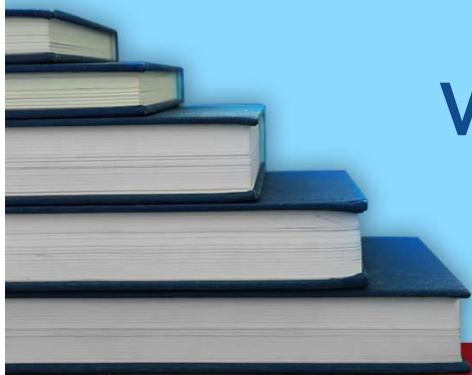


CHEMISTRY



WORKSHEET-1



STP

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Worksheet-1
(C. Organic Chemistry)
Fundamental Principles

Q.1 Which of the following is not an aromatic compound?

- A) Phenol
B) Vinyl alcohol
C) Benzaldehyde
D) Nitrobenzene

Q.2 Identify the incorrect statement about properties of organic compounds:

- A) They have low melting points
B) Their solutions are non-conductor
C) They show isomerism
D) They are non-flammable

Q.3 Which of the following is not a polar molecule?

- A) CHCl_3
B) CH_3COCH_3
C) CCl_4
D) CH_3OH

Q.4 Which one of the following statements is not correctly matched?

Options	Class of organic compound	Example
A)	Straight chain compound	1-Butene
B)	Alicyclic compound	Cyclohexene
C)	Aromatic compound	Toluene
D)	Heterocyclic compound	Aniline

Q.5 Which of the following is not an example of heterocyclic compound?

- A) Pyrrole
B) Catechol
C) Furan
D) Thiophene

Q.6 Which of the following is not a nucleophile?

- A) R_3C^+
B) $\text{R}-\text{CH}_2^-$
C) CN^-
D) NH_3

Q.7 Which of the following is an electrophile?

- A) Cl^-
B) BF_3
C) H_2O
D) NH_2^-

Q.8 Which of the following hydrocarbons is the most reactive?

- A) Alkane
B) Alkyne
C) Alkene
D) Benzene

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Q.9 In geometric isomerism, the cis-isomers have all of the following properties EXCEPT:

- A) They are polar molecules
- B) They have high boiling points
- C) They are symmetrical molecules
- D) They have low melting points

Q.10 Which of the following organic compounds does not show geometric isomerism?

- A) 2-Butene
- B) 3-Hexene
- C) 2-Pentene
- D) 1-Butene

Q.11 Which of the following is/are basic conditions for geometric isomerism?

- A) Having Carbon Carbon double bond (C = C)
- B) Different groups are attached with carbon containing double bond
- C) Double bond involves free rotation
- D) Both A and B

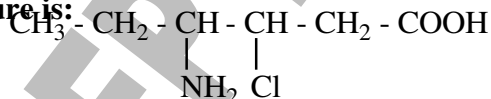
Q.12 Which of the following is the most stable free radical?

- A) $\begin{array}{c} \text{R} \\ | \\ \text{R}-\text{C}^{\bullet} \\ | \\ \text{R} \end{array}$
- B) $\text{R}-\text{C}^{\bullet}\text{H}_2$
- C) $\begin{array}{c} \text{R}-\text{C}^{\bullet}\text{H} \\ | \\ \text{R} \end{array}$
- D) $\text{C}^{\bullet}\text{H}_3$

Q.13 Which of the following is the least stable carbocation?

- A) Me_3C^+
- B) CH_3^+
- C) Me_2CH^+
- D) MeCH_2^+

Q.14 The correct name according to IUPAC of the given structure is:



- A) 4-Amino-3-chlorohexanoic acid
- B) 3-Amino-4-chlorohexanoic acid
- C) 4-Amino-5-chlorohexanoic acid
- D) 2-Amino-3-chlorohexanoic acid

Q.15 Which of the following type of cracking (pyrolysis) is used

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to increase production of petrol?

- A) Thermal cracking C) Electrolytic cracking
 B) Catalytic cracking D) Steam cracking

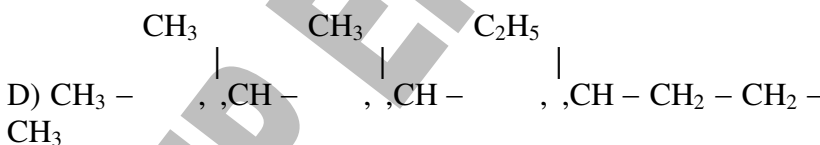
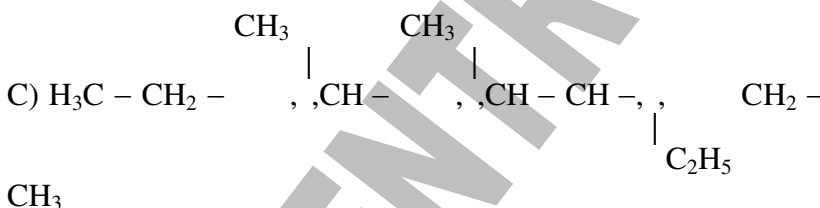
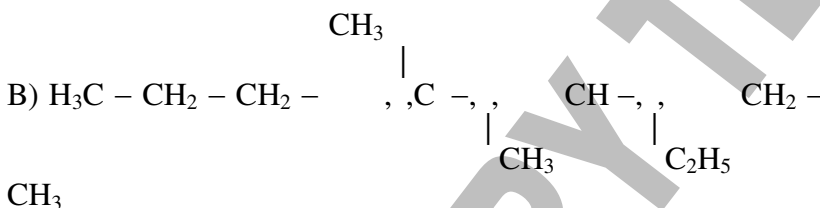
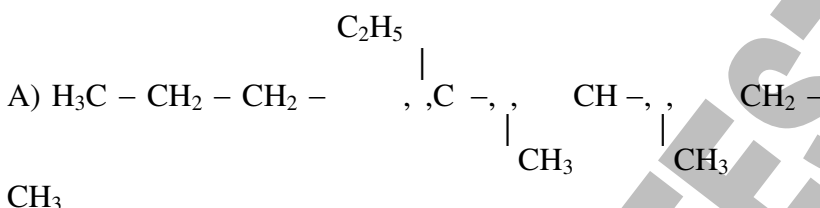
Q.16 Consider the following condensed formula of alkane:



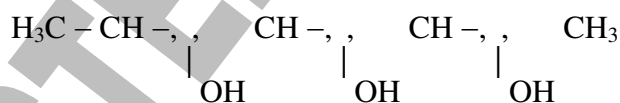
Correct name of above formula according to IUPAC is:

- A) 2,3,4-Trimethylpentane C) 2,4,4-Trimethylpentane
 B) 2,6,6-Trimethylpentane D) 2,2,4-Trimethylpentane

Q.17 The structural formula of the following given compound 4-Ethyl-3,4-dimethylheptane is:



Q.18 Consider the following structural formula of alcohol:



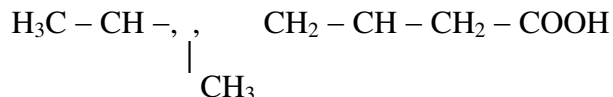
The correct name of above formula according to IUPAC is:

- A) 1,2,3-Pentanetriol C) Pentane-2,3,4-triol
 B) 1,2,3-Propanetriol D) Propylene-1,2,3-triol

SCRATCH WORK

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SCRATCH WORK

Q.19 Consider the following structural formula of a carboxylic acid:



The correct name according to IUPAC is:

- A) 5-Methylhexanoic acid C) 2-Methyl-5-hexanoic acid
B) 2-Methylhexanoic acid D) 5-Methylvaleric acid

Q.20 The correct name according to IUPAC of the following alkene is:



- A) 1,3-Pentadiene C) 2,3-Pentadiene
B) 2,4-Pentadiene D) 1,4-Pentadiene

Q.21 An atom or a group of atoms or a double bond or triple bond whose presence imparts specific properties to organic compounds is called a functional group, because they are the chemically functional parts of molecules. Which of the following is functional group of carboxylic acid?

- A) -COOH C) -CONH₂
B) -OH D) -CHO

Q.22 Which of the following is functional group of thioalcohol?

- A) Cyano group C) Mercapto group
B) Formyl group D) Amino group

Q.23 The type of isomerism which arises due to shifting of proton from one atom to other in the same molecule is called:

- A) Tautomerism C) Geometric isomerism
B) Metamerism D) Chain isomerism

Q.24 Which of the following class of organic compounds contains ring which has more than one kind of atoms?

- A) Aromatic C) Non-benzenoid
B) Heterocyclic D) Aliphatic

Q.25 The type of structural isomerism which arises due to the unequal distribution of carbon atoms on either side of the functional group is called:

- A) Chain isomerism C) Tautomerism
B) Metamerism D) Position isomerism

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Q.26 Which of the following pair of organic compounds shows position isomerism?

- A) $\text{CH}_3\text{-CH}_2\text{-CHO}$ and $\text{CH}_3\text{-CO-CH}_3$
 B) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-OH}$ and $\text{CH}_3\text{-CH(OH)CH}_3$
 C) $\text{C}_2\text{H}_5\text{-O-C}_2\text{H}_5$ and $\text{CH}_3\text{-O-C}_3\text{H}_7$
 D) $\text{CH}_3\text{-COOH}$ and HCOOCH_3

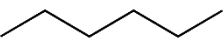
Q.27 There are two types of isomerism i.e. structural isomerism and stereoisomerism. The two main types of stereoisomerism are: Diastereomerism (including 'cis-trans isomerism' and Optical Isomerism). Each non-superimposable mirror image structure is called a/an:

- A) Metamer
 B) Elastomer
 C) Enantiomer
 D) Tautomer

Q.28 Which of the following is skeletal formula of hexane?

A) C_6H_{14}

B) $\text{H}_3\text{C - CH}_2\text{ - CH}_2\text{ - CH}_2\text{ - CH}_2\text{ - CH}_3$

C) 

D)
$$\begin{array}{cccccc} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \\ & | & | & | & | & | & | \\ \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{H} \\ & | & | & | & | & | & | \\ & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \end{array}$$

Q.29 Which of the following is structural formula of pentane?

A)
$$\begin{array}{cccccc} & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \\ & | & | & | & | & | \\ \text{H} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{C} & - \text{H} \\ & | & | & | & | & | \\ & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} \end{array}$$

B) $\text{H}_3\text{C - CH}_2\text{ - CH}_2\text{ - CH}_2\text{ - CH}_3$

C) $\text{H}_3\text{C(CH}_2\text{)}_3\text{CH}_3$

D) 

Q.30 A reaction which results in the removal of a small molecule from a large one is called?

- A) Addition reaction
 B) Elimination reaction
 C) Substitution reaction
 D) Oxidation reaction

Q.31 Which of the following terms is not used for organic compound?

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- A) Molecular formula C) Skeletal formula
B) Structural formula D) Ionic formula

Q.32 Mark the incorrect statement about petrol (gasoline):

- A) Greater is octane number better is the quality of petrol
B) Quality of petrol is increased by reforming
C) Production of petrol is increased by cracking
D) If octane number of petrol is 60 it is considered good quality of petrol

Q.33 Which of the following is/are types of organic reactions mechanisms?

- A) Polar or ionic mechanism only
B) Free radical mechanism only
C) Both A and B
D) Neither A nor B

STEP ENTRY TEST 2020

ANSWER KEY (Worksheet-1)

1	B	11	D	21	A	31	D
2	D	12	A	22	C	32	D
3	C	13	B	23	A	33	C
4	D	14	A	24	B		
5	B	15	B	25	B		
6	A	16	D	26	B		
7	B	17	A	27	C		
8	C	18	C	28	C		
9	C	19	A	29	B		
10	D	20	A	30	B		

ANSWERS EXPLAINED

Q.1 (B) Vinyl alcohol ($\text{CH}_2=\text{CH-OH}$) is not an aromatic compounds while others A, C and D are aromatic compounds.

- The term aromatic was derived from Greek word “aroma” meaning fragrant and was used in organic chemistry for a special class of compounds.
- These compounds have a low hydrogen to carbon ratio in their molecular formula and have a characteristics odour.
- However, it was soon realized that many aromatic compounds are odourless where as many others are fragrant though they are not aromatic.
- Further, when aromatic compounds of higher molecular mass were subjected to various methods of degradation, they often produced benzene or derivatives of benzene.
- It was observed that almost all the aromatic compounds have a six carbon unit in their molecules like benzene.

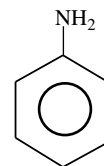
- Hence, benzene was recognized as the simplest and the parent member of this class of compounds.

- Aromatic compounds, also known as arenes or aromatics, are chemical compounds that contain conjugated planar ring systems with delocalized pi electron clouds instead of discrete alternating single and double bonds. Typical aromatic compounds are benzene and toluene. They should satisfy Hückel's rule ($4n + 2$).

Q.2 (D) Organic compounds are in the form of gases, liquids and solids. They are volatile and highly inflammable

Q.3 (C) Carbon tetrachloride (CCl_4) has polar carbon-chlorine bonds but the molecule is non-polar because their bond moments cancel the effect of each other. That is why its $\mu=0$ and molecule is non-polar. But others A, B and D are polar molecules.

Q.4 (D) Aniline is not heterocyclic compound. It is aromatic compound and its structural formula is:



Q.5 (B) Catechol

also known as pyrocatechol or 1,2-dihydroxybenzene, is an organic

compound with the molecular formula $C_6H_4(OH)_2$.

Q.6 (A) Tertiary carbocation (R_3C^+) bears positive charge and it acts as electrophile while all others B, C and D are nucleophiles.

Q.7 (B) BF_3 is a electrophile because central atom boron is deficient one electron pair while all others A, C and D are nucleophiles.

Q.8 (C) In alkene there is Carbon Carbon double bond ($C = C$).

- A pi-bond is weak bond as compared to a sigma-bond.
- During a reaction pi-bond breaks comparatively easily rendering alkenes as reactive group of compounds.
- Moreover, the loosely held pi electrons are more exposed to attack by the electrophilic reagents. Alkenes act as a nucleophilic reagent and they give electrophilic addition reactions. Both the above mentioned facts make the alkenes a very reactive class of compounds. The general order of reactivity is shown below:

Alkenes > Alkynes > Benzene > Alkanes

Q.9 (C) Since cis-form of geometric isomerism is unsymmetrical molecule so it has certain dipole moment value. It has high boiling point and low melting point.

Q.10 (D) 1-Butene does not fulfill the conditions of geometric isomerism. Though it has carbon carbon double bond ($C = C$) but different groups are not attached with carbon containing

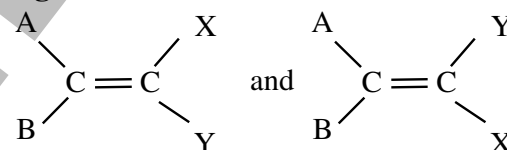
double bond, as shown in the structure $CH_2 = CH - CH_2 - CH_3$.

Q.11 (D) Basic conditions for geometric isomerism are such as:

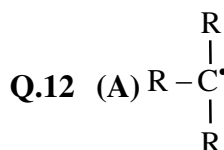
- Having Carbon Carbon double bond
- Different groups are attached with carbon containing double bond

Memorize: The presence of a double bond is not the only condition for geometrical isomerism. Each double bonded carbon atom must have two different groups attached to it.

e.g.

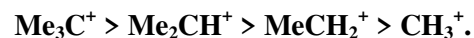


are geometrical isomers only if $A \neq B$ and $X \neq Y$. A can be the same as X and Y, and B can be the same as X or Y.



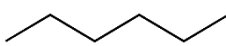
is the most stable free radical while others B, C, and D are not.

Q.13 (B) CH_3^+ (methyl carbocation) is the least stable because of less number of alkyl groups (i.e. electron donating) are attached with it. Order of stability of carbocations is



Q.14 (A) The correct name according to IUPAC of the given compound is 4-Amino-3-chlorohexanoic acid.

Q.27 (C) Optical isomers are two compounds which contain the same number and kinds of atoms, and bonds (i.e., the connectivity between atoms is the same), and different spatial arrangements of the atoms, but which have non-superimposable mirror images. Each non-superimposable mirror image structure is called an enantiomer. All α -amino acids show optical isomerism except glycine.

Q.28 (C) 

is the skeletal formula of hexane.

Q.29 (B) $\text{H}_3\text{C} - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$ is the structural formula of pentane.

Q.30 (B) Those reactions which involve the removal of atoms or groups of atoms from adjacent carbon atoms to form a multiple bond are called elimination reaction.

Q.31 (D) Ionic formula does not represent organic molecule.

Q.32 (D) The concept of octane number was introduced by Edgar.

- According to him n-heptane is the worst fuel and its octane number is zero and Isooctane is the best fuel its octane number is 100.
- The octane number of any fuel is the percentage by volume of isooctane in a mixture of isooctane and n-heptane.

- e.g. a petrol that burns like 90 : 10 mixture of isooctane and n-heptane is said to have an octane number of 90.
- Memorise: Good petrols have high octane number.
- The octane number of a petrol can be improved:
 - By increasing the proportion of branched chain and cyclic alkanes
 - By addition of aromatic hydrocarbons such as benzene
 - By addition of methanol or ethanol
 - By addition of tetraethyllead $(\text{C}_2\text{H}_5)_4\text{Pb}$
- Most modern cars run on petrol with an octane number of 95 – 99
- The petrol obtained from the gasoline fraction has an octane number of only about 55 – 60.
- It needs considerable modification blending before it can be used as a motor fuel.

Q.33 (C) 1) Polar or ionic mechanism:

(i) The mechanism of reactions involving the attack of electrophilic or nucleophile reagents on the polar substrate molecule is referred to as polar or ionic mechanism.

e.g.



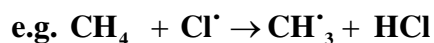
Polar substrate nucleophile

(ii) This type of mechanism is applicable to organic reactions in which heterolytic bonds fission takes place.

(iii) In this case the substrate molecule develops polarity (positive or negative centers).

2) **Free radical mechanism:**

(i) The mechanism of reactions involving the attack of free radicals on the substrate molecule is referred to as a free radical mechanism.



Substrate **Free radical**

(ii) This type of mechanism applies to organic reactions in which homolytic bond fission takes place.

(iii) The first step is the formation of free radical (R^\cdot) from a reagent by a homolytic fission. These free radicals can then attack the substrate to give the product.



STOP

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