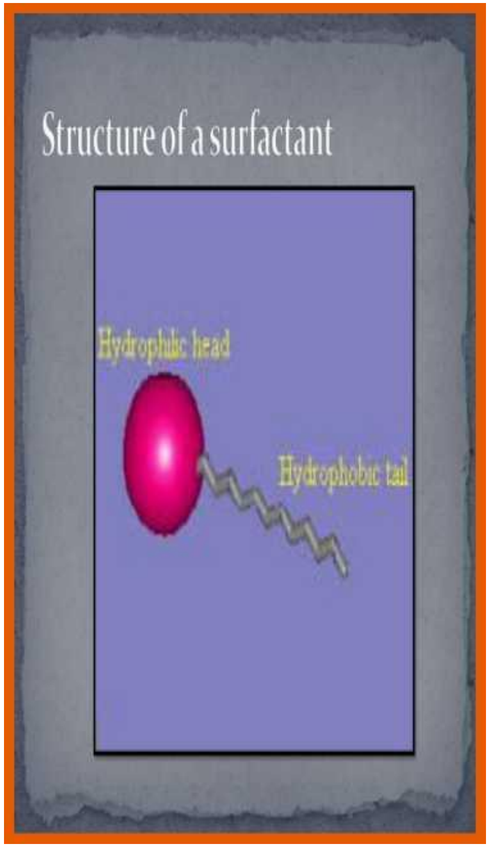
PHYSICAL PHARMACY
EXPERIMENT NO. 3
SURFACE ACTIVE AGENTS

Done by :
Lecturer Zeina Dawood
Lecturer Hiba Sabah
Asst. Lecturer Aqeel Abdulridha

introduction

Surface-active agent or *surfactant* are molecules and ions that are adsorbed at interfaces. Surfactants are materials that lower the surface tension (or interfacial tension) between two liquids or between a liquid and a solid. An alternative term is *amphiphile,* which suggests that the molecule or ion has a certain affinity for both polar and non-polar solvents. They are used in many pharmaceutical preparations as wetting agents, emulsifiers,
solubilizing and antifoaming agents.



When such molecule is placed in an air-water or oil-water system, the polar groups are attached or oriented toward the water, and the non-polar groups are oriented toward the air At the air-water interface, or oriented toward the oil at the oil-water interface (Figure 1).

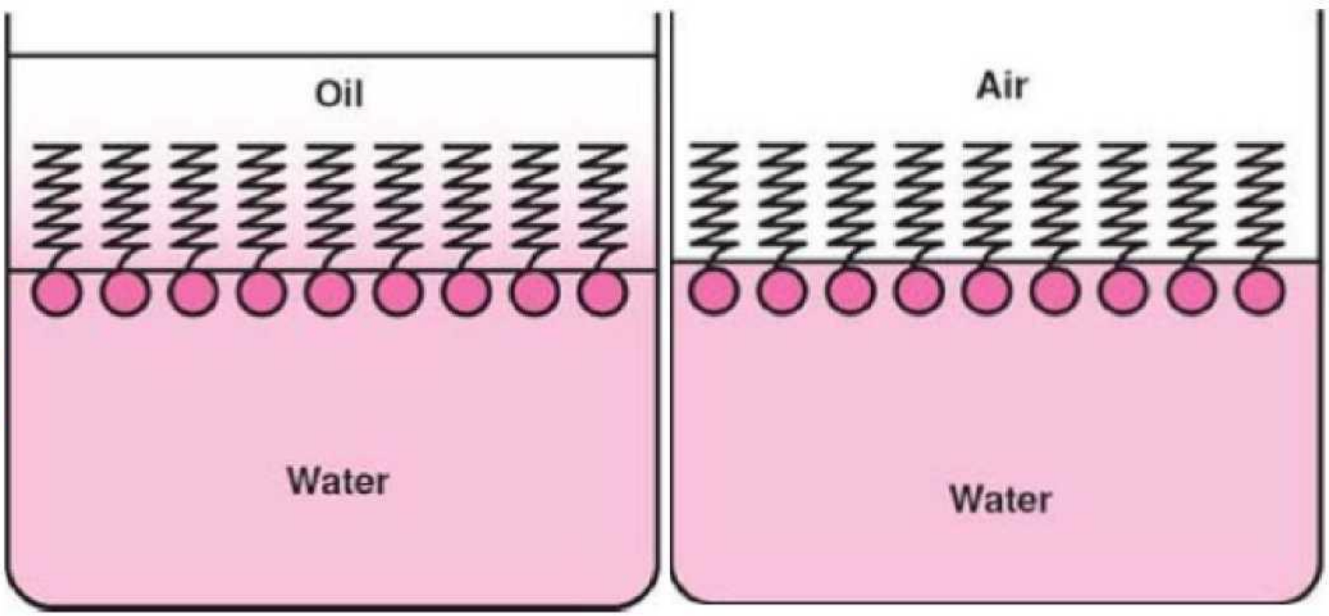


Figure 1: Adsorption of fatty acid molecule at a water-oil interface (left panel) and a water- air interface (right panel).

Surfactants are classified

According to their chemical structure and, more specifically, their polar group:

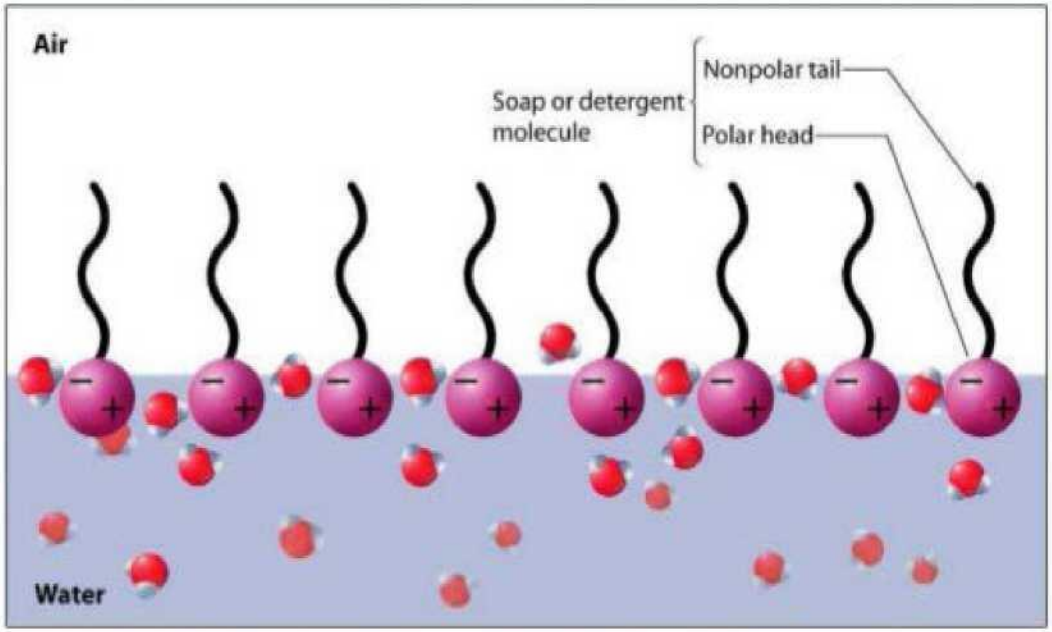
Anionic surfactant such as sodium dodecyl sulfate (SDS®)

Cationic surfactant such as cetyl trimethyl ammonium bromide (CTAB®)

Ampholytic (Zwitterionic®) surfactant such as phospholipids

Non-ionic surfactant such as poly oxy ethylene (Tween®)

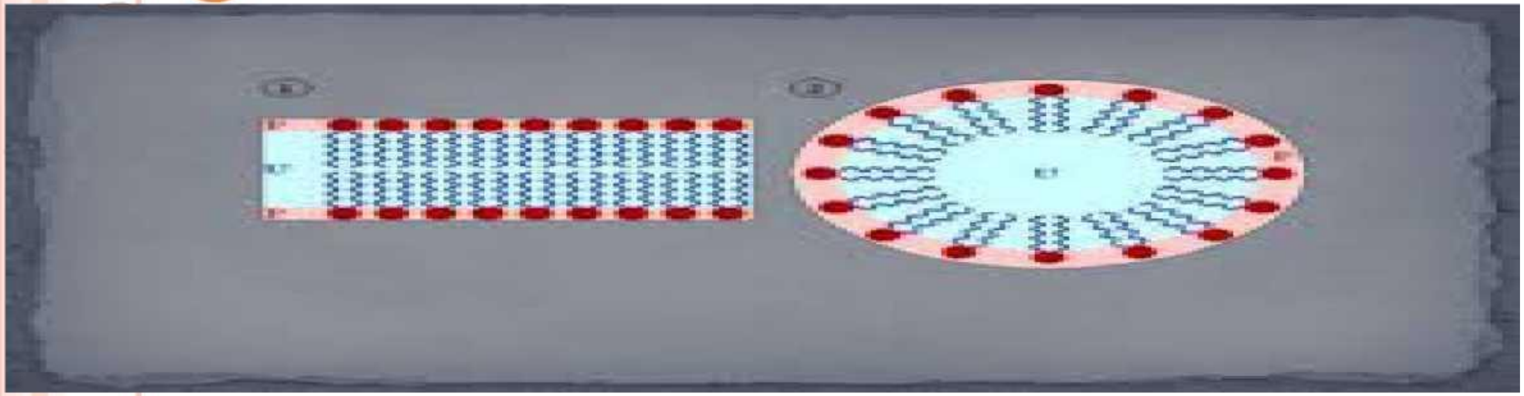
Surface Active Agents



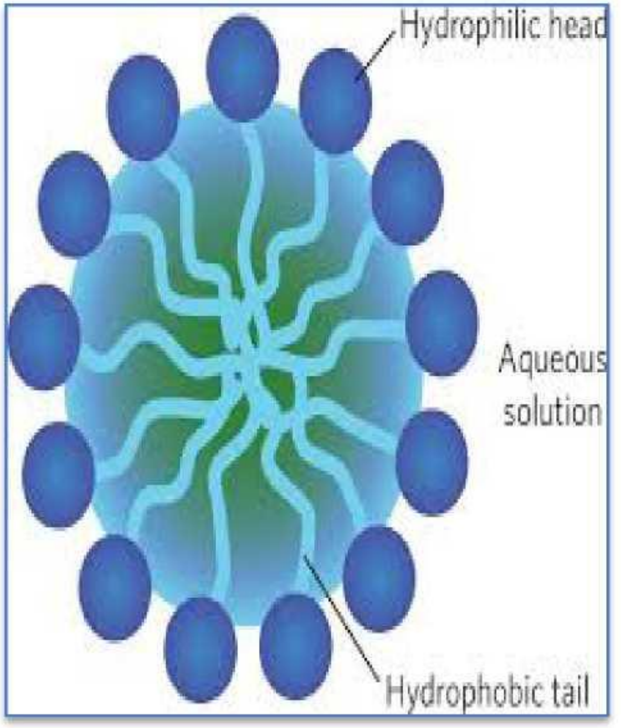
Micelles and the critical micelle concentration

Amphiphiles are characterised by having two regions of opposing solution affinities within the same molecule or ion. When Surface active agents present in a liquid medium at low concentration, the amphiphiles exist separately (a size as a sub-colloidal).

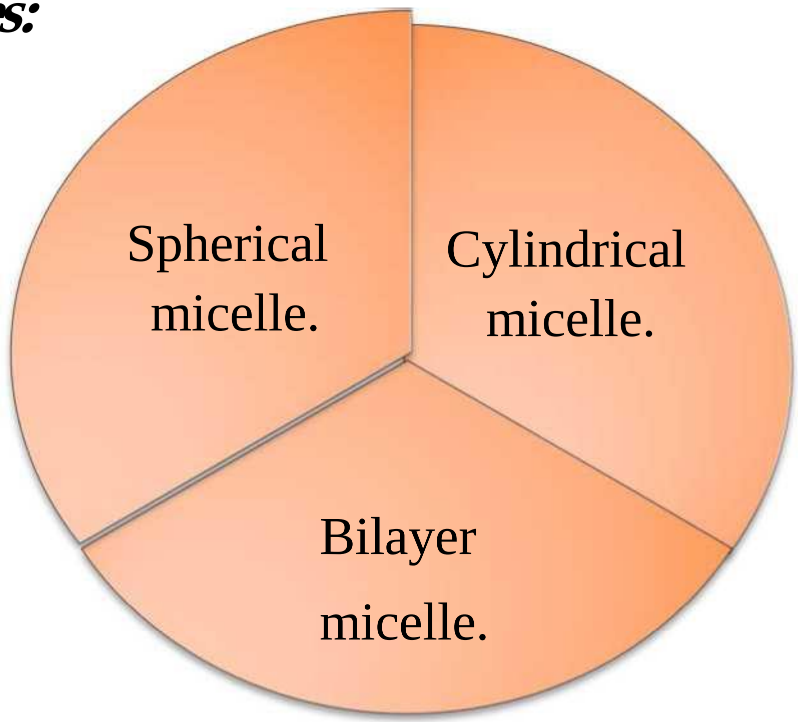
As the concentration is increased, aggregation occurs (l farrow range of concentration .These aggregates which may contain 50 or more monomers, are called micelles. Because the diameter of each micelle is of the order of 50 A micelle lies within the size range designed as colloidal.

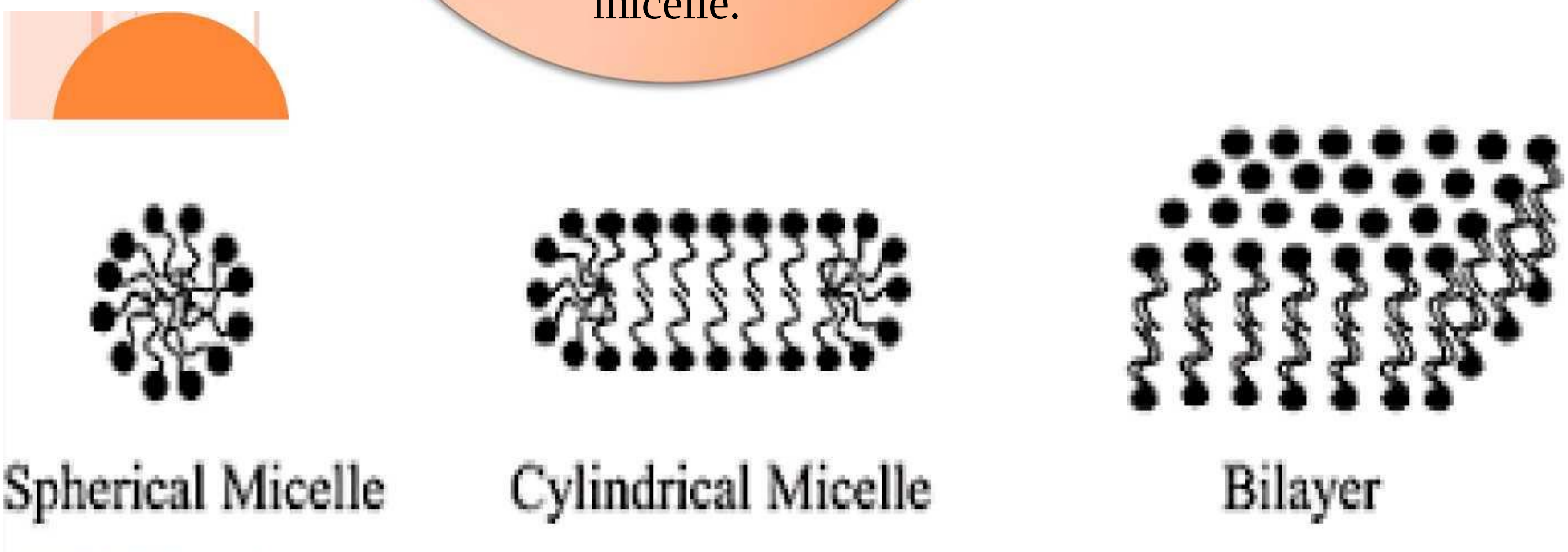


In general, Micelles are lipid molecules that arrange themselves in a spherical form in aqueous solutions. The formation of a micelle is a response to the amphipathic nature of fatty acids, meaning that they contain both hydrophilic regions (polar head groups) as well as hydrophobic regions (the long hydrophobic chain). The location of the molecule undergoing solubilisation in a micelle is related to the balance between the polar and non-polar properties of the molecule. The increase in solubility is due to adsorption or incorporation of the solute molecules into or in the colloidal particle (micelle).



Shapes of micelles:





Critical Micelle Concentration (CM.C): The concentration of monomers at which micelles form. An important property of amphiphilic colloid in solution is the ability of the micelle to increase the solubility of materials that are normally insoluble or only slightly soluble in the dispersion medium used this phenomenon is known as solubilisation.

Experimental work

Part C 6ring Salicylic acid powder, Tween60, distilled water, phenol red indicator, volumetric flask, (50ml), conical flask, (50ml), graduated pipettes, 6urette, filter paper, funnel, and a 6atance. Prepare NaOH Solution (0.05N).

Part l The a.im of the experiment is to show the effect of increasing the concentration of Tween on the solu6ility of salicylic acid.

Procedure:

1. *Prepare different concentration of tween60 (0%, 0.05%, 0.5%, 1%, 2%, 3%), prepare 50 mL of each soCution (use voCumetric flask, and pipette)from stock^soCution 5% (C1V1 =C2V2).*
2. *Place 25mCof each concentration in a conicaC ftask^of (50mL) then add 0.25g saficyfic acid to each flask.*
3. *Shake the flasks for 10 minutes.*
4. *Set to settCe for another10 minutes to permit the undissokved saficyfic acid to settle down fitter if necessary).*
5. *Withdraw 10mL of fifirate soCution andtitmte with standardized NaOH soCution (0.05N) using [illegible] indicator. Th[illegible]*

Step no(1) of procedure

To prepare 50 mbof 0% tween60 that mean we wibbnot use tween 60 just add50 mbD.W in the vohumetric flasks

y

To prepare 50 mb of 0.05% tween60 from 5%stock ,soCution by using dibution C1V1 = C2 V2 5 %*V1 =0.05%* 50

Vl= 0.5mb take from stock^sobution 5%tween 60 (using pipette) put it in the vobumetric flasks then compbete the vohume to 50 mC by adding

*The same procedure andcabcubation for preparation of the otherconcentration

Steps of experiment

prepare 50 mL of different concentration of tween 60 from stocky solution 5%tween 60 (C1V1=C2V2).

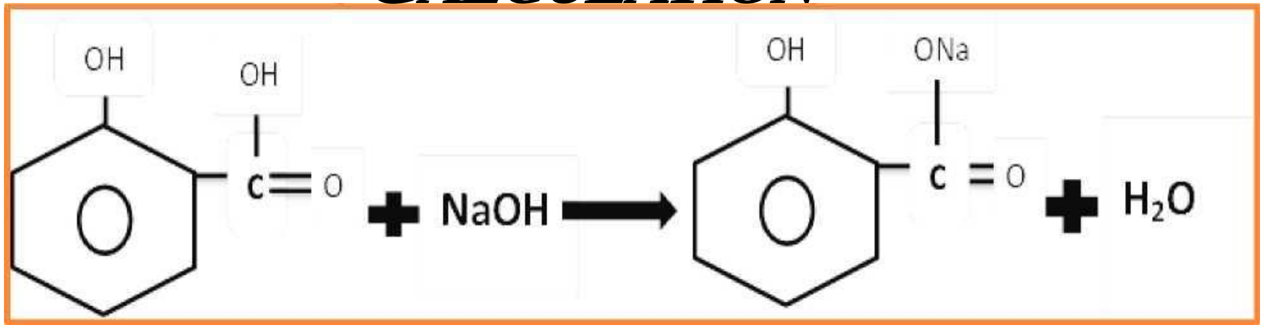
*PCace 25mCof each concentration in a conicaCfCask^*

add0.25g saCicyCic acidto eachfCask.

Shake the fCasks for 10 minutesSet to settCe for a.nother 10 minutes fiCter if necessary).

Withdmw 10mL of fiCtmte soCution and titrate with sta.ndardized(0.05N) NaOH soCution using phenoCredas indicator. Measure the endpoints.

CALCULATION



IM.wt of saCicyCic acid= 1M.wt NaOH

leq.wt of saCicyCic acid= leq.wt NaOH

138. Ig = 1L oflNNaOH

138.1g =1000mC of 1N NaOH

(138.1/1000) g =1m(of 1N NaOH

*138.1/1000*0.05 =1m[of0.05NNaOH*

Therefore, 0.0069g of saCicyCic acid is the chemicaCfactor. ChemicaCfactor end point=g saCicyCic acid/10 mC*

If the end point for 0%tween 60 was 2.6ml
The calculation will be

End point *chemical factor = g of salicylic acid in 10ml (filtrate)

2.6 ml * 0.0069 =0.0179 g of salicylic acid in10 ml

The solubility of salicylic acid in (g\100ml)

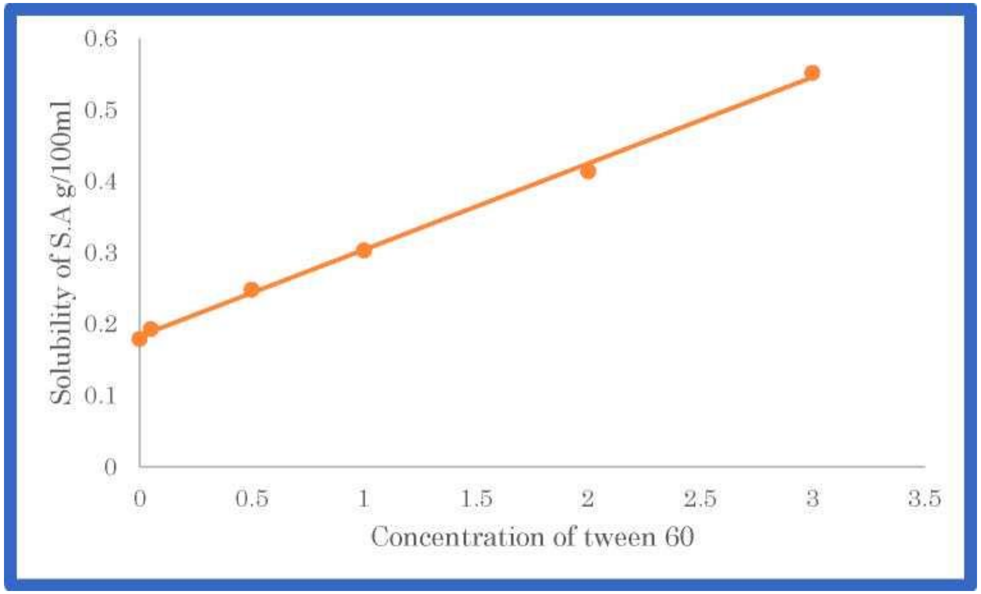
0.0179g 10ml

X 100ml

X= 0.179 g\100ml of salicylic acid

*The same calculation for other end points

Conc. of tween60	E.P (mls of NaOH)	Grams of S.A in 10 ml	Grams of S.A in 100 ml
0%			
0.05%			
0.5%			
1%			
2%			
3%			



THANK YOU FOR YOUR ATTENTION!

ANY QUESTIONS ?