SURFACTANT & HLB VALUE

1. Which of the following surfactants is an ANIONIC surfactant [GPAT-2023 SHIFT-I]

(a) Lecithin
(b) Sorbitan esters
(c) Benzalkonium chloride
(d) Soaps

2. Which of the following emulsifiers has the highest HLB value [GPAT-2023 SHIFT-I]

(a) Span 80
(b) Acacia
(c) Tween 80
(d) Sodium lauryl sulfate

3. The properties of solutions containing surface active agents change sharply over a narrow concentration range and are called as [GPAT-2021]

(a) Critical micelle concentration
(b) Ionic concentration
(c) Hydrogen ion concentration
(d) Surface tension

4. Which of the following is an example of hemiesters anionic surfactant for pharmaceutical emulsions [GPAT-2017]

(a) Sulfosuccinates
(b) Sarcosinates
(c) Taurates
(d) Lactylates

5. Which among the following statements describing surface activity for surfactants is incorrect [GPAT-2017]

(a) Increase in length of hydrocarbon chain decreases surface activity
(b) Increase in ethylene oxide chain of polyoxy ethylated nonionic surfactant ethylene decrease of sur face activity
(c) Increase in the surface activity results in decrease in surface tension
(d) Relationship between hydrocarbon chain length and surface activity is expressed by Traube's rule

6. Micelles are observed in water, when the added surfactant is within a particular concentration range. This concentration range should be [GPAT-2016]

(a) Equal to and less than CMC (b) Equal to and more than CMC

(c) Equal to CMC (d) More than CMC

7. HLB value of tragacanth is [GPAT-2018]

(a) 4.7 (b) 8.7 (c) 13.2 (d) 14.3

8. HLB of SPAN and TWEEN surfactants may be obtained from which of the following equations [GPAT-2016]

(a) HLB = E/5

(b) HLB = (E+P)/5

(c) HLB = 20 [(1-S)/A)]

(d) HLB = (hydrophilic group numbers)- (lipophilic group numbers) +7

9. The properties of solutions containing surface active agents change sharply over a narrow concentration range is called as [GATE-2006]

(a) Critical micellar concentration (b) lonic concentration

(c) Hydrogen ion concentration (d) Surface tension

10. HLB system is used to classify [GATE-2002]

(a) Surfactants (b) Preservatives

(c) Antioxidants (d) Sequestering agents

11. H.L.B values are given. Match them with correct surfactant [GATE-2000]

1. 0-3 **[P] Solubilizing agent**

2. 4-6 **[Q] Detergent**

[R] Antifoaming agent

[S] W/O emulgents

(a) 1 - [Q] 2- [S] (b) 1 - [R] 2 - [S]

(c) 1 - [R] 2 - [P] (d) 1 - [P] 2 - [S]

12. Benzalkonium chloride is a germicidal surfactant which is rendered inactive in the presence of [GATE-1994]

(a) Organic acid
(b) Cationic surfactants
(c) Soaps
(d) Inorganic salts

13. Surfactants are characterized by the presence of [GATE-1992, 1993]

(a) Water solubilizing groups alone
(b) Fat solubilizing groups alone
(c) Water and fat solubilising groups in the same molecule
(d) Groups with positive charge

14. _____ is an example of Anionic Surfactant

(a) Sodium oleate
(b) Cetrimide
(c) Span 60
(d) Lecithin

15. The HLB value of sodium lauryl sulphate is [GATE-1989]

(a) 6.5 (b) 13.8 (c) 25.0 (d) 40.0

SURFACTANT & HLB VALUE

SURFACE ACTIVE AGENTS

- Principle → reduction of surface tension between oil phase and water phase.

☐ Classification of Surface Active Agents

Class	Sub-class	Examples
Cationic	Quaternary ammonium salts	Cetyl trimethyl ammonium bromide (Cetrimide)
	Pyridinium compounds	Dodecyl pyridinium chloride
Anionic	Alkali soap	Potassium stearate, Triethanol amine acetate
	Organic sulphates	Sodium lauryl sulphate (SLS)
	Organic sulphonates	Sodium cetyl sulphonate
Non-ionic	Hydrophobic	Span (Sorbitan fatty acid ester)
	Hydrophilic	Tweens (Polysorbates)
	Polyoxyethylene monolaurate (Tween 20) Polyoxyethylene monopalmitate (Tween 40) Polyoxyethylene monostearate (Tween 60) Polyoxyethylene monooleate (Tween 80)	L → Tween 20
		P → Tween 40
		S→ Tween 60
		O → Tween 80
Ampholytic	-	N-dodecylalanine

HYDROPHILIC–LIPOPHILIC BALANCE (HLB) SYSTEM

- An arbitrary scale expressing hydrophilic vs. lipophilic characteristics of emulsifying agents.
- Developed by Griffin (1949).
- **Range:** 0–20.
- **Agents with HLB 1–8:** lipophilic → W/O emulsions.
- **Agents with HLB 8–18:** hydrophilic → O/W emulsions.

HLB Range	Application
1–3	Antifoaming agents (Simethicone)
3–6	W/O emulsifiers
7–9	Wetting agents
8–16	O/W emulsifiers
13–15	Detergents
15–18	Solubilizers

☐ Determination of HLB

1. $HLB = \frac{(E+P)}{5}$

   Where: E = % weight of ethylene oxide chain, P = % weight of polyhydric alcohol groups

2. $HLB = 20\left(1 - \frac{S}{A}\right)$

   Where: S = saponification no. of ester, A = acid no. of fatty acid

3. $HLB = \sum(\text{Hydrophilic group no.}) - \sum(\text{Lipophilic group no.}) + 7$

- **Required HLB (RHLB):-** The required HLB value is determined by the oil phase and is used to select the right emulsifier or emulsifier blend to stabilize the emulsion.

$$\% \text{ Emulsifier with High HLB} = \frac{RHLB - HLB_{low}}{HLB_{high} - RHLB}$$

- **HLB Values of Common Agents**

Agent	HLB Value
Oleic acid	1
Polyoxyethylene sorbitol beeswax derivative	2
Sorbitan tristearate	2.1
Glyceryl monostearate	3.8
Sorbitan monooleate (Span 80)	4.3
Sorbitan monolaurate (Span 20)	8.6
Brij 30	9.5
Polyoxyethylene monostearate	11.1
Triethanolamine oleate	12
Tween 80	15
Tween 20	16.7
Brij 35	16.9
Sodium oleate	18
Potassium oleate	20
Sodium lauryl sulphate	**40 (highest)**

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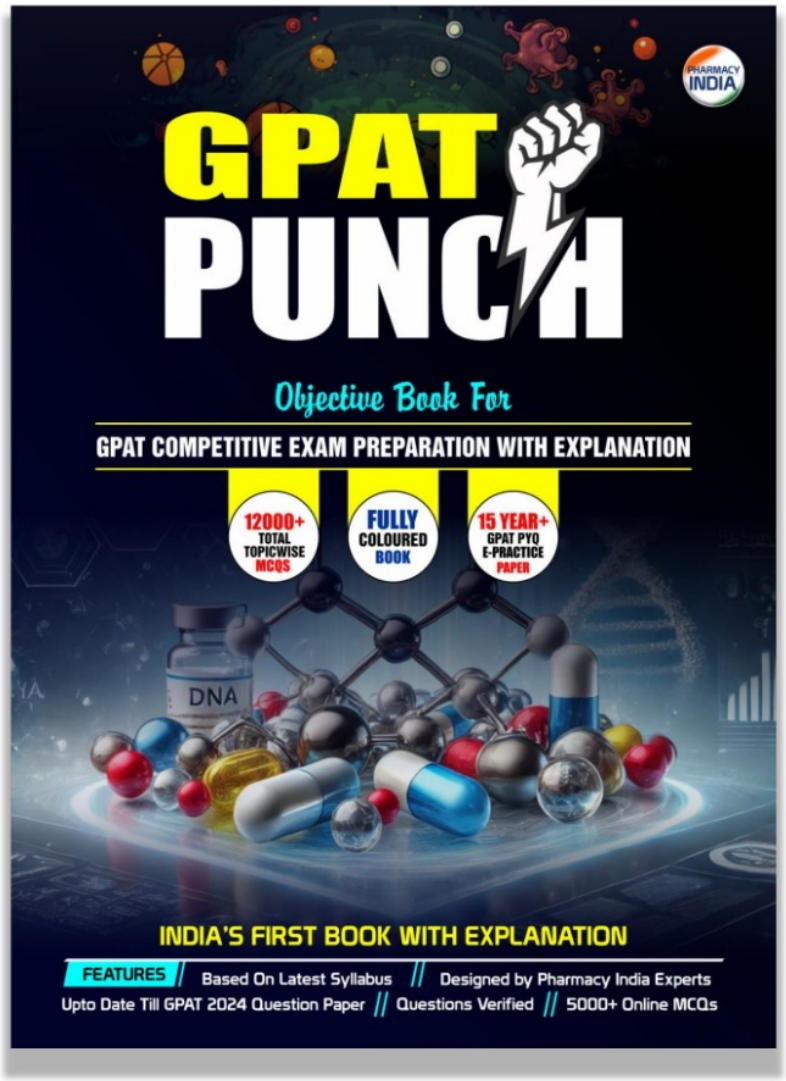

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