CARBON & ITS COMPOUND

CLASS-X S.A-II (Chemistry)

TIME- 3 hrs F.M- 90

SECTION-A

Q1: Which is the common name for ethyne? **Ans: : Acetylene** **1mark**

Q2: What is the term used for the compounds which have same molecular formula but different structures? **Ans: Isomers (strutural isomers)** **1mark**

Q3. What is next homologue of C_3H_7OH is called? **1mark**

Answer: **The next homologue of C_3H_7OH is called butanol C_4H_9OH.**

Q4. What is meant by the term functional group? **2marks**

Answer: **An atom or a group of atoms, which makes a carbon compound reactive and decides its properties. is called a functional group..**

Q5. Give the names of the following functional groups: **2marks**

i) —OH (ii) —COOH

Answer: (i) Alcoholic (ii) Carhoxylic.

Q6. What would be the electron dot structure of carbon dioxide which has the formula CO_2? **2marks**

Answer: Electron dot structure of CO_2 is O=C=O

Q7. A neutral organic compound a of molecular formula C_2H_6O on heating with excess of conc. H_2SO_4 gives compound B of molecular formula C_2H_4 . Compound B on reduction gives compound C of molecular formula C_2H_6 (a) Name A, B, and C. (b) Write chemical equation for the conversion of A to B. **2marks**

Answer: (a):- A- ethanol B- ethene C- ethane

(b):- $CH_3CH_2OH \xrightarrow{\text{Conc. } H_2SO_4} CH_2=CH_2 + H_2O$

Q8. Why a candle flame burns yellow, while a highly-oxygenated gas-fuel flame burns blue? **3 marks**

Answer: **The most important factor determining color of the flame is oxygen supply and the extent of fuel-oxygen pre-mixing, which determines the rate of combustion and thus the temperature and reaction paths, thereby producing different color hues. In case of candle, it is an incomplete combustion and the flame temperature is not high. This gives a yellow flame. While a highly-oxygenated gas (e.g. ethyne) flame burns blue because of complete combustion raising a very high temperature**.

Q9. Why is the reaction between methane and chlorine considered a substitution reaction? **3 marks**

Answer: **Methane reacts with chlorine in the presence of sunlight to form chloromethane and hydrogen chloride.**

$CH_4 + Cl_2 \rightarrow CH_3Cl + HCl$

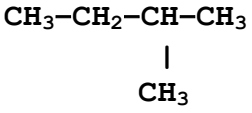
With the excess of chlorine, aH the four hydrogen atoms of methane are replaced by chlorine atoms to form carbon tetrachloride (CCl_4). This reaction is considered as substitution reactions because hydrogen of methane is substituted by chlorine.

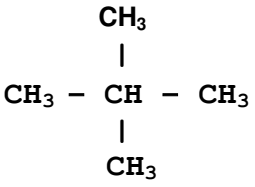
Q10. How many structural isomers can you draw for pentane? **3 marks**

Answer: There are three structural isomers of pentane:

(i) Pentane:- $CH_3-CH_2-CH_2-CH_2-CH_3$ **(iii) 2-2 dimethyl propane (neo-pentane)**

(ii) 2-methyl Butane (iso-pentane)





Q11. What are Hydrocarbons? Give examples. What are saturated hydrocarbons? **3 marks**

Answer: Compounds of carbon and hydrogen are called hydrocarbons. Methane, Ethane, Butane, ethyne, propene, benzene, petroleum products all are examples of hydrocarbons.
The hydrocarbons in which valency of carbon is satisfied by a single covalent bond are called saturated hydrocarbons. Alkanes like methane (CH_4), ethane(C_2H_6), propane(C_3H_8) etc. are examples of saturated hydrocarbons. Saturated hydrocarbons will generally give a clean flame.

Q12 "Saturated hydrocarbons burn with a blue flame while unsaturated hydrocarbons burn with a sooty flame". Why? **3 marks**

Answer: Saturated hydrocarbons have only C-C and C-H single bonds and thus contain the maximum possible number of hydrogen atoms per carbon atom. With sufficient oxygen, saturated hydrocarbons burn completely and give blue flame.
$CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
Unsaturated hydrocarbons contain a carbon-carbon double bond (C=C) or triple bond (C≡C). Hence they contain less number of hydrogen than carbon. Unsaturated hydrocarbons undergoe incomplete combustion and give yellow flame along with black sooty(carbon).
$C_2H_4 + O_2 \rightarrow CO_2 + 2H_2O + C(s)$

Q13 Differences between Organic Compounds and Inorganic Compounds. 3 marks

Organic Compounds	InOrganic Compounds
Mostly covalent bonding.	Mostly Ionic bonding.
Most of the compounds are gases and liquids. If solids have low melting points.	Most of these are solids with high melting points
Generally insoluble in water.	Many are soluble in water.
Soluble in organic solvents like alcohol, toulene etc.	Generally insoluble in organic solvents.
Aq. solution do not conduct electricity.	Since Aq. soln. forms ions, conducts electricity.
Burn and decompose easily.	Does not burn easily.
Slow reactions	Fast reactions generally.

Q14. People use a variety of methods to wash clothes. Usually after adding the soap, they 'beat' the clothes on a stone, or beat it with a paddle, scrub with a brush or the mixture is agitated in a washing machine. Why is agitation necessary to get clean clothes? **3 marks**

Answer: The soap micelles formed by soap entrap dirt and grease particles and lie on the surface of the clothes. When the clothes are agitated, these micelles get detached from the surface of the clothes and go into water

Q15.(a)What is vinegar? (b) Describe with a chemical eqn, what happens when sodium hydrogen carbonate reacts with ethanoic acid**.** **3 marks**

Answer.(a) 5 – 8% solution of acetic acid in water is called vinegar. (b) Sodium ethanoate (commonly called Sodium acetate), water and carbon dioxide is formed.

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

Q.16. What are the ill-effects of drinking excess of alcohol? **3 marks**

Answer. (i) It causes addiction and makes person dependenton it. (ii) With increase in the dose, the body loses its control and gradually one loses his consciousness. (iii) If consumed in large quantities, it may cause death by damaging liver.

Q.17. Complete the following equations: **3 marks**

(i) $CH_4 + O_2 \longrightarrow$ Ans. $CH_4 + 2O_2 \longrightarrow CO_2 + 2H_2O$

(ii) $CH_3COOH + C_2H_5OH \xrightarrow{\text{acid}}$ Ans. $CH_3COOH + C_2H_5OH \longrightarrow CH_3COOC_2H_5 + H_2O$ (Ethyl ethanoate)

(iii) $CH_3CH_2OH \xrightarrow[443\ K]{\text{Conc. } H_2SO_4}$ Ans. $CH_3CH_2OH \longrightarrow CH_2 = CH_2 + H_2O$

Q18. How is it that we can use detergents for washing clothes even when the water is hard, but not soaps? What change has been made in the composition of detergents to make them biodegradable? **3 marks**

Answer. (i) Detergent does not give ppt. with metal ions such as Ca^{2+} and Mg^{2+} which are responsible for hardness of water. (ii) Soap forms ppt. with these metal ions and is thus thrown out. (iii) Nowadays the detergents are made up of molecules in which the branching is kept minimum. These are degraded more easily than branched chain detergents.

Q19. How would you name the following compounds? **3 marks**

(i) $CH_3 - CH_2 - CH = CH_2$ Ans. (BUTENE) (ii) $CH_3 - CH_2 - CH_2 - CH(CH_3) - CH_3$ Ans.(2-Methyl pentane)

(iii) $CH_3 - CH_2 - CHO$ Ans.(Propanal)

Q20. (a) Why does carbon form compound mainly by covalent bonding? (b) List any two reasons for carbon forming a very large number of compounds. (c) An organic acid 'X' is a liquid which often freezes during winter time in cold countries, has the molecular formula, $C_2H_4O_2$. On warming it with ethanol in the presence of few drops of concentrated sulphuric acid, a compound 'Y' with a sweet smell is formed. **5 marks**

Answer. (a) Carbon (at. No. 6) has electronic configuration=2 , 4. As such, to obtain electronic configuration of nearest noble gas carbon has to either gain or lose 4 electrons.

- **Now, carbon cannot gain 4 electrons due to high energy considerations. Therefore, carbon has the tendency of sharing 4 electrons, and thus form covalent bonds in order to remain stable.**

(b) Carbon forms large number of compounds due to the following reasons:- (i) It has 4 valence electrons which can be shared easily with carbon or atoms of some other monovalent elements. (ii) It has the unique ability to form bonds with other atoms of carbon, giving rise to large molecules. This property is called catenation.

(c) (i) X is glacial acetic acid (CH_3COOH) (ii) Y is ethanol (C_2H_5OH) and sweet smell is an ester ethyl ethanoate ($CH_3COOC_2H_5$)

Q21. Write the name for the following compounds: **5 marks**

(i) $CH_3-\underset{\displaystyle CH_3}{\underset{|}{CH}}-CH_2-CH_3$ **(ii)** $CH_3-CH=CH-CH_2-CH_3$ **(iii)** $CH_3-\overset{\displaystyle O}{\overset{||}{C}}-CH_2-CH_3$

(iv) $CH_3-CH_2-\underset{\displaystyle Cl}{\underset{|}{CH}}-CH_3$ **Answer.(i) 2-methylbutane (ii) Pent-2-ene (iii) (Butanone) (iv) 2-chlorobutane**

Q22. Ethanol is commonly called alcohol and is the active ingredient of all alcoholic drinks. In addition, because it is a good solvent, it is also used in medicines such as tincture iodine, cough syrups, and many tonics. Ethanol is also soluble in water in all proportions. Consumption of small quantities of dilute ethanol causes drunkenness. Even though this practice is condemned, it is a socially widespread practice. However, intake of even a small quantity of pure ethanol (called absolute alcohol) can be lethal. Also, long term consumption of alcohol leads to many health problems.

(a) What is the commercial use of ethanol? (b) Is alcohol good for health? If, not, give reasons for it? What harm does it cause to social values? (c) What values do you observe this context ? **5 marks**

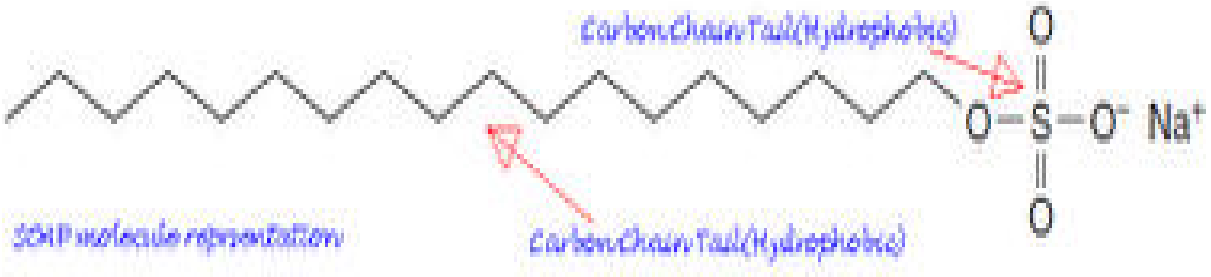
Answer. (a) As an ingredient in alcoholic drinks, tincture iodine, in cough syrup, etc.

(b) Consumption of alcohol even in small quantities is harmful. It makes a person addict, as it results in loss of sense of discrimination. Large quantity of it can lead to loss of consciousness. It leads to damage of liver and kidney. It brings unrest in family and society resulting in crime ridden society.

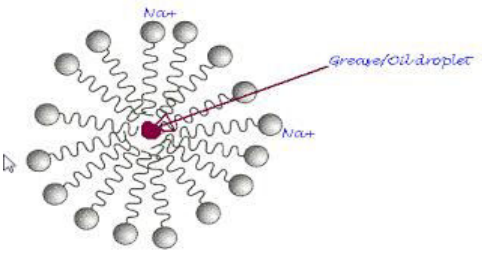
(c) C onsciousness about health, responsibility towards family and society,good moral character, etc. are some of values associated in this context.

Q23 What is soap? Why does micelle formation take place when soap is added to water? Will a micelle be formed in other solvents such as ethanol also?

Answer: **Soap are sodium or potassium salts of long-chain carboxylic acids. In general a a soap is the dual-nature molecule, sodium dodecyl sulphate , with its long, snake-like structure. Its head is an ionized sulphonic acid group –SO−4 Na+, ion paired with a sodium cation. The remainder of the molecule (tail) is a wholly non-ionic straight-chain alkyl group.** **5 marks**



The acid-head of the soap is capable of ionic reactions and thus dissolves in water, that's why it is hydorphilic (water loving) in nature. While the carbon chain dissolves in oil and is hydrophobic (water hating) by nature. When soap is added to the water, the hydrophilic end aligns along the surface of water and the hydrophobic tail remains out of water. Such cluster of molecules in which hydrophobic tail are in interior of the cluster and ionic ends are on the surface of the cluster is called micelle.



The soap micelles thus helps in dissolving dirt/grease in water and help in cleaning clothes.
No, micelle will not be formed when added in solvents like ethanol

Q24. An organic compound 'X' is widely used as a preservative in pickles and has a molecular formula $C_2H_2O_2$. This compound reacts with ethanol to form a sweet smelling compound 'Y '. **5 marks**

a. Identify the compound 'X'
b. Write the chemical equation for its reaction with ethanol to form compound 'Y'.
c. How can we get compound 'X' back from 'Y'?
d. Name the process and write corresponding chemical equation.
e. Which gas is produced when compound 'X' reacts with washing soda? Write the chemical equation.

Answer:

a. Compound X is ethanoic acid which gives and ester (Y) when reacts with ethanol.
b. $CH_3COOH + CH_3CH_2OH \rightarrow CH_3COOC_2H_5$
c. Esters gives back alcohol and carboxylic acid in the presence of acid or base.
d. $CH_3COOC_2H_5 \xrightarrow{NaOH} C_2H_5OH + CH_3COOH$
e.CO_2 **gas is released.**

$CH_3COOH + Na2CO_3 \rightarrow 2CH_3COONa + H_2O + CO_2$

SECTION-B (1 x 18 = 18)

Q25: Which one of the following is an unsaturated hydrocarbon?
(a) Acetylene (b) Butane (c) Propane (d) Decane

Q26: Which of the following represents alkynes?
(a) -C−C- (b) -C=C- **(c) -C≡C-** (d) none of these

Q27: Complete combustion of a hydrocarbon gives
(a) $CO + H_2O$ **(b)** $CO_2 + H_2O$ (c) $CO + H_2$ (d) $CO_2 + H_2$

Q28: Buckminsterfullerene is an example of _____ of carbon
(a) an isomer (b) an isotope **(c) an allotrope** (d) a functional group

Q29: Butanone is a four-carbon compound with the functional group
(a) carboxylic acid. (b) aldehyde. **(c) ketone**. (d) alcohol.

Q30: Major constituent of LPG is _____.
(a) ethane **(b) butane** (c) propane (d) pentane

Q31: The gas used in welding and cutting metals is
(a) ethyne (b) ethane (c) ethene (d) propene

Q32. A carboxylic group is present in

(a) ethylene **(b) formic acid** (c) formaldehyde (d) ethanol

Q33. Which of the following will react with sodium metal?

(a) acetic acid (b) formic acid **(c) ethyl alcohol** (d) acetylene

Q34. Which of the following will give a pleasant smell of ester when heated with ethyl alcohol and a small quantity of sulphuric acid?

(a) CH_3COOH (b) CH_3CH_2OH (c) CH_3OH (d) CH_3CHO

Q35. The hydrophilic end of a synthetic detergent is

(a) $CH_3 – (CH_2)_{10} – CH_2$ - (b) $-CO^- Na^+$ **(c)** $-SO^-_3 Na^+$ $(d) – CO0^- Na^+$

Q36. Formalin is an aqueous solution of

(a) formaldehyde (b) formic acid (c) acetic acid (d) citric acid

Q37. IUPAC name of acetone is

(a) propanal (b) propanol **(c) propanone** (d) propanoic acid

Q38. When acetic acid is treated with $NaHCO_3$, the gas evolved is

(a) H_2 **(b) CO_2** (c) CH_4 (d) CO

Q39. Ethanol on complete oxidation gives

(a) CO_2 and water (b) acetaldehyde (c) acetic acid (d) acetone.

.Q40. Ethanoic acid was added to sodium bicarbonate solution and the gas evolved was tested with burning splinter. Which one of the following four observations is correct?

(a) the gas burns with pop sound and the flame gets extinguished **(b) the flame gets extinguished and gas does not burn**. (c) the gas burns with a blue flame and the splinter burns brightly. (d) the gas is brown in colour

Q41. Which acid amongst following can be used for the preparation of soap?

(a) stearic acid (b) citric acid (d) oxalic acid (d) formic acid.

Q42. Hardness of water is caused by the presence of salts of:

(a) sodium and potassium **(b) calcium and magnesium** (c) sodium and lithium (d) potassium and calcium