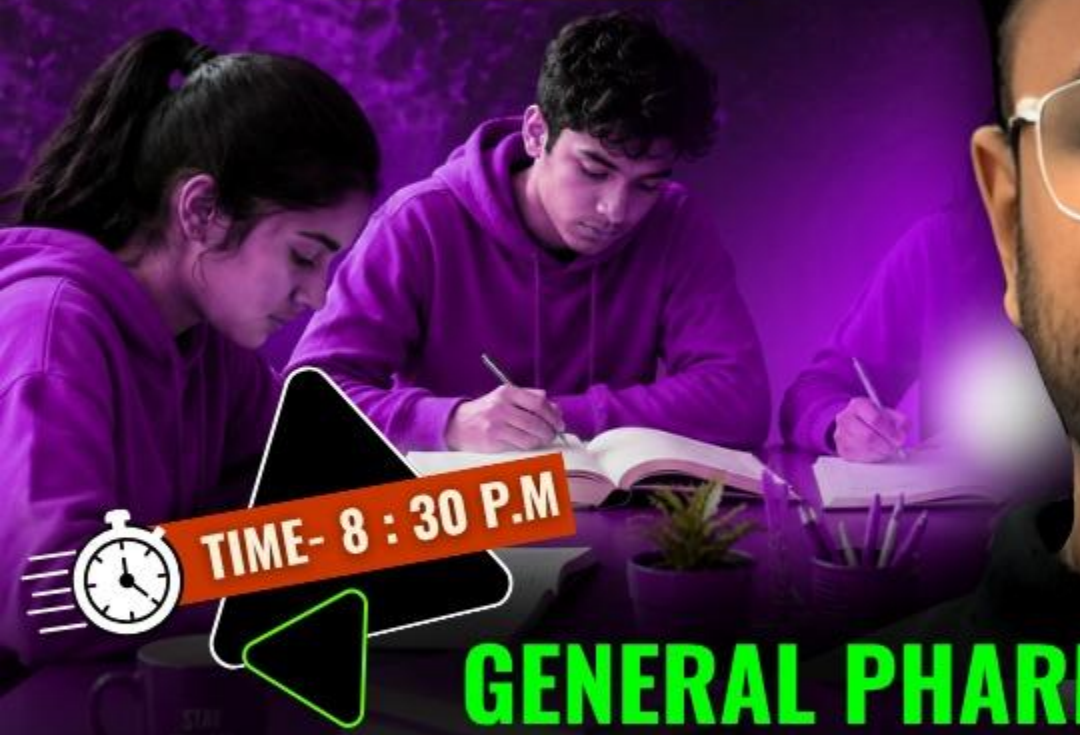
GPAT 2027-28



TIME- 8 : 30 P.M

PHARMACOLOGY

CLASS- 2

GENERAL PHARMACOLOGY, ROUTES OF DRUG ADMINISTRATION & PHARMACOKINETICS

UPDATED QUESTIONS TILL GPAT 2026

GPAT

VIDEO LECTURE + PDF

STEP 1 – DOWNLOAD PHARMACY INDIA MOBILE APP FROM PLAY STORE

STEP 2 – VISIT STORE OPTION – SEARCH GPAT MANIA – ACCESS PDF + VIDEO

DAILY UPDATES

जुड़िए PHARMACY INDIA

के साथ.....

WHATSAPP & TELEGRAM SE JUDNE KE LIYE ICONS PAR CLICK KARE

Introduction & Routes of Drug Administration

Q16. What are orphan drugs: [GPAT 2026]

A. Drugs which are used to treat rare diseases
B. Orphan drugs are essential drugs
C. Drugs which satisfy a large population
D. Drugs which are used for the treatment of orphan children

Pharmacokinetics

Q11. A patient with hypoalbuminemia experiences increased effects of a highly protein-bound drug because: [GPAT 2026]

A. Hepatic metabolism is increased
B. Drug distribution is limited to plasma
C. Renal excretion is blocked
D. More drug is present in its free active form

Q.16 The common name of convective transport is: [GPAT 2025]
A. Passive transport
B. Pore transport
C. Active transport
D. Endocytosis

1. **The ultralente insulin preparation is administered by which route [GPAT-2024]**

(a) I.V.
(b) Oral administration
(c) I.M
(d) S.C

1. **The ultralente insulin preparation is administered by which route [GPAT-2024]**

(a) I.V.

(b) Oral administration

(c) I.M

(d) S.C

Ultralente Insulin

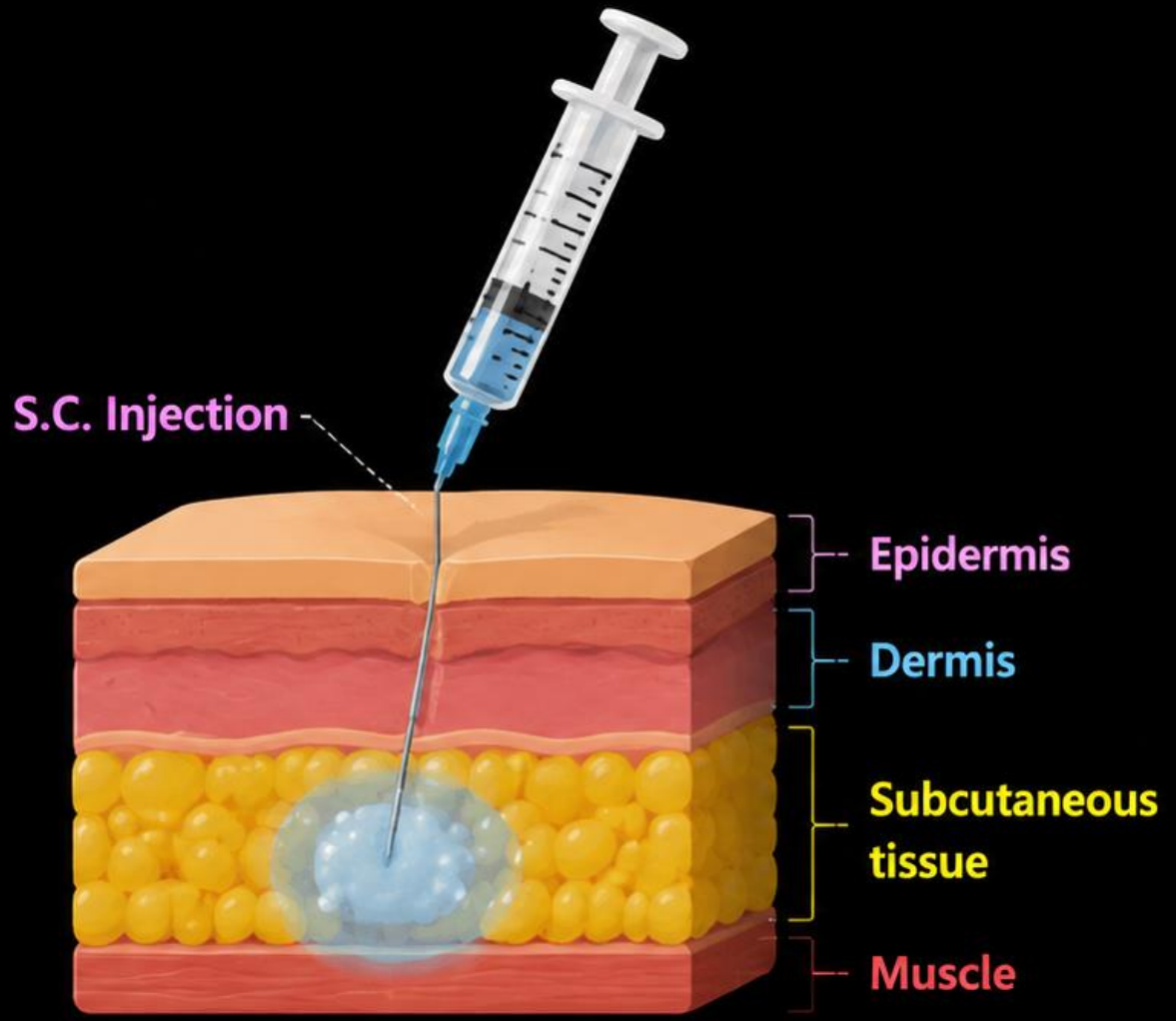
→ Route: Subcutaneous (S.C.)

Ultralente is a long-acting insulin preparation.

Absorbed slowly from subcutaneous tissue → prolonged action (up to 24 hrs).

Depot formation in S.C. tissue → slow and steady release.

Therefore, administered by **Subcutaneous (S.C.)** route.



Depot formation →

Slow absorption → Prolonged action

Onset: 4–6 hrs | Duration: Up to 24 hrs | Provides basal insulin coverage | Not for I.V. or I.M.

2. **What do you mean by Orphan drug [GPAT- 2023 SHIFT-I]**

(a) A drug meant to be distributed among orphans who cannot afford the cost of drug

(b) A drug for a disease which is not having any other treatment options at all

(c) A drug which is useful for rare disease

(d) A drug that is available in abundance

2. **What do you mean by Orphan drug [GPAT- 2023 SHIFT-I]**

(a) A drug meant to be distributed among orphans who cannot afford the cost of drug

(b) A drug for a disease which is not having any other treatment options at all

(c) A drug which is useful for rare disease

(d) A drug that is available in abundance

ORPHAN DRUG

Orphan drug is a drug intended for the prevention, diagnosis or treatment of rare diseases.

RARE DISEASE
Affects a small number of people

KEY POINTS

- For rare diseases
- Addresses unmet medical need
- Encouraged by incentives
- High development cost, low patient population

3. **Which of the statement is TRUE in geriatrics practice [GPAT-2022]**

(a) The incidence of adverse drug reactions diminishes with advancement of age

(b) Dose reduction is inevitable for each and every drug used in geriatric patients

(c) Patient compliance is higher in geriatric patients

(d) Polypharmacy is often a problem in elderly

3. **Which of the statement is TRUE in geriatrics practice [GPAT-2022]**

(a) The incidence of adverse drug reactions diminishes with advancement of age

(b) Dose reduction is inevitable for each and every drug used in geriatric patients

(c) Patient compliance is higher in geriatric patients

(d) Polypharmacy is often a problem in elderly

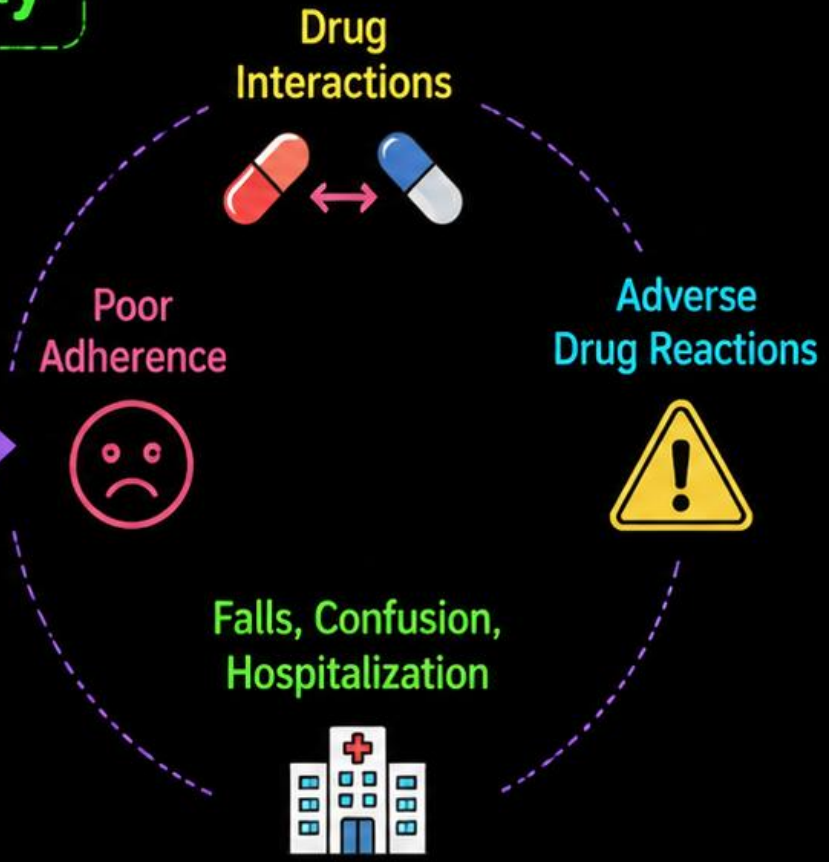
TRUE STATEMENT IN GERIATRIC PRACTICE

Polypharmacy is often a problem in elderly

Elderly often have multiple chronic diseases → require multiple drugs

Increases risk of ADRs, drug interactions & non-adherence

Regular review & deprescribing improve outcomes



Goal: Use **RIGHT** drug, **RIGHT** dose, for **RIGHT** patient

4. **Which of the following is considered as differentiated product [GPAT-2019]**

(a) Ranitidine
(b) Zantac
(c) Isoniazid
(d) Paracetamol

4. **Which of the following is considered as differentiated product [GPAT-2019]**

(a) Ranitidine

(b) Zantac

(c) Isoniazid

(d) Paracetamol

DIFFERENTIATED PRODUCT

A pharmaceutical product that is not **pharmaceutically equivalent** to a reference product due to **differences in**

- Salt / Ester
- Dosage Form
- Strength
- Release Pattern
- Route of Administration
- Other Factors

Not pharmaceutically equivalent to the reference product

Ranitidine
Active ingredient
(Generic)

✗

Zantac
Brand name with unique formulation
(Differentiated Product)

✓

Isoniazid
Active ingredient
(Generic)

✗

Paracetamol
Active ingredient
(Generic)

✗

Differentiated product has **unique formulation / characteristics** → **not equivalent** to reference product.

5. **In relation to buccal and sublingual route of administration which of the following statement is INCORRECT [GPAT-2017]**

(a) Absorption through epithelium is not affected by partition coefficient of the drug

(b) Drug absorption by these routes bypasses first-pass metabolism

(c) There is an optimum log P for sublingual absorption

(d) These are preferred routes for anti-anginal drug

5. In relation to buccal and sublingual route of administration which of the following statement is INCORRECT [GPAT-2017]

(a) Absorption through epithelium is not affected by partition coefficient of the drug

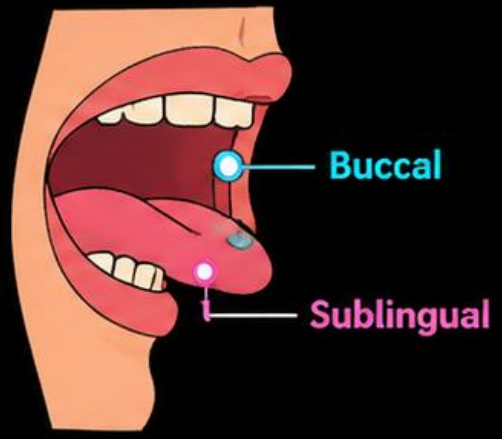
(b) Drug absorption by these routes bypasses first-pass metabolism

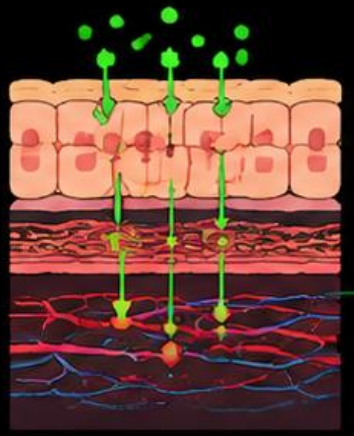
(c) There is an optimum log P for sublingual absorption

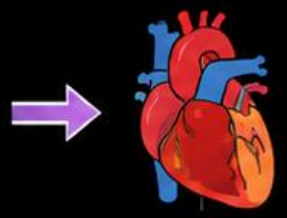
(d) These are preferred routes for anti-anginal drug

Buccal & Sublingual Route – Key Points

Absorption Pathway







Systemic circulation
(Bypasses first-pass metabolism)

First-Pass Metabolism

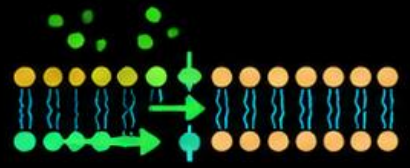
Oral   Systemic circulation

First-pass metabolism

Buccal/ Sublingual  Systemic circulation

(Bypass liver)

1. Partitiion Coefficient



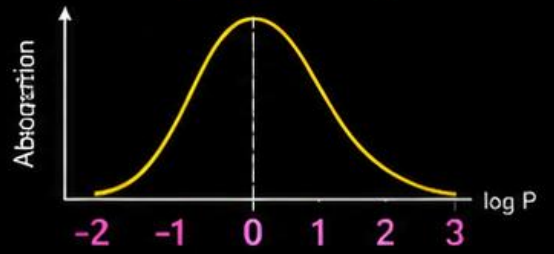
Lipid soluble drugs (optimum log P) absorb better through lipid rich membranes.

❌ Incorrcet Statement

2. Bypasses First-Pass

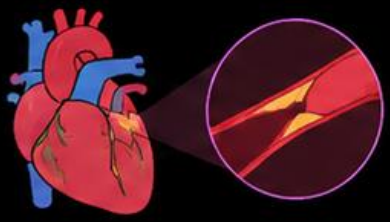
Absorbed directly into systemic circulation → No first-pass metabolism.

3. Optimum log P



Both very hydrophilic (low log P) and very lipophilic (high log P) show **lower absorption.**

4. Preferred for Anti-anginal



Rapid onset of action → Ideal for anti-anginal drugs (e.g., Glyceryl trinitrate).

❌ **Incorrect:** Absorption through epithelium is not affected by partition coefficient of the drug.

6. **Which of the following routes of administration of drugs is associated with Phlebitis [GPAT-2011]**

(a) Subcutaneous
(b) Intravenous
(c) Intraspinal
(d) Intradural

6. **Which of the following routes of administration of drugs is associated with Phlebitis [GPAT-2011]**

(a) Subcutaneous

(b) Intravenous

(c) Intraspinal

(d) Intradural

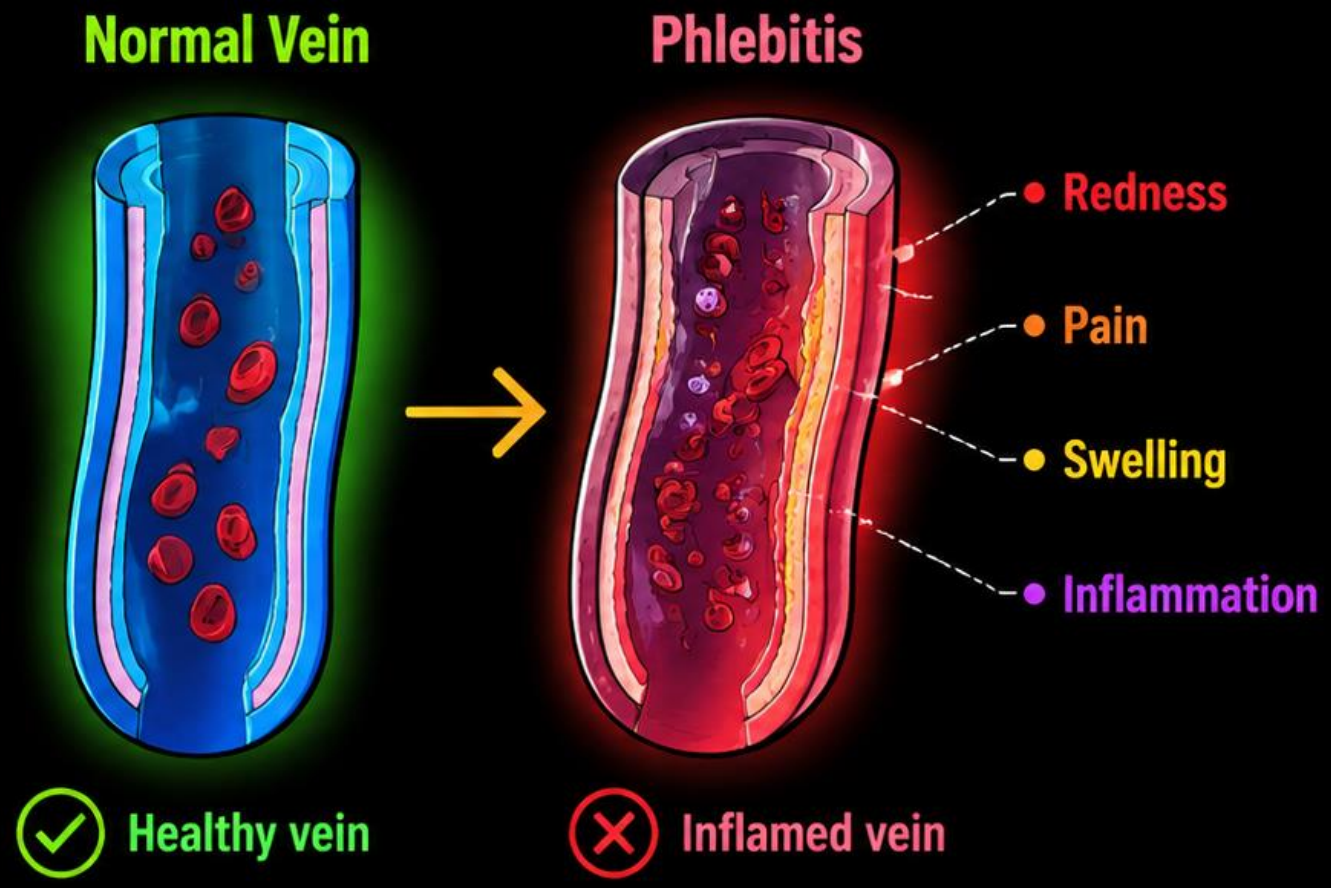
Phlebitis → Intravenous Route

Phlebitis is **inflammation** of the vein caused by **irritation** of the venous **endothelium**.

Why in IV?

- Direct contact of drug/irritant with vein wall
- Chemical irritation
- Prolonged IV cannulation

★ Thus, **phlebitis** is associated with **Intravenous route.**



Phlebitis → Intravenous route

7. **Name of a drug accepted by a scientific body USAN (United States adopted names) council is [GATE-2011]**

(a) Generic name
(b) Chemical name
(c) Proprietary name
(d) Brand name

7. Name of a drug accepted by a scientific body USAN (United States adopted names) council is [GATE-2011]

(a) Generic name

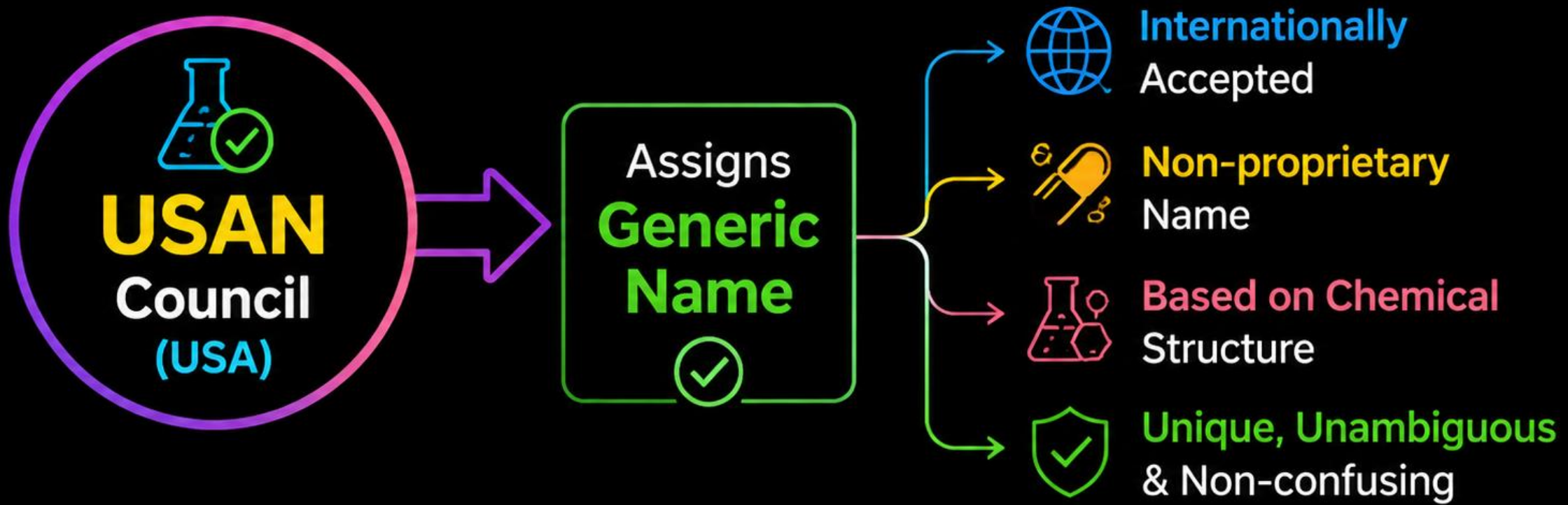
(b) Chemical name

(c) Proprietary name

(d) Brand name

USAN Council (USA)

Approves Generic Names for Drugs



Generic Name = Name accepted by **USAN Council**

8. **Which of the following is an orphan drug [GATE-2011]**

(a) Liothyronine
(b) Carbimazole
(c) Nitroglycerine
(d) Anti-HIV drug

8. **Which of the following is an orphan drug [GATE-2011]**

(a) Liothyronine

(b) Carbimazole

(c) Nitroglycerine

(d) Anti-HIV drug

Explanation:

- Orphan drugs are used for rare diseases.
- Liothyronine (T3) is used to treat myxedema coma, which is a rare and life-threatening complication of severe hypothyroidism.
- This specific, rare indication qualifies it for orphan drug status. Anti-HIV drugs are not orphan drugs as HIV/AIDS is not considered a rare disease.

9. **Who is known as the father of Pharmacology**

(a) Jonathan Pereira
(b) Ramnath Chopra
(c) Oswald Schmiedeberg
(d) James black

9. **Who is known as the father of Pharmacology**

(a) Jonathan Pereira

(b) Ramnath Chopra

(c) Oswald Schmiedeberg

(d) James black

Father of Pharmacology

Oswald Schmiedeberg

(1838 – 1921)

- Pioneered experimental pharmacology.
- Established the concept of drug action on the body.
- Author of "Grundriss der Arzneimittellehre" (1870)
- Laid the foundation for modern pharmacology.

Oswald Schmiedeberg is known as the Father of Pharmacology.

10. **Sublingual route of administration has the following advantages except [GATE-2011]**

(a) Quick onset of action
(b) Avoid first pass effect
(c) Dose can be regulated
(d) Highly recommended for prolonged action

10. **Sublingual route of administration has the following advantages except [GATE-2011]**

(a) Quick onset of action

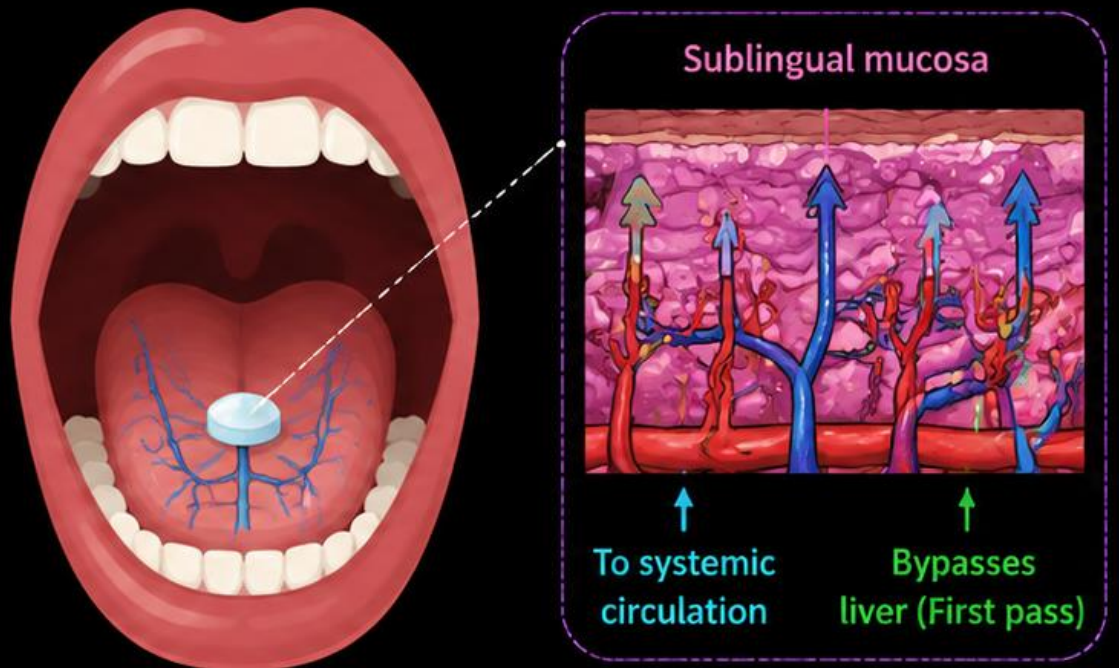
(b) Avoid first pass effect

(c) Dose can be regulated

(d) Highly recommended for prolonged action

Sublingual Route

Advantages



Quick onset
Rapid absorption

Avoids first pass effect
Goes directly to systemic circulation

Dose can be regulated
Easy to adjust & titrate

Not recommended for prolonged action
Suitable for rapid, short-term effect only

Best for quick relief,
Not for long-term therapy.

11. **Which of the following drugs given rectally has a local action [GATE-2011]**

(a) Diazepam
(b) 5-aminosalicylic acid
(c) Aminophylline
(d) Ergotamine

11. **Which of the following drugs given rectally has a local action [GATE-2011]**

(a) Diazepam

(b) 5-aminosalicylic acid

(c) Aminophylline

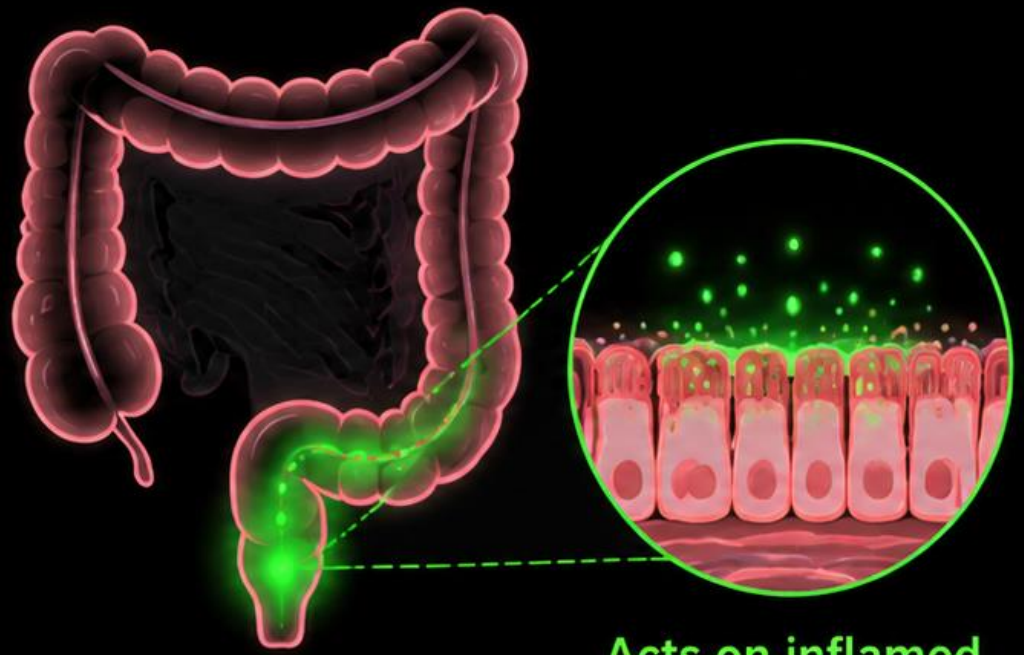
(d) Ergotamine

Rectal Route – Local Action

5-Aminosalicylic acid (5-ASA) → **Local action** in the colon/rectum for **inflammatory bowel disease (ulcerative colitis).**

- Acts **topically** on **colonic mucosa**
- **Minimal absorption** → **Minimal systemic effect**
- Reduces **inflammation** locally
- Formulated as **suppositories/enemas**

Local Action in Colon



Acts on inflamed colonic mucosa

Others – Systemic Action

Diazepam
→ Absorbed
→ **CNS** effect

Aminophylline
→ Absorbed
→ **Bronchodilation**

Ergotamine
→ Absorbed
→ **Vasoconstriction**

5-ASA → **Local**

Others → **Systemic**

12. **The following agents are available as transdermal patch except [GATE-2011]**

(a) Insulin
(b) Estradiol
(c) Fentanyl
(d) Nicotine

12. **The following agents are available as transdermal patch except [GATE-2011]**

(a) Insulin

(b) Estradiol

(c) Fentanyl

(d) Nicotine

Only INSULIN is NOT available as Transdermal Patch

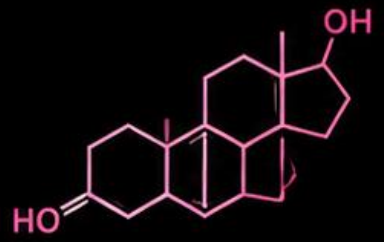
Insulin

Not suitable

Large peptide
(MW ~5800 Da)

Poor skin permeation

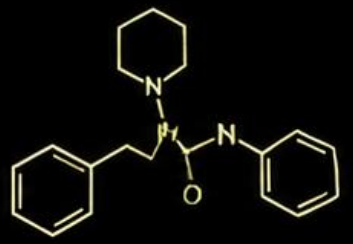
Estradiol



Available

Small, lipophilic
(Good permeation)

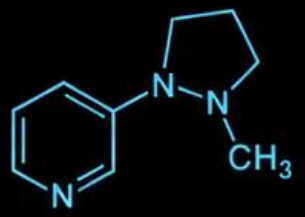
Fentanyl



Available

Highly lipophilic
(Good permeation)

Nicotine



Available

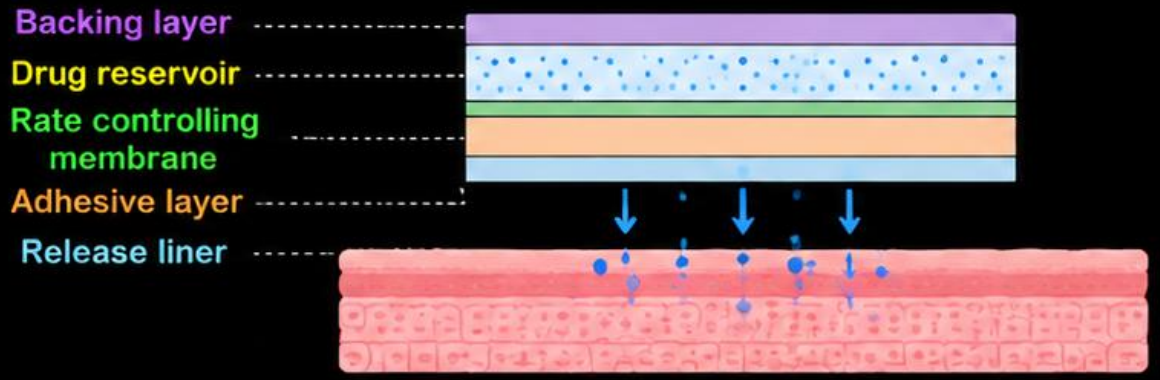
Small, lipophilic
(Good permeation)

Why Insulin not?

- Insulin is a large, hydrophilic peptide
- Cannot cross the stratum corneum
- Gets degraded in skin

→ Therefore, not used in transdermal patches.

Transdermal Patch Works By



Drug absorbed into systemic circulation

13. **Following are advantages of transdermal administration except**

(a) Action is fast and can be used in emergency
(b) Avoids first pass metabolism
(c) Prolonged action
(d) Provides smooth non-fluctuating plasma concentration

13. Following are advantages of transdermal administration except

(a) Action is fast and can be used in emergency

(b) Avoids first pass metabolism

(c) Prolonged action

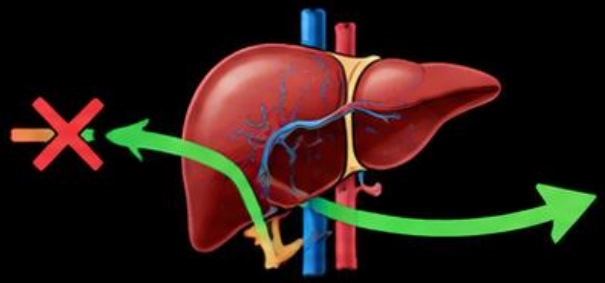
(d) Provides smooth non-fluctuating plasma concentration

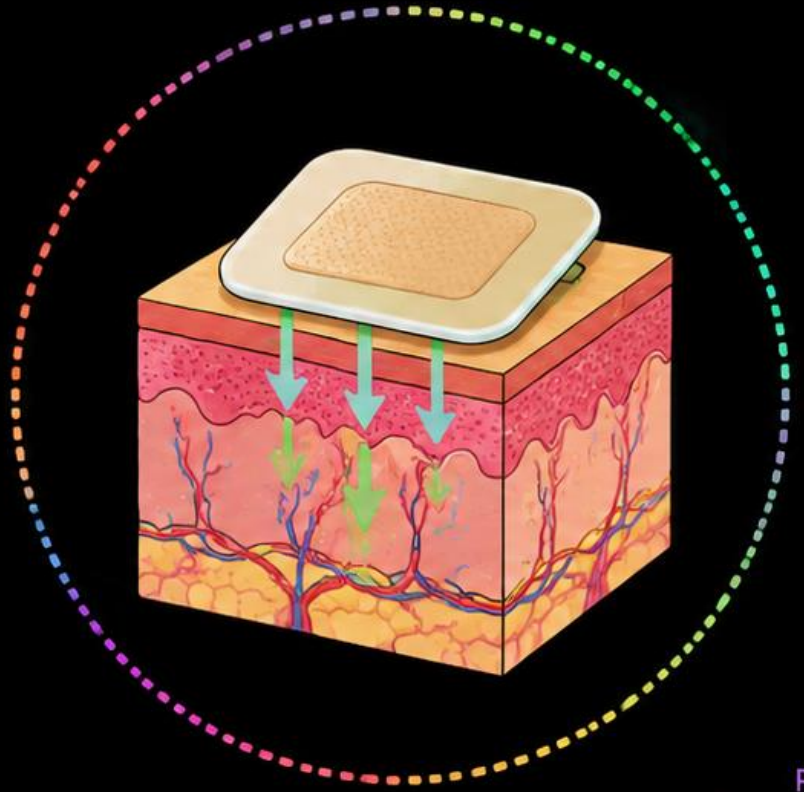
Transdermal
Advantages

Action is fast & used in emergency

Absorption is slow
(Not for emergencies)

Avoids first pass metabolism

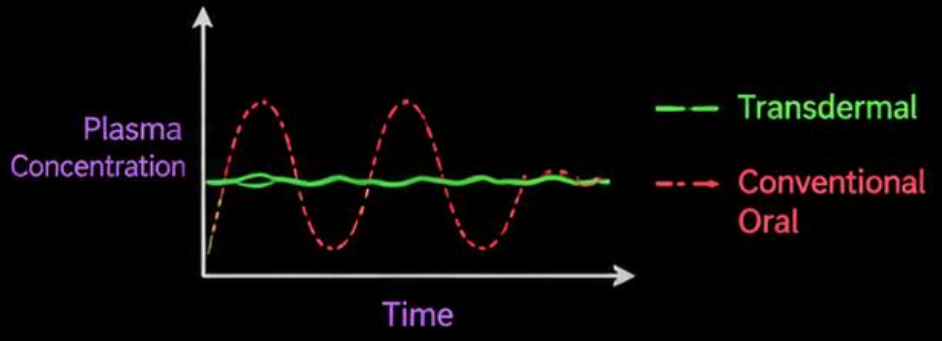




Prolonged action

Sustained release for long duration

Smooth non-fluctuating plasma concentration



14. **Enteric-coating of tablets is associate with**

(a) Rapid absorption of drug
(b) Slow excretion of the drug
(c) Frequent administration of the drug
(d) Prevention of gastric irritation by the drug

14. **Enteric-coating of tablets is associate with**

(a) Rapid absorption of drug

(b) Slow excretion of the drug

(c) Frequent administration of the drug

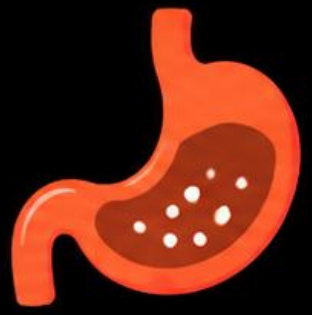
(d) Prevention of gastric irritation by the drug

Enteric-Coating of Tablets

Protects drug from stomach & prevents gastric irritation

Enteric-Coated Tablet

In Stomach (Acidic pH)



Coating Intact
No drug release

In Intestine (Alkaline pH)

Coating Dissolves
Drug released

Result

Prevents gastric irritation

Enteric coating allows the tablet to pass through stomach and release the drug in intestine → prevents gastric irritation.

15. **First pass effect for a drug is of importance in deciding plasma concentration once when the drug is administered**

(a) Intramuscularly
(b) Intravenously
(c) Orally
(d) Sublingually

15. First pass effect for a drug is of importance in deciding plasma concentration once when the drug is administered

(a) Intramuscularly

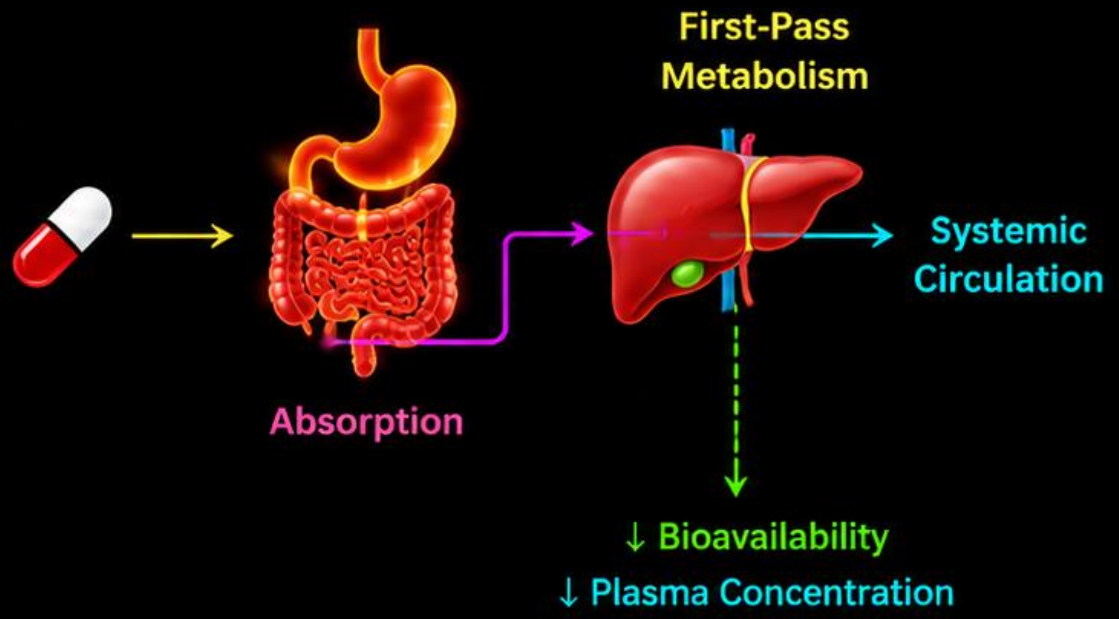
(b) Intravenously

(c) Orally

(d) Sublingually

First-Pass Effect

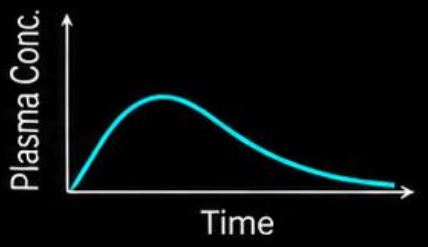
Metabolism of a drug **in the liver before** it reaches **systemic circulation**.



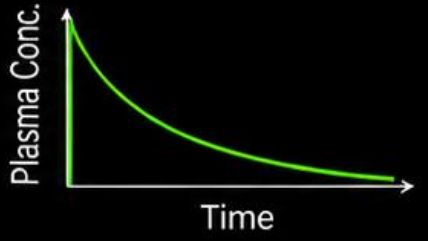
First-pass effect is **important** only when drug is **absorbed** through **GIT** and goes to **liver** via **portal circulation**.

Impact of First-Pass Effect on Plasma Concentration

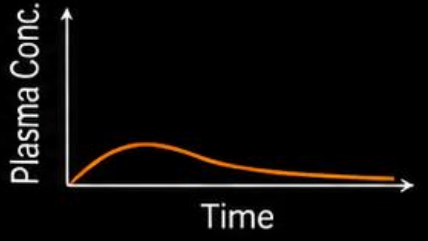
Intramuscular
Partial first-pass (less significant)



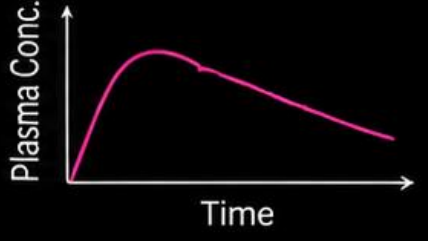
Intravenous
No first-pass



Oral
Marked first-pass



Sublingual
Minimal/No first-pass



First-pass effect is **most relevant** for **oral** administration.

16. **Liposome drug delivery system is used for all except**

(a) Vincristine
(b) Amphotericin
(c) Hyoscine
(d) Amikacin

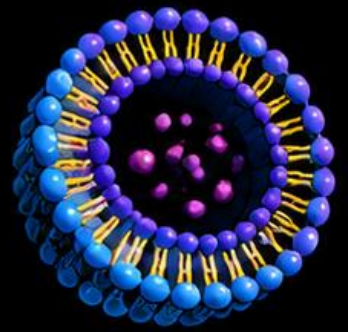
16. **Liposome drug delivery system is used for all except**

(a) Vincristine

(b) Amphotericin

(c) Hyoscine

(d) Amikacin



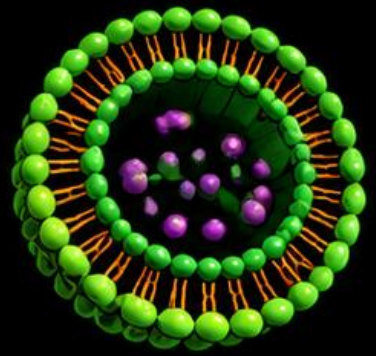
LIPOSOME DRUG DELIVERY SYSTEM

✱ Used for hydrophobic / toxic drugs → improves delivery, reduces toxicity

- Improved bioavailability
- Targeted delivery
- Reduced toxicity

VINCRISTINE

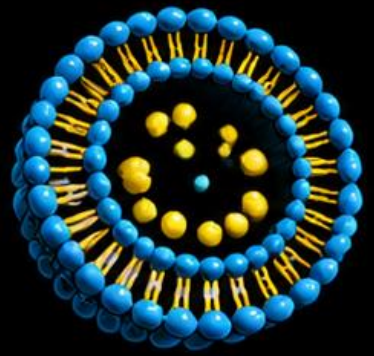
✓ Used



In liposomal form
(e.g., Marqibo®)

AMPHOTERICIN

✓ Used



Liposomal amphotericin B
(e.g., AmBisome®)

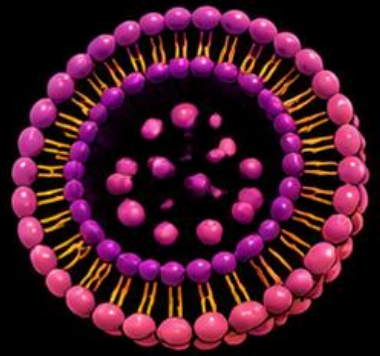
HYOSCINE

✗ Not used

Small, stable, non-toxic
→ No liposome needed

AMIKACIN

✓ Used



Liposomal amikacin
(under research/use)

KEY POINT: Liposomes are used for Vincristine, Amphotericin, Amikacin
Hyoscine is not used (not beneficial / not required)

17. **Essential drug is**

(a) Drugs that has been developed specifically to treat a rare medical condition

(b) Those drugs that satisfy the health care needs of the majority of the population

(c) Those drugs that satisfy the health care needs of at least 50% of the population

(d) Drug that is to be used with in first hour of the acute attack of the disease

17. **Essential drug is**

(a) Drugs that has been developed specifically to treat a rare medical condition

(b) Those drugs that satisfy the health care needs of the majority of the population

(c) Those drugs that satisfy the health care needs of at least 50% of the population

(d) Drug that is to be used with in first hour of the acute attack of the disease

Essential Drug

Drugs that satisfy the health care needs of the majority of the population.

Key Points

Meets priority health needs

Relevant to the population

Safe, effective & quality assured

Available & affordable

⭐ Focus on the **needs** of **most people, not a few.**

18. **True about Routes of drug administration [GATE-2012]**

(a) 80% bio-availability by I.V. injection

(b) I.M. administration needs sterile technique

(c) I.D. injection produces local tissue necrosis and irritation

(d) Inhalation produces delayed systemic bioavailability

18. **True about Routes of drug administration [GATE-2012]**

(a) 80% bio-availability by I.V. injection

(b) I.M. administration needs sterile technique

(c) I.D. injection produces local tissue necrosis and irritation

(d) Inhalation produces delayed systemic bioavailability

Explanation:

STATEMENT	ANALYSIS
IV Bioavailability	False. Intravenous (IV) administration places the drug directly into the systemic circulation, so by definition, it has 100% bioavailability.
IM Sterility	True. All parenteral routes that bypass the body's natural defenses (IM, IV, SC, etc.) require aseptic (sterile) techniques to prevent introducing infection.
ID Necrosis	False. Intradermal (ID) injection involves a very small volume into the skin and is unlikely to cause necrosis. It is used for sensitivity tests.
Inhalation Onset	False. The large surface area and high blood flow of the lungs lead to very rapid, not delayed, systemic absorption and onset of action.

19. **Maximum first pass metabolism is seen by which route**

(a) Intravenous
(b) Intra-arterial
(c) Rectal
(d) Oral

19. **Maximum first pass metabolism is seen by which route**

(a) Intravenous
(b) Intra-arterial
(c) Rectal
(d) Oral

MAXIMUM FIRST PASS METABOLISM

First pass metabolism:
Metabolism of drug in GIT wall + Liver before reaching systemic circulation

MAXIMUM by ORAL route

⇒ More the contact with GIT wall and Liver, more the first pass metabolism

ORAL	GIT ABSORPTION	LIVER METABOLISM	SYSTEMIC CIRCULATION	MAXIMUM ★★★★★
RECTAL	PARTIAL GIT ABSORPTION	LESS LIVER METABOLISM	SYSTEMIC CIRCULATION	MODERATE ★★★
INTRA-ARTERIAL		SOME LIVER METABOLISM	SYSTEMIC CIRCULATION	LOW ★★
INTRAVENOUS		MINIMAL / NO LIVER METABOLISM	SYSTEMIC CIRCULATION	MINIMUM ★

Oral > Rectal > Intra-arterial > Intravenous

First pass metabolism decreasing order

20. From which of the following routes, Bioavailability of the drug is likely to be 100 percent [GATE-2010]

(a) Subcutaneous
(b) Intravenous
(c) Intramuscular
(d) Intradermal

20. From which of the following routes, Bioavailability of the drug is likely to be 100 percent [GATE-2010]

(a) Subcutaneous

(b) Intravenous

(c) Intramuscular

(d) Intradermal

BIOAVAILABILITY

Fraction of unchanged drug reaching systemic circulation

INTRAVENOUS (IV)

100% BIOAVAILABILITY

Direct entry into systemic circulation → No absorption barriers, No first-pass loss

ROUTE	ABSORPTION PATH	BIOAVAILABILITY
IV	Direct to Bloodstream	100% (No loss)
IM	Absorbed from Muscle	< 100% (Not complete)
SC	Absorbed from Subcutaneous tissue	< 100% (Not complete)
ID	Absorbed from Dermis	< 100% (Not complete)

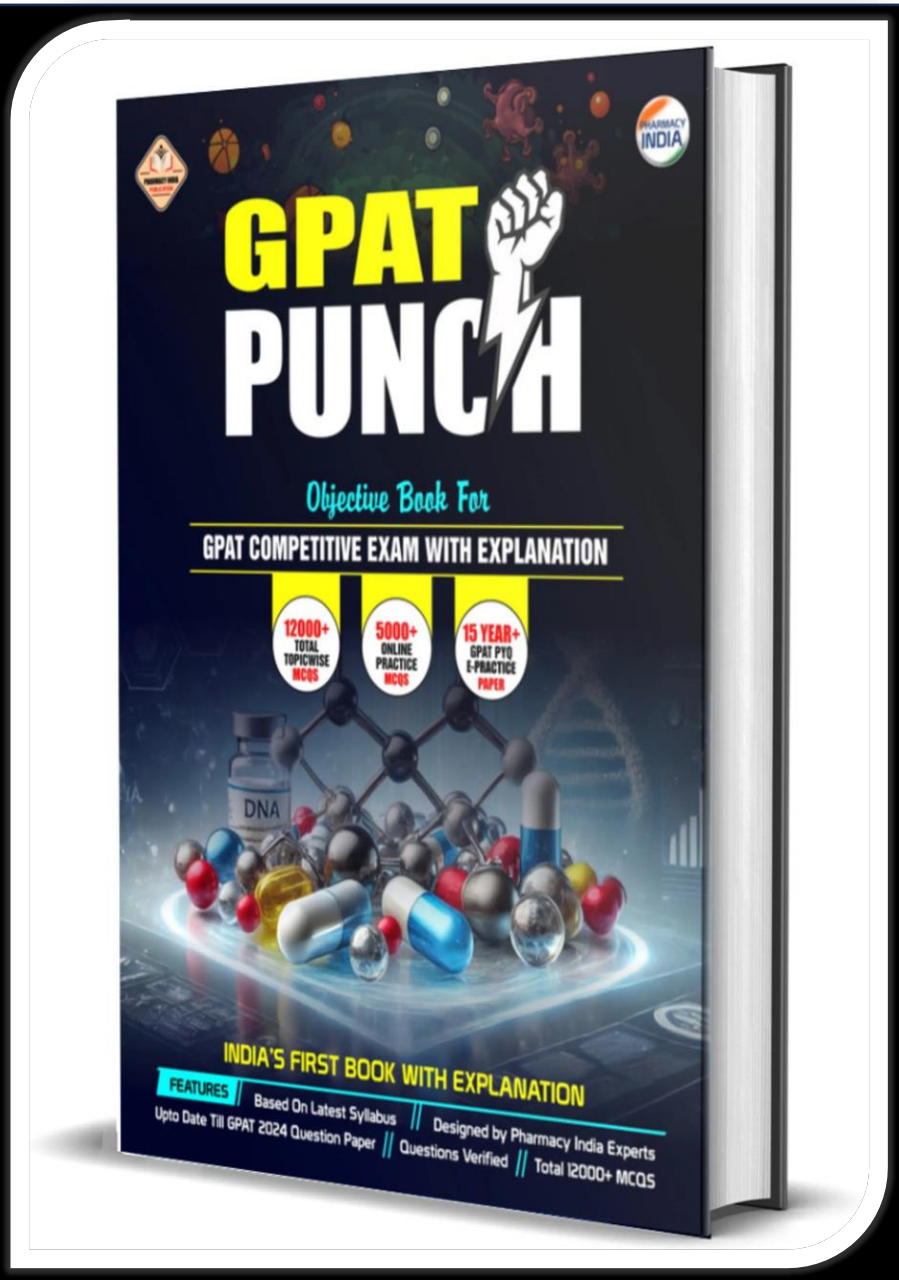
KEY TAKEAWAY | IV → Direct → 100% > IM → High > SC → Moderate > ID → Low

Best Books for GPAT Exam

AVAILABLE ON

Flipkart amazon

NOW AVAILABLE
CASH ON DELIVERY



GPAT PUNCH OBJECTIVE BOOK

- Based on Latest Syllabus
- Upto Date Till GPAT 2025 Question Paper
- 5000+ Online Practice MCQs
- Total 12000+ MCQs
- 15 Year+ GPAT PYQ E-Practice Paper

Best Books for GPAT Exam

AVAILABLE ON

Flipkart amazon

NOW AVAILABLE
CASH ON DELIVERY

GPAT BOOSTER BOOKS

- According to Latest Syllabus
- All Topics Covered in Concise Forms
- Important for GPAT Exam
- Subject-wise Previous Year Questions included
- Includes short notes for rapid last-minute revision

21. **Drug not given sublingually is**

(a) Isosorbide dinitrate
(b) Buprenorphine
(c) Ergotamine tartrate
(d) Isosorbide-5-mononitrate

21. **Drug not given sublingually is**

(a) Isosorbide dinitrate

(b) Buprenorphine

(c) Ergotamine tartrate

(d) Isosorbide-5-mononitrate

Drug NOT given Sublingually

Isosorbide dinitrate

(Sublingual)

Rapid relief in angina (5–10 min)

Buprenorphine

(Sublingual)

For pain / opioid dependence

Ergotamine tartrate

(Sublingual)

For acute migraine

Isosorbide-5-mononitrate

(Not Sublingual)

Designed for oral use (sustained release)

Poor & inconsistent absorption sublingually

Isosorbide dinitrate, Buprenorphine & Ergotamine → Sublingual

Isosorbide-5-mononitrate → Not given sublingually

22. _____ is expressed in both the intestinal epithelium and the kidney [GPAT-2024]

(a) CYP_1D_6

(b) CYP_3A_{42}

(c) CYP_1A_2

(d) CYP_2E_1

22. _____ is expressed in both the intestinal epithelium and the kidney [GPAT-2024]

(a) CYP_1D_6

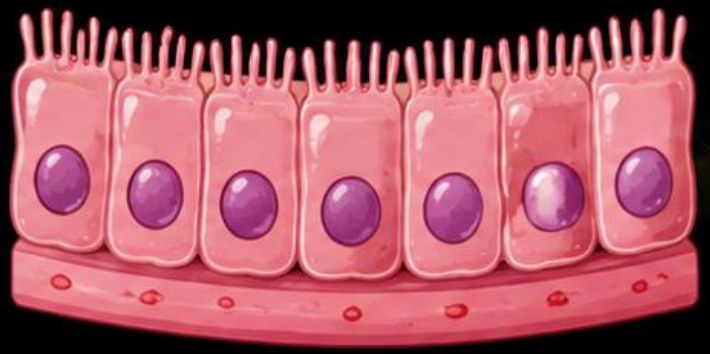
(b) CYP_3A_{42}

(c) CYP_1A_2

(d) CYP_2E_1

CYP_3A4_{42} is expressed in both Intestinal Epithelium and Kidney

Intestinal Epithelium

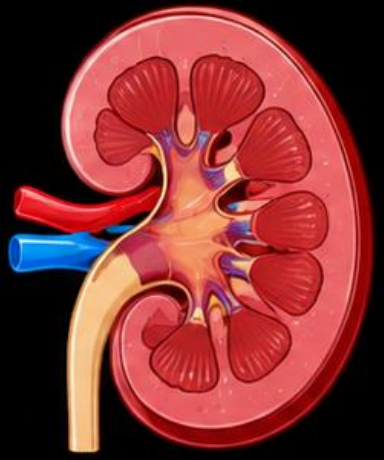


High expression in enterocytes

CYP_3A4_{42}

Key role in first-pass metabolism & drug elimination

Kidney



Expressed in proximal tubular cells

Why not others?

CYP_1D_6	CYP_1A_2	CYP_2E_1
Mainly liver	Mainly liver	Mainly liver

23. Which of the following describes the effect of reversible drug binding to plasma proteins?

(a) It accelerates drug metabolism
(b) It promotes rapid elimination of the drug
(c) It sequesters drugs in a non-diffusible form
(d) It reduces drug accumulation in tissues

23. **Which of the following describes the effect of reversible drug binding to plasma proteins?**

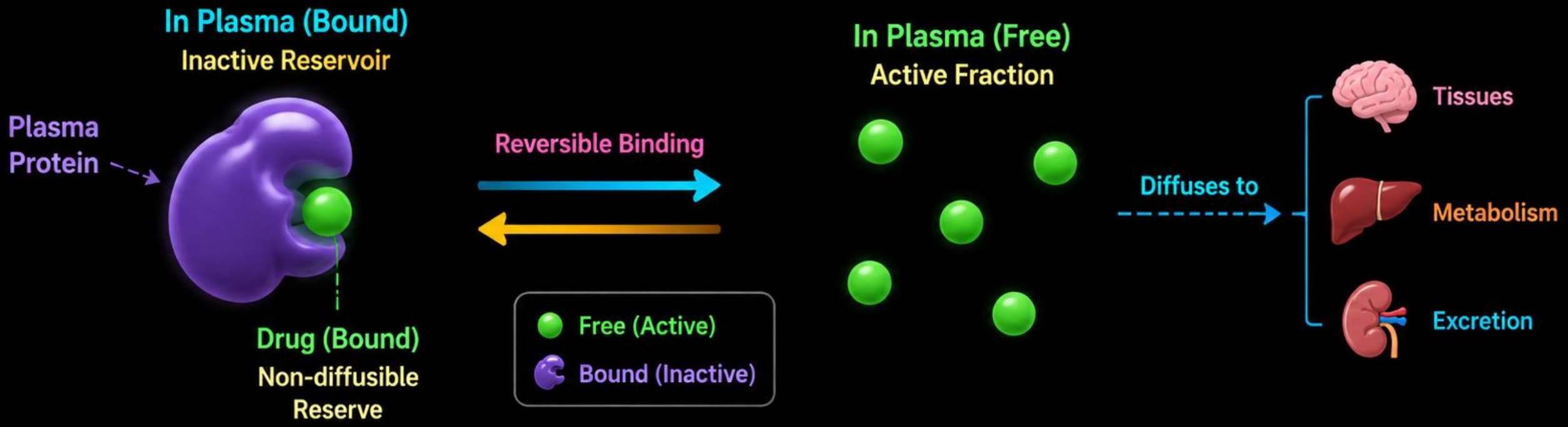
(a) It accelerates drug metabolism

(b) It promotes rapid elimination of the drug

(c) It sequesters drugs in a non-diffusible form

(d) It reduces drug accumulation in tissues

Reversible Drug Binding to Plasma Proteins – Effect



Acts as a reservoir
Prolongs duration of action

Maintains equilibrium
Only free drug is pharmacologically active

Slows elimination
↓ Filtration & metabolism of bound drug

Limits tissue accumulation
Less free drug available to distribute

Key Effect: Sequesters drug in a non-diffusible form → Prolonged action, limited distribution

24. A 70 kg woman was administered 1000 mg of the drug as iv, bolus. After its uniform distribution in the body, the plasma concentration of the drug was found to be 50 mg/L. What is its volume of distribution [GPAT-2023 SHIFT-I]

(a) 70L
(b) 500L
(c) 20L
(d) 0.1L

24. A 70 kg woman was administered 1000 mg of the drug as iv, bolus. After its uniform distribution in the body, the plasma concentration of the drug was found to be 50 mg/L. What is its volume of distribution [GPAT-2023 SHIFT-I]

(a) 70L

(b) 500L

(c) 20L

(d) 0.1L

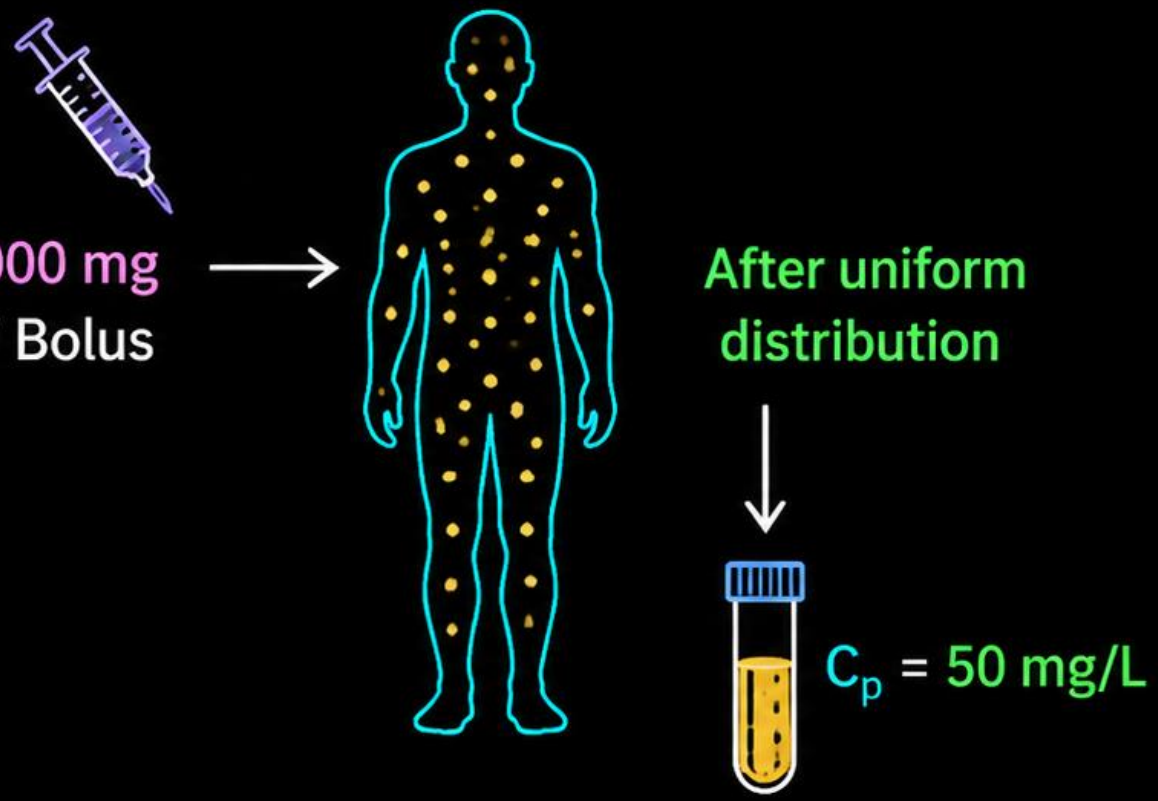
Vd (Volume of Distribution)

$$V_d = \frac{\text{Dose}}{C_p}$$

- Dose (iv, bolus) = 1000 mg
- C_p (after distribution) = 50 mg/L
- V_d = ?

$$V_d = \frac{1000\ \text{mg}}{50\ \text{mg/L}}$$

$$= 20\ \text{L}$$



★ V_d = 20 L

(Apparent volume in which drug is distributed)

25. **Which of the following could be the reason(s) for Pharmacokinetic Drug Interactions [GPAT-2022]**

[P] Interference with absorption
[Q] Changes in protein binding
[R] Competition at receptor sites
[S] Interference with renal excretion

(a) P, Q and R only
(b) P, Q and S only
(c) P, T and D only
(d) R only

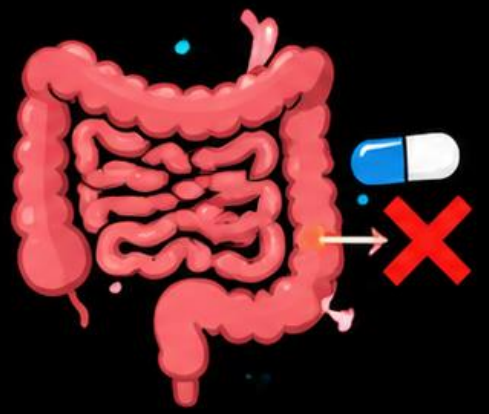
25. **Which of the following could be the reason(s) for Pharmacokinetic Drug Interactions [GPAT-2022]**

[P] Interference with absorption
[Q] Changes in protein binding
[R] Competition at receptor sites
[S] Interference with renal excretion

(a) P, Q and R only
(b) P, Q and S only
(c) P, T and D only
(d) R only

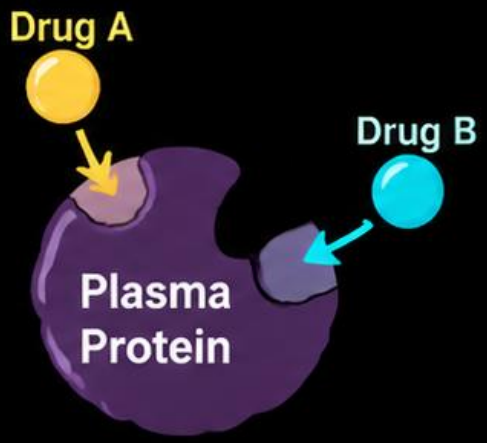
Pharmacokinetic Drug Interactions

1. Interference with Absorption



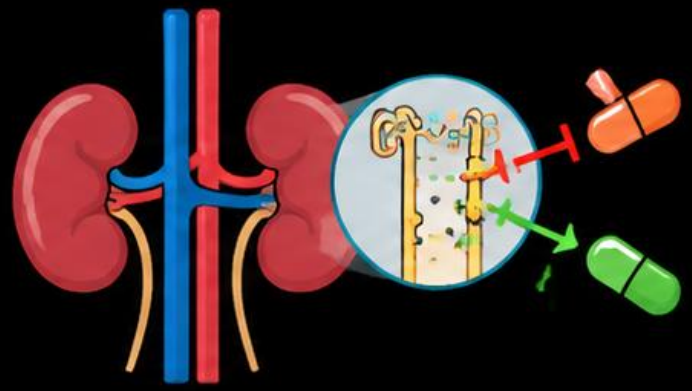
↓ Absorption
↓ Bioavailability

2. Changes in Protein Binding



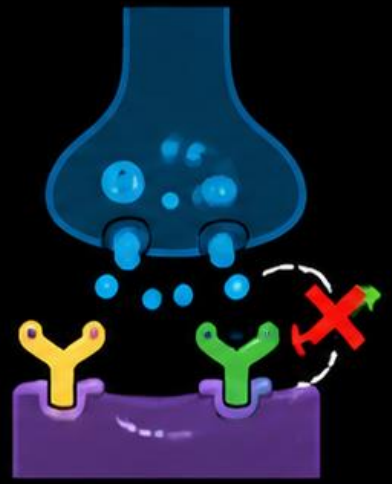
Displacement
↑ Free drug
↑ Effect / Toxicity

3. Interference with Renal Excretion



↓ Excretion
↑ Plasma level
↑ Toxicity

4. Competition at Receptor Sites



Pharmacodynamic Interaction

PK Interactions alter ADME → change drug concentration in body

26. **Ion trapping is an important process in drug distribution with potential therapeutic benefit. It is defined as [GPAT-2021]**

(a) An acidic drug will accumulate on the more basic side of the membrane and a basic drug on more basic side

(b) An acidic drug will accumulate on the more acidic side of the membrane and a basic drug on more basic side

(c) An acidic drug will accumulate on the more basic side of the membrane and a basic drug on more acidic side

(d) An acidic drug will accumulate on the more acidic side of the membrane and a drug on more acidic side

26. **Ion trapping is an important process in drug distribution with potential therapeutic benefit. It is defined as [GPAT-2021]**

(a) An acidic drug will accumulate on the more basic side of the membrane and a basic drug on more basic side

(b) An acidic drug will accumulate on the more acidic side of the membrane and a basic drug on more basic side

(c) An acidic drug will accumulate on the more basic side of the membrane and a basic drug on more acidic side

(d) An acidic drug will accumulate on the more acidic side of the membrane and a drug on more acidic side

Explanation:

Drug Type	Behavior	Consequence
Acidic Drug	Crosses a membrane from an acidic environment (non-ionized form) to a basic one. In the basic environment, it becomes ionized (charged).	The ionized form cannot cross back easily, so the acidic drug gets trapped on the more basic side.
Basic Drug	Crosses a membrane from a basic environment (non-ionized form) to an acidic one. In the acidic environment, it becomes ionized (charged).	The ionized form cannot cross back easily, so the basic drug gets trapped on the more acidic side.

27. Nineteen isoforms of human P450 enzyme have been identified. It is noteworthy that alone is responsible for the metabolism of over 50% of the prescription drugs metabolized by liver [GPAT-2019]

(a) CYP_3A_4
(b) CYP_1AZ
(c) CYP_1A_1
(d) CYP_2B_6

27. Nineteen isoforms of human P450 enzyme have been identified. It is noteworthy that alone is responsible for the metabolism of over 50% of the prescription drugs metabolized by liver [GPAT-2019]

(a) CYP_3A_4

(b) CYP_1AZ

(c) CYP_1A_1

(d) CYP_2B_6

Explanation:

- **Abundance: CYP3A4 is the most abundant and clinically significant drug-metabolizing enzyme in humans.**
- **Substrate Range: It has a very broad range of substrates and is responsible for the metabolism of approximately 50% of all marketed drugs.**
- **Location: Its high expression in both the liver and the small intestine makes it a critical factor in both hepatic clearance and oral bioavailability.**

28. **Which of the following is a characteristic of cytochrome P-450 [GPAT-2017]**

(a) Catayzes aromatic and aliphatic hydroxylation
(b) Located in the lipophilic environment of mitochondrial membrane
(c) Catalyzes O-, S-, N-methylation reactions
(d) Catalyzes conjugation reactions

28. **Which of the following is a characteristic of cytochrome P-450 [GPAT-2017]**

(a) Catayzes aromatic and aliphatic hydroxylation

(b) Located in the lipophilic environment of mitochondrial membrane

(c) Catalyzes O-, S-, N-methylation reactions

(d) Catalyzes conjugation reactions

Explanation:

- Reaction Type: Cytochrome P450 enzymes are the primary catalysts for Phase I (functionalization) reactions.
- Primary Function: Their main role is oxidation, which includes key reactions like aromatic and aliphatic hydroxylation. This introduces a polar group onto the drug molecule.
- Other Reactions: Methylation and conjugation are primarily Phase II reactions, catalyzed by different enzyme families (e.g., UGTs for conjugation). CYP450s are located in the smooth endoplasmic reticulum, not mitochondria.

29. **Identify the FALSE statements [GPAT-2016]**

(a) A characteristic of drugs eliminated by zero order kinetic process is that the half-life is not constant

(b) The plasma drug concentration versus time curve for a drug eliminated by zero order kinetics linear

(c) A fundamental characteristic of all first order pharmacokinetics processes is that the rate of the process is proportional to drug concentration

(d) A characteristic of absorption by lipid diffusion is its saturability at high drug concentrations

29. **Identify the FALSE statements [GPAT-2016]**

(a) A characteristic of drugs eliminated by zero order kinetic process is that the half-life is not constant

(b) The plasma drug concentration versus time curve for a drug eliminated by zero order kinetics linear

(c) A fundamental characteristic of all first order pharmacokinetics processes is that the rate of the process is proportional to drug concentration

(d) A characteristic of absorption by lipid diffusion is its saturability at high drug concentrations

Explanation:

- The statement is FALSE.
- Passive Lipid Diffusion: This process relies on the concentration gradient and is not carrier-mediated. Therefore, it does not have a finite number of "slots" that can become saturated.
- Saturability: Saturability is a hallmark of carrier-mediated processes like active transport or facilitated diffusion, where the rate of transport levels off once all carrier proteins are occupied.

30. Therapeutic Index is [GPAT-2015]

(a) ED_{50} / LD_{50}

(b) LD_{50} / ED_{50}

(c) ED_{50} -LD_{50}

(d) ED_{50} x LD_{50}

30. Therapeutic Index is [GPAT-2015]

(a) ED_{50} / LD_{50}

(b) LD_{50} / ED_{50}

(c) ED_{50} -LD_{50}

(d) ED_{50} x LD_{50}

Explanation:

Term	Definition	Formula Component
LD_{50}	Median Lethal Dose: The dose lethal to 50% of a test population.	Numerator (measure of toxicity)
ED_{50}	Median Effective Dose: The dose that produces a therapeutic effect in 50% of the population.	Denominator (measure of efficacy)
Therapeutic Index (TI)	A measure of a drug's safety. A higher TI indicates a safer drug because a much larger dose is needed to produce a lethal effect than a therapeutic one.	$TI = LD_{50} / ED_{50}$

31. What is the effect of increased clearance on the half-life of a drug

(a) Increases half-life
(b) Decreases half-life
(c) No effect on half-life
(d) Depends on bioavailability

31. What is the effect of increased clearance on the half-life of a drug

(a) Increases half-life

(b) Decreases half-life

(c) No effect on half-life

(d) Depends on bioavailability

Explanation:

- Inverse Relationship: Half-life (t½) and Clearance (CL) are inversely related.
- Conceptual Link: Clearance is a measure of how efficiently the body removes a drug. If the body removes the drug more efficiently (increased clearance), the time it takes for the drug's concentration to fall by half (half-life) will be shorter.
- Formula: The relationship is shown by the formula: $t_{1/2} \approx (0.693 \times Vd) / CL$. As CL (the denominator) increases, t½ decreases.

32. **Monitoring of plasma drug concentration is required while using [GPAT-2014]**

(a) Antihypertensive drugs
(b) Levodopa
(c) Lithium carbonate
(d) MAO inhibitors

32. **Monitoring of plasma drug concentration is required while using [GPAT-2014]**

(a) Antihypertensive drugs

(b) Levodopa

(c) Lithium carbonate

(d) MAO inhibitors

Explanation:

- Narrow Therapeutic Index: Lithium has a very narrow therapeutic range where it is effective but not toxic (approx. 0.6-1.2 mEq/L).
- Risk of Toxicity: Concentrations slightly above this range can cause serious toxicity (tremors, confusion, seizures), while concentrations below it are ineffective.
- TDM Requirement: Therefore, Therapeutic Drug Monitoring (TDM), the measurement of plasma drug concentrations, is essential to maintain the patient within the safe and effective range.

33. **Hoffman elimination is seen in [GPAT-2013]**

(a) Atracurium
(b) Pancuronium
(c) d-Tubocurarine
(d) Vecuronium

33. **Hoffman elimination is seen in [GPAT-2013]**

(a) Atracurium

(b) Pancuronium

(c) d-Tubocurarine

(d) Vecuronium

Explanation:

- **Definition: Hofmann elimination is a non-enzymatic, spontaneous degradation of a drug that occurs at physiological pH and temperature.**
- **Clinical Significance: This pathway is independent of liver or kidney function, making drugs like Atracurium and its isomer Cisatracurium useful in patients with organ failure.**
- **Mechanism: It is a chemical process that breaks down the quaternary ammonium structure of the drug molecule.**

34. **Which of the following respective Phase-I and Phase-II reactions are the most common drug biotransformation reaction [GPAT-2012]**

(a) Oxidation and Glucuronidation
(b) Reduction and Acetylation
(c) Hydrolysis and Glucuronidation
(d) Oxidation and Glutathione conjugation

34. **Which of the following respective Phase-I and Phase-II reactions are the most common drug biotransformation reaction [GPAT-2012]**

(a) Oxidation and Glucuronidation

(b) Reduction and Acetylation

(c) Hydrolysis and Glucuronidation

(d) Oxidation and Glutathione conjugation

Explanation:

Biotransformation Phase	Most Common Reaction	Key Enzymes Involved
Phase I (Functionalization)	Oxidation	Cytochrome P450 (CYP) superfamily
Phase II (Conjugation)	Glucuronidation	UDP-glucuronosyltransferases (UGTs)

35. **Find the process by which the conversion of salicylic acid takes place in the colon [GPAT-2012]**

(a) Hydrolysis
(b) Deamination
(c) Acetylation
(d) Azoreduction

35. **Find the process by which the conversion of salicylic acid takes place in the colon [GPAT-2012]**

(a) Hydrolysis

(b) Deamination

(c) Acetylation

(d) Azoreduction

Explanation:

- Prodrug: The drug Sulfasalazine consists of sulfapyridine linked to 5-aminosalicylic acid by an azo bond (-N=N-).
- Activation Site: It travels to the colon intact, where resident gut bacteria produce azoreductase enzymes.
- Reaction: These enzymes cleave the azo bond via azoreduction, releasing the active anti-inflammatory agent (5-ASA) to act locally on the colonic mucosa.

36. **Inhibition/induction of which of the following Cytochrome P450 enzyme system is most likely to be involved in important drug-drug interactions [GPAT-2011]**

(a) CYP_3A_4

(b) CYP_2D_6

(c) CYP_2C_{19}

(d) CYP_1A_2

36. **Inhibition/induction of which of the following Cytochrome P450 enzyme system is most likely to be involved in important drug-drug interactions [GPAT-2011]**

(a) CYP_3A_4

(b) CYP_2D_6

(c) CYP_2C_{19}

(d) CYP_1A_2

Explanation:

- Metabolic Workhorse: CYP3A4 metabolizes the largest proportion (~50%) of clinically used drugs.
- High Interaction Potential: Because so many drugs are substrates, inducers, or inhibitors of CYP3A4, the potential for clinically significant drug-drug interactions involving this enzyme is the highest.
- Example: Grapefruit juice (an inhibitor) can dangerously increase levels of statins (substrates), while St. John's Wort (an inducer) can decrease the effectiveness of oral contraceptives (substrates).

37. **Which of the following parameters from plasma concentration time profile study gives indication of the rate of drug absorption [GPAT-2011]**

(a) Cmax
(b) tmax
(c) AUC
(d) t1/2

37. **Which of the following parameters from plasma concentration time profile study gives indication of the rate of drug absorption [GPAT-2011]**

(a) Cmax

(b) tmax

(c) AUC

(d) t1/2

Explanation:

Parameter	What It Represents	Relation to Absorption
tmax	The time taken to reach the maximum plasma concentration.	Direct indicator of the rate of absorption. A shorter tmax means faster absorption.
Cmax	The maximum plasma concentration achieved.	Reflects both the rate and extent of absorption.
AUC	The Area Under the Curve; total drug exposure over time.	Indicator of the extent of absorption (bioavailability).
t½	The half-life of the drug.	Indicator of the rate of elimination.

38. **P-Glycoprotein pump is responsible for which one of the followings [GPAT-2011]**

(a) Transporting the drugs from the enterocytes into the gut lumen

(b) Transporting the drugs from gut lumen into enterocytes

(c) Transporting the drugs from oral mucosa into blood capillaries

(d) Transporting the drugs from Peyer's patches into the gut lumen

38. P-Glycoprotein pump is responsible for which one of the followings [GPAT-2011]

(a) Transporting the drugs from the enterocytes into the gut lumen

(b) Transporting the drugs from gut lumen into enterocytes

(c) Transporting the drugs from oral mucosa into blood capillaries

(d) Transporting the drugs from Peyer's patches into the gut lumen

Explanation:

- **Function: P-glycoprotein (P-gp) is an efflux transporter. Its function is to actively pump substances out of cells.**
- **Location in Gut: In intestinal epithelial cells (enterocytes), it is located on the apical (lumen-facing) side.**
- **Effect on Bioavailability: When a drug is absorbed into an enterocyte, P-gp can pump it back into the gut lumen, thereby reducing the net amount of drug that reaches the bloodstream and lowering its oral bioavailability.**

39. **The characteristic of non-linear pharmacokinetics includes [GPAT-2010]**

(a) Area under the curve is proportional to the dose
(b) Elimination half-life remains constant
(c) Area under the curve is not proportional to the dose
(d) Amount of drug excreted through remains constant

39. **The characteristic of non-linear pharmacokinetics includes [GPAT-2010]**

(a) Area under the curve is proportional to the dose

(b) Elimination half-life remains constant

(c) Area under the curve is not proportional to the dose

(d) Amount of drug excreted through remains constant

Explanation:

Pharmacokinetics Type	Dose Proportionality	Half-life (t½)	Example Enzymes
Linear (First-Order)	A change in dose gives a proportional change in AUC. (e.g., doubling dose doubles AUC).	Constant	Most drugs at therapeutic doses.
Non-Linear (Zero-Order)	A change in dose gives a disproportionate change in AUC. (e.g., doubling dose > doubles AUC).	Changes with dose	Phenytoin, Ethanol (at high concentrations).

40. **The Volume of distribution of a drug administered at a dose of 300 mg and exhibiting 30 microgram/ml instantaneous concentration in plasma shall be [GPAT-2010]**

(a) 10 L
(b) 100 L
(c) 1.0 L
(d) 0.10 L

40. The Volume of distribution of a drug administered at a dose of 300 mg and exhibiting 30 microgram/ml instantaneous concentration in plasma shall be [GPAT-2010]

(a) 10 L

(b) 100 L

(c) 1.0 L

(d) 0.10 L

Explanation:

- Step 1: Unify Units: The dose is in milligrams (mg) and the concentration is in micrograms/milliliter (mcg/ml). Convert the concentration to mg/L (since 1 mcg/ml = 1 mg/L). So, 30 mcg/ml = 30 mg/L.
- Step 2: Apply Formula: The formula for Volume of Distribution (Vd) is Dose / C_0.
- Step 3: Calculate: Vd = 300 mg / 30 mg/L = 10 L.

41. **The loading dose of a drug is usually based on [GATE-1992, 2001]**

(a) Total body clearance of the drug
(b) Percentage of the drug bound to plasma proteins
(c) Fraction of drug excreted unchanged in urine
(d) Apparent volume of distribution and desired drug concentration in plasma

41. **The loading dose of a drug is usually based on [GATE-1992, 2001]**

(a) Total body clearance of the drug

(b) Percentage of the drug bound to plasma proteins

(c) Fraction of drug excreted unchanged in urine

(d) Apparent volume of distribution and desired drug concentration in plasma

Explanation:

Dose Type	Purpose	Determining Factors	Formula
Loading Dose	To rapidly achieve the target therapeutic concentration.	Volume of Distribution (Vd) and the desired Target Concentration (Css).	LD = Vd × Css
Maintenance Dose	To maintain the target concentration by replacing the amount of drug eliminated.	Clearance (CL) and the desired Target Concentration (Css).	MD = CL × Css

42. **The initial distribution of a drug into the tissue is determined chiefly by [GATE-1999]**

(a) Rate of blood flow to the tissue
(b) Plasma protein binding of the drug
(c) Affinity for the tissue
(d) Stomach emptying time

42. **The initial distribution of a drug into the tissue is determined chiefly by [GATE-1999]**

(a) Rate of blood flow to the tissue

(b) Plasma protein binding of the drug

(c) Affinity for the tissue

(d) Stomach emptying time

Explanation:

- Initial Distribution Phase: Immediately after entering the bloodstream, a drug is distributed first and fastest to organs with high blood flow (perfusion).
- High-Perfusion Organs: These include the brain, heart, liver, and kidneys, which receive a large portion of the cardiac output.
- Later Phases: Factors like tissue affinity and plasma protein binding determine the later stages of distribution and the final extent to which a drug accumulates in different tissues.

43. **The term bioavailability refers to the [GATE-1997]**

(a) Relationship between the physical and chemical properties of a drug and the systemic absorption of a drug

(b) Measurement of the rate and amount of therapeutically active drug that reaches the systemic circulation

(c) Movement of a drug into the body tissues over time

(d) Dissolution of a drug in the gastrointestinal tract

43. **The term bioavailability refers to the [GATE-1997]**

(a) Relationship between the physical and chemical properties of a drug and the systemic absorption of a drug

(b) Measurement of the rate and amount of therapeutically active drug that reaches the systemic circulation

(c) Movement of a drug into the body tissues over time

(d) Dissolution of a drug in the gastrointestinal tract

Explanation:

- Definition: Bioavailability is a pharmacokinetic term that quantifies drug absorption.
- Key Components: It has two main components:
- Rate of absorption: How quickly the drug reaches the circulation (measured by tmax).
- Extent of absorption: The total fraction of the dose that reaches the circulation (measured by AUC).

44. **A list of ACE inhibitor is given below. One of them is NOT a Prodrug. Identify [GATE-1998]**

(a) Benazepril
(b) Captopril
(c) Quinapril
(d) Ramipril

44. A list of ACE inhibitor is given below. One of them is NOT a Prodrug. Identify [GATE-1998]

(a) Benazepril

(b) Captopril

(c) Quinapril

(d) Ramipril

Explanation:

Drug Type	Mechanism	Examples
Prodrug ACE Inhibitors	Are inactive and must be hydrolyzed (activated) in the liver to their active form (e.g., enalaprilat).	Enalapril, Ramipril, Benazepril, Quinapril
Active ACE Inhibitors	Are administered in their pharmacologically active form and do not require metabolic conversion.	Captopril, Lisinopril

45. **The area under the serum concentration time curve of the drug represents [GATE-1993, 1998]**

(a) The biological half-life of the drug
(b) The amount of drug in the original dosage from
(c) The amount of drug absorbed
(d) The amount of drug exereted in the urine

45. **The area under the serum concentration time curve of the drug represents [GATE-1993, 1998]**

(a) The biological half-life of the drug

(b) The amount of drug in the original dosage from

(c) The amount of drug absorbed

(d) The amount of drug exereted in the urine

Explanation:

- Definition: The Area Under the Curve (AUC) is the integral of the plasma concentration-time curve.
- Representation: It represents the total systemic exposure to a drug over a given period.
- Application: For a given dose, the AUC is directly proportional to the total amount of unchanged drug that successfully reaches the systemic circulation, making it the primary measure for the extent of absorption or bioavailability.

46. **The volume of distribution of drugs is [GATE-1990]**

(a) An expression of total body volume

(b) A measure of total fluid volume

(c) A relationship between the total amount of drug in the body and the concentration of the drug in the blood

(d) Proportional to bioavailability of the drug

46. **The volume of distribution of drugs is [GATE-1990]**

(a) An expression of total body volume

(b) A measure of total fluid volume

(c) A relationship between the total amount of drug in the body and the concentration of the drug in the blood

(d) Proportional to bioavailability of the drug

Explanation:

- Theoretical Volume: Vd is not a real physiological volume but a theoretical (or apparent) volume.
- Definition: It represents the volume that would be required to contain the total amount of drug in the body at the same concentration as it is in the blood or plasma.
- Interpretation: A large Vd suggests the drug is extensively distributed into tissues outside of the plasma, while a small Vd suggests it remains primarily in the plasma.

47. **The rate of diffusion of drug across biological membrane is [GATE-1990]**

(a) Directly proportional to the concentration gradients
(b) Directly proportional to membrane thickness
(c) Independent of partition coefficient of the drug
(d) None of these

47. The rate of diffusion of drug across biological membrane is [GATE-1990]

(a) Directly proportional to the concentration gradients

(b) Directly proportional to membrane thickness

(c) Independent of partition coefficient of the drug

(d) None of these

Explanation:

- Fick's Law of Diffusion.
- The rate of diffusion is directly proportional to the concentration gradient (the difference in concentration across the membrane) and the surface area of the membrane.
- It is inversely proportional to the thickness of the membrane. It is also directly proportional to the lipid solubility (partition coefficient).

48. **Drugs which are capable of penetrating the blood brain barrier are usually [GATE-1993]**

(a) Highly water soluble
(b) Quaternary ammonium compounds
(c) Highly lipid soluble
(d) Highly ionized at physiological pH

48. **Drugs which are capable of penetrating the blood brain barrier are usually [GATE-1993]**

(a) Highly water soluble

(b) Quaternary ammonium compounds

(c) Highly lipid soluble

(d) Highly ionized at physiological pH

Explanation:

Characteristic	Ability to Cross BBB	Reason
Highly Lipid Soluble	Can cross	The Blood-Brain Barrier (BBB) is composed of tightly packed endothelial cells with lipid membranes. Lipid-soluble (lipophilic) drugs can readily diffuse across these membranes.
Water Soluble / Ionized	Cannot cross easily	These molecules are repelled by the lipid membranes and cannot pass through the tight junctions of the BBB.
Quaternary Compounds	Cannot cross	These molecules have a permanent positive charge, making them highly polar and unable to cross the lipid barrier.

49. **Biotransformation of a drug refers to [GATE-1994]**

(a) Chemical alteration inside the body

(b) Binding of drugs to plasma albumin

(c) Passage of drugs across the cell membrane

(d) Disposition of drug from the body

49. **Biotransformation of a drug refers to [GATE-1994]**

(a) Chemical alteration inside the body

(b) Binding of drugs to plasma albumin

(c) Passage of drugs across the cell membrane

(d) Disposition of drug from the body

Explanation:

- **Definition: Biotransformation is another term for drug metabolism.**
- **Process: It involves the chemical alteration of a drug by the body, primarily by enzymes in the liver.**
- **Purpose: The main goal is to convert lipid-soluble (lipophilic) drugs into more water-soluble (hydrophilic) compounds that are more easily excreted by the kidneys.**

50. **When a constant fraction of a drug is eliminated in unit time it is called [GATE-1995]**

(a) Zero order kinetics
(b) First order kinetics
(c) Saturation kinetics
(d) Rate of clearance

50. **When a constant fraction of a drug is eliminated in unit time it is called [GATE-1995]**

(a) Zero order kinetics

(b) First order kinetics

(c) Saturation kinetics

(d) Rate of clearance

Explanation:

Kinetics Type	Elimination Pattern	Rate of Elimination	Half-life
First-Order	A constant fraction (or percentage) of the drug is eliminated per unit of time.	Proportional to the drug concentration.	Constant.
Zero-Order	A constant amount (e.g., mg/hr) of the drug is eliminated per unit of time.	Independent of drug concentration (it's saturated).	Not constant.

@PharmacyIndia

THANK YOU!

Download Pharmacy India Mobile App from Playstore

BEST SELLER

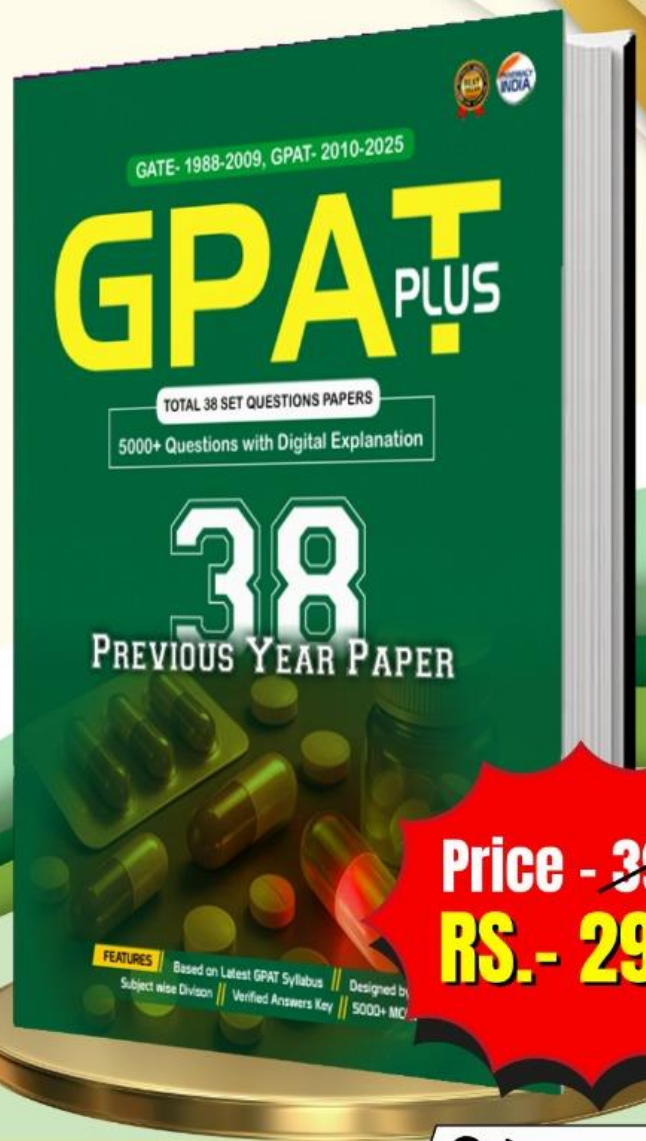
GPAT PLUS

38 PREVIOUS YEAR QUESTION PAPERS WITH DIGITAL EXPLAINATION

PHARMACY INDIA

FEATURES

- Based on Latest GPAT Syllabus
- Subjectwise Division
- Verified Questions
- Designed by Experts
- Digital Explaination



FREE SHIPPING

Price - ~~399~~
RS.- 299/-

DOWNLOAD PHARMACY INDIA APP FROM PLAYSTORE

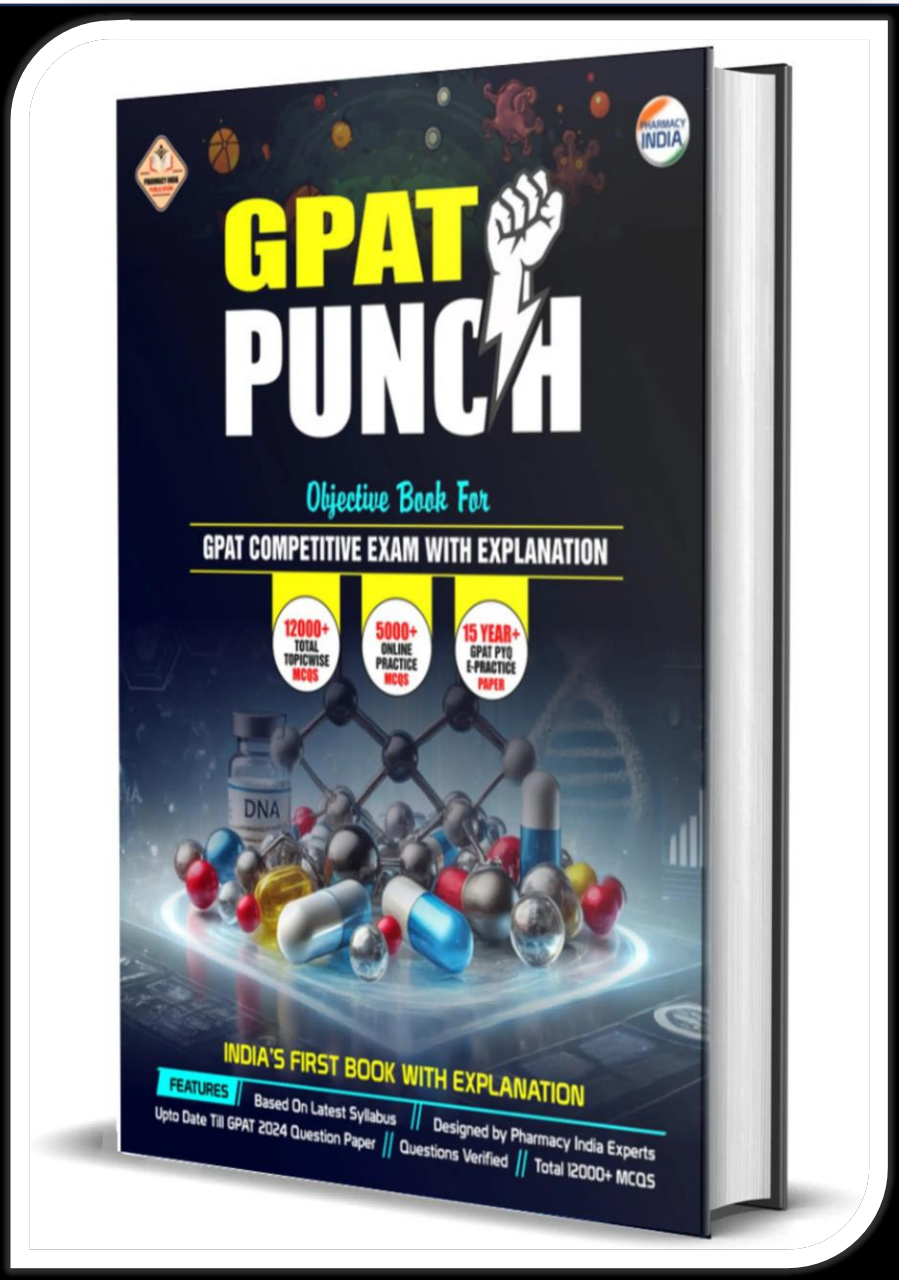
6395596959
8006781759

Best Book for GPAT Exam

AVAILABLE ON

Flipkart amazon

NOW AVAILABLE
CASH ON DELIVERY



GPAT PUNCH OBJECTIVE BOOK

- Based on Latest Syllabus
- Upto Date Till GPAT 2026 Question Paper
- 5000+ Online Practice MCQs
- Total 12000+ MCQs
- 16 Year+ GPAT PYQ E-Practice Paper

Best Books for GPAT Exam

AVAILABLE ON

Flipkart amazon

NOW AVAILABLE
CASH ON DELIVERY

GPAT BOOSTER BOOKS

- According to Latest Syllabus
- All Topics Covered in Concise Forms
- Important for GPAT Exam
- Subject-wise Previous Year Questions included
- Includes short notes for rapid last-minute revision

DAILY UPDATES

जुड़िए PHARMACY INDIA

के साथ.....

WHATSAPP & TELEGRAM SE JUDNE KE LIYE ICONS PAR CLICK KARE