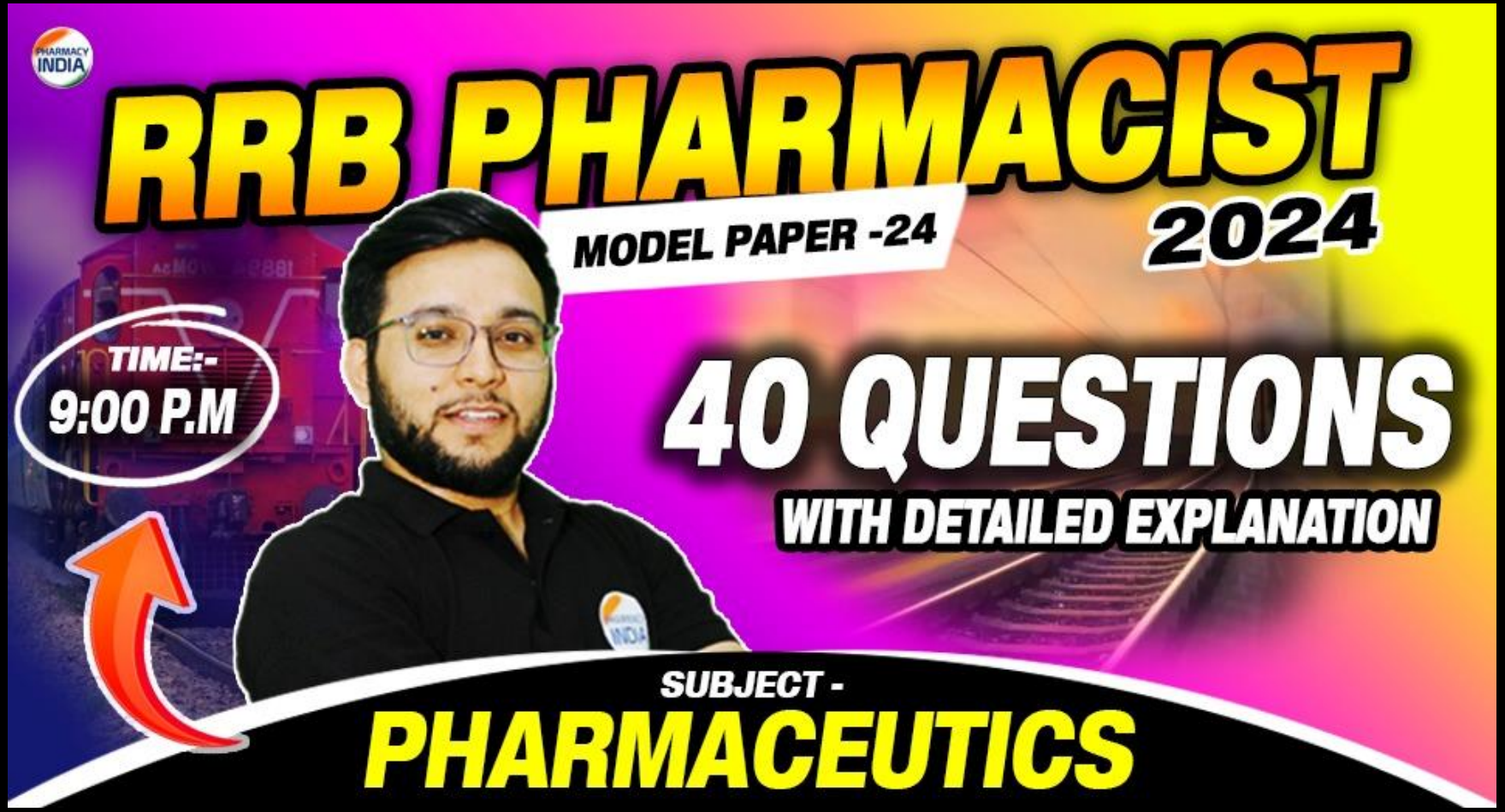

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1. In a suspension, the particle size is

(a) 5-10 micron

(b) 10-15 micron

(c) 0.5-5 micron

(d) 8-12 micron

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Suspension

- ✓ Pharmaceutical suspension may be defined as a dispersion in which insoluble solids (drugs) are suspended in a liquid medium .
- ✓ Pharmaceutical suspension is a heterogeneous system consisting of two phases in which internal phase is dispersed uniformly throughout the external phase.
- ✓ Particle size ranges from 0.5 to 5 micron.

2. An example of flocculating agent used in suspensions is

(a) Sodium carboxymethyl cellulose

(b) Sodium lauryl sulphate

(c) Sodium alginate

(d) Bentonite

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(c) Sodium alginate

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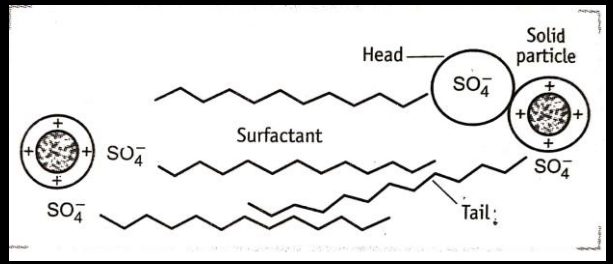
Surfactants

- ✓ Surfactant aid in dispersion by reducing the interfacial tension between the solid particles and the vehicle.
- ✓ Examples:- sodium lauryl sulfate di-octyl sulfosuccinate, non-ionic surfactants such as tweens also assumes partial negative charge in aqueous dispersion and form a network-like structure between particles.



3. Which is INCORRECT statement for flocculated suspension

(a) Particles form loose aggregate structure

(b) Sediment is formed slowly

(c) Sediment is loosely packed

(d) Sediment is easy to redisperse

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In the potential energy curves , it represents the **primary minimum.**	In the potential energy curve , it represents **the secondry minimum**
Bioavailability is relatively high	**Bioavailability us comparatively less.**

4. A quaternary ammonium compound used as antimicrobial in suspension is

(a) Propyl paraben

(b) Phenoxyethanol

(c) Chlorocresol

(d) Cetrimide

4. A quaternary ammonium compound used as antimicrobial in suspension is

(a) Propyl paraben

(b) Phenoxyethanol

(c) Chlorocresol

(d) Cetrimide

Preservative

- Cetrimide is a quaternary ammonium compound used as an antimicrobial compound in a concentration of 0.01-0.02%.

5. Incremental particle size measurement is done by the diametre which is measured by using Andreasen Pipette method of sedimentation

(a) Surface number diameter
(b) Stoke's diameter
(c) Length number diameter
(d) Volume number diameter

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Stokes Diameter

- It describes the diameter of an equivalent sphere undergoing sedimentation at the same rate as the asymmetric particles.
- The rate of settling of particles in a suspension or emulsion may be obtained by stokes law. The equation is rearranged to get the Stokes diameter of a particle.

$$d_{st} = \sqrt{\frac{18\eta_o h}{(\rho_s - \rho_0) g t}}$$

Where,

h = d distance of fall in time, (t) m
n = viscosity of the medium, Pa.s
p_s = density of the particles, kg/ m^3
P_o = density of the dispersion medium, kg /m^3
g = acceleration due to gravity, m/s

6. In coarse dispersions, the condition when no clear supernatant is shown on standing is known as

(a) Ionic equilibrium

(b) Donnan membrane equilibrium

(c) Flocculation equilibrium

(d) Phase equilibrium

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Flocculation Equilibrium

- The sedimentation volume can have values ranging from less than 1 to greater than 1.
- F is normally less than 1, and in this case, the ultimate volume of sediment is smaller than the original volume of suspension, in which F = 0.5.
- If the volume of sediment in a flocculated suspension equals the original volume of suspension, then F = 1.
- Such a product is said to be in “flocculation equilibrium” and shows no clear supernatant on standing. It is therefore pharmaceutically acceptable.

7. A suspensoid in suspension formulation is

(a) An active drug

(b) A solubilizing vehicle

(c) A wetting agen

(d) A preservative

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(b) A solubilizing vehicle

(c) A wetting agen

(d) A preservative

Suspensoid

- A suspensoid is a substance that is dispersed throughout another substance, also known as a suspended phase.

8. The factors affecting rate of settling particles of a suspension are based on

(a) Raoult's law

(b) Stoke's law

(c) Henry's law

(d) Poiseuille's Law

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(a) Raoult's law

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Theory of Sedimentation

- ✓ The rate of sedimentation of particles can be expressed by the stokes law, using this equation

Rate of sedimentation = $d^2(p_1.p_2)g/18n$

Where,

d= diameter of the particles , cm (m)

P1= density of the dispersed phase , g/cm3 (kg/m3)

P2= density of the dispersion medium , g/cm3(kg/m3)

N= viscosity of the dispersion medium

G=acceleration due to gravity , 980.7 cm/s2

9. Which of the following statements is TRUE for flocculated suspensions

(a) Hard Cake is formed

(b) Rate of sedimentation is high

(c) They are difficult to re-disperse

(d) Suspension is pleasing in appearance

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10. Which among the following is a thickening agent for suspension EXCEPT

(a) Acacia

(b) Tragacanth

(c) Starch

(d) Lactose

10. Which among the following is a thickening agent for suspension EXCEPT

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(b) Tragacanth

(c) Starch

(d) Lactose

Thickening Agents

- ✓ They act as structured vehicle.
  - ✓ Xanthan Gum
  - ✓ Tragacanth
  - ✓ Acacia
  - ✓ Starch

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11. Shake well before use label must be put on one of the following

(a) Ophthalmic gels

(b) Ocuserts

(c) Ophthalmic suspension

(d) Ophthalmic solution

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Characteristics of an Ideal Suspension

- ✓ Solid particles should be of such size that they do **settle rapidly**.
- ✓ If sediment is formed, it should **not form a hard cake** at the bottom of container.
- ✓ If sedimentation occurs it should be easily **redispersable on shaking**.
- ✓ Viscosity of the suspension should be such that the product **can be easily poured from the bottle**.
- ✓ Suspension for topical use **should spread when applied and leave a film** of medicament at the site of application.
- ✓ Suspension for oral use should have an **acceptable taste** .

12. A thick, viscous formulation consisting of aqueous suspensions of insoluble inorganic drugs is

(a) Lotion

(b) Paste

(c) Elixir

(d) Magma

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(a) Lotion

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(c) Elixir

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Magma

- ✓ Magmas are aqueous suspensions of insoluble inorganic drugs. They differ from gels in that the suspended particles are larger.
- ✓ Magmas are thick and viscous, and so there is no necessity of suspending agents except for Dihydroxyaluminum Aminoacetate Magma which contains suspending agents in addition to suitable preservatives and flavoring agents.

- ✓ Magmas may be prepared by:
- ✓ (1) Simple Hydration
- ✓ (2) Chemical Reactions

13. The particles which are deeply bonded, settle rapidly, easily redispersible are known as

(a) Coagules
(b) Defloccules
(c) Floccules
(d) Sediments

13. The particles which are deeply bonded, settle rapidly, easily redispersible are known as

(a) Coagules
(b) Defloccules
(c) Floccules
(d) Sediments

- The particles which are deeply bonded, settle rapidly, easily redispersible are known as floccules.
- Flocs are loosely bound clusters having the open type of structures.
- Aggregates are strongly bound particles and more difficult to redisperse.

14. Which is NOT correct for deflocculated suspension

(a) Chances of cake formation are more

(b) Particles settle fast

(c) Particle present as separate unit (d) Sediment is difficult to redisperse

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15. Example for semi-synthetic thickening agent

(a) Polysorbate

(b) Tragacanth

(c) Carbowaxes

(d) Microcrystalline cellulose

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(a) Polysorbate

(b) Tragacanth

(c) Carbowaxes

(d) Microcrystalline cellulose

Thickening Agents

- Several cellulose ethers have the ability to increase viscosity of aqueous systems in which they are dispersed. They include:
  - Methylcellulose (Semi-synthetic)
  - Hydroxyethylcellulose (Semi-synthetic)
  - Sodium carboxymethylcellulose (Semi-synthetic)
  - Microcrystalline cellulose (Semi-synthetic)
  - Hypromellose (Semi-synthetic)

16. The sediment consists of loosely packed particles possessing a scaffolding like structure is seen in

(a) Flocculated suspension

(c) Non-flocculated suspension

(b) Newtonian suspensions

(d) All of these

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17. The stability of suspensions can be evaluated by

(a) Sedimentation volume

(b) Degree of flocculation

(c) Re-dispersibility

(d) All of these

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Sedimentation Volume

It is defined as $F = \frac{V_u}{V_o}$

Vu= ultimate volume of sediment
Vo= initial volume of the suspension

- ✓ F is denoted as sedimentation volume.it is a dimension less number.
- ✓ If sedimentation volume measured in measuring cylinder then the equation can be written as Hu/Ho where H represents height of sediment.
- ✓ F can assume a value of one when there is no sedimentation which is a desirable property of an ideal suspension
- ✓ F value is between these limits 0 to 1 .higher the sedimentation volume better the physical stability.
- ✓ Sedimentation volume method is used as one of the common basic quality control tools because it is simple and easy to estimate.

Degree of Flocculation

It is defined as

$$B = \frac{F}{Fa}$$

F = sedimentation volume of flocculated system
Fa = sedimentation volume of deflocculated system

$$B = \frac{Vu}{Va}$$

Vu = ultimate sediment volume of flocculated system
Va = ultimate sediment volume of deflocculated system

- ✓ If F =Fa then b will be one.
- ✓ If the b value is nearer to one then the suspension does not represent a flocculated suspension. It it indicates that the system under study is a deflocculated system.
- ✓ In general higher the value of B the greater be the physical stability.
- ✓ It is a destructive method of testing because the flocculated system is converted to a deflocculated by the addition of deflocculating agents such as electrolytes.

Redispersibility

- ✓ Evaluation of the redispersibility of a sediment is also important as per the definition of physical stability.
- ✓ Mechanical shaker device which simulates the human arm motion can be used to achieve reproducible results under controlled conditions . These type of methods act as a rough indicator for the rapid screening of suspensions for their stability.
- ✓ Time required or number of revolutions are noted shorter the time at lower the number of revolutions the greater or faster the redispersibility.

18. Polymorphism is important in the formulation of

(a) Solutions

(b) Ointments

(c) Capsules

(d) Suspensions

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(a) Solutions

(b) Ointments

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Physical Stability

- ✓ In a suspension, the suspended solids may grow in size during storage. This phenomenon is known as crystal growth. The following are the mechanism
  1. Ostwald ripening
  2. Temperature changes
  3. Polymorphic transformation

Polymorphic transformation

- Change in the atomic structure of a mineral (but not in its chemical composition) to produce a different form.
- Crystal growth may arise during size during (by crushing and grinding) and dry heat sterilization etc.

19. Degree of the flocculation of a suspension is expressed as

(a) volume of flocculated sediment to total volume of suspension

(b) Ratio of total volume of suspension to volume of flocculated sediment

(c) Ratio of sedimentation volume of flocculated suspension to the sedimentation volume of the suspension when deflocculated

(d) Sediment volume of flocculated suspension

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20. Hixon and Crowell Cube-root law is related to

(a) Micro emulsification

(b) Drug dissolution

(c) Stability of API against hydrolytic degradation

(d) Sedimentation in liquids containing more than 10% suspended particles

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(a) Micro emulsification

(b) Drug dissolution

(c) Stability of API against hydrolytic degradation

(d) Sedimentation in liquids containing more than 10% suspended particles

Hixson Crowell Cube root Law

- ✓ Hixson and Crowell's cubic root low of dissolution for change in surface area on dissolution due to decrease in particle and decrease in surface area.

$$W_o^{1/3} - W^{1/3} = k_2 t$$

W_o = original mass of drug
W = mass of drug remaining to dissolve at time t
k_2 = dissolution rate constant

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21. Which is known as Milk of Magnesia

(a) Suspension of $Mg(OH)_2$

(b) Suspension of MgO

(c) Suspension of $MgCO_3$

(d) Suspension of Milk and MgO

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(b) Suspension of MgO

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(d) Suspension of Milk and MgO

Milk of magnesia

- ✓ Magnesium hydroxide is an inorganic compound with the chemical formula $Mg(OH)_2$.
- ✓ It occurs in nature as the mineral brucite.
- ✓ It is a white solid with low solubility in water.
- ✓ Magnesium hydroxide is a common component of antacids, such as milk of magnesia.

22. Which of the following is an example of external preparation of suspension containing indiffusible solids

(a) Sulphadimidine

(b) Hydrocortisone

(c) Phenobarbitone

(d) Aspirin

22. Which of the following is an example of external preparation of suspension containing indiffusible solids

(a) Sulphadimidine

(b) Hydrocortisone

(c) Phenobarbitone

(d) Aspirin

- ✓ Examples of indiffusible substances include Aspirin, Chalk, Phenobarbitone, Succinylsulphathiazole, Sulphadimidine (for oral use).
- ✓ Calamine, Zinc oxide, Precipitated sulphur, Hydrocortisone, Triamcinolone acetonide (for external use).

23. In extemporaneous preparation of a suspension, Levigation is used to

(a) Reduce viscosity

(b) Reduce zeta potential

(c) Reduce particle size

(d) All of these

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- ✓ An extemporaneous preparation is a drug specially prepared by a pharmacist because an appropriate drug is not readily available.
- ✓ Levigation is used in the extemporaneous preparation of a suspension to reduce particle size.

24. Which of the following is related to a suspension

(a) Stoke‘s law

(b) Brownian movement

(c) Zeta potential

(d) All of these

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(a) Stoke‘s law

(b) Brownian movement

(c) Zeta potential

(d) All of these

Factors Influencing Particle Settling

- ✓ Ideal characterstics of suspensions have highlighted the need to prevent the settling of particles.
- ✓ The study of theories relating to sedimentation provides information regarding factors that affect the settling of solids.
- ✓ Particle shape
- ✓ Theory of Brownian movement
- ✓ Theory of sedimentation
  - ✓ Particle size
  - ✓ Viscosity of medium
  - ✓ Density of the medium

25. Higher zeta potential gives deflocculated type suspension and results in

(a) Sedimentation

(b) Transparent form

(c) Cake form

(d) Brittle form

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(a) Sedimentation

(b) Transparent form

(c) Cake form

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- ✓ The term "deflocculant" denotes a substance which, when added to scattered particles in suspension, causes a reduction in apparent viscosity.
- ✓ Deflocculants are substances which prevent flocculation by increasing zeta potential and therefore the repulsive forces between particles.
- ✓ Higher zeta potential gives deflocculated type suspension and results in cake formation.

26. Which is used as a natural thickening agent in suspensions

(a) Colloidal silicon dioxide

(b) Tragacanth

(c) Methyl cellulose

(d) Carbomer

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Thickening Agents

- ✓ They act as structured vehicle.
  - ✓ Xanthan Gum
  - ✓ Tragacanth
  - ✓ Acacia
  - ✓ Starch

27. The concentration of sodium carboxy methyl cellulose which is required for the formulation of injectable suspension is

(a) Upto 5%

(b) Upto 0.5%

(c) Upto 2%

(d) Upto 0.2%

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- ✓The concentration of sodium carboxy methyl cellulose which is required for the formulation of injectable suspension is upto 5%.

28. A maximum sedimentation volume will be obtained when zeta potential is

(a) Negative

(b) Neutral

(c) Positive

(d) Zero

28. A maximum sedimentation volume will be obtained when zeta potential is

(a) Negative

(b) Neutral

(c) Positive

(d) Zero

- ✓ A maximum sedimentation volume is obtained when zeta potential approaches zero, which can happen when a stable suspension flocculates.
- ✓ Zeta potential is the electrical potential at the slipping plane, which is the interface between a mobile fluid and fluid that's attached to a surface.
- ✓ It's caused by the net electrical charge within the region bounded by the slipping plane, and also depends on the location of that plane.

29. The term used to determine the protecting power of a lyophillic colloid is

(a) Oxidation number

(b) Coagulation value

(c) Gold number

(d) Critical micelle concentration

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Gold Number

- ✓ It is a measure of the protective ability of hydrophilic colloids.
- ✓ It is defined as the number of milligrams of hydrophilic colloid which when added to → 10ml of red gold sol → prevents the change in colour → from red to violet → on the addition of 1ml of 10% solution of sodium chloride.
- ✓ Lower the gold number higher the protective ability of the colloid.

30. Ostwald ripening can destabilize

(a) Emulsion

(b) Suspension

(c) Creams

(d) Solution

30. Ostwald ripening can destabilize

(a) Emulsion

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(c) Creams

(d) Solution

Ostwald Ripening

- ✓ In a polydisperse suspension small particles are more soluble in the medium than the large particles.
- ✓ As a drug conc decrease around the smaller particles more and more drug goes into the solution.
- ✓ On the other hand as the drug increases the around the larger particles , the drug in solution crystallize on the larger particles i.e crystal growth. Thus, the smaller particles become still smaller and larger particles become still larger. This phenomena is know as Ostwald ripening.

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31. Which of the following is a blend preservative of an emulsion system

(a) Propyl paraben

(b) Mixture of methyl paraben and propyl paraben

(c) Ethyl paraben

(d) Sodium sorbate

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(c) Ethyl paraben

(d) Sodium sorbate

- **Antioxidants-** Propyl gallate, Ascorbic acid, Tocopherol etc are used to prevent from oxidation.
- **Preservatives –** Prevent the growth of microorganism. E.g. Benzoic acid, Ethyl paraben, Chloroform Water, Chlorocresol & Phenoxyethanol.
- **Flavouring agent**

Taste	Flavours
Bitter	Wild cheery, walnut, chocolate, Mint, Anise
Salty	Peach, Butterscotch, vanilla, wintergreen mint, Apicort
Sour	Liquorice, root bear, citrus flavors or Raspberry
Excessively sweet	Vanilla, fruit and berry

32. For the preparation of Cod liver oil/Arachis oli emulsion the ratio of oil water gum required is

(a) 04:02:01

(b) 03:02:01

(C) 02.02.01

(D) 01.02.01

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(a) 04:02:01

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(C) 02.02.01

(D) 01.02.01

❑ Preparation Method

- ✓ **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

PROPORTION	OIL	WATER	GUM	METHOD
Fixed Oil (Castor Oil, Cod liver Oil, Olive Oil, Almond Oil)	4	2	1	F (4:2:1) Dry/ Wet gum method
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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)

33. Liquid membrane systems are also called as

(a) Multiple emulsion

(b) Aquasomes

(c) Virosomes

(d) Nanocapsules

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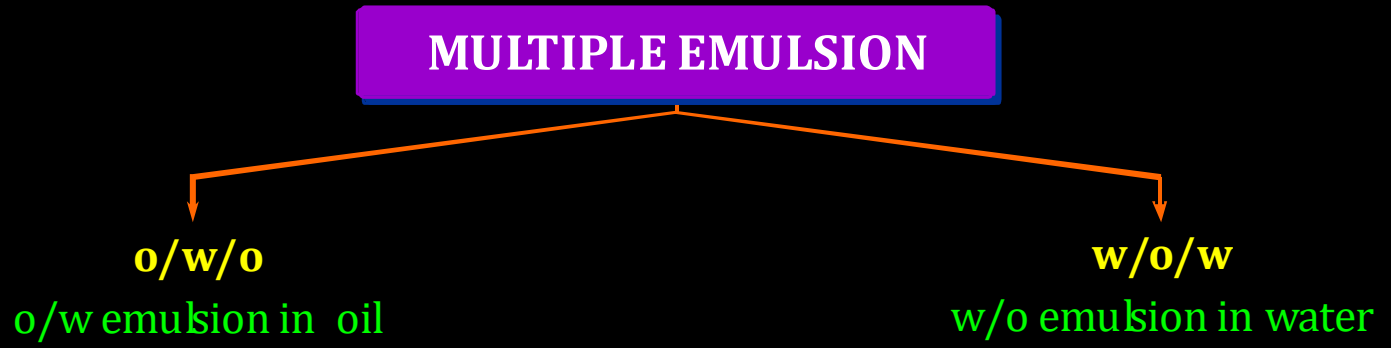
SPECIAL TYPES OF EMULSION



- 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.
- Also called as liquid membrane systems.
- Suitable for dosage formulation of olive oil, vitamin A and water. **[GATE-03]**

34. Which of the following is an example of an ampholytic synthetic surface – active agent

(a) Tween 80

(b) Dodecylpyridinium chloride

(c) Sodium stearate

(d) N dodecyl alanine

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✓ 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, N-dodecyl alanine

35. Which of the defect in an emulsion make most unstable

(a) Creaming

(b) Flocculation

(c) Cracking

(d) sedimentation

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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.

36. Which of the following emulsifiers has highest HLB value

(a) PEG 400

(b) Cetrimide

(c) Sodium lauryl sulfate

(d) Span 80

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HLB VALUES OF SOME COMMON SURFACE ACTIVE AGENT

SURFACE ACTIVE AGENT	HLB VALUE
Oleic acid	1.0
Glyceryl monostearate (pure)	3.8
Sorbitan monooleate (Span 80)	4.3
Sorbitan monostearate (Span 60)	4.7
Glyceryl monostearate (self emulsifying)	5.5
Gum acacia	8.0
Sorbitan monolaurate (Span 20)	8.6
Triethanolamine oleate	12.0
Polyoxyethylene sorbitan monooelate (Tween 80)	15.0
Polyoxyethylene sorbitan monolaurate (Tween 20)	16.7
Potassium oleate	20.0
Sodium lauryl sulphate	40.0

37. Formula for primary emulsion of castor emulsion is

(a) Oil: Water: Gum=4:3:1

(b) Oil: Water: Gum=3:2:1

(c) Oil: Water: Gum=2:2:1

(d) Oil: Water: Gum=4:2:1

37. Formula for primary emulsion of castor emulsion is 9

(a) Oil: Water: Gum=4:3:1

(b) Oil: Water: Gum=3:2:1

(c) Oil: Water: Gum=2:2:1

(d) Oil: Water: Gum=4:2:1

❑ Preparation Method

- ✓ **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

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38. According to Wedge theory, soaps give

(a) W/O emulsions

(b) 0/W/O emulsions

(c) 0/W emulsions

(d) W/O/W emulsions

38. According to Wedge theory, soaps give

(a) W/O emulsions

(b) O/W/O emulsions

(c) O/W emulsions

(d) W/O/W emulsions

Wedge theory

- According to this theory, monovalent soaps like sodium stearate gives o/w type emulsion and divalent soaps like calcium stearate gives w/o type emulsion.
- This was explained by the successful accommodation of the soap molecules at the interface and subsequent possible orientation of the soap molecules to give the type of emulsion.

Limitations

- This theory could not explain the formation of type of emulsion.
- The calcium stearate will not obey this theory, it will ionize and will not exist as a wedge.

39. Example of cationic emulsifying agent is

(a) Polysorbate 80

(b) Cetrimide

(c) Sodium dodecanoate

(d) Sorbitan monooleate

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

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(d) Leaching

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d. 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.

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