

## Notes

What are soaps?

A soap is a water-soluble compound which is made via a process called saponification by the reaction between sodium hydroxide or potassium hydroxide with vegetable or animal oil (fats).

Characteristics of Soap?

→ Hardness: - Harder soap which is a dense bar lasts longer.

→ Cleansing - The first reason the majority of people use soap is to get clean. A soap molecule consists of a chain of carbon atoms where one end of the chain attracts oil and the other attracts water. Soap should be balanced and not too much or too less of cleansing ingredient should be added.

Conditioner ⇒ Soap conditioners are referred to as emollients. Once you have washed your hands and what's left behind on your skin after you rinse, depends on the type of soap a person uses. For instance, consider a person with dry skin, he/she should select a soap with moisturizing emollients that can prevent water evaporation.

Lather: - Most people like soap which produces lather. The balance of bubbles and cleansing, soothing cream makes lather so satisfying.

Fragrance  $\Rightarrow$  It is an essential factor. Aromas evoke a unique combination of personal memory and enrich our daily life. Fragrances revitalize us, calm us, & most importantly mask our body odour.

What is Detergent?

Amphipathic molecules that contain charged hydrophilic or polar groups at the end of long lipophilic hydrocarbon groups are called detergents. The charged hydrophilic groups is also called the head - the long lipophilic hydrocarbon group called the tail. Detergents are also known as surfactants as they have the ability to decrease the surface tension of water.

Properties of Detergents  $\Rightarrow$

- $\rightarrow$  The concentration at which micelles formation starts is called as critical micelle concentration (cmc).
- $\rightarrow$  Aggregation number is the average number of monomers in a micelle.
- $\rightarrow$  Relative micelles size is indicated by micelles molecular weight.
- $\rightarrow$  The temperature at which the detergent solutions is around or above its critical micelle concentration separates into two phases is called the cloud point.

### Cleansing Action of Soaps & Detergents:

Most of the dirt is oily in nature and oil does not dissolve in water. The molecules of soap constitutes sodium or potassium salts of long-chain carboxylic acids. In case of soaps, the carbon chain dissolve in oil and the ionic end dissolve in water. Thus the soap molecules form ~~the~~ structures called micelles. In micelles one end is towards the oil droplet and the other end which is the ionic faces outside. Therefore it forms an emulsion in water & helps in dissolving the dirt when we wash our clothes.

Soap is a kind of molecules in which both the ends have different properties,

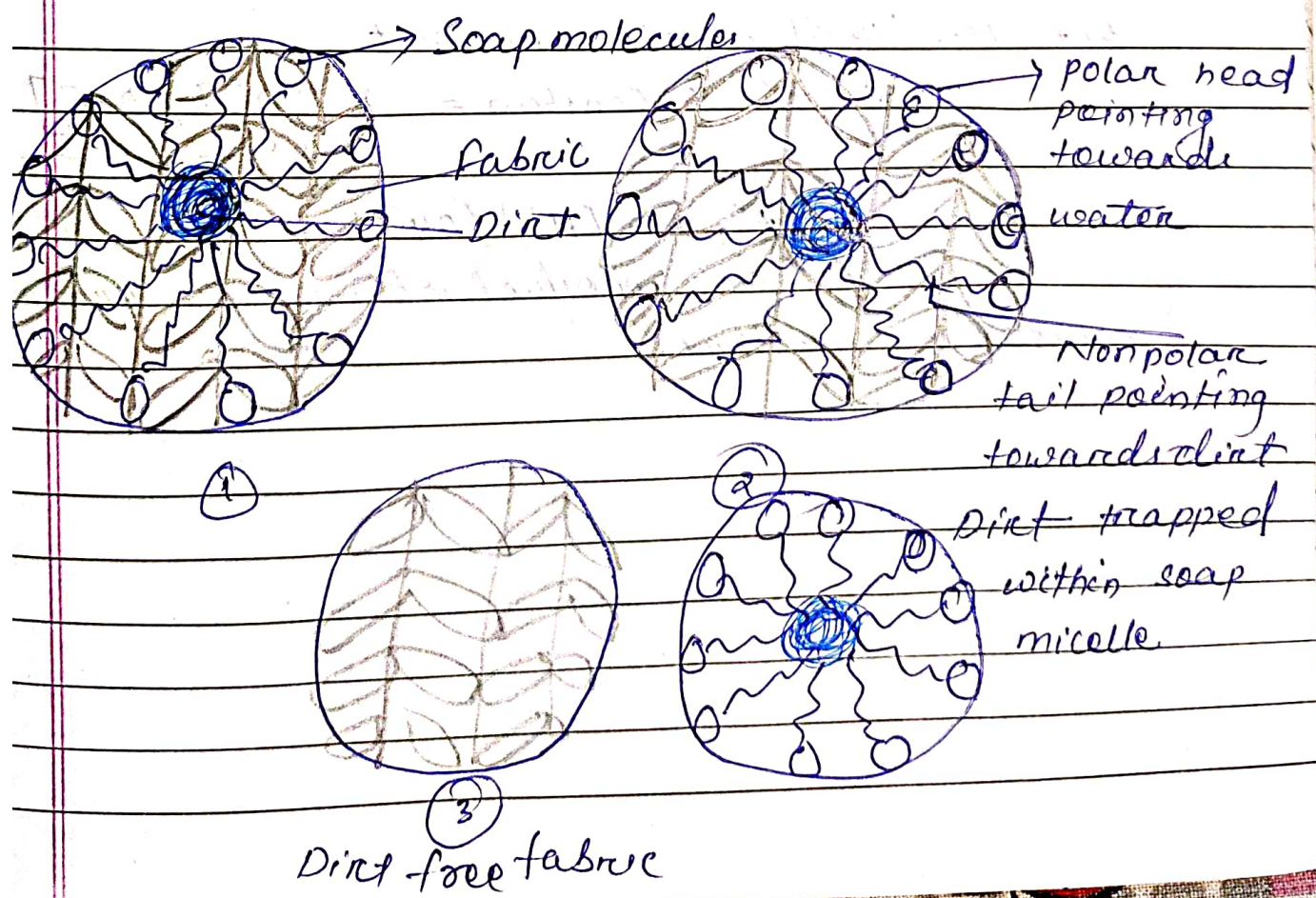
- > Hydrophilic end
- Hydrophobic end

The first one is the hydrophilic end which dissolves in water and is attracted to it where as the second one is the hydrophobic end that is dissolved in hydrocarbons and is water repulsive nature.

If on the surface of the water soap is present then the hydrophobic tail which is not soluble in water will align along the water surface.

In water, the soap molecules are uniquely oriented which helps to keep the hydrocarbon part outside the water. When the clusters of molecules are formed then hydrophobic tail comes at the interior of the cluster and the ionic ends come at the surface of the cluster & this formation is called of micelle. When the soap is in the form of micelles then it has the ability to clean the oily dirt which gets accumulated at the centre. These micelles remain as colloidal solutions. Therefore, the dirt from the cloth is easily washed away. The soap solution appears cloudy as it forms a colloid solution which scatters light.

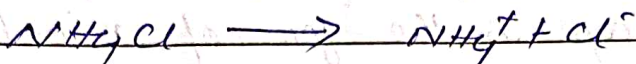
~~Read more about soap and detergent we have briefly seen the properties of soaps and detergents for more further query on this topic~~



### Common Ion Effect

If an ionic equilibrium,  $AB \rightleftharpoons A^+ + B^-$ , a salt containing a common ion (eg.  $AC$ ,  $BD$ ) is added, the equilibrium shifts in the backward direction.

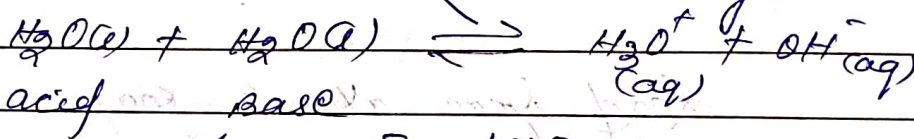
eg



$NH_4Cl$  provides the common ion  $NH_4^+$  ions hence dissociation of  $NH_4OH$  is suppressed in accordance with Lechatelier's principle.

### Ionic product of water

Water is a weak electrolyte



$$K_c = \frac{[H_3O^+][OH^-]}{[H_2O]} = \frac{[H^+][OH^-]}{[H_2O]}$$

But the  $[H_2O]$  remains constant

$$\therefore K_c \times \text{Constant} = \frac{[H_3O^+][OH^-]}{\text{denominator}}$$

$$K_w = [H^+][OH^-]$$

$\therefore$  Ionic product of water or called ionisation constant

MCQ Liquid State

- 1) The state of freezing involves  
 (A) Loss of kinetic energy (C) Liquid solidifies  
 (B) increased force of attraction (D) all of above.
- 2) The vapour pressure is directly proportional to the temperature because of  
 (A) more kinetic energy only  
 (B) faster particle movement only  
 (C) more potential energy  
 (D) more kinetic energy and faster particle movement
- 3) When the movement of water molecules in liquid become equal to the molecules in vapor form, a state is called  
 (A) Equilibrium (C) Ideal  
 (B) Constant (D) non ideal
- 4) When the gas liquefies, the molecules lose kinetic energy and experience increase  
 (A) force of attraction (C) Density  
 (B) volume (D) pressure
- 5) The reciprocal of viscosity is known as  
 (A) Anti viscosity (B) intrinsic viscosity  
 (C) reduced viscosity (D) fluidity
- 6) The molecules which have partial positive charge at one end and partial negative charge at the other are called  
 (A) ion pairs (B) charged molecules (C) Dipole (D) electric molecules

7) With the rise of temperature the surface tension of a liquid

- (A) Increases (B) Decreases  
(C) Remains the same (D) None of the above

8) The unit in which surface tension is measured

- (A) Dyne cm (B) dyne  $\text{cm}^{-1}$   
(C)  $\text{dyne}^{-1}\text{cm}$  (D)  $\text{dyne}^{-1}\text{cm}^{-1}$

9) Which of the following liquid has maximum viscosity

- (A) water (B) Ethyl alcohol  
(C) Acetone (D) Glycerine

10) Small drops are spherical in shape. It is due to

- (A) High viscosity  
(B) Their tendency to acquire minimum surface area  
(C) Low viscosity  
(D) Their tendency to acquire maximum surface area

Short Question:

1) Define surface tension & its units?

2) How does vapour pressure varies with temperature?

3) Explain why:-

(a) Droplets of liquids are spherical in shape

(b) At the boiling point, the temperature of liquid does not rise although it is being heated.

(c) Glycerol is more viscous than water.

4) Explain the term viscosity of a liquid.

5) Define the term surface tension and surface energy?

### Long Question?

- ✓ (A) Define the terms surface tension and surface energy. Discuss capillary rise method for determination of surface tension in the laboratory?
- (B) What are liquid crystals? How are they classified?
- (C) Discuss the cleansing action of soap?
- (D) Explain the term Ionic product of water?
- (E) Relation ship between  $K_a$  &  $K_b$ ?
- (F) Define vapour pressure & what are the factors affecting vapour pressure?