

# CHEMISTRY STUDY MATERIALS FOR CLASS 10

## (NCERT Based: Questions with Answers)

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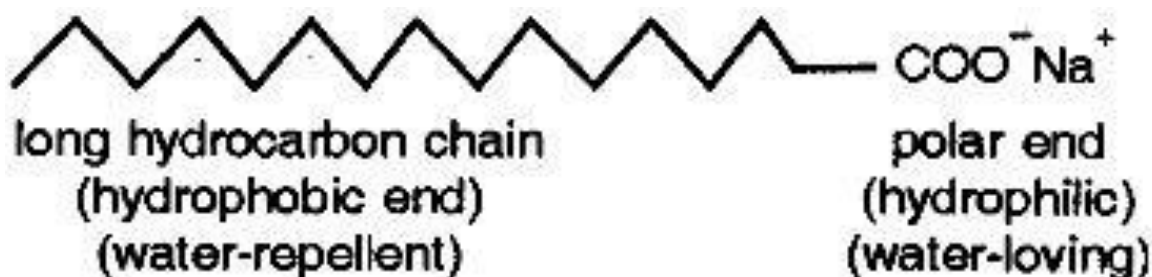
### CARBON AND ITS COMPOUNDS

#### LONG ANSWER TYPE QUESTIONS ( 5 MARKS)

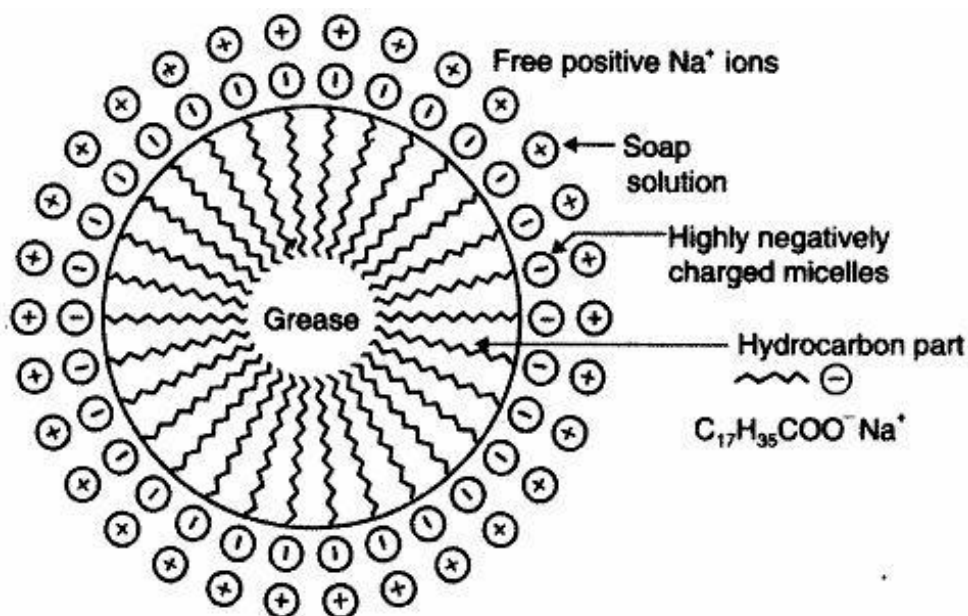
1. What is the difference between the chemical composition of soaps and detergents? State in brief the action of soaps in removing an oily spot from a shirt. Why soaps are not considered suitable for washing where water is hard?

**Answer.** Soaps are sodium or potassium salts of fatty acids having — COONa group. Detergents are sodium or potassium salts of sulphonic acids having — SO<sub>3</sub>Na and — SO<sub>4</sub>Na group.

**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 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 cleaning, 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 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.

**2. List in tabular form three physical and two chemical properties on the basis of which ethanol and ethanoic acid can be differentiated**

**Answer.**

**Physical properties:**

Ethanol	Ethanoic acid
1. It has specific smell.	1. It has vinegar like smell.
2. It has burning taste.	2. It is sour in taste.
3. It does not freeze in winters.	3. It freezes in winters.

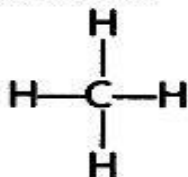
**Chemical properties:**

Ethanol	Ethanoic acid
1. It does not react with $\text{NaHCO}_3$ .	1. It gives $\text{CO}_2$ with $\text{NaHCO}_3$ .
2. It burns with blue flame.	2. It does not burn with blue flame.
3. It does not affect blue litmus.	3. It turns blue litmus red.

3. What are the hydrocarbons write the name and general formula of (i) Saturated hydrocarbons, (ii) Unsaturated hydrocarbons, and draw the structure of one hydrocarbon of each type. How can an unsaturated hydrocarbon be made saturated?

Answer.

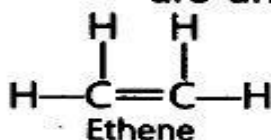
(i) Alkanes,  $C_nH_{2n+2}$  are saturated hydrocarbons.



Methane

(Saturated hydrocarbon)

(ii) Alkenes,  $C_nH_{2n}$  and Alkynes,  $C_nH_{2n-2}$  are unsaturated hydrocarbons.



Ethene

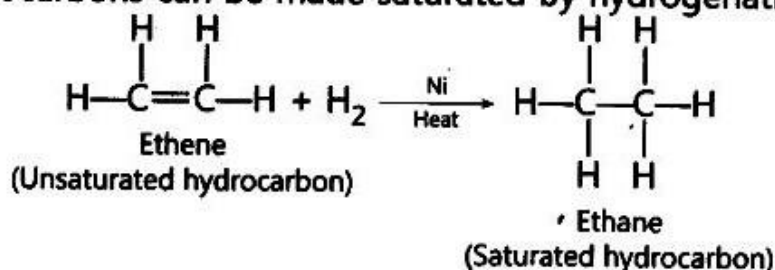
(Unsaturated hydrocarbon)



Ethyne

(Unsaturated hydrocarbon)

Unsaturated hydrocarbons can be made saturated by hydrogenation.



4. What are detergents chemically? 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. Detergents chemically are sodium or potassium salts of sulphonic acid of benzene or alkene.

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  $Mg^{2+}$  and  $Ca^{2+}$  ions because they do not form insoluble salts with  $Mg^{2+}$  and  $Ca^{2+}$  ions.

### 5. What are micelles? Why does it form when soap is added to water?

**Will a micelle be formed in other solvents such as ethanol also?**

**State briefly how the formations of micelles help to clean the clothes having oily spots.**

**Answer.** Micelles: When molecular ions in soaps and detergents aggregate, they form micelles. It is formed because soap has hydrophobic part. Water can attract hydrophilic part but not hydrophobic part.

No, micelle will not be formed in ethanol, as soap will dissolve in ethanol. Micelles trap (attract) dirt, grease, oily spot, etc. which is washed away by water.

### 6. (a) What is soap? Why are soaps not suitable for washing clothes when the water is hard?

**(b) Explain the action of soap in removing an oily spot from a piece of cloth.**

**Answer.** (a) Soap is sodium or potassium salt of higher fatty acids such as Oleic acid ( $C_{17}H_{33}COOH$ ), Stearic acid ( $C_{17}H_{35}COOH$ ), Palmitic acid ( $C_{15}H_{31}COOH$ ), etc.

A soap is a sodium or potassium salt of long chain fatty acids. Hard water contains salts of calcium and magnesium. On adding soap to water, calcium and magnesium ions present in water displace sodium or potassium ions from the soap molecules forming an insoluble substance called scum.

Scum results in wastage of soap.

(b) Cleansing action of soaps:

The oily spot present on clothes is organic in nature and insoluble in water. Therefore, it cannot be removed by only washing with water. When soap is dissolved in water, its hydrophobic ends attach themselves to the oily spot and remove it from the cloth. Then, the molecules of soap arrange themselves in the form of micelle and trap the dirt at the centre of the cluster. These micelles remain suspended in the water. Hence, the oily spots are easily rinsed away by water.

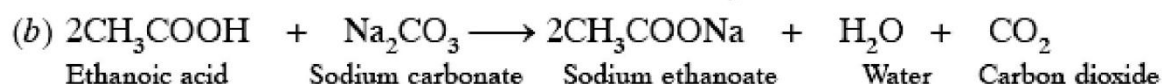
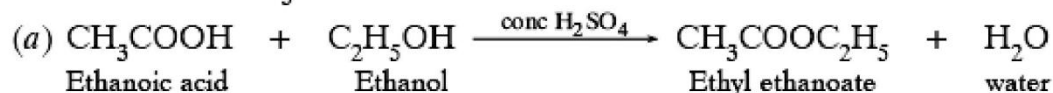
7. A carbon compound X turns blue litmus to red and has a molecular formula  $C_2H_4O_2$ . Identify X and draw its structure. Write chemical equation for the reaction and name of the product formed in each case when X reacts with

(a) Ethanol in the presence of conc.  $H_2SO_4$

(b) Sodium carbonate.

**Answer.** 'X' is ethanoic acid.

Its structure is  $CH_3-\overset{\overset{O}{\parallel}}{C}-OH$



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