



# Introduction to pharmacology

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# ILOS

- Recognize different aspects of pharmacology
- Define meaning of different nomenclature of drugs
- Outline processes of passage of drug across cell membranes

# 1- Introduction

## Pharmacology

Science dealing with drugs

## Drugs

Chemical substance that **stimulate** or **inhibit** existing cell function

They do not create new function

Used for: -

1. Treatment
2. Prevention
3. Diagnosis

# 1- Introduction

## Drug Nomenclature

### 1] Chemical Name: -

= Description of chemical structure  
N-acetyl- $\rho$ -aminophen

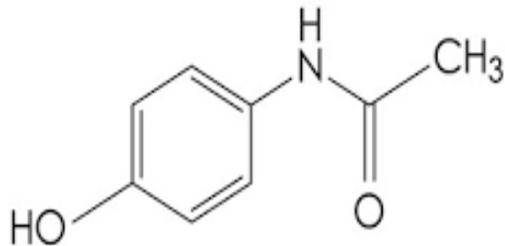
### 2] Generic Name: -

- Paracetamol

### 3] Trade Name: -

= Name given by individual drug companies

- Paramol
- Panadol



acetaminophen (C<sub>8</sub>H<sub>9</sub>NO<sub>2</sub>)

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- Most of drugs are restricted for sale by prescription only.
- Some drugs can be used by the public without a prescription e.g., nasal & oral decongestant (**Over The Counter = OTC**)

# 1- Introduction

## Source of Drugs

### 1] Plant: -

Leaves of Belladonna ► Atropine

### 2] Mineral: -

- Magnesium sulfate ( $\text{MgSO}_4$ )
- Radioactive Iodine ( $^{131}\text{I}$ )

### 3] Animal: -

- Cow ► Heparin

### 4] Micro-organism: -

- Penicillium fungus ► Penicillin

### 5] Synthetic: -

- Aspirin
- Sulfonamides

### 6] Biotechnology: -

Genetic engineering ► Human insulin



# 1- Introduction

## Pharmacokinetics

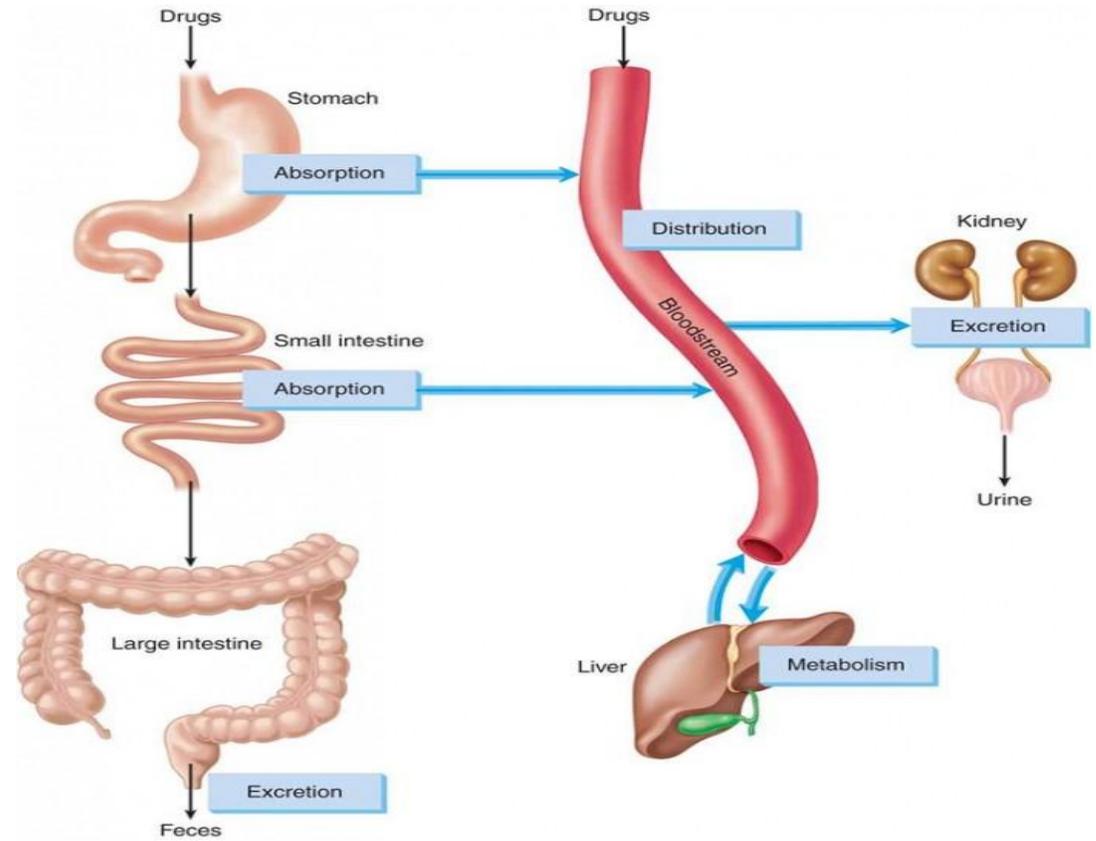
What the body does to the drug?

1. Absorption
2. Distribution
3. Metabolism
4. Excretion

## Pharmacodynamics

What the drug does to the body?

1. Mechanism of action
2. Pharmacological actions





# 1- Introduction



## Pharmacotherapeutics

Study of selection and use of drugs in treatment, prevention and diagnosis



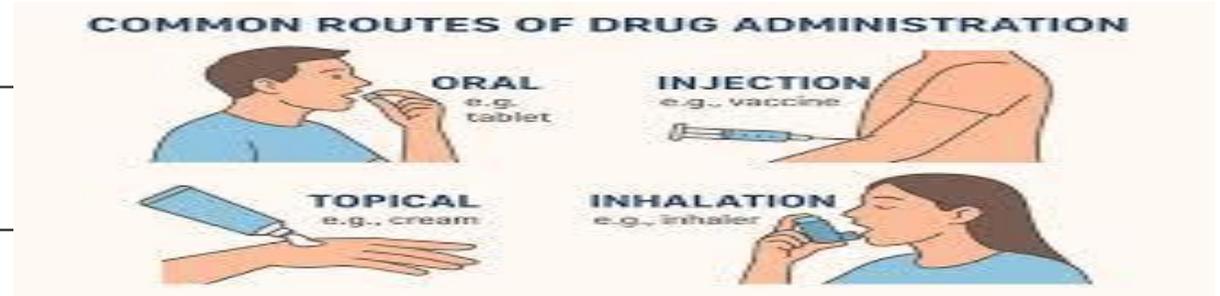
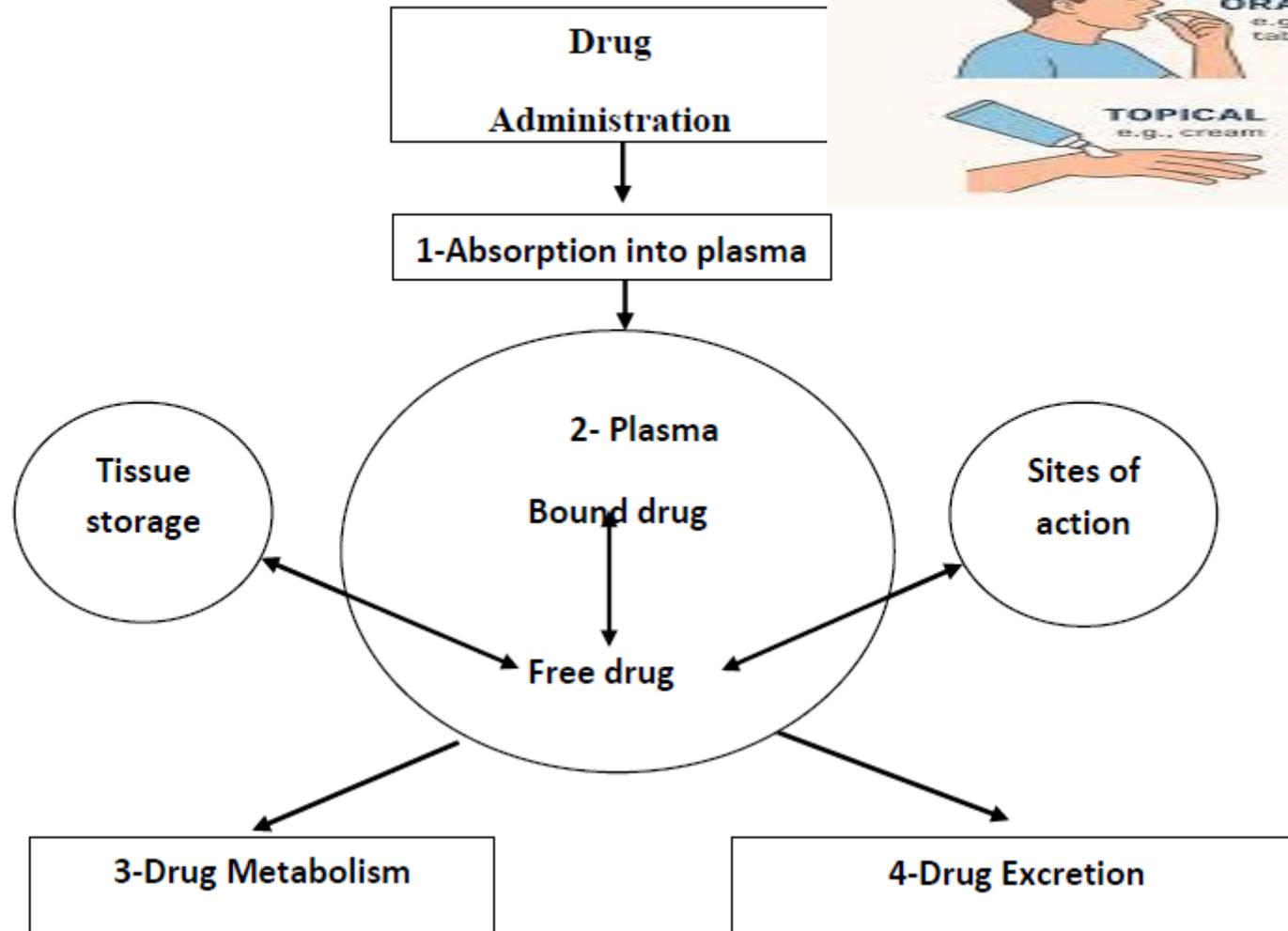
## Toxicology

Study of side effects of drug

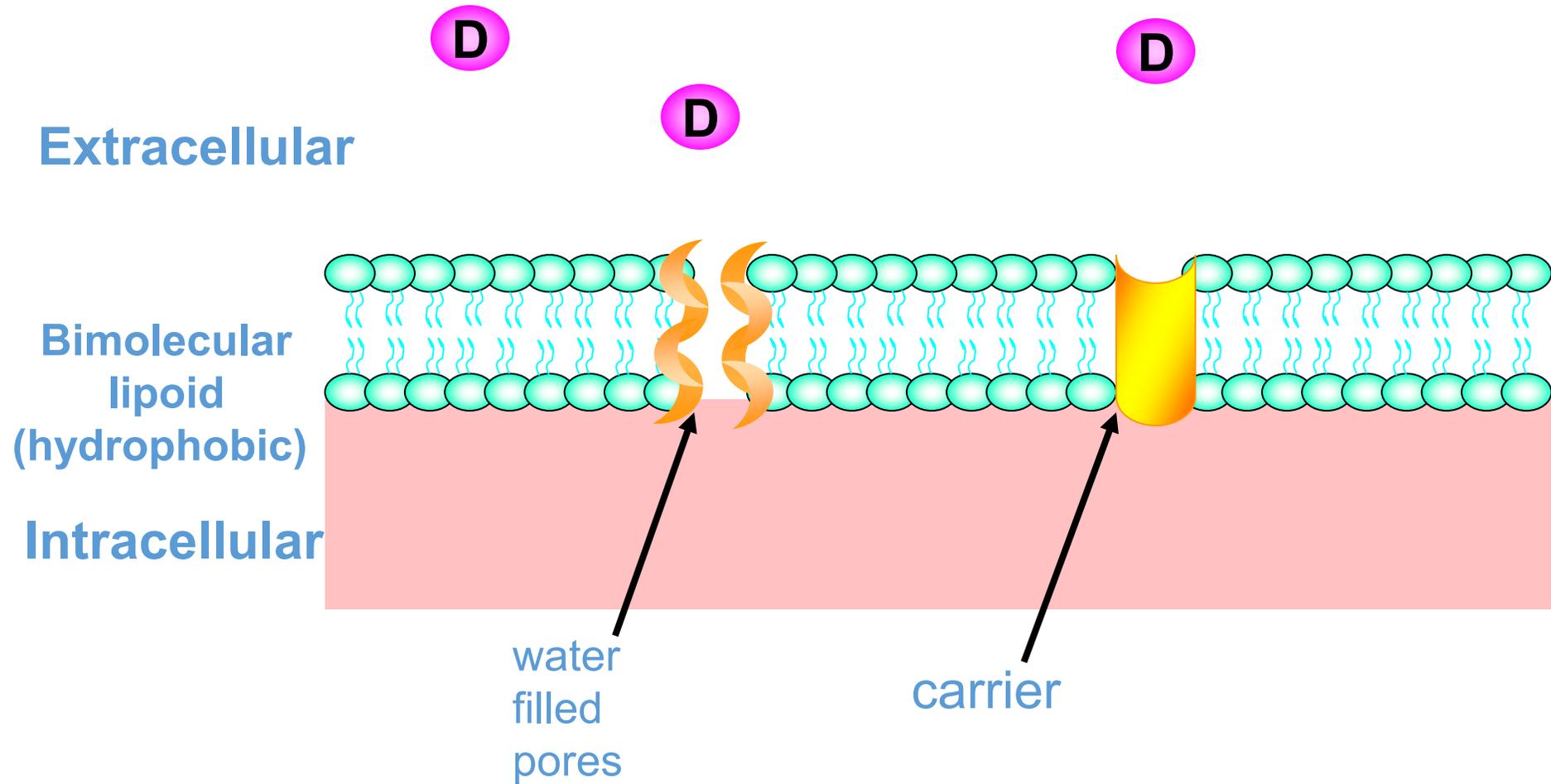


# Pharmacokinetics

## Components of Pharmacokinetics



## 2- Passage Across Membranes



The passage of drugs across cell membranes occurs by any of the following processes:

**1) Passive transfer:**

**A. Simple diffusion**

**B. Filtration**

**2) Specialized transport:**

**a. Facilitated diffusion**

**b. Active transport**

**c. Endocytosis**

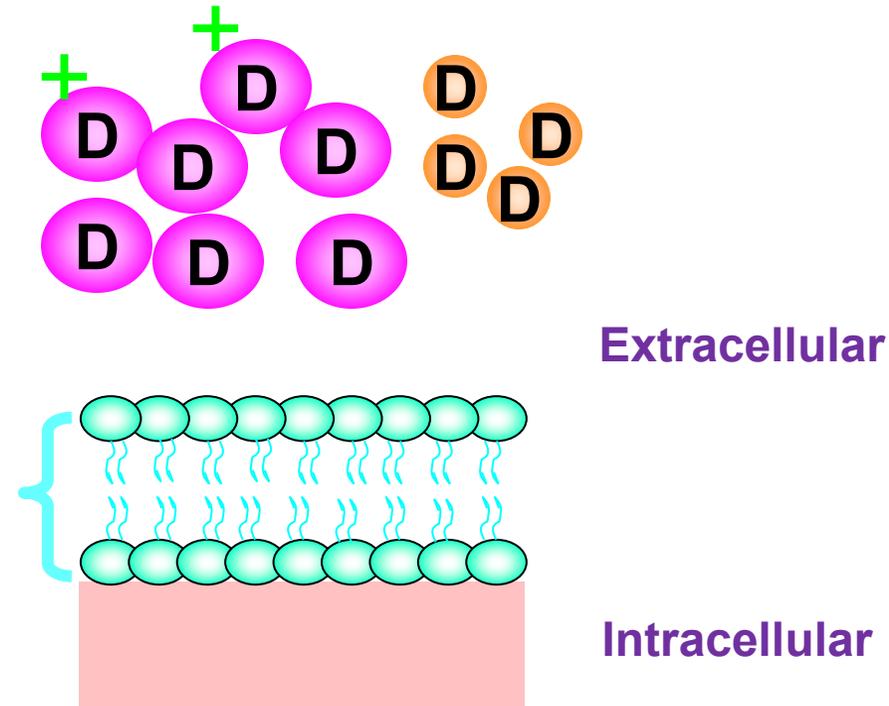
# 1) Passive transfer

## A. Simple diffusion

For **lipid-soluble molecules**: through **the lipid layer** driven **along concentration gradient**

It depends on:

- Concentration gradient
- Molecular size
- Degree of ionization
- Lipid solubility
- Thickness of membrane



Chief process involved in absorption and distribution of drugs

# Lipid solubility

It is measured by:

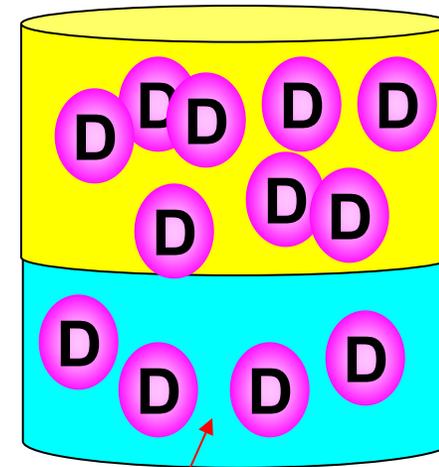
**Lipid / water partition coefficient**

It is a Ratio of drug

Concentration in **lipid phase**

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Concentration in **water phase**

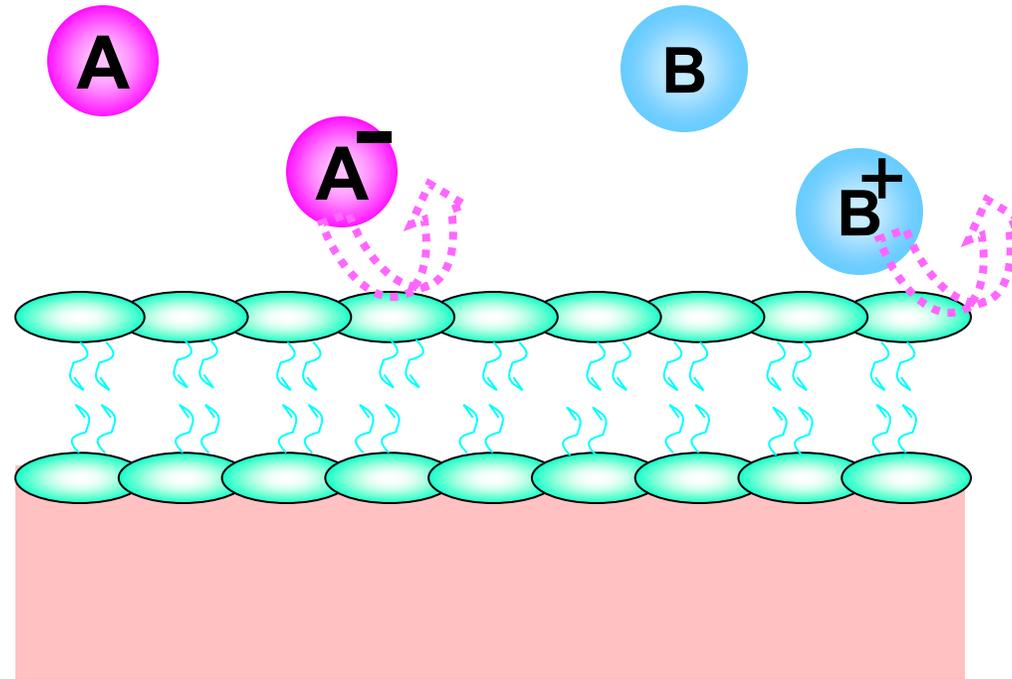


**one immiscible  
lipid/water system**

# Degree of ionization

weak acids

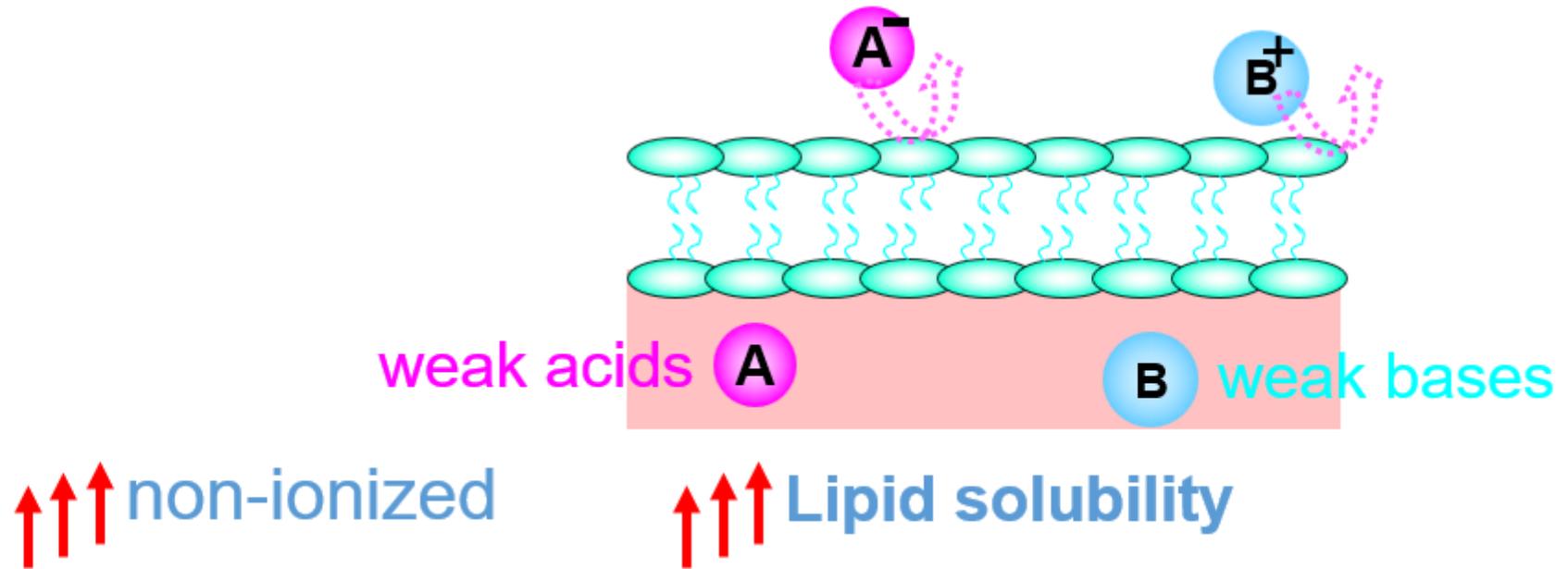
weak bases



↑↑↑ non-ionized

↑↑↑ Lipid solubility

# Degree of ionization



## A] Simple Diffusion

***Factors Affecting Simple Diffusion = The easier to pass:***

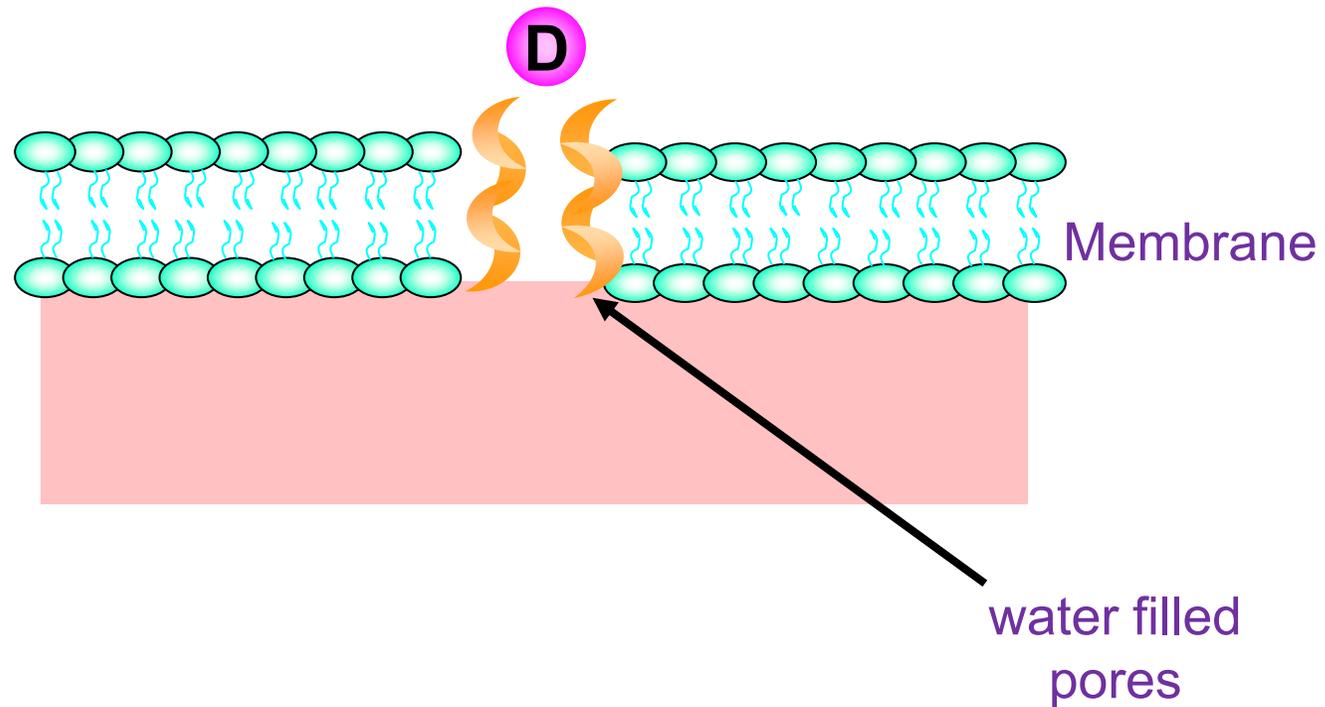
- 1- Concentration gradient** = Drugs pass ALONG concentration gradient
- 2- Molecular size** = The smaller, the easier to pass
- 3- Lipid solubility** = The more lipid soluble, the easier to pass
- 4- No energy**
- 5- No carrier**
- 6- Ionization** = The less ionized, the more lipid soluble, the easier to pass



# 1) Passive transfer

## B. Filtration

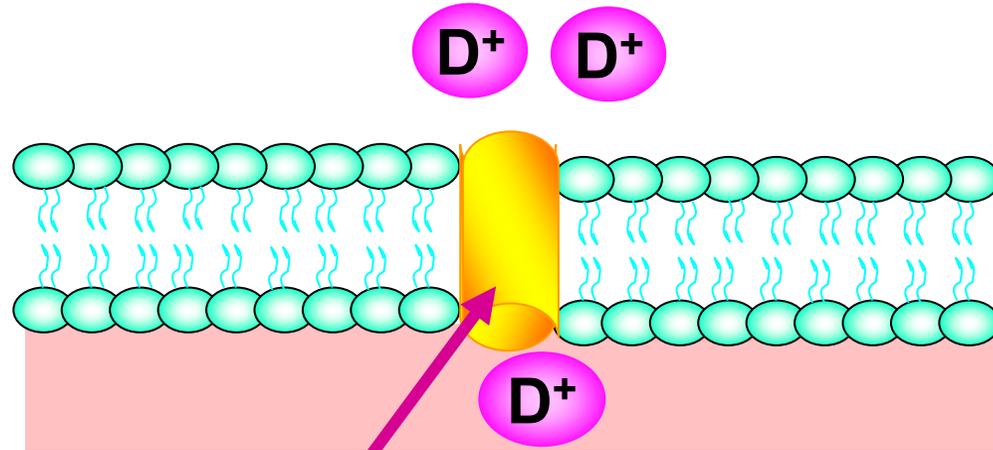
For **water soluble molecules**: through the **aqueous pores** along concentration gradient



## 2) Specialized transport:

### a. Facilitated diffusion:

For **large molecules**: through specialized transmembrane **carrier proteins** that facilitate their passage **along concentration gradient**



Too large  
Poorly lipid soluble  
Require:  
• Carrier

**Carrier**

(Membrane transporters)

**e.g. Glucose uptake by cells**

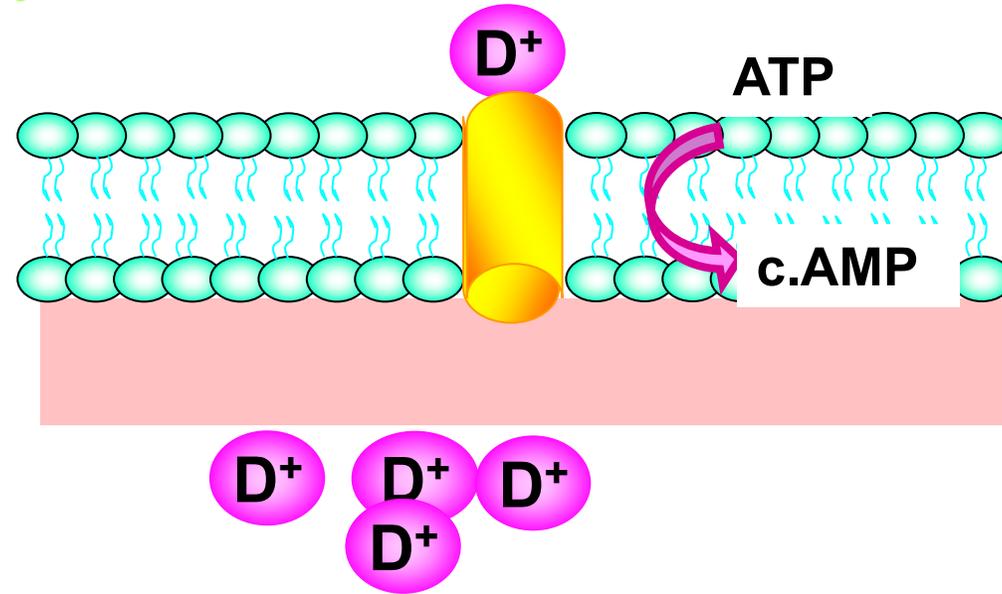
## 2) Specialized transport:

### b. Active transport:

Against concentration gradient

Require:

Energy & Carrier

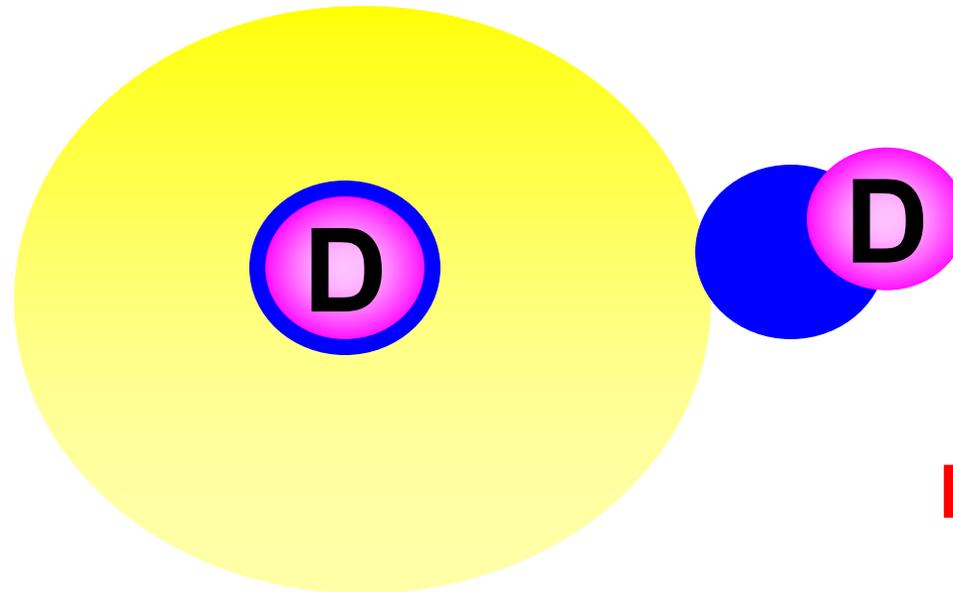
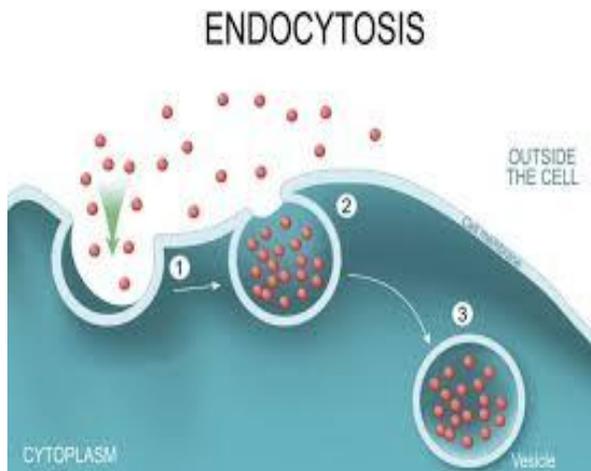


e.g. Penicillin excretion by renal tubules “Active tubular secretion”

### 3) Specialized transport:

#### c. Endocytosis:

where large molecules are engulfed inside cells,  
e.g., absorption of B12 and intrinsic factor.



**Energy dependent**

# Mcqs

**1. The study of absorption, distribution, metabolism and excretion of drug is known as:**

- (a) Pharmacy
- (b) Pharmacokinetics
- (c) Pharmacodynamics
- (d) Pharmacopoeia

**2. The science which is concerned with the study of mechanism of action of drug and pharmacological effects produced on the human body is known as:**

- (a) Pharmacokinetics
- (b) Toxicology
- (c) Pharmacology
- (d) Pharmacodynamics





# Mcqs



**3. The main mechanism of most drugs absorption through GIT is:**

- (a) Active transport
- (b) Passive diffusion
- (c) Filtration
- (d) Endocytosis and exocytosis

**4. The hydrophilic drug has the following property :**

- (a) Low ability to penetrate through cell membrane lipids
- (b) Penetrate through membranes by endocytosis
- (c) Cant pass through membranes water pores
- (d) Easy permeation through blood brain barrier





**Thank You**

