

## Question Bank CH-4

Question.1 Give the names of the following functional groups:

- (i) —OH (ii) —COOH

Answer. (i) Alcohol group (ii) Carboxylic acid group

Question.2 What is the difference in the molecular formula of any two consecutive members of a homologous series of organic compounds?

Answer. —CH<sub>2</sub>— is the difference in the molecular formula of any two consecutive members of a homologous series of organic compounds

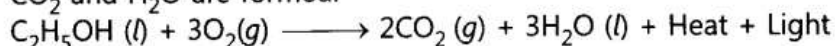
Question.3

- (a) Give a chemical test to distinguish between saturated and unsaturated hydrocarbons.  
(b) (i) Name the products formed when ethanol burns in air. ‘  
(ii) What two forms of energy are liberated on burning alcohol?  
(c) Why is the reaction between methane and chlorine considered a substitution reaction?

Answer.

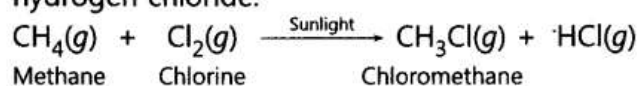
- (a) Add bromine water. Saturated hydrocarbons do not react whereas unsaturated hydrocarbon will decolourise bromine water.

- (b) (i) CO<sub>2</sub> and H<sub>2</sub>O are formed.



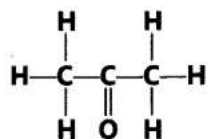
- (ii) Heat energy and light energy

- (c) It is because ‘Cl’ atom substitutes ‘H’ atom of methane to form chloromethane and hydrogen chloride.



Question.4

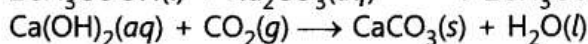
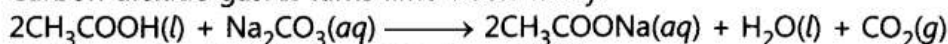
- (a) Why are covalent compounds generally poor conductors of electricity?  
(b) Name the following compound:



- (c) Name the gas evolved when ethanoic acid is added to sodium carbonate. How would you prove the presence of this gas?

Answer:

- (a) It is because they do not form ions.
- (b) Propanone
- (c) Carbon dioxide gas. It turns lime water milky.



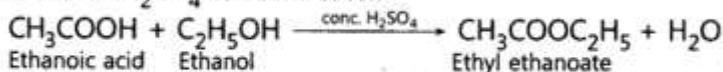
Calcium  
hydroxide

Carbon  
dioxide

Calcium  
carbonate

Question 5: Distinguish between esterification and saponification reactions of organic compounds with the help of the chemical equation for each. What is the use of (i) esters and (ii) saponification process?

**Esterification:** It is a process in which alcohol and carboxylic acid combine in the presence of conc.  $\text{H}_2\text{SO}_4$  to form ester.



Ethanoic acid

Ethanol

Ethyl ethanoate

**Saponification:** When an ester reacts with sodium hydroxide, sodium salt of acid and alcohol is formed.



Ethyl  
ethanoate

Sodium  
hydroxide

Sodium  
ethanoate

Ethanol

**Uses:**

- (i) Esters are used in cold drinks, ice creams, perfumes and as artificial flavouring agents.
- (ii) Saponification process is used in the manufacture of soaps.

Question 6: What happens when a small piece of sodium is dropped into ethanol?

Answer.

Hydrogen gas will be evolved.



Question 7. What is meant by a functional group in an organic compound? Name the functional group present in

(i)  $\text{CH}_3\text{CH}_2\text{OH}$

(ii)  $\text{CH}_3\text{COOH}$

(b) State one point of difference between soap and synthetic detergent.

Answer.

(a) Functional group is an atom or group of atoms or reactive part of compound, which determines chemical properties of compounds.

(i)  $\text{—OH}$  (Alcohol)

(ii)  $\text{—COOH}$  (Carboxylic acid)

(b) Soaps do not work well with hard water, detergents work well with hard water.

Question8. Give reasons for the following observations:

- (a) The element carbon forms a very large number of compounds.
- (b) Air holes of a gas burner have to be adjusted when the heated vessels get blackened by the flame.
- (c) Use of synthetic detergents causes pollution of water.

Answer.

- (a) Carbon forms large number of compounds since carbon is small in size and can form stable covalent bonds (catenation) and it shows tetravalency.
- (b) Air holes of gas burner are made open (adjusted) so that air can pass through, which is needed for complete combustion, so that heated vessels do not get blackened.
- (c) Some synthetic detergents are non-biodegradable, therefore, cause pollution of water.

Question9: Define homologous series of organic compounds. List its two characteristics. Write the name and formula of the first member of the series of alkenes.

Answer: The series of organic compounds having same functional group and similar chemical properties is called homologous series.

Each member differs from successive member by  $\text{—CH}_2\text{—}$  group. The difference in molecular weight between two successive members is 14 u.

Characteristics:

- (i) It has same general formula, from which, all members can be derived.
- (ii) They have similar chemical properties.

$\text{C}_2\text{H}_4$ ,  $\text{CH}_2=\text{CH}_2$ , Ethene is first member of alkene series.

Question10: Give reasons for the following:

- (i) Element carbon forms compounds mainly by covalent bonding.
- (ii) Diamond has a high melting point.
- (iii) Graphite is a good conductor of electricity.
- (iv) Acetylene burns with a sooty flame.
- (v) Kerosene does not decolourise bromine water while cooking oils do.

Answer: (i) It is because carbon has four valence electrons, it cannot gain or lose four electrons because high energy is needed. It can only share four electrons.

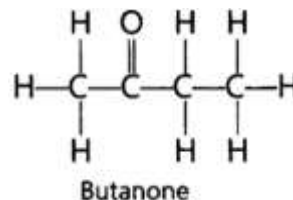
- (ii) It is due to strong covalent bonds and compact structure of diamond.
- (iii) It is due to presence of free electrons in graphite because each carbon is linked to three more carbon atoms.
- (iv) It is due to high percentage of carbon and also its an unsaturated hydrocarbon, it burns with sooty or smoky flame.

(v) Kerosene oil is mixture of saturated hydrocarbons therefore does not decolourise bromine water.

Question 11: a) Draw the structure of butanone molecule.

b) Why does micelle formation take place when soap is added to water? Why are micelles not formed when soap is added to ethanol?

Answer: It is because large number of molecular ions of soaps get aggregated and form colloidal solution. Soap has hydrophobic tail (hydrocarbon) which dissolves in hydrocarbon part and hydrophilic part dissolves in water.



Ethanol is non-polar solvent therefore micelles are not formed because hydrocarbon part gets attracted towards ethanol and gets dissolve, which do not dissolve in water which lead to formation of micelle.

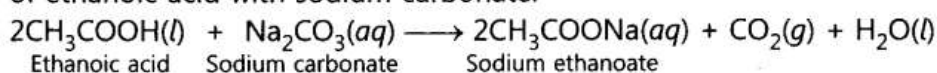
Question12. What is ethanoic acid? Write the formula of the functional group present in this acid. What special name is given to its 5 – 8% solution in water? How does ethanoic acid react with sodium carbonate? Write a chemical equation of the reaction and common name of the salt produced.

Answer.

$\text{CH}_3\text{COOH}$  is ethanoic acid.  $-\text{COOH}$  is the formula of the functional group present in ethanoic acid.

Its 5 to 8% solution in water is called vinegar.

Sodium ethanoate and brisk effervescence due to carbon dioxide gas are formed on reaction of ethanoic acid with sodium carbonate.



The salt produced has common name sodium acetate.

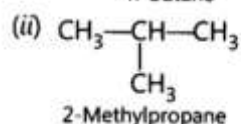
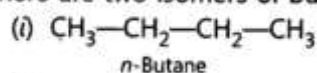
Question 13: Explain isomerism. State the characteristics of isomers. Draw the structures of possible isomers of butane.

Answer: Isomerism is a phenomenon due to which some compounds have same molecular formula but different structural formulae.

Characteristics:

- (i) They differ in structural formula.
- (ii) They differ in melting point.
- (iii) They differ in boiling point.
- (iv) They differ in solubility in same solvent.

There are two isomers of butane,  $\text{C}_4\text{H}_{10}$ .



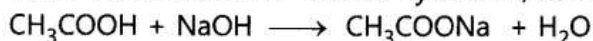
Question 14: Write the names and molecular formula of two organic compounds having functional group suffixed as '-oic acid'. With the help of a balanced chemical equation and explain what happens when any one of them reacts with sodium hydroxide.

Answer.

Methanoic acid, its molecular formula is  $\text{CH}_2\text{O}_2$ .

Ethanoic acid, its molecular formula is  $\text{C}_2\text{H}_4\text{O}_2$ .

When acid reacts with sodium hydroxide, its sodium salt and water is formed.



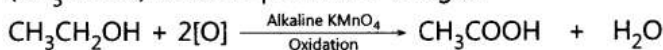
Ethanoic acid

Sodium ethanoate    Water

Question 15: An organic compound 'A' is an essential constituent of wine and beer. Oxidation of 'A' yields an organic acid 'B' which is present in vinegar. Name the compounds 'A' and 'B' and write their structural formula. What happens when 'A' and 'B' react in the presence of an acid catalyst? Write the chemical equation for the reaction.

Answer.

'A' is ethanol ( $\text{C}_2\text{H}_5\text{OH}$ ) which is essential constituent of wine and beer and 'B' is acetic acid ( $\text{CH}_3\text{COOH}$ ) which is present in vinegar.



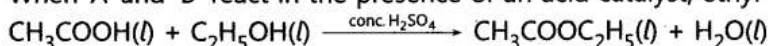
(Present in wine  
and beer)

'A'

Acetic acid  
(Present in vinegar)

'B'

When 'A' and 'B' react in the presence of an acid catalyst, ethyl ethanoate is formed.



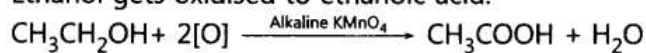
'B'

'A'

Question.16: With the help of balanced chemical equations explain what happens when ethanol is heated with (i) alkaline solution of potassium permanganate, (ii) excess concentrated sulphuric acid at 443 K. Mention any two uses of ethanol.

Answer.

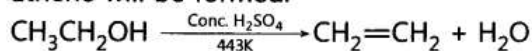
(i) Ethanol gets oxidised to ethanoic acid.



Ethanol

Ethanoic acid

(ii) Ethene will be formed.



Ethanol

Ethene

Uses:

(i) It is used in tonics and cough syrups.    (ii) It is used as fuel.

(iii) It is used as solvent.

(iv) It is used in wine, beer and whisky.

(any two)

Question 17: Write chemical equations for what happens when

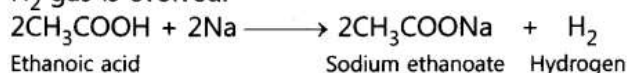
(i) sodium metal is added to ethanoic acid.

(ii) solid sodium carbonate is added to ethanoic acid.

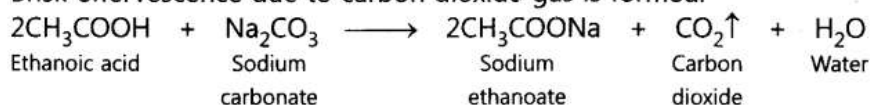
(iii) ethanoic acid reacts with a dilute solution of sodium hydroxide.

Answer.

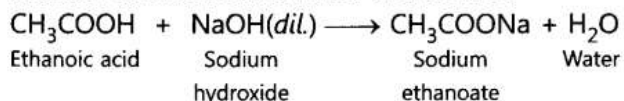
(i)  $\text{H}_2$  gas is evolved.



(ii) Brisk effervescence due to carbon dioxide gas is formed.



(iii) Sodium ethanoate and water are formed.



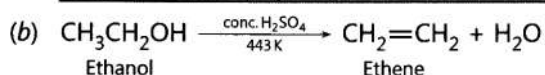
Question 18: (a) In tabular form, differentiate between ethanol and ethanoic acid under the following heads:

(i) Physical state (ii) Taste

(iii)  $\text{NaHCO}_3$  test (iv) Ester test

b) Write a chemical reaction to show the dehydration of ethanol.

(a) Properties	Ethanol	Ethanoic acid
(i) Physical state	It is liquid with specific smell.	It is also liquid with vinegar like smell.
(ii) Taste	It has burning taste.	It has sour taste.
(iii) $\text{NaHCO}_3$ test	It does not react.	It gives brisk effervescence due to $\text{CO}_2$ .
(iv) Ester test	Add acetic acid and conc. $\text{H}_2\text{SO}_4$ , pleasant fruity smelling compound, ester is formed.	Add ethyl alcohol and conc. $\text{H}_2\text{SO}_4$ , pleasant fruity smelling compound, ester is formed.



Question 19: Write a chemical equation in each case to represent the following types of chemical reactions of organic compounds:

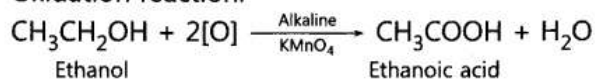
(i) Oxidation reactions

(ii) Addition reactions

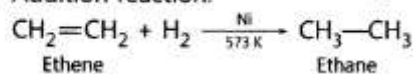
(iii) Substitution reactions

Answer.

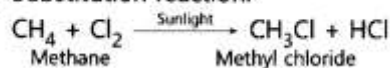
(i) Oxidation reaction:



(ii) Addition reaction:



(iii) Substitution reaction:



Question 20: List two merits and two demerits of using detergents for cleansing. State the reason for the suitability of detergents for washing, even in the case of water having calcium and magnesium ions.

Answer.

Merits:

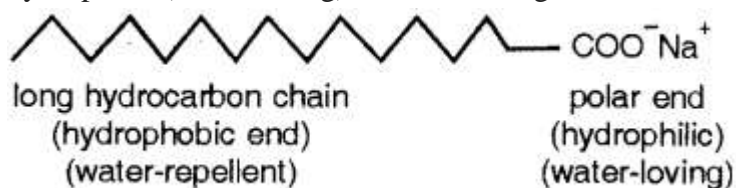
- (i) They work well with hard water.
- (ii) They are more effective than soaps.

Demerits:

- (i) They are expensive.
  - (ii) Some of them having branching are non-biodegradable, therefore create water pollution.
- Detergents are suitable for hard water having  $\text{Mg}^{2+}$  and  $\text{Ca}^{2+}$  ions because they do not form insoluble salts with  $\text{Mg}^{2+}$  and  $\text{Ca}^{2+}$  ions.

Question 21: State in brief the action of soaps in removing an oily spot from a shirt. Why soaps are not considered suitable for washing where water is hard?

Answer: Cleansing action of soap: Soap molecules consist of a large hydrocarbon tail which is hydrophobic (water-hating or water repelling) with a negatively charged head which is hydrophilic (water-loving) as shown in figure.



When a soap is dissolved in water, the molecules associate together as clusters called micelles in which water molecules, being polar in nature, surround the ions and the

hydrocarbon part of the molecule attracts grease, oil and dirt.

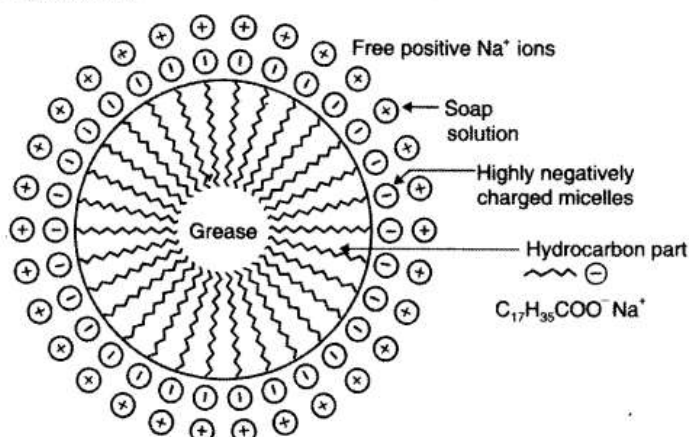
**The tails stick inwards and the heads outwards.**

In cleansing, the hydrocarbon tail attaches itself to oily dirt. When water is agitated (shaken vigorously), the oily dirt tends to lift off from the dirty surface and dissociate into fragments.

This gives opportunity to other tails to stick to oil. The solution now contains small globules of oil surrounded by soap molecules.

The negatively charged heads present in water prevent the small globules from coming together and form aggregates. Thus, the oily dirt is removed.

Hard water has  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  ions. When it reacts with soap, it forms insoluble compound and the soap goes waste.



#### Question-22

A mixture of oxygen and ethyne is burnt for welding. Can you tell why a mixture of ethyne and air is not used?

Answer:

When a mixture of oxygen and ethyne is burnt, it burns completely producing a blue flame. This blue flame is extremely hot which produced a very high temperature which is used for welding metals. But the mixture of ethyne and air is not used for welding purposes because burning of ethyne in air produces a sooty flame, which is not enough to melt metals for welding.

Question 23: Explain the nature of the covalent bond using the bond formation of  $\text{CH}_3\text{Cl}$ .

Answer:

$\text{CH}_3\text{Cl}$  (methyl chloride) is made up of one carbon atom, three hydrogen atoms and one chlorine atom. Carbon atom has 4 valence electrons, each hydrogen atom has one valence electron, and a chlorine atom has 7 valence electrons. Carbon atom shares its four valence electrons with three hydrogen atoms and 1 chlorine atom to form methyl chloride as follows:



From the above reaction, in the dot structure of methyl chloride ( $\text{CH}_3\text{Cl}$ ) there are four pairs of shared electrons between carbon and other atoms. Each pair of shared electrons constitutes one single covalent bond. So, methyl chloride has four single covalent bonds.

Question 24: Why are carbon and its compounds used as fuels for most applications?

Solution:



Carbon and its compounds are used as fuels for most of the applications because they burn in air releasing a lot of heat energy.

Question 24: Explain the formation of scum when hard water is treated with soap.

Solution:

The precipitate form of scum is formed when soap is used for washing clothes. With hard water, a large amount of soap is wasted in reacting with the calcium and magnesium ions of hard water to form an insoluble precipitate. The precipitate formed by the action of hard water on soap, sticks to the clothes being washed and interferes with the cleaning ability of the additional soap. This makes the cleaning of clothes difficult.

Question 25: What change will you observe if you test soap with litmus paper (red and blue)?

Solution:

Soap is the salt of a strong base (NaOH) and a weak acid (carboxylic acid), so a solution of soap in water is basic in nature. Being basic, a soap solution turns red litmus paper blue,

Question 26: Would you be able to check if water is hard by using a detergent?

Solution:

We would not be able to check whether a sample of water is hard by using a detergent, this is because a detergent forms lather easily even with hard water.