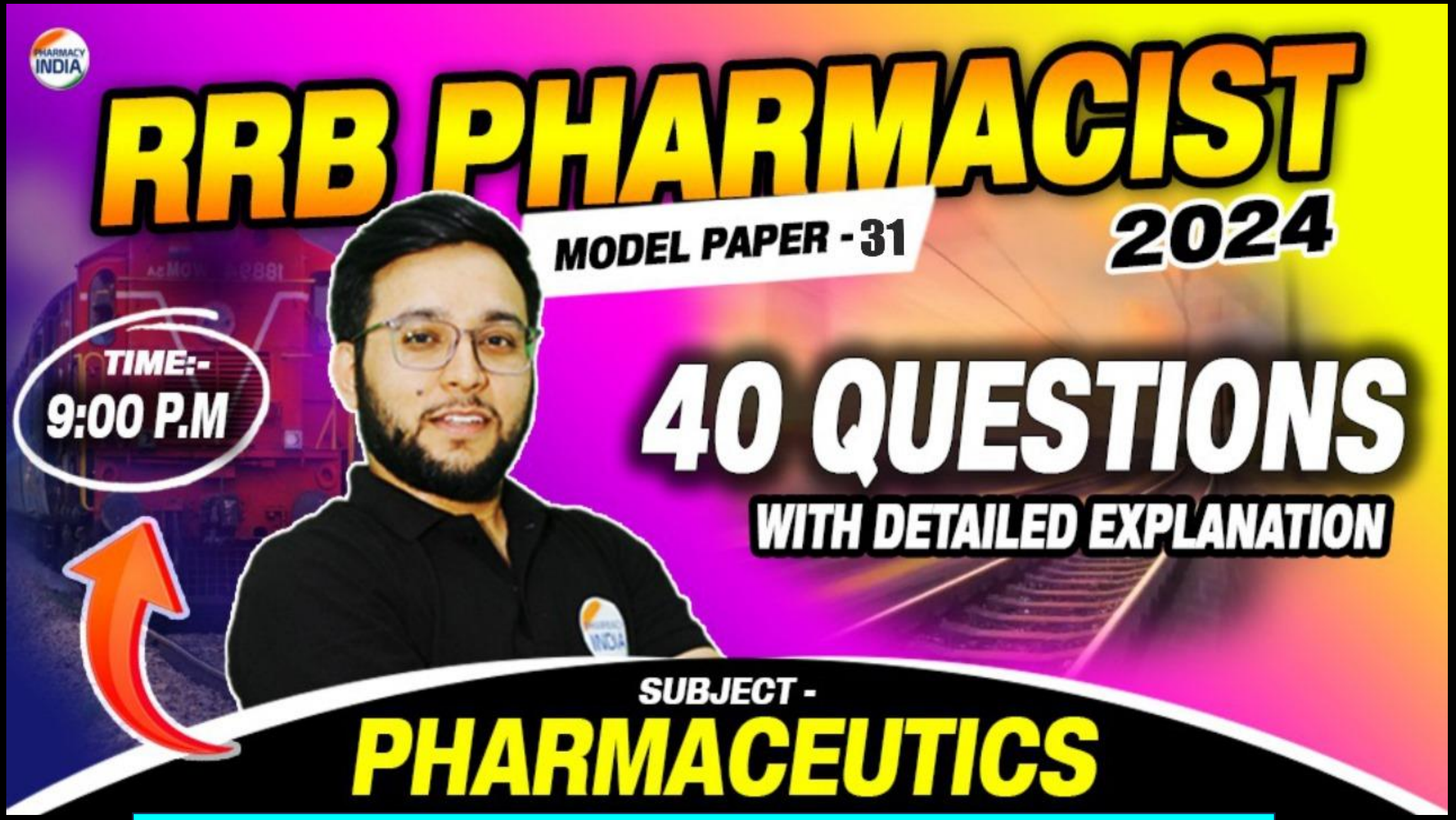

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1. Example of cationic emulsifying agent is

(a) Polysorbate 80

(b) Cetrimide

(c) Sodium dodecanoate

(d) Sorbitan monooleate

1. Example of cationic emulsifying agent is

(a) Polysorbate 80

(b) Cetrimide

(c) Sodium dodecanoate

(d) Sorbitan monooleate

✓ Types of surfactants

Types	Example
Anionic	Sodium lauryl sulphate(SLS), Triaton-X200, Sodium acetyl sulphate, Docusate
Cationic	Benzalkonium chloride, Cetyl trimethyl ammonium, Cetrimide
Non-ionic	Tween, Span, Myrj, Brij, Diethanolamine, PEG, Tween 80
Amphoteric	N- alkylamino acid, Lecithin, Betaines

2. Creams are

(a) Emulsions

(b) Suspensions

(c) Ointments

(d) Pastes

2. Creams are

(a) Emulsions

(b) Suspensions

(c) Ointments

(d) Pastes

❑ Example of Emulsion

- **Oral Emulsion** - Usually O/W type e.g. Castor oil, Cod liver oil
- **Cosmetics** - O/W type (Vanishing Cream)
  - W/O type (Cold Cream)
- **Parenteral Emulsion** - Fat soluble vitamins A, D, E and Sex hormones
- **Diagnostic Emulsion** - Radio-opaque emulsion for X-Ray

3. The complete separation of two phases in emulsion is called

(a) Creaming
(b) Sedimentation
(c) Cracking
(d) Leaching

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Breaking or Cracking

- Complete separation of oil and aqueous phase, irreversible.
- When ammonium chloride is gradually and slowly mixed into emulsion containing ammonium oleate, emulsion gets Cracked.
- When sodium chloride is gradually and slowly mixed into emulsion containing sodium oleate, emulsion gets Destabilize.
- Occurs due to addition of incompatible emulsifying agent. e. g. Monovalent soap + Divalent soap.

4. Which of the following is a natural emulsifying agent obtained from vegetable source

(a) Starch

(b) Gelatin

(c) Egg yolk

(d) Wool fat

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C. Non-ionic: Glyceryl ester-glyceryl monoesters etc.

4. Inorganic: Milk of magnesia, Mg oxide, Mg trioxide etc.

5. Alcohols (polyoles): Carbowax, cholesterol and lecithin.

5. W/O emulsifiers have HLB scale value range

(a) 1-3

(b) 3-6

(c) 7-9

(d) 13-16

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(a) 1-3

(b) 3-6

(c) 7-9

(d) 13-16

Explanation -

HLB RANGE	CATEGORY	EXAMPLE
1-3	Antifoaming agents	Simethicone
3-6	w/o emulsifying agents	Span 80, Span 60
7-9	Wetting agents	Span 20, Span 40
8-16	o/w emulsifying agents	Tween 20, 40, 60, 80
13-15	Detergents	Tween 20, 40
15-18	Solubilizing agents	SLS

6. Quaternary ammonium compounds are used as

(a) Nonionic emulsifying agent
(b) Cationic emulsifying agent
(c) Anionic emulsifying agent
(d) Natural emulsifying agent

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7. Bottle method is used for preparation of

(a) Suspensions
(b) Lotions
(c) Ointments
(d) Emulsions

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(a) Suspensions

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Preparation Method for Emulsion

- ✓ **Dry Gum methods**

  Oil + Gum → Triturate → Add water → Again Triturate

- ✓ **Wet gum method**

  Water + Gum → Triturate → Add oil → Again Triturate

- ✓ **Bottle method** - Used for volatile or non viscous oils

8. Example for a cationic emulsifying agent

(a) Dioctyl sodium sulphosuccinate

(b) Polyoxyethylene sorbitan mono-oleate

(c) Cetyl trimethyl ammonium bromide

(d) Sodium carboxymethyl cellulose

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9. Which of the following statements is FALSE respect to emulsions

(a) Emulsions are the finely divided solids which are dispersed in a liquid which acts as a continuous phase

(b) Emulsions are the liquid preparation containing two immiscible liquids, one of which is dispersed into the other as minute globules

(c) Emulsions has two phase dispersed phase and continuous phase

(d) Emulsifying agent is added to the system which forms a film around the globules in order to form an emulsion

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Emulsion

- Biphasic system consisting of two immiscible liquids usually water and oil.
- It consists of two phase

  Internal phase - Dispersed or Discontinuous

  External phase - Dispersion or Continuous
- Emulsion is coarse dispersion having globule size 0.1-100 mm
- It may be defined as biphasic liquid dosage form in which two liquids are immiscible with each other.
- Thermodynamically unstable, emulsifying agents are needed.

10. Which one of the following is an emulsifying agent from the vegetable source

(a) Gelatin

(b) Acacia

(c) Wool fat

(d) Methyl cellulose

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11. Coalescence of the dispersed globules and separation of the disperse as a separate layer in an emulsion is called

(a) Cracking
(b) Creaming
(c) Phase inversion
(d) Breaking

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12. Preparation of emulsions using fixed oil the ratio of Oil: Water: Gum

(a) 4:2:1

(b) 2:2:1

(c) 3:2:1

(d) 1:2:1

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Volatile Oil (Turpentine Oil, Sandal wood Oil, Cinnamon Oil)	2	2	1	V (2:2:1) Bottle method
Oleo Resin (Balsam of peru)	1	2	1	O (1:2:1)

13. Which is NOT true for dry gum method

(a) Dry acacia is used

(b) It is a quick process

(c) All apparatus should be dry

(d) Primary emulsion is viscous and creamy

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(a) Dry acacia is used

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Dry gum method

- Measure the required quantity of oil in a dry measure and transfer it into a dry mortar.
- Add the calculated quantity of gum acacia into it and triturate rapidly so as to form a uniform mixture.
- Add required quantity of water and triturate vigorously till a clicking sound is produced and the product becomes white or nearly white due to the total internal reflection of light. The emulsion produced at this stage is known as primary emulsion.
- Add more of water to produce required volume.

14. Which of the following is true about Agar

(a) It is not a good emulsifying agent, as it forms a very coarse and viscous emulsion

(b) It is used in agent by preparing 10% mucilage, by dissolving in boiling water and cooled at 20°C

(c) It is rarely used as an emulsifying agent because it produces very coarse and thick emulsion

(d) Stable emulsion can be prepared with gum acacia as emulsifying agent

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Agar

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- It is rarely used as an emulsifying agent because it produces very coarse and thick emulsion.
- Stable emulsion can be prepared with gum acacia as emulsifying agent.

15. Increasing the proportion of the dispersed phase of an emulsion by more than 60% may lead to

(a) Cracking
(b) Frothing
(c) Phase inversion
(d) Creaming

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(a) Cracking

(b) Frothing

(c) Phase inversion

(d) Creaming

Phase inversion:

- Inversion in which O/W emulsion inverts to become a W/O emulsion and vice versa.
- The reason for the phase inversion is using of wrong type of emulsifying agents.

Causes

- Addition of an electrolyte may lead to phase inversion.
- May arise due to inappropriate emulsifier.

16. Which of the following is an emulsifying agent of wool fat

(a) Lanolin
(b) Wool alcohol
(c) Paraffin wax
(d) Mineral oil

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5. Alcohols (polyoles): Carbowax, cholesterol and lecithin.

17. Separation of dispersed phase of an emulsion into separate layers is called

(a) Cracking
(b) Irrigation
(c) Thickening
(d) Dispersing

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18. Which one of the following is an example for reversible process

(a) Creaming
(b) Cracking
(c) Phase inversion
(d) Both (b) and (c)

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Creaming

- It is the concentration of globules at the top or bottom of emulsion.
- Rate of creaming is determined by Stoke's equation

✓ **Prevented by**

- Reducing particle size by homogenization.
- Increasing viscosity by adding thickening agent.
- Reducing the difference in densities.

19. Which of the following emulsifying agent is from plant source

(a) Egg yolk
(b) Lecithin
(c) Lanolin
(d) Pectin

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20. The amount of castor oil in commercial emulsion ranges from

(a) 1-10%

(b) 30-50%

(c) 70-74%

(d) 80-85%

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21. A cationic surfactant used as disinfectant

(a) Benzalkonium chloride
(b) Hexachlorophene
(c) Chloroxylenol
(d) Proflavine

21. A cationic surfactant used as disinfectant

(a) Benzalkonium chloride

(b) Hexachlorophene

(c) Chloroxylenol

(d) Proflavine

- Cationic surfactants are positively charged in an aqueous solution (e.g. quaternary ammonium and pyridinium), and expensive.
- Because of their bactericidal action, they are widely used for other applications such as preservatives, sterilizing contaminated surfaces, and emulsions.

22. Emulsions containing more than two phases are called as

(a) Mixed emulsion

(b) Heterogenous emulsion

(c) Homogenized emulsion

(d) Multiple emulsion

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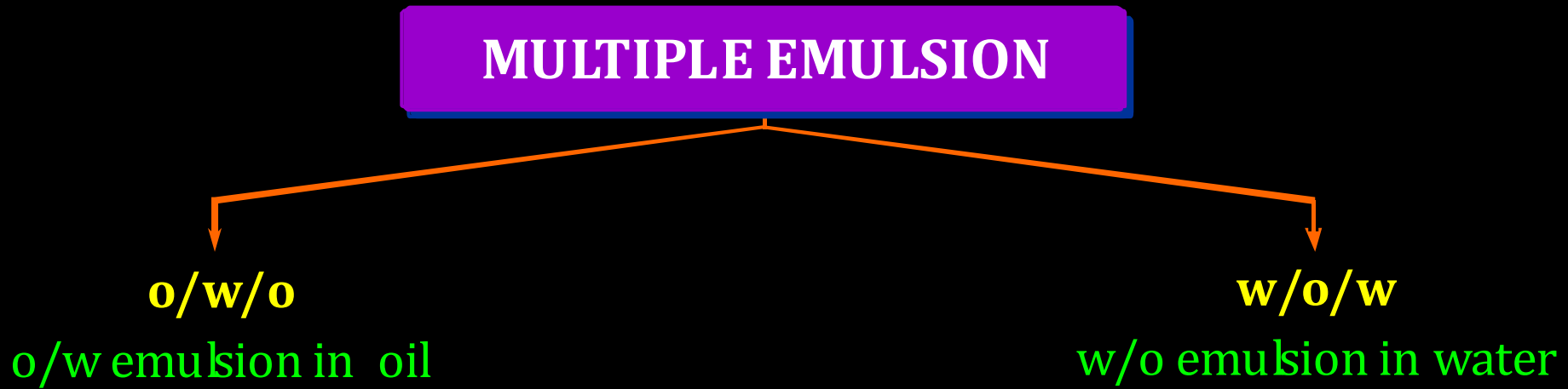
SPECIAL TYPES OF EMULSION



- Size of globules – 0.1 -100 µm (Generally)
- The internal phase in monodisperse system (All particles having the same size) should not be more than 74% of total volume of system.
- Suitable for dosage formulation of olive oil, vitamin A and water. **[GATE-03]**

23. Which one of the following is an example of non-ionic emulsifying agent

(a) Yellow paraffin wax
(b) Bee's wax
(c) Liquid paraffin
(d) Spans

23. Which one of the following is an example of non-ionic emulsifying agent

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24. HLB system was developed by

(a) Griffin

(b) Stock's

(c) Dalla Valle

(d) None of these

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❖ Hydrophilic Lipophilic Balance(HLB) System

- Determined by Griffin
- Hydrophilic–lipophilic balance (HLB) is the balance of the size and strength of the hydrophilic and lipophilic moieties of a surfactant molecule.

25. Example for anionic surfactant

(a) Glycine

(b) Sodium dodecyl sulphate

(c) Trialkyl ammonium

(d) Polyethylene glycol

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26. Spans & Tweens are

(a) Highly polymerized mannuronic acid anhydride

(b) Phospholipids

(c) Polyoxyalkylene derivative

(d) Glycoside

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(a) Highly polymerized mannuronic acid anhydride

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Tweens, which are polyoxyethylene derivatives of spans, are hydrophilic and have high HLB values (9.6-16.7).

In order to form stable emulsions, an emulsifier or emulsifier mixture having HLB value equal to the HLB value of the oil phase should be used.

27. Sodium lauryl Sulphate is

(a) Cationic surface active agents

(b) Ampholytic surface active agents

(c) Nonionic surface active agents

(d) Anionic surface active agents

27. Sodium lauryl Sulphate is

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(c) Nonionic surface active agents

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28. In the formulation, to facilitate the wetting of insoluble solids, which of the following agents is used

(a) Suspending agents
(b) Flavoring agents
(c) Wetting agents
(d) None of these

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(a) Suspending agents

(b) Flavoring agents

(c) Wetting agents

(d) None of these

Wetting Phenomena

- In industry large quantities of powders such as talc or charcoal are added to water . These powders do not get wetted properly in spite of their higher densities than water., instead these float on the surfaces.
- Wetting is an adsorption process in which an intimate contact of the solids with liquid phase is achieved.
- In the formulation, to facilitate the wetting of insoluble solids wetting agents are used.

29. The liquid drops or gas bubbles are always spherical due to

(a) Volume tension

(b) Surface tension

(c) Gravitational force

(d) Magnetic force

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(a) Volume tension

(b) Surface tension

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Surface Tension & Interfacial tension

S.No.	Surface tension	Interfacial tension
1.	Surface tension is defined as the force per unit length parallel to the surface to counter balance the net inward pull.	Interfacial tension is the force per unit length existing at the interface between two immiscible liquid phases.
2.	Water molecules in the bulk experience equal cohesive forces of attraction. Therefore, net force is zero. Molecules on the surface experiences less adhesive force of attraction between air molecule and water molecule than the cohesive force between water molecules in bulk.	Interfacial tension is less than surface tension because the adhesive force between two liquid phases forming an interface are greater than when a liquid and a gas phase exist together. If two liquids are completely miscible, no interfacial tension exist between them.
3.	Indicates strength of cohesive force. (force of attraction between same molecules)	Indicates strength of adhesive force. (force of attraction between different molecules)
4.	CGS unit – dynes/ cm SI system – Newton/ m	CGS unit – dynes/ cm SI system – Newton/ m

30. Dilatant material termed as

(a) Shear thickening system

(b) Shear thinning system

(c) Plastic system

(d) Pseudoplastic system

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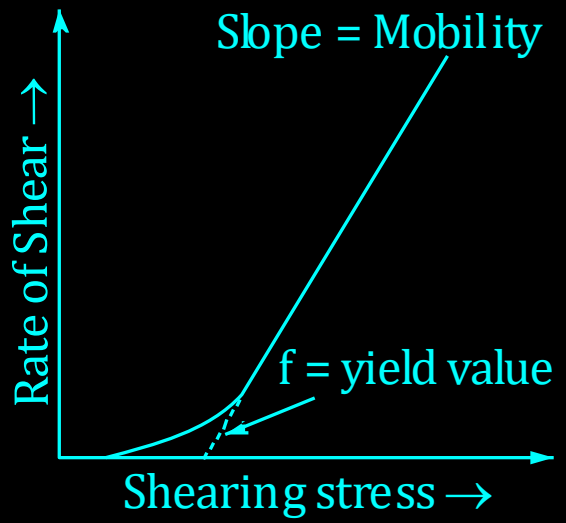
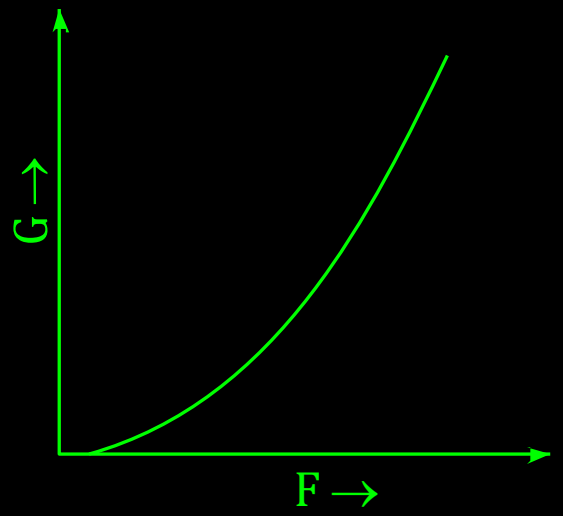
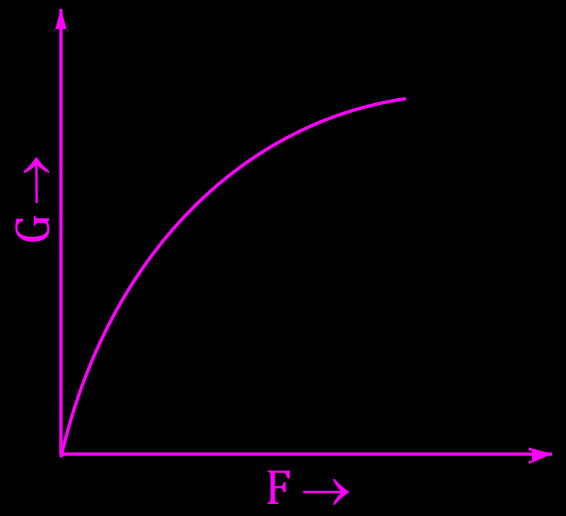
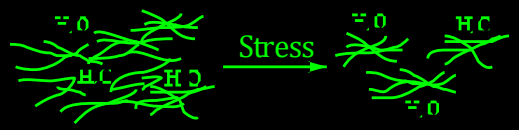
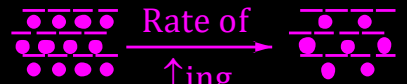
S.No.	PLASTIC FLOW	PSEUDOPLASTIC FLOW	DILATANT FLOW
1	Curves do not pass through origin	Curve begins at the origin	It also originate from origin
2	Lines extrapolates to axis, leads to formation of linear curve called yield value.	No part of curve is linear so, no yield value	No yield value
3	Flocculated suspension ↑ses yield value	Mainly natural & synthetic gum exhibit Pseudoplastic flow.	Curve exhibit dilatant flow
4			

5	Equ^{n} → $U = \frac{F-f}{G}$ U = Plastic viscosity f = Yield value [N/m^2] G = Rate of shear [S] F = Shear stress [N/m^2]	Equ^{n} → $F^N = \eta' G$ N = 1 (Newtonian flow) N > 1 (Non-newtonian flow)	Equ^{n} → $F^N = \eta' G$ N<1 = degree of dilatency ↑ses N=1 = Newtonian flow N>1 = Non-newtonian
6	Known as Bingham bodies	SHEAR THINNING SYSTEM	SHEAR THICKENING SYSTEM
7	It doesn't flow until shearing stress is extended as yield value	 Polymer at rest random arrangement water is bound Polymer under flow. alignment on Long axis water is released	 Closed packed particle Minimum void volume Low consistency Open packed particle Maximum void volume High consistency
8	Viscosity is linearly increase with increase in rate of shear	Viscosity of pseudoplastic substance decrease with increase rate of shear	Viscosity of dilatant substance increases with increase in stress
9	**Eg :** Flocculated particles in concentrated suspension	**Eg :** Liquid dispersion of natural and synthetics gums (tragacanth, Sodium alginate, Methyl cellulose, Sodium carboxy methyl cellulose)	**Eg:** • Suspension containing high concentration of solids, • Suspension of starch in water, • Inorganic pigments in water, kaolin in water, zinc oxide in water

31. Fluid moves in a direction opposite to the sedimentation movement

(a) Settling
(b) Elutriation
(c) Centrifugation
(d) Precipitation

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(a) Settling

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(c) Centrifugation

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Elutriation

Elutriation is a process for separating particles based on their size, shape and density, using a stream of gas or liquid flowing in a direction usually opposite to the direction of sedimentation.

32. How surfactants will facilitate or aid wetting of hydrophobic materials in liquid

(a) By decreasing the solid-liquid interfacial tension

(b) By increasing the solid-liquid interfacial tension

(c) By decreasing the solid-liquid interfacial tension and by increasing the solid-liquid interfacial tension

(d) None of these

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(c) By decreasing the solid-liquid interfacial tension and by increasing the solid-liquid interfacial tension

(d) None of these

❖ Surfactants

- Surfactants are used as emulsifying agent/emulgents.
- They decrease interfacial tension.
- They prevent coalescence of droplets and stabilize the system by acting as barrier to droplets.
- Classified by presence of water and fat solubilizing group in same molecule.

33. Coulter current method used for determination of

(a) Number of particle
(b) Particle volume
(c) Particle velocity
(d) All of these

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(a) Number of particle

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COULTER COUNTER METHOD

- It operates on the principle that when a particle suspended in a conducting liquid passes through a small orifice (opening), on either side of which are electrodes, a change in electric resistance occurs.
- The coulter counter is a popular instrument for measuring the particle volume & particle size.

34. "Zephiran" is a

(a) Anionic

(b) Cationic

(c) Non-ionic

(d) Ampholytic

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Zephiran

Zephiran, also known as benzalkonium chloride, is a cationic detergent and ammonium compound that's used as a disinfectant and antiseptic in the medical field.

It's also a germicide and topical antiseptic.

Zephiran is chemically stable, has low surface tension, and is an efficient wetting agent.

35. The most important influence of temperature on emulsion stability

(a) Creaming
(b) Caking
(c) Cracking
(d) Phase inversion

35. The most important influence of temperature on emulsion stability

(a) Creaming

(b) Caking

(c) Cracking

(d) Phase inversion

Phase inversion:

- Inversion in which O/W emulsion inverts to become a W/O emulsion and vice versa.
- The reason for the phase inversion is using of wrong type of emulsifying agents.

Causes

- Addition of an electrolyte may lead to phase inversion.
- May arise due to inappropriate emulsifier.

36. Example for a non-ionic emulsifying agent

(a) Sodium lauryl sulphate
(b) Polyoxyethylene sorbitan monooleate
(c) Cetyltrimethyl ammonium bromide
(d) Dodecyl pyridinium chloride

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Tween 80

- Polyoxyethylene sorbitan monooleate.
- Polysorbate 80 is a nonionic surfactant and emulsifier often used in pharmaceuticals, foods, and cosmetics. This synthetic compound is a viscous, water-soluble yellow liquid.

37. Which of the following is NOT an instability problem of emulsion

(a) Creaming
(b) Phase inversion
(c) Cracking
(d) Flashing

37. Which of the following is NOT an instability problem of emulsion

(a) Creaming

(b) Phase inversion

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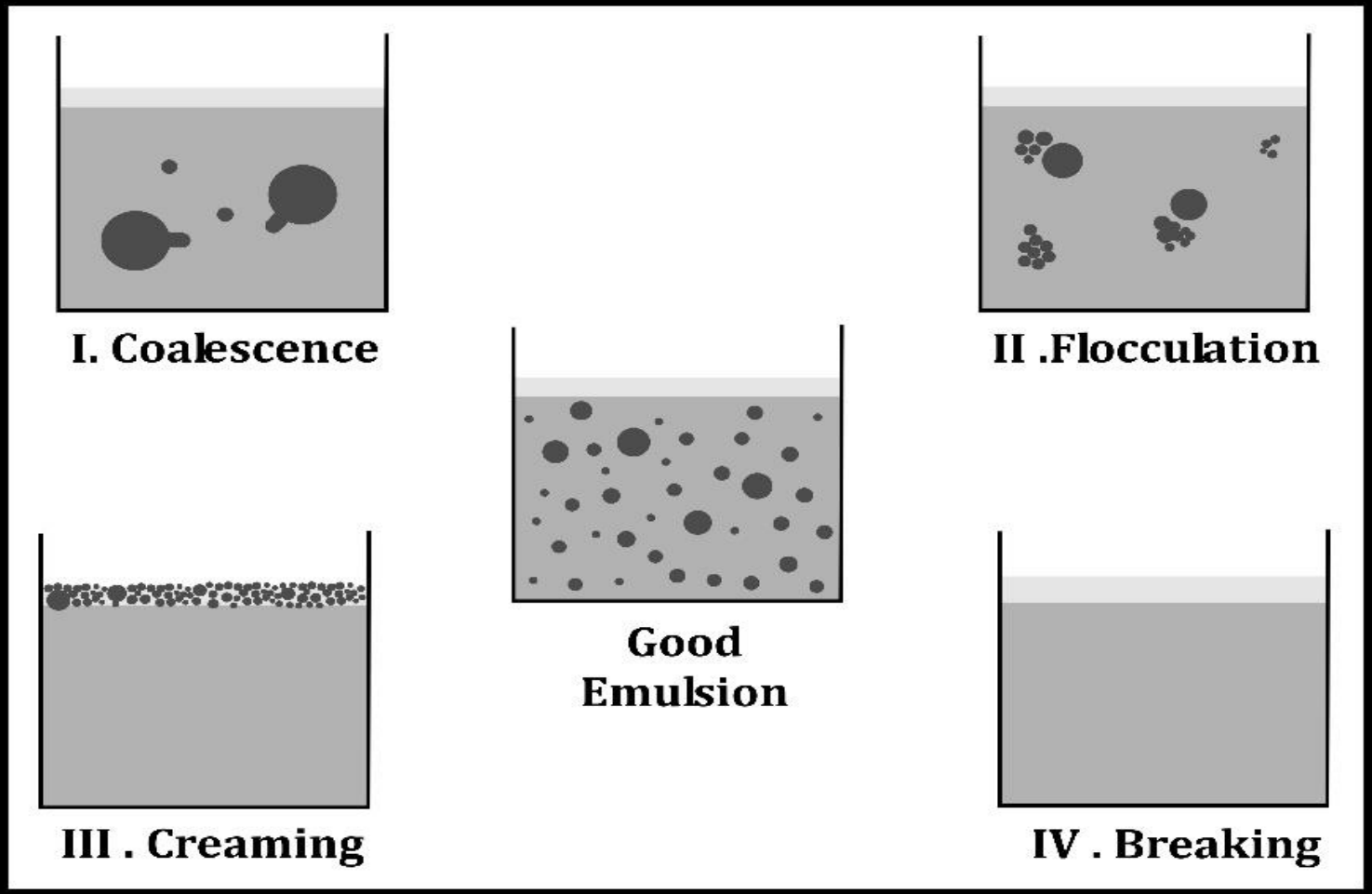
(d) Flashing

Instability problem of emulsion



38. Which of the following is NOT used as an emulsifying agent

(a) Surfactant
(b) Hydrophilic colloids
(c) Electrolytes
(d) Finely divided solids

38. Which of the following is NOT used as an emulsifying agent

(a) Surfactant

(b) Hydrophilic colloids

(c) Electrolytes

(d) Finely divided solids

Emulsifying agent

Class	Examples
1. Surface active agents	
• **Cationic**	• Quaternary ammonium compounds: Cetrimide, Benzalkonium chloride
• **Nonionic**	• Polyoxy ethylene fatty alcohol ethers $C_{12}H_{25}(OCH_2CH_2)_nOH$ • Sorbitan fatty acid esters • Polyoxyethylene sorbitan fatty acid esters • Polyoxyethylene polyoxypopylene block copolymers • Lanolin alcohols and ethoxylated lanolin alcohols
• **Anionic**	• Soaps - Mono valent, Polyvalent, Organic • Sulphates • Sulphonates $(CH_3(CH_2)_n CH_2SO_3 - Na^+)$
2. Hydrophilic colloids	
• **Semisynthetic**	• Sodium carboxymethyl cellulose • Hydroxyl propyl cellulose • Methyl cellulose
• **Natural**	• Plant origin - Acacia , Tragacanth, Agar, Pectin, lecithin • Animal origin – Gelatin, Lecithin, Cholesterol, Wool fat, Egg yolk
3. Finely divided solids	
• **Colloidal clays**	• Bentonite $(Al_2O_3.4SiO_2.H_2O)$ • Veegum (Magnesium Aluminium silicate) • Magnesium trisilicate
• **Metallic hydroxides**	• Magnesium hydroxide • Aluminium hydroxide

39. In relation to emulsion, formation of a layer of relatively concentrated emulsion above or below the surface is known as

(a) Cracking

(b) Creaming

(c) Mottling

(d) Phase inversion

39. In relation to emulsion, formation of a layer of relatively concentrated emulsion above or below the surface is known as

(a) Cracking

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Creaming

- It is the concentration of globules at the top or bottom of emulsion.
- Rate of creaming is determined by Stoke's equation

✓ **Prevented by**

- Reducing particle size by homogenization.
- Increasing viscosity by adding thickening agent.
- Reducing the difference in densities.

40. To identify the emulsion type, which of the following tests are conducted

(a) Dilution test

(b) Dye test

(c) Conductivity test

(d) All of these

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(a) Dilution test

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(d) All of these

❑ Identification test

Test	O/W emulsion	W/O emulsion
Color	Usually white	Takes the color of oil
Feel on skin	Non-greasy	Greasy
Dye solubility test	Water soluble dye(amaranth) Continous phase – coloured Oil soluble dye(sudan III) Globules – coloured	Water soluble dye(amaranth) Globules – coloured Oil soluble dye(sudan III) Continous phase – coloured
Bottling paper test	Wet the bottling paper	Does not wet the blotting paper
Conductivity test	Conducts current	Does not conduct current
Direction of creaming	Upward movement	Downward movement
Fluorescence test	Exhibits dot pattern fluorescence	Exhibits fluorescence throughout the emulsion
$CoCl_2$ /Filter paper test	Filter paper changes from blue to pink	No change

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