, separatory funnel is chosen as the apparatus for differential extraction.

40. Which is not used as an absorbent in adsorption chromatography?

a) Silica gel

b) Alumina

c) Potassium permanganate

d) Starch

Answer: c

Explanation: A good adsorbent requires large surface area, should be easily available, less expensive. They should also be thermally stable, and have high abrasion resistance. Silica,

alumina, and starch possesses these characteristics while potassium permanganate does not, so it cannot be an adsorbent.

41. In column chromatography, identify the mobile and stationary phase from the following.
a) Solid, Liquid
b) Liquid, Solid
c) Gas, Liquid
d) Solid, Solid
Answer: b
Explanation: In column chromatography, the mobile phase is made out of liquid or a mixture of liquids which is allowed to flow down the column, and the stationary phase consists of solid, that is the adsorbent(alumina or silica gel) over which the liquid(mobile phase) flows.

42. Paper chromatography is a type of which chromatography?
a) Column chromatography
b) Thin layer chromatography
c) Adsorption chromatography
d) Partition chromatography
Answer: d
Explanation: Paper chromatography is a type of partition chromatography. This is because, they spend more time in the stationary phase than the mobile phase. Also, they won't travel very fast up the paper. Partition chromatography employs the method of separation by making use of the partition of the solutes between the two liquid phases.

43. The mobile phase in chromatography can comprise of which of the following?
a) Gas or liquid
b) Liquid or solid
c) Solid or gas

d) Liquid only
Answer: a
Explanation: The function of the mobile phase in chromatography is to flow over the stationary phase through the packed bed or column. So, only fluids (liquid or gas) can be employed as mobile phase whereas solids cannot be mobile phase, simply due to its inability to flow like fluids and also the interaction with the stationary phase (solid or liquid) will be affected and hence, solids cannot be used as mobile phase.
44. Which type of chromatography involves the separation of a mixture over a column of adsorbent packed in a glass tube?
a) Thin layer chromatography
b) Partition chromatography
c) Column chromatography
d) Gas liquid chromatography
Answer: c
Explanation: Column chromatography involves the separation of a mixture over a column of adsorbent packed in a glass tube. The mixture adsorbed on the adsorbent is placed at the top of the column and the mobile phase is allowed to flow through the column slowly.
45. Gas chromatography can be performed in X, whereas liquid chromatography can be performed in Y. Identify X and Y.
a) X = only plane surfaces, Y = only columns
b) X = only columns, Y = only plane surfaces
c) X = only columns, Y = columns or plane surfaces
d) X = columns or plane surfaces, Y = only plane surfaces
Answer: c
Explanation: Gas chromatography can be done only in columns because in this method, the sample is vaporized and injected onto the top of the chromatographic column. It could be gas-liquid or gas-solid chromatography. Liquid

chromatography has liquid as the mobile phase where sample ions or molecules are dissolved. So, it can be carried out either in a column or a plane.

46. What is the paper strip developed in partition chromatography called?

a) Chromatograph

b) Chroma

c) Chromatographing strip

d) Chromatogram

Answer: d

Explanation: The paper strip so developed by retaining different components according to their different partitions in the two phases is called a chromatogram. The spots of the separated colored components are visible at different lengths from the location of the initial point on the chromatogram.

47. Which is the most suitable carrier gas in gas chromatography?

a) Helium

b) Nitrogen

c) Oxygen

d) Carbon dioxide

Answer: a

Explanation: In gas chromatography, the carrier gas should be an inert gas which does not react with the sample. Even though nitrogen and some other gases are also used, 90% of the instruments use helium as the carrier gas. Hydrogen is preferred for improved separations.

48. Alkanes are also known as _____

a) alkenes

b) paraffin

c) aromatic

d) alicyclic

Answer: b

Explanation: Alkanes are saturated aliphatic open chain hydrocarbons with carbon-carbon single bonds. They are inert under normal conditions they do not react with acids, bases and other reagents. They were earlier known as paraffin, in Latin Param = little and affine means affinity.

49. Is of hydrogenation is _____ on steric crowding.

a) may be related to

b) dependent

c) independent

d) not related to

Answer: b

Explanation: Ease of hydrogenation depends on the steric crowding across multiple Bond, more the steric crowding, the less is reactivity towards hydrogenation. This concept is used in one of the methods of preparation of alkanes from the hydrogenation of alkenes and alkynes.

50. How many carbons are there in the product of a decarboxylation reaction when compared with the reactant?

a) two carbons more

b) one carbon more

c) one carbon less

d) an equal number of carbons

Answer: c

Explanation: Decarboxylation of sodium or potassium salt of fatty acids is decarboxylation reaction. This reaction is used for descending of series as the alkane obtained has one carbon less than the parent compound. Here quicklime is used as it is more hygroscopic than sodium hydroxide and keeps Sodium Hydroxide in a dry state.

51. Which of the following reaction is used to increase the length of the carbon chain?

a) Wolff Kishnn’s reaction

b) Clemmensen reduction

c) Kolbe’s electrolysis
d) Wurtz reaction
Answer: d
Explanation: Wurtz reaction is used to increase the length of the carbon chain, Kolbe’s electrolysis is used when alkanes require even number of carbon atoms while clemmensen reduction and wolff-kishner are used for removing water molecule.
52. Corey-House synthesis is used for alkanes having _____ number of carbon atoms.
a) 6
b) 3
c) 2
d) 4
Answer: b
Explanation: Corey-House synthesis is one of the methods of preparation of alkanes and this method can be used to prepare alkanes having an odd number of carbon atoms. As 6, 2, and 4 are even numbers only the compound with three carbon atoms can be prepared.
53. Alkynes are _____ in nature and first four members are _____ gases.
a) polar, white
b) nonpolar, colourless
c) polar, colourless
d) nonpolar, white

Answer: b
Explanation: Alkanes being nonpolar in nature, soluble in nonpolar solvents but insoluble and polar solvent such as water. The first four members of alkanes are colourless gases, the next 13 members are colourless liquids and next higher

members are colourless solids, this can be explained on the basis of the magnitude of attraction forces.

54. Which of the following is not a process of halogenation of alkanes?
a) acylation
b) chlorination
c) bromination
d) iodination
Answer: a
Explanation: Chlorination, bromination and iodination are the processes of halogenation of alkanes. Mechanism of halogenation of alkanes is free radical in nature that is the attacking reagent is a halogen-free radical, therefore it is a chain reaction.
55. In the combustion reaction of alkanes if Ethane is used how many moles of oxygen are required?
a) 3
b) 4
c) 7
d) 3.5
Answer: d
Explanation: The combustion reaction of alkanes has a standard reaction that is $C_nH_{2n+2} + (3n/2 + 1/2)O_2 \rightarrow nCO_2 + (n + 1)H_2O$. In the case of combustion of ethane, n = 2. That means the number of moles of oxygen required is 3(2)/2 + 1/2 = 3.5
56. Methane cannot be prepared by the reduction of alkenes or alkynes.
a) true
b) false
Answer: a
Explanation: Methane cannot be prepared by reduction of alkenes or alkynes because alkanes or alkynes require a

minimum of two carbon atoms in order to form, but Methane has only a single carbon in it Methane cannot be prepared by Kolbe's electrolysis and woods reaction also.

57. Which of the following is true regarding the boiling point?

a) cannot say

b) n-Octane is greater than isooctane

c) n-Octane is less than isooctane

d) n-Octane is equal to isooctane

Answer: b

Explanation: The boiling point of alkanes decreases on branching and boiling point is directly proportional to the van der walls forces and the van der wall forces are directly proportional to the molecular mass as well as surface area. So we can say that the boiling point of n-Octane is greater than that of isooctane.