BP102T · B.PHARM THEORY

BP102T General Pharmacy

Unit IV — Monophasic and Biphasic Liquids

Pills & Python Notes

From-zero teaching standard: every technical term is defined before use.

Syllabus coverage: Unit IV (9 hours).

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CHAPTER 12: MONOPHASIC LIQUIDS

Unit IV · ~4.5 hours

12.1 Introduction

A monophasic liquid is a medicine in which everything is completely dissolved — one clear, uniform phase, like sugar fully dissolved in *sharbat*. No shaking needed, no settling. Syrups for cough, aromatic waters, elixirs, mouthwashes, eye drops — all are monophasic liquids. The skill here is knowing which preparation suits which route: internal liquids you drink, external liquids you apply, and liquids for body cavities that need extra care.

Learning objectives — after studying this chapter, you should be able to:

- define a monophasic liquid and distinguish it from a biphasic liquid;
- define and describe the preparation of aromatic waters, syrups, elixirs and linctus;
- define and give examples of liniments, lotions, throat paints, applications, gargles, mouthwashes, enemas, eye drops, ear drops, nasal drops and tinctures;
- name the excipients used in monophasic liquids and state their functions;
- describe the general method of preparation of monophasic liquids.

12.2 Definition

Scientific definition: Monophasic liquids are liquid dosage forms in which the drug is completely dissolved in the vehicle, forming a single homogeneous phase.

Simple explanation: The drug has fully "disappeared" into the liquid — you see one clear, uniform liquid with nothing settling at the bottom. No shaking required before use.

Vehicle = the liquid base in which the drug is dissolved (e.g., purified water, alcohol, glycerin).

12.3 Key Terminology

Term	Meaning	Simple explanation
Monophasic	Single-phase system	"Fully dissolved, one clear liquid"
Biphasic	Two-phase system	"Needs shaking — solid in liquid, or oil in water"
Vehicle	The solvent/base liquid	The "carrier" liquid
Aromatic water	Saturated aqueous solution of a volatile oil	"Perfumed water" carrying a medicine
Syrup	Concentrated aqueous solution of sucrose (with or without drug)	Sweet, thick medicinal liquid
Elixir	Sweetened hydroalcoholic (water + alcohol) solution	Sweet liquid with some alcohol
Linctus	Viscous syrupy liquid for cough, taken undiluted in small doses	Thick cough liquid, sipped not gulped
Tincture	Alcoholic extract of a crude drug	Drug "soaked" out of plant material into alcohol

12.4 Detailed Explanation

12.4.1 Monophasic liquids for INTERNAL use

A. Aromatic waters — saturated aqueous solutions of volatile oils or aromatic substances in purified water.

- Used as flavouring vehicles and mild carminatives (relieve gas).
- Examples: peppermint water, cinnamon water, chloroform water (traditional carminative vehicle).
- **Preparation:** shake the volatile oil vigorously with purified water, then filter. (Some are made by diluting a concentrated aromatic water.)

B. Syrups — concentrated aqueous solutions of sucrose, with or without added drugs.

- Simple syrup (the base) is about two-thirds sucrose in water — the sugar both sweetens and preserves (high sugar = microbes can't grow easily).
- **Types:** flavoured syrups (vehicle, e.g., orange syrup), medicated syrups (contain drug, e.g., cough syrups).
- **Preparation:** dissolve sucrose in purified water with gentle heat and stirring; add the drug/flavour; make up the volume; strain if needed. Avoid overheating (caramelisation).

C. Elixirs — clear, sweetened **hydroalcoholic** liquids (water + alcohol) for oral use.

- The alcohol helps dissolve drugs that won't dissolve in water alone; sugar and flavour mask the taste.
- Example: phenobarbital elixir (classic textbook example of a drug needing alcohol to dissolve).
- **Preparation:** dissolve the drug in alcohol first, then add the aqueous sweetened portion with stirring.

D. Linctus — viscous, syrupy liquids used for cough, taken in **small doses without dilution with water**.

- The thickness soothes the throat; the patient sips it slowly.
- Example: simple/codeine-type linctus (textbook examples; codeine preparations are controlled in practice).

Preparation	Base	Key character	Example
Aromatic water	Water	Dilute, flavoured vehicle	Peppermint water
Syrup	Conc. sucrose solution	Sweet, thick, preserved by sugar	Medicated cough syrup
Elixir	Water + alcohol, sweetened	Dissolves poorly water-soluble drugs	Phenobarbital elixir
Linctus	Viscous syrup	Taken undiluted, sips for cough	Cough linctus

12.4.2 Monophasic liquids for EXTERNAL use and body cavities

Preparation	What it is	How used	Examples
Liniment	Alcoholic or oily liquid	Rubbed on skin **with friction**; not on broken skin	Turpentine liniment
Lotion	Aqueous liquid	Applied **without friction** (dabbed/poured)	Calamine lotion
Throat paint	Viscous liquid	Painted on throat with a brush	Compound iodine (Mandl's) paint
Application	General term for liquid applied to skin/mucous membrane	Brushed or dabbed on	(class term)
Gargle	Aqueous solution	Held in throat and gargled, **not swallowed**	Antiseptic gargles
Mouthwash	Aqueous, flavoured solution	Rinsed in mouth for hygiene/freshness	Chlorhexidine mouthwash
Enema	Liquid introduced into the **rectum**	For evacuation or retention of drug	Evacuant/retention enemas
Eye drops	**Sterile** aqueous or oily solution	Instilled into the eye	Antibiotic eye drops
Ear drops	Solution instilled into the ear	For wax or infection	Wax-softening ear drops
Nasal drops	Solution instilled into the nose	Decongestant action	Decongestant nasal drops
Tincture	Alcoholic extract of crude drug	Used as such or as ingredient	Tincture of cardamom (flavouring)

Study of official preparations: pharmacopoeias (including the IP) contain official monographs for many of these — simple syrup, aromatic waters, tinctures, eye preparations — prescribing their composition and quality standards. (Exact monograph details are in the pharmacopoeia itself; learn the *principles* here.)

12.4.3 Excipients used in monophasic liquids

Excipient	Function	Examples
Vehicle	Dissolves/carries the drug	Purified water, alcohol, glycerin, propylene glycol
Sweetener	Masks bitter taste	Sucrose, sorbitol, saccharin
Flavouring agent	Improves palatability	Orange, peppermint, raspberry flavours
Colouring agent	Attractive appearance, identification	Approved colours
Preservative	Prevents microbial growth	Benzoic acid, parabens
Buffer	Keeps pH stable	Citrate/phosphate buffers
Antioxidant	Prevents oxidation of drug	Sodium metabisulphite
Viscosity builder	Thickens (linctus, throat paints)	Glycerin, syrup base

12.4.4 General method of preparation

1. **Weigh/measure** all ingredients accurately.
2. **Dissolve** the drug in the vehicle with stirring; use gentle heat if needed (never boil off alcohol or volatile flavours).
3. **Add** sweeteners, flavours, colours and preservatives; mix well.
4. **Filter or strain** to get a clear liquid (except where suspended matter is intended).
5. **Make up the volume** with vehicle, pack in suitable containers, label (including "shake well" only if biphasic — monophasic liquids don't need it).

12.5 Easy Analogy

- A monophasic liquid is like **sugar fully dissolved in tea** — one uniform liquid. A biphasic liquid is like **oil floating on water** or **chalk shaken in water** — two phases that separate.
- **Liniment vs lotion:** liniment is "massage oil" (rub with friction); lotion is "dab-on liquid" (no friction). Mixing them up is a favourite exam trap.

12.6 Diagram — The Monophasic Family

Draw two branches: **Internal** (glass/spoon icons: aromatic water, syrup, elixir, linctus) and **External & body cavities** (skin drop icon: liniment, lotion; throat icon: throat paint, gargle; mouth icon: mouthwash; eye/ear/nose dropper icons; rectum icon: enema; bottle icon: tincture). Label each with one-line use.

AI Image Prompt: "Clean educational textbook diagram, white background, two-branch chart titled 'Monophasic Liquids': left branch 'For Internal Use' with simple icons for aromatic water, syrup, elixir, linctus; right branch 'For External Use and Body Cavities' with simple icons for liniment, lotion, throat paint, gargle, mouthwash, enema, eye drops, ear drops, nasal drops, tincture; clear black labels, minimal decoration, professional pharmacy textbook style."

12.7 Flowchart — Preparation of a Syrup

```
Weigh sucrose + purified water
        ↓
Dissolve with gentle heat and stirring
        ↓
Add drug / flavour / colour (dissolved separately if needed)
        ↓
Cool → make up volume with purified water
        ↓
Strain/filter → pack in well-closed container → label
```

12.8 Examples

- **Simple syrup** — the sweet base for many liquid medicines.
- **Peppermint water** — aromatic water used as a flavoured vehicle.
- **Calamine lotion** — dabbed (not rubbed) on itchy skin.
- **Turpentine liniment** — rubbed with friction on aching muscles.
- **Chlorhexidine mouthwash** — rinsed, not swallowed.
- **Tincture of cardamom** — alcoholic flavouring.

12.9 Pharmacy Relevance

- **Dispensing:** measure volumes accurately (use a measure, not a household spoon); filter for clarity; label external preparations "FOR EXTERNAL USE ONLY".
- **Counselling:** gargles are not swallowed; nasal decongestant drops are for short-term use only; eye drops must stay sterile — don't touch the dropper tip.
- **Safety:** liniments must not be applied to broken skin; enemas need correct positioning and technique — demonstrate or explain.

12.10 India Context

Syrups dominate the Indian paediatric market (cough and cold syrups, antipyretic syrups); calamine lotion is a household item for prickly heat; and the IP prescribes standards for syrups, oral liquids and eye preparations. Jan Aushadhi outlets commonly dispense simple, affordable monophasic liquids.

12.11 High-Yield Points

1. **Remember:** Monophasic = drug fully dissolved, single phase, no shaking needed.
2. **Exam Pearl:** Aromatic water = saturated aqueous solution of volatile oil (e.g., peppermint water).
3. **Exam Pearl:** Syrup = concentrated sucrose solution; Elixir = sweetened hydroalcoholic; Linctus = viscous, taken undiluted in small doses for cough.
4. **Exam Pearl:** Liniment = rubbed WITH friction (alcoholic/oily); Lotion = applied WITHOUT friction (aqueous).
5. Gargle = throat, not swallowed; Mouthwash = mouth hygiene; Enema = rectum.
6. **Exam Pearl:** Eye drops must be STERILE.
7. Tincture = alcoholic extract of crude drug.
8. Excipients: vehicle, sweetener, flavour, colour, preservative, buffer, antioxidant.

12.12 Common Confusions & Common Mistakes

Do not confuse:

- **Liniment ≠ Lotion:** liniment is rubbed with friction; lotion is applied without friction.
- **Syrup ≠ Elixir ≠ Linctus:** syrup = sucrose base; elixir = water + alcohol; linctus = thick, undiluted sips.
- **Gargle ≠ Mouthwash:** gargle acts on the throat; mouthwash on the mouth.
- **Tincture ≠ Aromatic water:** tincture uses alcohol to extract crude drug; aromatic water is a dilute aqueous solution of a volatile oil.

Common mistakes: labelling a monophasic liquid "shake well" (nothing to shake); applying liniment on broken skin; swallowing a gargle; touching the eye-dropper tip to the eye.

12.13 Memory Tricks

- "**L**iniment = **L**abour (rub with friction); **L**otion = **L**ight dab (no friction)."
- "Internal four: **A**romatic water, **S**yrup, **E**lixir, **L**inctus — **ASEL**, 'a sip every litre' is wrong, they're sipped in small doses!"

12.14 Exam-Oriented Summary

Monophasic liquids have the drug fully dissolved in one phase. Internal: aromatic waters (volatile oil in water), syrups (conc. sucrose), elixirs (sweetened water + alcohol), linctus (viscous, undiluted sips for cough). External/body cavity: liniments (rubbed with friction), lotions (applied without friction), throat paints, applications, gargles (not swallowed), mouthwashes, enemas (rectal), sterile eye drops, ear drops, nasal drops, tinctures (alcoholic crude-drug extracts). Excipients: vehicles, sweeteners, flavours, colours, preservatives, buffers, antioxidants. Preparation: dissolve → add adjuncts → filter → make up volume → pack and label.

One-Minute Revision: Monophasic = dissolved, one phase. ASEL internal. Liniment friction / lotion no friction. Gargle not swallowed. Eye drops sterile. Tincture = alcohol extract. Label external "FOR EXTERNAL USE ONLY".

12.15 Questions

Very Short Answer (1–2 marks)

1. Define a monophasic liquid. 2. Define a syrup. 3. What is an elixir? 4. What is a linctus? 5. Define a tincture. 6. Why must eye drops be sterile?

Short Answer (3–5 marks)

1. Distinguish between liniments and lotions with examples.
2. Define and describe the preparation of aromatic waters and syrups.
3. Write short notes on: (a) gargles and mouthwashes, (b) enemas.
4. Name the excipients used in monophasic liquids with one function each.

Long Answer (5–10 marks)

1. Define monophasic liquids. Classify them for internal use and describe each with preparation and examples.
2. Describe the monophasic preparations used externally and for body cavities with examples.

MCQs

1. Which is taken undiluted in small doses for cough? (a) Syrup (b) Elixir (c) Linctus (d) Aromatic water — **Ans: (c)**. Linctus is viscous and sipped undiluted.
2. A liniment is applied: (a) without friction (b) with friction (c) in the eye (d) in the rectum — **Ans: (b)**. Liniments are rubbed on skin with friction.
3. Tinctures are prepared using: (a) water only (b) alcohol (c) oil only (d) glycerin only — **Ans: (b)**. Alcoholic extracts of crude drugs.
4. Which must be sterile? (a) Lotion (b) Liniment (c) Eye drops (d) Gargle — **Ans: (c)**. Eye preparations must be sterile.
5. An elixir contains: (a) only water (b) water + alcohol, sweetened (c) only sucrose (d) only oil — **Ans: (b)**. Sweetened hydroalcoholic solution.

Viva: Why is alcohol used in elixirs? What is the difference between a gargle and a mouthwash? How is a linctus taken? Why is "shake well" wrong on a syrup label? What does "for external use only" protect against?

Application-based: 1. *A mother asks whether she can use her child's cough linctus by mixing it in a glass of water like a syrup. What do you advise? (Ans: No — linctus is designed to be taken undiluted in small sips so its viscous soothing action stays in the throat; diluting defeats the purpose.)* 2. *A patient applies turpentine liniment on a cut wound and complains of burning. What went wrong? (Ans: Liniments are for unbroken skin with friction; on broken skin the alcohol/irritant base causes burning — advise stopping use on the wound and switching to an appropriate preparation.)*

CHAPTER 13: BIPHASIC LIQUIDS

Unit IV · ~4.5 hours

13.1 Introduction

Not every drug dissolves. Some drugs are insoluble powders that must be *suspended* in liquid (like chalk shaken in water), and some are oils that must be *emulsified* (like milk, where butterfat droplets float in water). These are biphasic liquids — two phases in one bottle — and they come with a golden rule the patient must follow: **shake well before use**. Suspensions and emulsions each have their own science of keeping the two phases happily mixed.

> **Learning objectives** — after studying this chapter, you should be able to:
>
> - define suspensions and emulsions and distinguish them from monophasic liquids;
> - distinguish flocculated from deflocculated suspensions;
> - list the advantages and disadvantages of suspensions and emulsions;
> - name the formulation excipients for suspensions and emulsions;
> - describe the general methods of preparation of suspensions;
> - define emulsifying agents, classify them, and name the tests for identifying emulsion types;
> - describe the general methods of preparation of emulsions.

13.2 Definition

Scientific definition: Biphasic liquids are liquid dosage forms containing two distinct phases — a dispersed (internal) phase distributed through a continuous (external) phase.

Simple explanation: Two things that don't fully mix, held together in one bottle — solid particles floating in liquid (suspension) or tiny droplets of one liquid floating in another (emulsion). They separate on standing, so the patient must shake before use.

Feature	Monophasic	Biphasic
Phases	One (dissolved)	Two (dispersed + continuous)
Appearance	Clear, uniform	Cloudy; separates on standing
Shake before use?	No	**Yes**
Examples	Syrup, elixir	Suspensions, emulsions, calamine lotion

13.3 Key Terminology

Term	Meaning	Simple explanation
Suspension	Solid particles dispersed in a liquid	"Medicinal chalk-water"
Emulsion	Liquid droplets dispersed in another liquid	"Medicinal milk"
Dispersed (internal) phase	The droplets/particles spread through	The "guests"
Continuous (external) phase	The medium carrying them	The "host"
Flocculation	Particles forming loose, fluffy aggregates	Particles "holding hands loosely"
Deflocculation	Particles staying separate and individual	Particles "standing apart"
Caking	Hard sediment that won't redisperse	The "cement" at the bottle bottom
Creaming	Emulsion droplets rising to the top	Like cream rising on milk
Cracking	Irreversible separation of an emulsion	The emulsion "breaking" permanently
Emulsifying agent	Substance that keeps the two liquids mixed	The "peacemaker" between oil and water

13.4 Detailed Explanation

13.4.1 SUSPENSIONS

Definition: A suspension is a biphasic liquid dosage form in which finely divided solid drug particles are dispersed in a liquid vehicle.

Types:

Feature	Flocculated suspension	Deflocculated suspension
Particle arrangement	Loose, fluffy aggregates (flocs)	Separate, individual particles
Sedimentation	Settles **fast**	Settles **slowly**
Sediment	Loose, fluffy — **easily redispersed** by shaking	Tight, hard **cake** — difficult to redisperse
Appearance	Less elegant (cloudy, fast-settling)	More elegant initially
Preferred?	**Yes** — redispersibility matters most	No — caking is the danger

Key lesson: a flocculated suspension looks less pretty but is safer — the patient can always shake it back to uniformity. A deflocculated suspension may form an irreversible cake, giving an under-dose from the top and an over-dose from the bottom.

Advantages of suspensions:

- Drugs that are insoluble or unstable in solution can be given as liquids.
- Taste masking — the drug isn't dissolved, so bitter taste is reduced.
- Flexible dosing for children (easy dose adjustment by volume).
- Faster action than tablets for some drugs.

Disadvantages:

- Must be shaken well — forgotten shaking = wrong dose.
- Physical instability (caking, settling).
- Bulky to transport and store.
- Pouring accuracy depends on the patient.

Formulation excipients:

Excipient	Function	Examples
Suspending/viscosity agent	Thickens vehicle, slows settling	Tragacanth, bentonite, sodium CMC, methylcellulose
Wetting agent	Helps hydrophobic powder mix with water	Polysorbates (Tweens)
Flocculating agent	Creates controlled flocculation	Electrolytes (in small amounts)
Preservative	Prevents microbial growth	Benzoates, parabens
Sweetener/flavour	Palatability	Sucrose, fruit flavours
Buffer	pH stability	Citrate buffer

General methods of preparation:

1. **Trituration (levigation):** grind the powder with a little vehicle (or glycerin) into a smooth paste, then dilute gradually with the remaining vehicle containing the suspending agent.
2. **Precipitation:** form fine particles *in situ* by a chemical reaction in the vehicle (for very fine particles).
3. Add flavours, sweeteners, preservatives; make up the volume; pack and label **"SHAKE WELL BEFORE USE"**.

13.4.2 EMULSIONS

Definition: An emulsion is a biphasic liquid dosage form in which one liquid is dispersed as fine droplets in another immiscible liquid.

Types:

Type	Dispersed phase	Continuous phase	Feels like	Example
o/w (oil in water)	Oil	Water	Light, watery, washes off	Milk, vanishing-cream type
w/o (water in oil)	Water	Oil	Greasy, water-resistant	Cold cream, butter
Multiple (o/w/o, w/o/w)	—	—	Advanced/controlled release	(concept level)

Mnemonic hook: read the type name as "X **in** Y" — o/w = oil droplets *in* water.

Tests for identification of emulsion type:

Test	Procedure (principle)	o/w result	w/o result
Dilution test	Add water (or oil) and observe mixing	Mixes freely with **water**	Mixes freely with **oil**
Dye test	Add a water-soluble dye (e.g., methylene blue)	Colour spreads **uniformly**	Colour stays in **spots**
Conductivity test	Pass electric current	**Conducts** (water continuous)	Does **not** conduct (oil continuous)
Fluorescence test	Observe under UV light	Spotty fluorescence	Uniform fluorescence

Emulsifying agents (emulgents) — the "peacemakers" that sit at the oil–water boundary:

Class	Examples
Natural	Acacia (gum arabic), tragacanth, gelatin, egg yolk
Synthetic (surfactants)	Tweens (water-soluble, favour o/w), Spans (oil-soluble, favour w/o)
Finely divided solids	Bentonite, magnesium hydroxide
Auxiliary	Cetyl alcohol, glyceryl monostearate (support the main emulgent)

Advantages of emulsions: mask oily taste; improve absorption of oils; can deliver oil-soluble drugs in a watery-feeling product; flexible dosing. **Disadvantages:** creaming (reversible) and cracking (irreversible); microbial growth in the water phase; needs shaking; bulky.

Formulation excipients: emulsifying agents, preservatives, antioxidants (protect oils from rancidity), flavouring agents, viscosity builders.

General methods of preparation:

1. **Dry gum method (Continental):** gum (acacia) + oil triturated first, then water added all at once with rapid trituration to form the primary emulsion; then diluted. Ratio memory: oil : water : gum = 4:2:1.
2. **Wet gum method (English):** gum + water triturated first into a mucilage, then oil added slowly with trituration. Same 4:2:1 proportions.
3. **Bottle method:** for volatile oils — oil + gum shaken in a bottle (avoids trituration losses).
4. **In-situ soap method:** soap formed at the interface (e.g., calcium soaps give w/o emulsions).

Instability to remember: Creaming (droplets rise — reversible by shaking) vs **cracking** (droplets merge, phases separate permanently — irreversible; the preparation is ruined).

13.5 Easy Analogy

- A **suspension** is like *bhangra dancers in a crowd*: in a flocculated suspension they hold hands in loose groups (easy to regroup after they sit down = redisperse); in a deflocculated one they stand alone and, once seated, pack into a solid block (cake) that won't get up again.
- An **emulsion** is like a successful marriage between oil and water — it only works with a good counsellor (the emulsifying agent). Without one, they separate (crack).

13.6 Diagram — Emulsion Type Identification Tests

Draw four mini-panels: (1) dilution test — drop of water merging into o/w vs beading on w/o; (2) dye test — water-soluble dye spreading evenly in o/w vs staying as spots in w/o; (3) conductivity — bulb glowing for o/w, dark for w/o; (4) summary table of o/w vs w/o.

AI Image Prompt: "Clean educational textbook diagram, white background, four labelled mini-panels titled 'Tests for Emulsion Type': dilution test showing water drop merging vs beading, dye test showing uniform vs spotty colour, conductivity test showing glowing vs dark bulb, and a small o/w vs w/o summary table, clear black labels, minimal decoration, professional pharmacy textbook style."

13.7 Flowchart — Dry Gum Method (Emulsion)

```
Acacia gum + oil → triturate well (dry mix)
        ↓
Add all the water AT ONCE
        ↓
Triturate rapidly → primary emulsion forms (thick, white)
        ↓
Test: a drop disperses in water (o/w confirmed)
        ↓
Dilute gradually with remaining water + adjuncts
        ↓
Pack → label "SHAKE WELL BEFORE USE"
```

13.8 Examples

- **Paracetamol suspension** — paediatric fever medicine (shake well!).
- **Calamine lotion** — a suspension for external use (also a lotion — applied without friction).
- **Antacid suspensions** — neutralise acid; must be uniform per spoonful.
- **Cod liver oil emulsion** — masks fishy oily taste.
- **Milk** — nature's own o/w emulsion; **butter** — w/o.

13.9 Pharmacy Relevance

- **The golden rule:** every biphasic liquid must be labelled and counselled **"SHAKE WELL BEFORE USE"** — dose uniformity depends on it.
- **Counselling:** use the enclosed measure; keep suspensions from freezing (emulsions can crack); discard if an emulsion shows permanent oil separation.
- **Dispensing:** check for caking before dispensing a suspension — a hard cake means the preparation is no good.

13.10 India Context

Paediatric suspensions (antipyretic, antibiotic) are among the highest-volume products in Indian retail pharmacy; ORS and antacid suspensions are OTC staples. The IP includes tests for the quality of suspensions and emulsions.

13.11 High-Yield Points

1. **Remember:** Biphasic = two phases; shake well before use.
2. **Exam Pearl:** Suspension = solid in liquid; Emulsion = liquid in liquid.
3. **Exam Pearl:** Flocculated = fast settling but EASILY redispersed (preferred); Deflocculated = slow settling but CAKES (dangerous).
4. Caking = irreversible hard sediment; Creaming = reversible rising; Cracking = irreversible emulsion break.
5. **Exam Pearl:** o/w = oil in water (light); w/o = water in oil (greasy).
6. Four identification tests: **dilution, dye, conductivity, fluorescence**.
7. **Exam Pearl:** Emulgent classes — natural (acacia, tragacanth, gelatin, egg yolk), synthetic (Tweens/Spans), finely divided solids (bentonite), auxiliary.
8. Dry gum (Continental) = gum + oil first; Wet gum (English) = gum + water first; ratio 4:2:1.
9. Suspension excipients: suspending agent, wetting agent, flocculating agent, preservative, sweetener.

13.12 Common Confusions & Common Mistakes

Do not confuse:

- **Flocculated ≠ Deflocculated:** flocculated settles fast but redisperses (good); deflocculated settles slow but cakes (bad).
- **Creaming ≠ Cracking:** creaming is reversible (shake); cracking is permanent (discard).
- **Dry gum ≠ Wet gum:** dry = gum + oil first (Continental); wet = gum + water first (English).
- **Suspension ≠ Emulsion:** solid-in-liquid vs liquid-in-liquid.

Common mistakes: forgetting "shake well" counselling; dispensing a caked suspension; calling creaming "cracking"; using the dye test backwards (water-soluble dye spreads uniformly in o/w).

13.13 Memory Tricks

- "**F**locculated = **F**luffy, **F**ast-settling, **F**ine to redisperse."
- "Emulsion tests: **D**ilution, **D**ye, **C**onductivity, **F**luorescence — **D**octors **D**etect **C**ream **F**ast."
- "Dry gum: **D**ry = **D**irect oil first; Wet gum: **W**ater first."

13.14 Exam-Oriented Summary

Biphasic liquids have two phases and must be shaken before use. Suspensions: solid particles in liquid; flocculated (loose flocs, fast settling, easily redispersed — preferred) vs deflocculated (individual particles, slow settling, cakes — dangerous). Excipients: suspending agents, wetting agents, flocculating agents, preservatives, sweeteners. Preparation by trituration or precipitation. Emulsions: liquid droplets in an immiscible liquid; o/w (oil in water, light) vs w/o (water in oil, greasy). Identified by dilution, dye, conductivity and fluorescence tests. Emulgents: natural, synthetic (Tweens/Spans), finely divided solids, auxiliary. Prepared by dry gum (Continental), wet gum (English), bottle, or in-situ soap methods. Creaming is reversible; cracking is permanent.

One-Minute Revision: Biphasic = shake well. Suspension solid-in-liquid; emulsion liquid-in-liquid. Flocculated good (redisperses), deflocculated cakes. o/w light, w/o greasy. Tests: dilution, dye, conductivity, fluorescence. Dry gum = oil first; wet gum = water first. Creaming reversible, cracking permanent.

13.15 Questions

Very Short Answer (1–2 marks)

1. Define a biphasic liquid. 2. Define a suspension. 3. Define an emulsion. 4. What is caking? 5. What is cracking? 6. Name two natural emulsifying agents.

Short Answer (3–5 marks)

1. Distinguish between flocculated and deflocculated suspensions.
2. Write the advantages and disadvantages of suspensions.
3. Classify emulsifying agents with examples.
4. Describe the tests for identification of emulsion types.

Long Answer (5–10 marks)

1. Define suspensions. Describe their types, excipients and general methods of preparation.
2. Define emulsions. Classify them, describe the emulsifying agents and the methods of preparation, and explain the identification tests.

MCQs

1. Which suspension type is preferred and why? (a) Deflocculated — elegant (b) Flocculated — easily redispersed (c) Deflocculated — slow settling (d) Flocculated — slow settling — **Ans: (b)**. Redispersibility beats appearance.
2. Cracking of an emulsion is: (a) reversible by shaking (b) irreversible separation (c) a dye test (d) a preparation method — **Ans: (b)**. Cracked emulsions cannot be restored.
3. In the dye test with a water-soluble dye, uniform colour indicates: (a) w/o emulsion (b) o/w emulsion (c) suspension (d) cracked emulsion — **Ans: (b)**. The dye spreads through the continuous water phase.
4. In the dry gum (Continental) method, trituration starts with: (a) gum + water (b) gum + oil (c) oil + water (d) water only — **Ans: (b)**. Dry = gum and oil first, then all the water at once.
5. An example of a w/o emulsion is: (a) milk (b) vanishing cream type (c) cold cream (d) o/w lotion — **Ans: (c)**. Cold cream/butter are water-in-oil.

Viva: Why must biphasic liquids be shaken before use? What is the danger of a caked suspension? How does the conductivity test distinguish o/w from w/o? Which emulgent class do Tweens and Spans belong to? What is the 4:2:1 ratio in emulsion preparation?

Application-based: 1. *A mother gives her child the top spoonful of an antibiotic suspension without shaking; the bottle had been standing for a week and shows a hard sediment. What are the two dosing risks? (Ans: The top liquid is under-dosed (drug is in the cake) so the infection is under-treated; if the cake later breaks up, a later dose could be over-concentrated. Counsel: always shake well; discard if it won't redisperse.)* 2. *An emulsion shows a clear oil layer on top that does not remix on shaking. What happened, and what do you do? (Ans: Cracking — irreversible phase separation; do not dispense/use; replace the preparation.)*

UNIT IV INFOGRAPHIC — Liquid Dosage Forms at a Glance

Concept box for the PDF designer: One-page visual panel titled "Liquid Dosage Forms — One Page". Top strip: **Monophasic** (one clear liquid icon, "no shaking") vs **Biphasic** (two-layer bottle icon, "SHAKE WELL"). Middle-left: internal monophasics (ASEL badges with icons); middle-right: external & cavity preparations (icon row: liniment/friction hand, lotion/dab, throat, mouth, eye/ear/nose droppers, rectum, tincture bottle). Bottom: suspensions (flocculated vs deflocculated mini-diagram) and emulsions (o/w vs w/o droplets; four test badges: dilution, dye, conductivity, fluorescence). Footer strip: "Pills & Python · pillsandpython.com".

COMBINED REFERENCES — Units III, IV, V

1. Ansel, H.C., Allen, L.V. & Popovich, N.G. *Pharmaceutical Dosage Forms and Drug Delivery Systems.* (Standard textbook for dosage forms.)
2. Cooper & Gunn's *Dispensing for Pharmaceutical Students.* (Classic dispensing textbook — powders, liquids, semisolids.)
3. Bentley's *Textbook of Pharmaceutics.* (Covers all dosage forms in the syllabus.)
4. Indian Pharmacopoeia. (Official standards for dosage-form preparations.)
5. Remington: *The Science and Practice of Pharmacy.* (Background reference on dosage-form science.)