



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 للوقاية
3. **Diagnosis** ↴

لعطاء دواء معين لاكتشاف وجود مرض معين

1- Introduction

Drug Nomenclature

1] Chemical Name: -

= Description of chemical structure
N-acetyl- ρ -aminophen

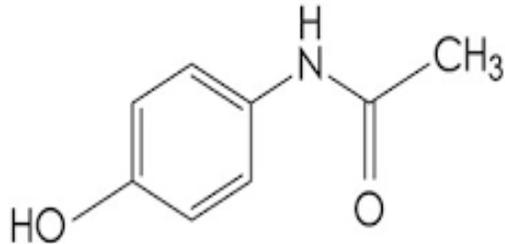
2] Generic Name: -

- Paracetamol

3] Trade Name: -

= Name given by individual drug companies

- Paramol
- Panadol



acetaminophen (C₈H₉NO₂)

shutterstock.com - 2493769801



- 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)

→ ادویہ جو انہیں (سے) لے کر دیکھنا چاہیے انہیں دیکھنا

1- Introduction

Source of Drugs

1] Plant: -

Leaves of Belladonna ▶ Atropine

2] Mineral: -

- Magnesium sulfate (MgSO₄)
- Radioactive Iodine (¹³¹I)

3] Animal: -

- Cow ▶ Heparin

4] Micro-organism: -

- Penicillium fungus ▶ Penicillin

5] Synthetic: -

- Aspirin
- Sulfonamides

6] Biotechnology: -

Genetic engineering ▶ Human insulin



1- Introduction

Pharmacokinetics

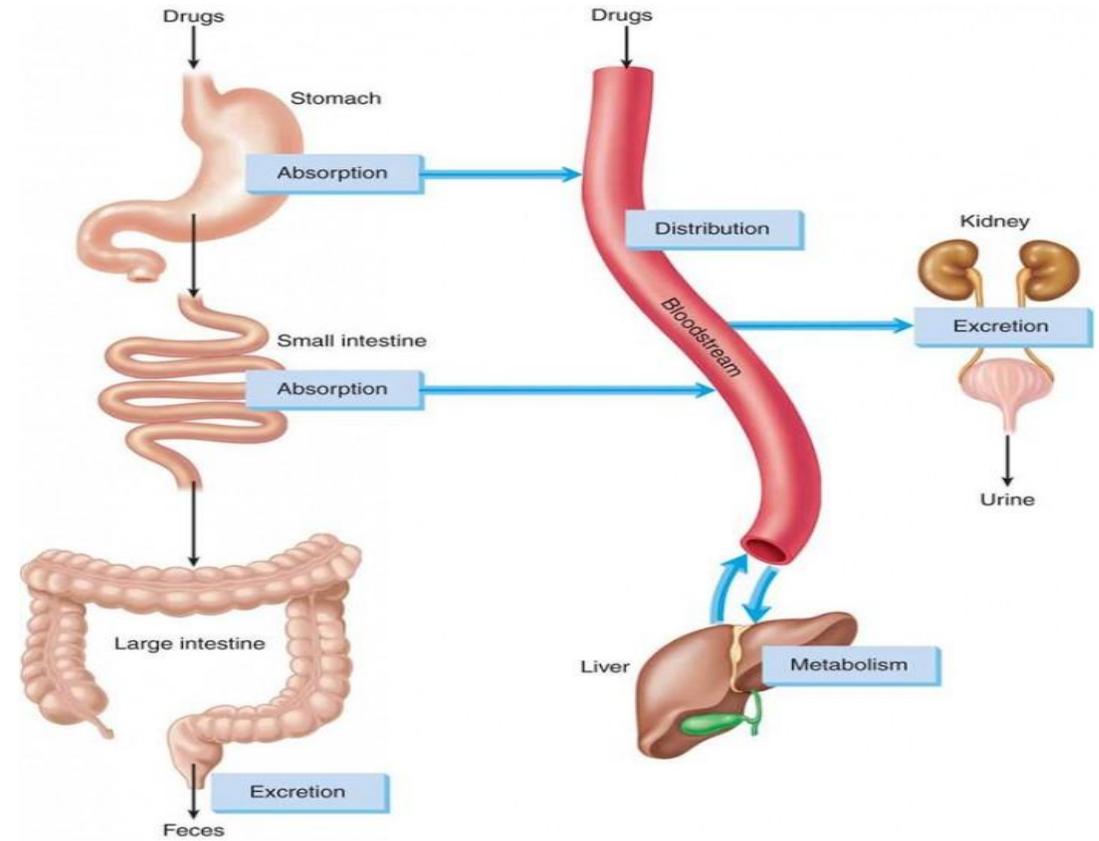
What the body does to the drug?

1. Absorption
2. Distribution
3. Metabolism → in liver
4. Excretion → by kidney

Pharmacodynamics

What the drug does to the body?

1. Mechanism of action
2. Pharmacological actions
→ analgesic
↓ temperature





1- Introduction



Pharmacotherapeutics

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

اختيار الدواء بناءً على الصعوبات المتوقعة
← كين اختيار الدواء المناسب



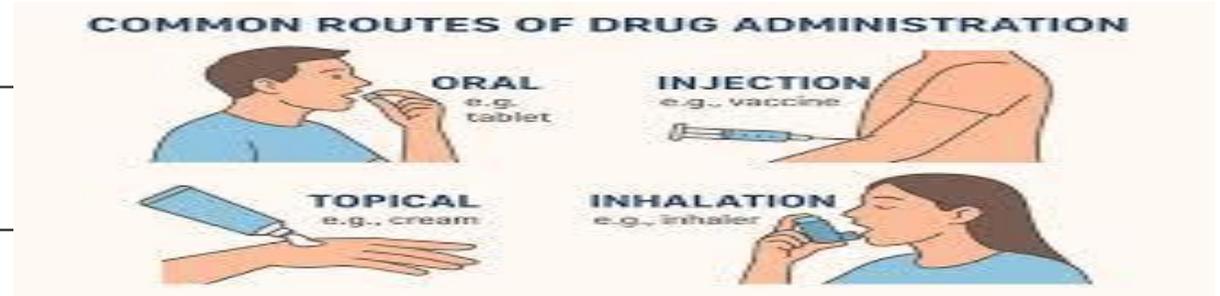
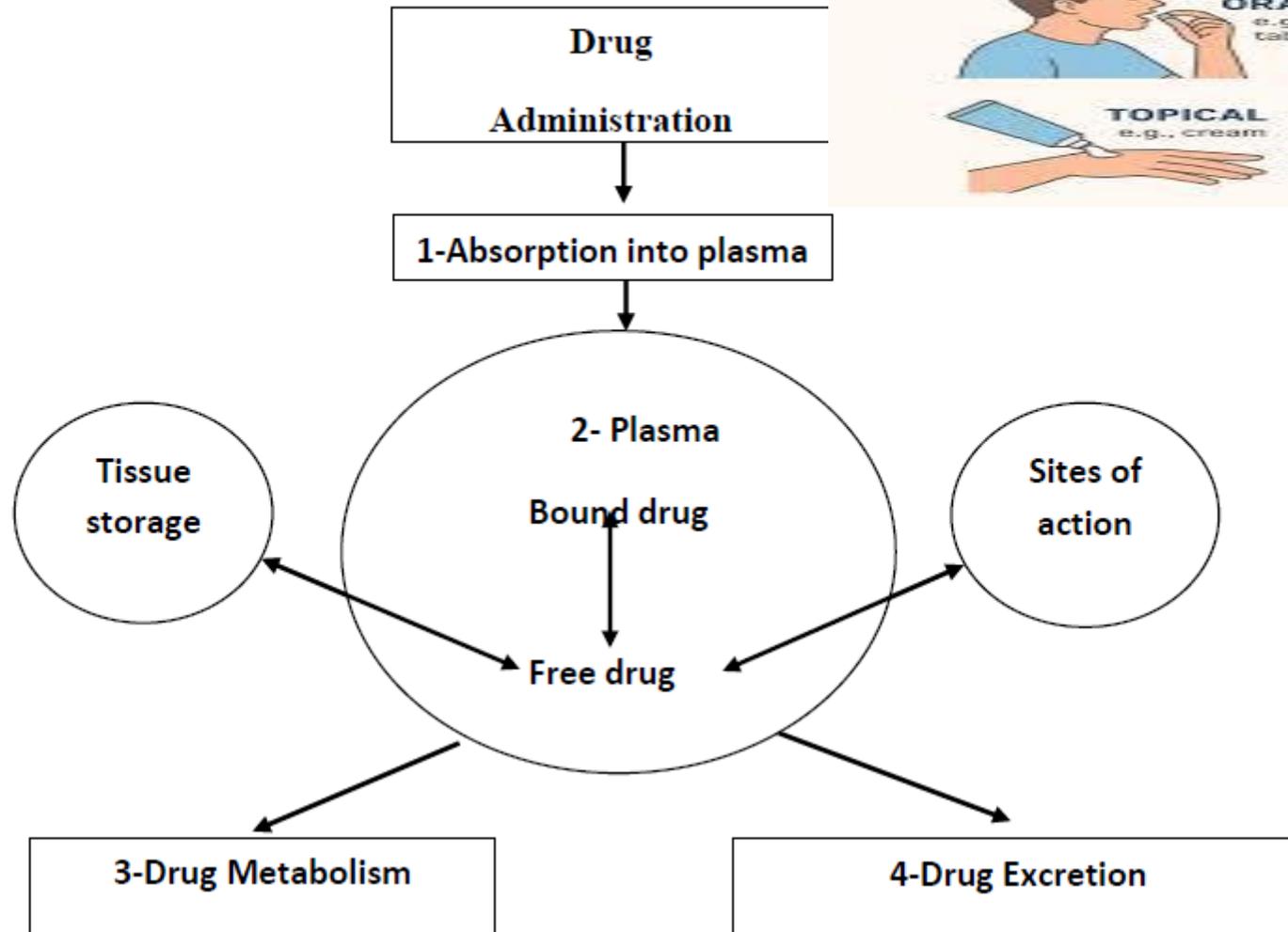
Toxicology

Study of side effects of drug

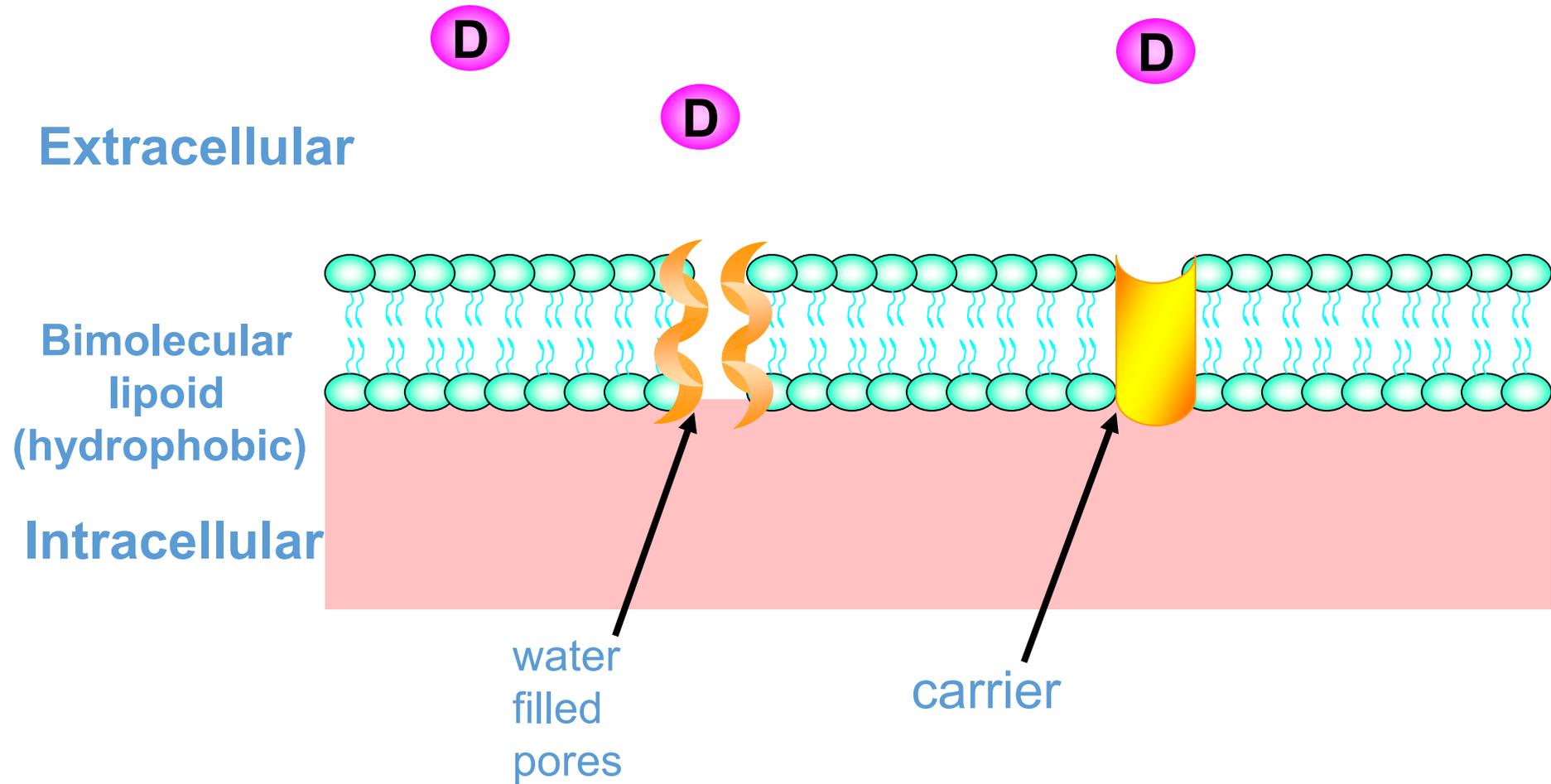


Pharmacokinetics

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

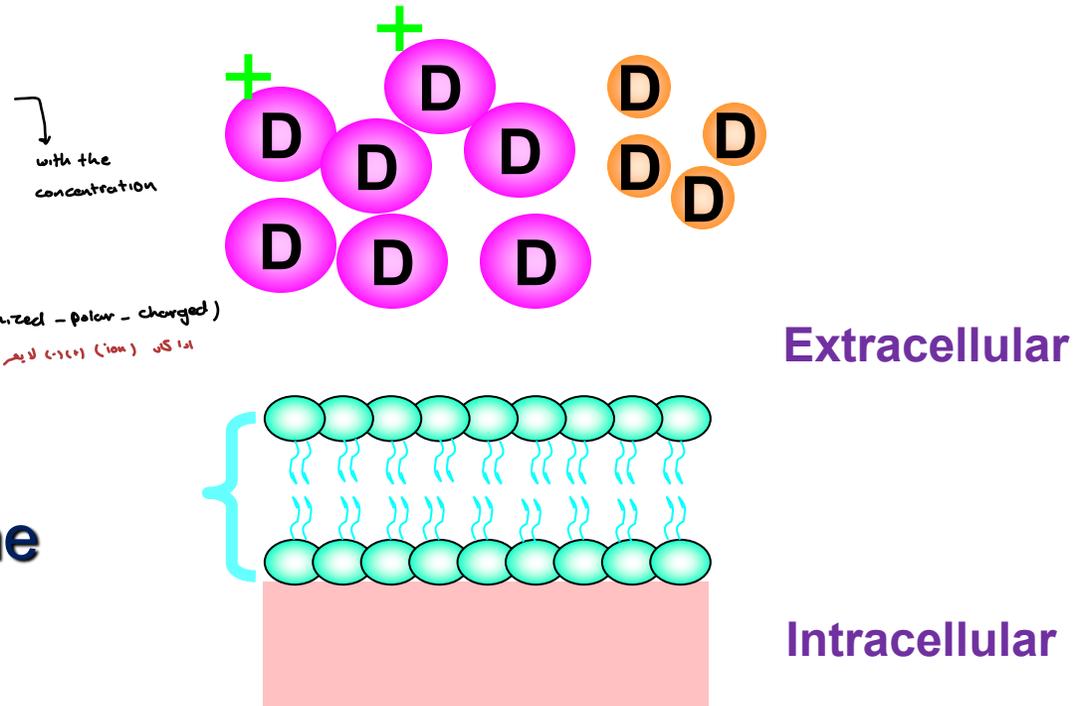
A. Simple diffusion

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

لأنه يجب أن يكون قليل
أو ينتشر بسهولة عن طريق الـ (Alveoli)
من الجلد أو أن الجلد أحمك



Chief process involved in absorption and distribution of drugs

Lipid solubility

It is measured by:

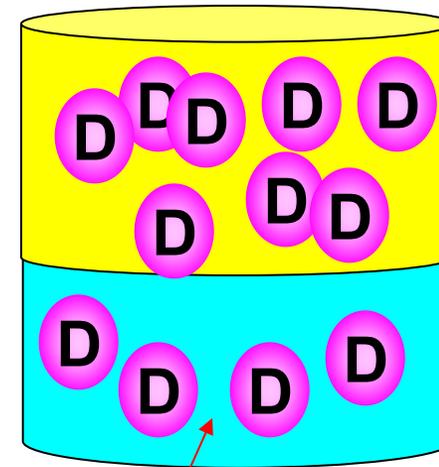
Lipid / water partition coefficient

It is a **Ratio of drug**

→ إذا كانت النسبة عالية
يكون lipid soluble
 $R = 100 / R = 5$
↓
more lipid soluble

Concentration in **lipid phase**

Concentration in **water phase**

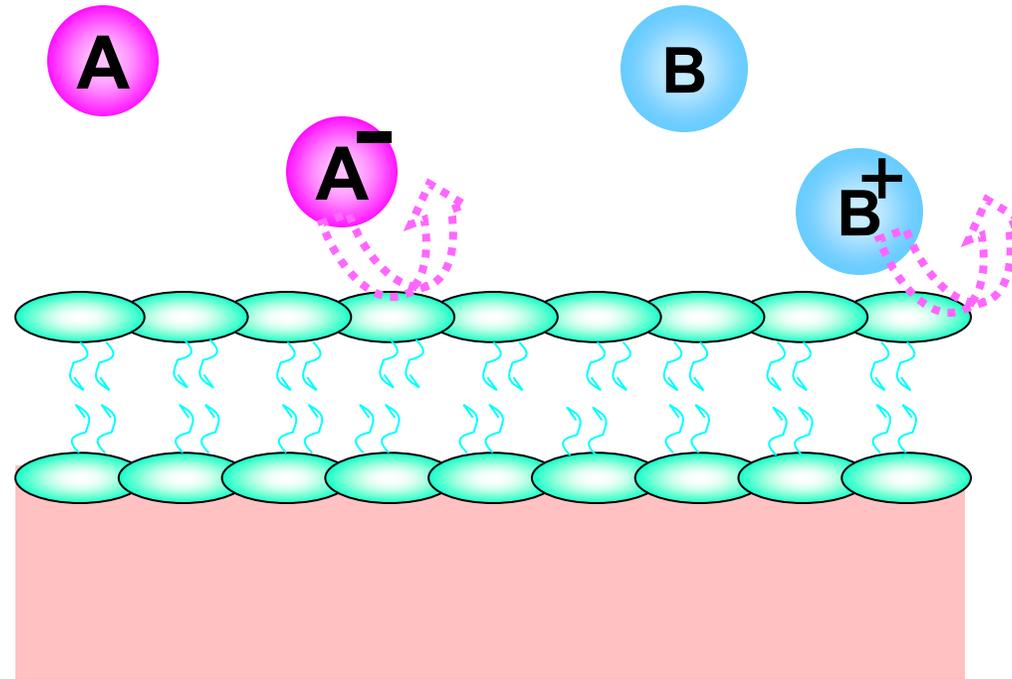


**one immiscible
lipid/water system**

Degree of ionization

weak acids

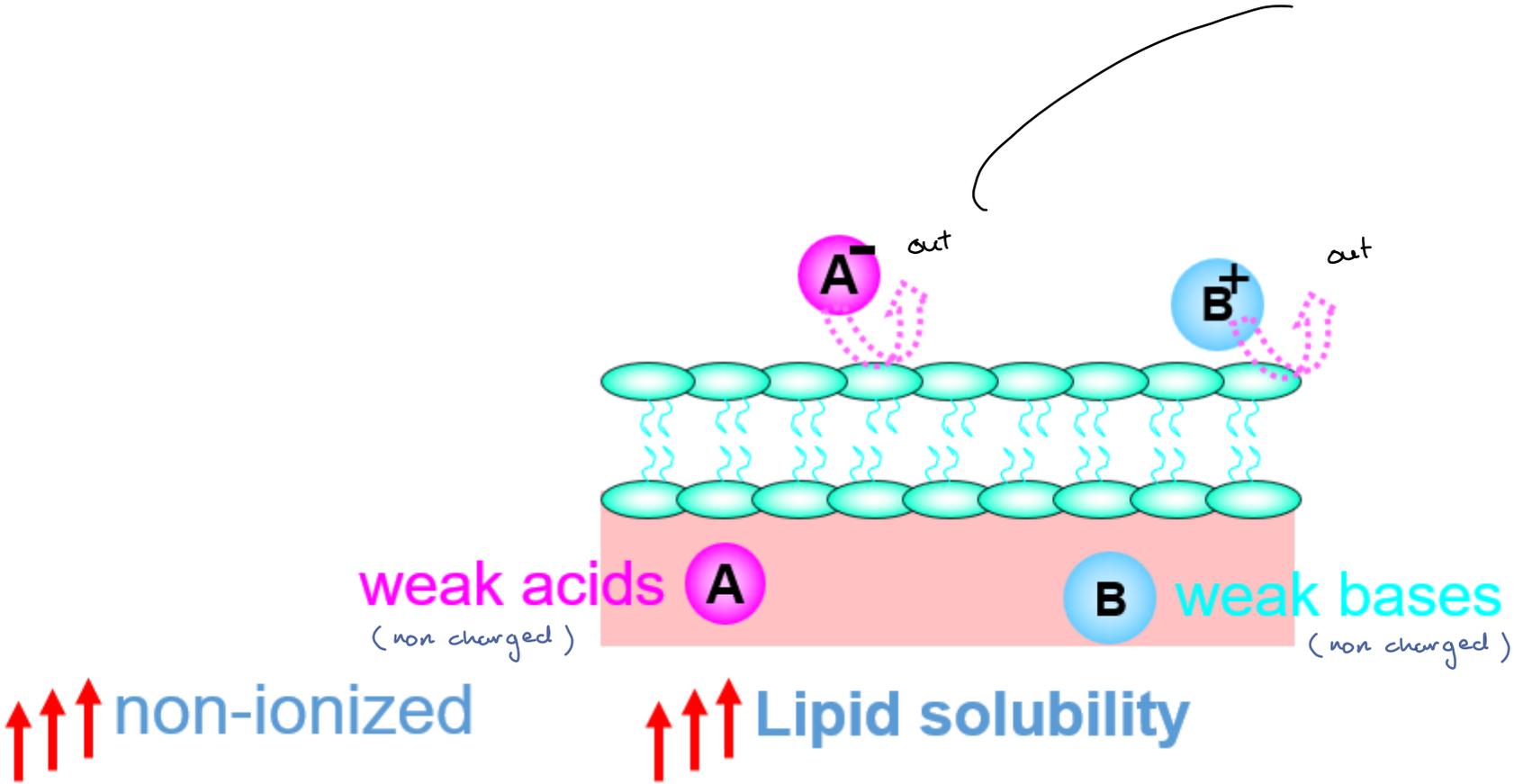
weak bases



↑↑↑ 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

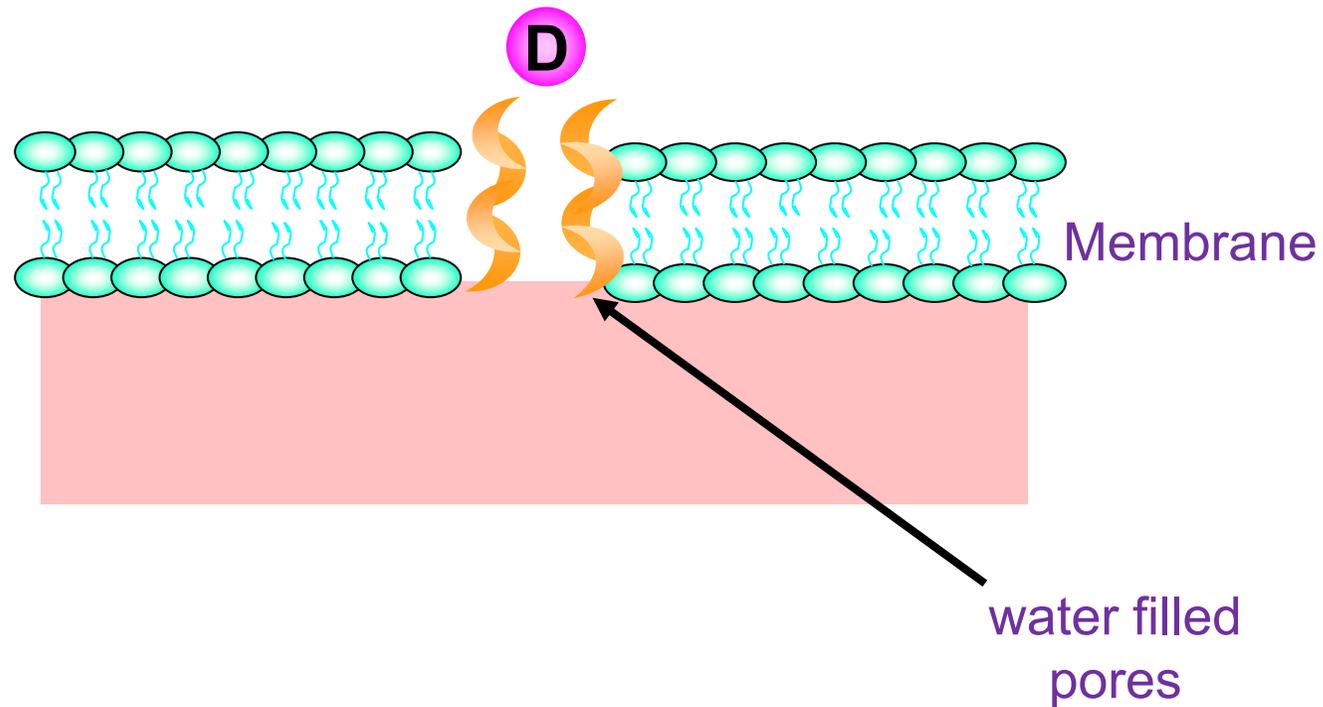
6- Ionization = The less ionized, the more lipid soluble, the easier to pass



1) Passive transfer

B. Filtration

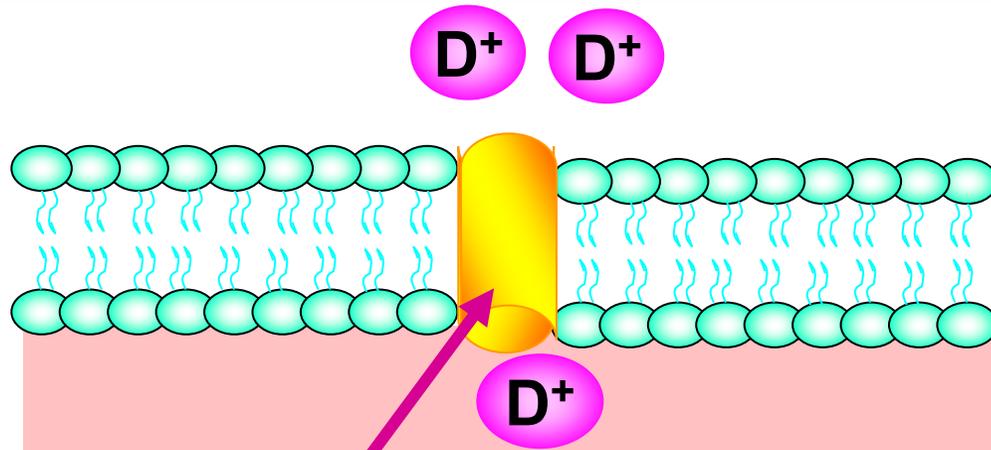
For **water soluble molecules**: through the **aqueous pores** along concentration gradient



2) Specialized transport:

a. Facilitated diffusion:

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



Carrier

(Membrane transporters)

Too large

Poorly lipid soluble

Require:

- Carrier

e.g. Glucose uptake by cells

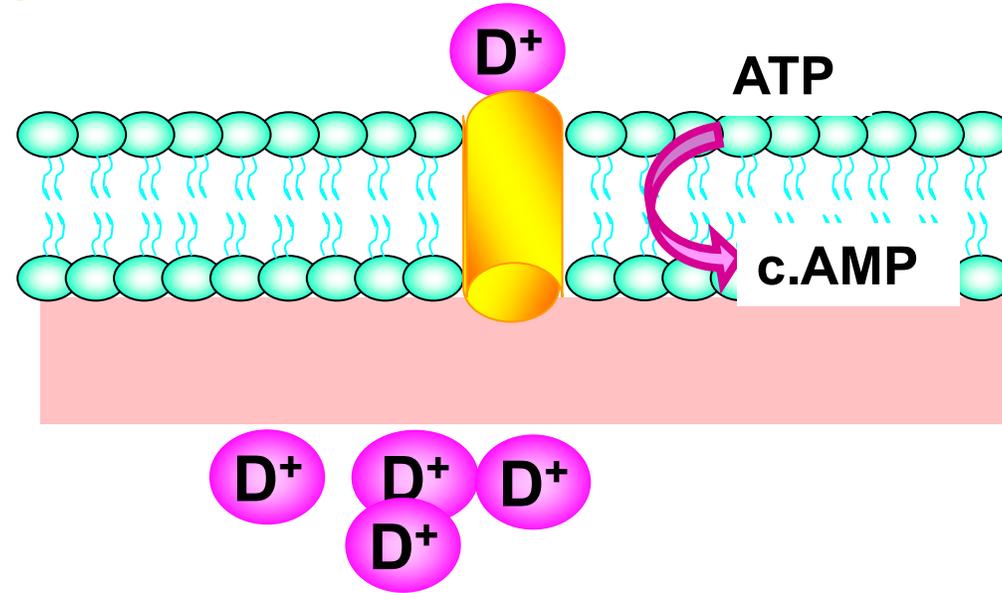
2) Specialized transport:

b. Active transport:

Against concentration gradient

Require:

Energy & Carrier

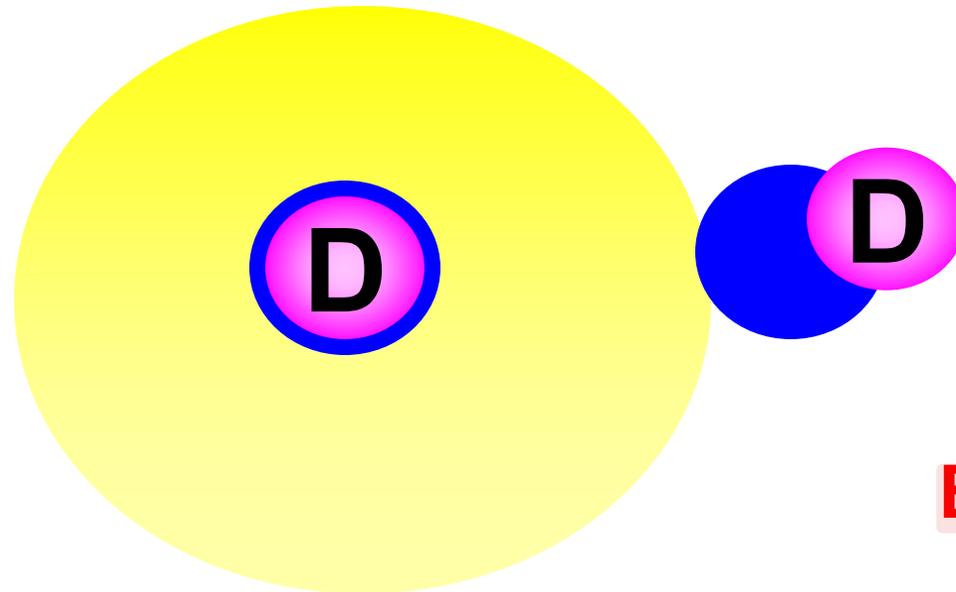
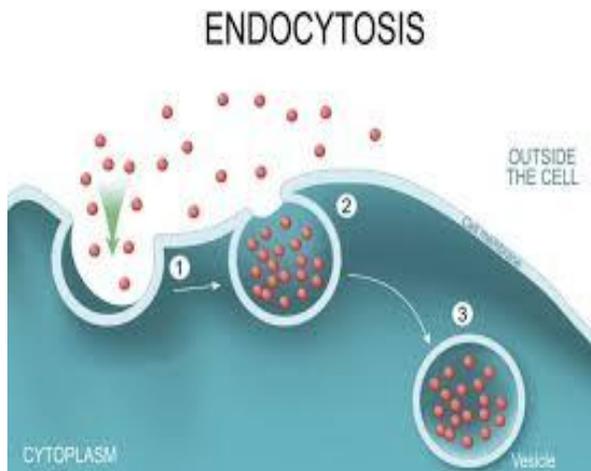


e.g. Penicillin excretion by renal tubules “Active tubular secretion”

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

← لا يحتوي على

water pores

(حالي منهم)

او يجد ان يكون

lipid soluble

لاختران ل (BBB)





Thank You

