Al-Azhar University-Gaza
Department of Pharmaceutics and industrial Pharmacy

Final exam
Biopharmaceutics and Pharmacokinetics (1)

مركز الدراسة ①

اسم الطالبة

Sections	Marks
Short section	/20
Second section	/20
Third section	/20
Total	/60

Answer the following questions please:

Section 1:

Put true or false and fill the table in the following page please:

F 1. Increasing the concentration and by increasing the viscosity of the medium the bioavailability of the drugs administered by the intranasal route of administration decreases. increase

T 2. By increasing the thickness of the stagnant layer formed around the solid particles decreases the dissolution rate and so decreases the bioavailability of the drugs.

F 3. According to Gibbs-Donnan equation the dissolution rate should be increased by increasing the specific surface area of the particles which should be achieved by particle size reduction.

F 4. The cholinergic drug decreases the motility and secretion and so, the gastric emptying rate which obeys first order kinetics.

T 5. Increasing the intestinal motility affects positively the passive transport and negatively the active transport of the drugs.

F 6. By increasing the amount of water in the stomach, the residence time of the drugs decreases, the acidity decreases and the gastric emptying rate decreases.

F 7. The liberation of the drugs from the suppository bases should be increased by increasing the solubility of the drug in the vehicle and by increasing the spreading capacity.

T 8. The dissolution rate for the drugs that has a high aqueous solubility is rapid and the rate limiting step is the rate at which the drug crosses the cell membrane.

F 9. Minimize first pass-metabolism of the drugs and so enhanced bioavailability of the drugs when the rectal route of administration is used.

F 10. The ideal suppository base should have high water number, stable on storage conditions and to be in a meta-stable form.

F 11. Decreasing the particle size of the drugs when the rectal route of administration is used increases the bioavailability of the drugs because it increases the liberation phase from the vehicle.

F 12. The hydrosoluble drugs incorporated in a liposoluble bases gives slow release, bad absorption and local effect.

F 13. The amorphous zinc insulin suspension has larger onset time of action and shorter duration of action rather than the crystalline zinc insulin suspension.

Section 2

Answer the following short questions?

1. **Give two disadvantages of the rectal route of administration?**

- low surface area Compare intestine (permiability)
- spacific techneq. (choose base - stering condition , ...)
- microbial degradation
- less acceptable by patient
- veriability Content.

2. **How the vaginal absorption of the drugs can be Improved?**

- use Pentration enhancer CMC
- use. mucoadherance polymer. carpacol
- increase. viscosity of product

3. **Give the definition of the first-pass effect and which is the route that much suffers from it?**

First pass effect → Portal circulation which make degradation and detoxification of subs. by liver enzyme

- route: gastric ,.. intestinal. rectal at (ascending and transverse. Colon).

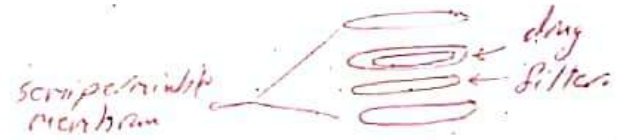
4. **What is the eutectic mixture and why it should be used?**

eutectic mixture : Combination bet. 2 ch. Comp. which Compatible together to make new Comp. have M.P lower than lowest one.

- use to decrease MP. ⟶ increase absorption of subs. in intestine

5. **What is the ocusert p-40?**

- multi layer dosag form. have pilocarpin - 40 mcg/hr release.
- use for 7 day



6. **Explain how the Isotonicity affects the intramuscular absorption?**

isotonic prevented dehydration cell and decrease Pain

hypertonic ⟶ shrinking cell (stuning) ⟶ Pain.

hypotonic ⟶ swollen ⟶ pain . cluster.

14. The Intraocular availability decreases when blinking of the eye and increasing the age of the patient.

15. By increasing the concentration of the drug and the specific surface area of the drug the rate of absorption should be increased according to Michaelis-Menten equation. first like low

16. The presence of food when the cephalosporin's are administered should reduce the rate and the extent of absorption.

17. Unionized substances that are lipid soluble are poorly absorbed and completely ionized drugs like quaternary ammonium and sulfonate derivatives are poorly absorbed.

18. After the intramuscular administration of the drugs the binding of the drugs to the muscle protein prolong the biological half- lives of the drug in the body.

19. The activated charcoal should be used because of its very specific absorptive properties.

20. The onset time of action when the drug is administered by the sublingual route of administration is the faster route after the intravascular administration route.

Q	A	Q	A
1		11	
2		12	
3		13	
4		14	
5		15	
6		16	
7		17	
8		18	
9		19	
10		20	

7. What are the properties of the vehicle used for the intranasal preparation posses?

- non irretant and non toxic
- inert and Compitable with drug.
- easy fibration drug.
- increase viscosity to make ↑ Contact time

8. Explain the mechanisms of the absorption enhancers?

1- inhibite enzyme degradation
2- inhibite mucous secretion
3- decrease viscosity.
4- increase transcellular
5- increase paracellular

9. How the pH and the pKa of the drugs affects the ocular permeation?

pH affect to irritation of eye tissue and effect to ionization of drug

- non ionize drug ⟶ pentration
- ionize drug ⟶ not pentrate

10. Explain how the tonicity affects the corneal permeability?

- isotonic ⟶ perfect to prevented irretation
- hypertonic ⟶ staning ⟶ decrease permiability.
- hypotonic ⟶ increase permiability.

Section 3

1. **Mention and explain in details the factors affecting the intranasal absorption?**

[1] physiochemical factor of drug
- structure modify.
- polymorphesim
- Mut
- solubility - dissolution rate
- lipophilicity.

[2] Formulated Factor.
- volum. 100 ml.
- P.S 10 - 20 Mm
- isotonic
- buffer agent
- surface area
- deposition of Drug.
- excipiant
  - humectant
  - viscosity modifier
  - emulsifier
  - anti oxidant
  - preservative
  - buffer agent

[3] biological factor.
- membran permiability
- viscularization
- mucous flow rate
- mucus content
- pH 5.5 - 6.5
- thickness membran.
- binding protein

2. Mention and explain in details the factors affecting the IM Absorption?

1- blood supply
2- dissolution and solubility.
3- pH and pKa
4- protein binding.
5- sex.
6- viscosity. (hyaluronidase)
7- disease state
8- vol. 2-4 ml
9- formula susp. - oil . eq:
10- tonicity.

4. **Mention the advantages and disadvantages of the ocular route of administration?** and facts affected.

advantage

- self administration
- free pain
- [illegible] compliant (acceptable)

3. Mention and explain in details the factors that affect the deposition of the drugs in the various regions of the respiratory tract.

DEPARTMENT OF PHARMACEUTICS AND INDUSTRIAL PHARMACY

Biopharmaceutics and Pharmacokinetics (1)

FINAL EXAM

DATE: 26/06/[redacted]

TIME: 120 MIN

اسم الطالب: [redacted]

Sections	Marks
Section 1	/40
Section 2	/30
Section 3	/30
Total	/100

F 17. The rate of emptying rate of a material from the stomach is inversely proportional to the volume of the material in the stomach and obey first-order kinetics.

T 18. For the drugs that has low density, it s preferable that the bases to crystallize rapidly to prevent the settling of the particles.

T 19. The presence of the surfactants in the formulation action mechanism is to increase the solubility of the drugs and enhaces its bioavailability.

F 20. By decreasing the particle size, increasing the drug concentration and increasing the density of the gas the drugs bioavailability increases after the pulmonary drug administration.

T 21. The Biopharmaceutics should be defined as the science that examines the interrelationship of the physicochemical properties of the drug and the route of administration on the rate and extent of systemic drug absorption.

T 22. The presence of the viscosity enhancers reduces the surface tension of the tear film and increases the contact time with the drug and decreases the drainage rate.

F 23. For highly aqueous soluble drugs the rate limiting step is the rate of the libration from the dosage form.

T 24. The rectal formulations formed from a liposoluble bases with liposoluble drugs give slow release, good absorption and systemic effect.

10. The nasal route of administration has all of the following advantages except:
    A. First-pass metabolism is absent.
    B. Rapid drug absorption and quick onset time of action can be achieved.
    C. Drug degradation that is observed in the GIT is absent.
    D. The bioavailability for large drug molecules is good.
    E. Convenient for the patients on long term therapy.
11. The liberation of the drug from the suppository bases should be increased by:
    A. Increasing the viscosity of the vehicle.
    B. Increasing the solubility of the drug in the vehicle.
    C. Decreasing the particle size of the drug.
    D. Decreasing the spreading capacity.
    E. None of the above answers.
12. Differences in bioavailability are most frecuently observed with drugs administered by the following routes:
    A. Subcutanous.
    B. Intravenous.
    C. Oral.
    D. Sublingual.
    E. Intramuscular.
13. Which of the following drugs undergo marked hydrolysis in the GI tract?
    A. Aspirin
    B. Penicillin G
    C. Acetaminophen
    D. Hydrocortisone
    E. Chlortetracycline
14. Drugs that are absorbed form the GIT are generally:
    A. Absorbed into the portal circulation and pass through the liver before entering the ge circulation.
    B. Filtered from the blood by the kidney, and then reabsorbed into the general circulatic
    C. Absorbed into the portal circulation and are distributed by an enterohepatic cycle.
    D. Not affected by liver enzymes.
    E. Stored in the liver.
15. According to pH partition theory, a weakly acidic drug will most likely be absorbed from stomach because:
    A. The drug will exist primarily in the unionized, more water - soluble form
    B. The drug will exist primarily in the ionized, more water - soluble form
    C. Weak acids are more soluble in acid media
    D. The ionic form of the drug facilitates dissolution
    E. A + B
16. Activated charcoal is used because of which of its:
    A. Neutralizing properties.
    B. Emetic properties.
    C. Absorptive properties.
    D. Adsorptive properties.
    E. Stabilizing properties.

Section 1 (40 Marks)

A. Put true or false please: (24 marks)

(انقل الاجابة الى الجدول رقم ١ الموضح فى الصفحة رقم ٥)

1. Increasing the amount of water in the stomach decreases the residence time, decreases the viscosity of the medium, decreases the acidity and increases the gastric emptying rate. T
2. The absorption of the drugs administered by rectal route of administration is limited because of the small surface area which should be increased by using of meta-stable form bases. F
3. The rate and extent of the drugs decreases after the oral administration for solutions > capsules > suspensions > tablets > coated tablets. F
4. By increasing the concentration and by increasing the viscosity of the medium the bioavailability of the drugs administered by the intranasal route of administration decreases. F
5. By decreasing the thickness of the membrane, decreasing the tear turnover and decreasing the ocular clearance the corneal permeability increases. T
6. Cholinergic drugs increases the secretion and motility and thus increases the gastric emptying rate. T
7. The hydrates forms are less soluble that the anhydrous forms and with decreased dissolution rates. T
8. Reduced rate of the gastric emptying rate gives delayed onset time of action. T
9. The presence of food on the gastrointestinal absorption reduces the rate but not the extent of the absorption of the Cephalosporines.
10. The formulation of the rectal suppositories contains hydrosoluble drug with a liposoluble base gives slow release, local effect and bad absorption. F
11. The peak concentration is the difference between the onset time and the time for the drug to decline back to the minimum effective concentration. F
12. After the intramuscular administration of the drugs the rate of absorption is uniform and the onset time of action is rapid, which is increased when the drugs binds to the muscle proteins. F
13. The amorphous zinc-suspensions insulin has shorter onset time than the crystalline zinc-suspensions insulin and longer duration of action. F
14. Increasing the stagnant layer formed around the solid particles increases the dissolution rate of the drugs and thus enhance its bioavailability. F
15. The penetration enhancers increases the contact time between the dosage forms and the vaginal membrane and thus increasing the biovailability. F
16. According to the Gibbs-Donnan equation the dissolution rate should be increased by increasing the specific surface area which should be achieved by particle size reduction. F

B. MULTIPLE CHOISES (16 marks)

(انقل الاجابة الى الجدول رقم ٢ الموضح فى الصفحة رقم ٥)

Select the ONE lettered answer or completion that is BEST in each of the following cases:

1. The rate of change in the amount of drug in the body is a function of the:
   A. Rate of adsorption.
   B. Rate of elimination.
   C. Size of the dose administered.
   D. Both A and B.
   E. Amount of unabsorbed drug in the G.I.T.

2. Which one of the following statements concerning active transport is NOT correct?
   A. Consume energy.
   B. May be adversely affected by certain chemicals.
   C. Is structure specific.
   D. Reach equilibrium faster than passive transport system.
   E. Can become saturated.

After oral adminstration, drugs generally are absorbed best from the:

A. Buccal cavity .
B. Stomach .
C. Duodenum .
D. Ileum .
E. Rectum..

In which of the following absorption mechanisms the drug must-not to be in an aqueous solution in order to be absorped:

A. Passive diffusion.
B. Ion pair.
C. Active transport.
D. Facilitated diffusion.
E. Pinocytosis.

Minimize first-pass effect is the advantage of the following route of administration:

A. Pulmonary route of administration.
B. Oral route of administration.
C. Vaginal route of administration.
D. Intravenous rote of administration.
E. Rectal route of administration.

The pH of the vehicle of the nasal preparations is:

A. 5-7 5,5 - 6.5 adult
B. 6-8
C. 3-4.
D. 7-8
E. None of the above answers.

In which of the following anatomical zones the pores should has a considerable importance in the passive diffusion:

A. Gastric mucosa.
B. Small intestine.
C. Large intestine.
D. Sublingual.
E. Intramuscular.

Most drugs are:

A. Highly ionic.
B. Strong acids or bases.
C. No electrolytes.
D. Weak acids or bases.
E. None of the above answers.

The amorphous solids has the following properties:

A. Irregular external shape.
B. Increased solubility.
C. Increased stability.
D. A + B
E. B + C

B. Answer the following short q

the method of preparation affects the rectal absorption of the drugs?

preparation by molding or compression 26 دواء 3 ملزمة
use hydrosoluble base or liposoluble base which affect
to rate of release drug.

the influence of the binding agents on the GI drugs absorption?

→ binding agent may by: 1/ factor action from food such
as Ca^{+2} ⟶ ↓ avilability of tetracyclin.

2/ GI Content : such as mucin which decrease
bioavilability of streptomycin

3/ adsorption agent such as charcoal

w the Nitrofurantoin absorption is affected in the presence of food?

w the pathological state affect the intramuscular absorption of the drugs?

pathological state such as myocardial infarction or
kidney ~~effect~~ shock or circulatory shock will affect
to absorption of drug form muscle by alter blood suppl

plain how the eutectics affect the dissolution rate?

by ↓ M.P ⟶ ↓ ↑ absorption
↳ ↑ solubility. ⟶ ↑ dissolution rate

Section 2 (30 Marks)

A. Define the following please:

1. First-pass effect.

~~Portal~~ circulation which degradation and detoxification any subs after to stomake befor reach to systemic circulation

2. Stroma.

most larg layer in Cornd which have 90% of water, located between epithilium and endothelum

3. AUC. related the amount of drug reach to circulation systemic

4. Hyaluronidase.

enzyme use to break hyaluronic acid which persence in skin and muscle, which decrease viscosity of media

5. Bioavailability.

~~Study the~~ rate and extend of drug absorption

6. What is the meaning of the Ocusert p-20?

multi layer contain drug release obey. zero order kinatic. Pilocarbin 20 mcg/hr.

7. How the degree of inhalation affect the deposition of the drugs in the res tract?

8. What is a Cerumen?

Yellow ear wax. that attractant any Perign Bo. Partic

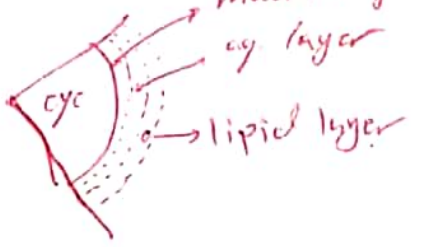
9. What are the consequences of the pH variation of the ocular administered drugs it s about 5 and 11?

5 ⟶ acidity ⟶ irritation ⟶ tear turover.

11 ⟶ irritation ⟶ tear turnover ⟶ ↓ bioavilab

10. What you know about the tear film?

tear film have 3 layer.



Section 3 30 Marks

Mention and explain in the biological and physicochemical factors (Five for each and how) affecting the pulmonary absorption?

nasal absorption.

1) Physicochemical

drug

- modify structure
- solubility and dissolution rate
- Mwt ↑ → ↓ abs.
- Polymorphisim ↑ dissolution
- lipophilicity ↑ → ↑ abs.

formula

1- ↓ vol. 100 Ml
2- size 10 - 20 Mn
3- tonisity
4- pH and buffer
5- surface area of particle
6- deposition of dr
7 excipient
8- Conc. of drug.
→ -bioactant
- osmotic agent
- viscosity modifi
- antioxidant
- preservative
- solubilizer
- absorption enh

biological

→ membrane permeability ↑ → ↑ abs
→ vasicularization ↑ → ↑ abs.
→ thickness of membran ↑ → Abs ↓
→ pH 5.5 — 6.5 → non ionize drug
→ mucus secretion ↑ → ↓ abs
→ viscosity of mucous ↑ → ↓ abs
→ protein binding ↑ → free conc only
→ mucociliary clearance ↑ → ↓ abs.
→ Pathological state ↑ → patient hyper sensitive

Mention and explain in details the factors affecting the nasal absorption?

Vaginal.

advantage

- → drug not take in GIT. because degradation
- → = make nausea and vomiting.
- → avoid first pass effect
- → self administration
- → easy termination
- → not degradation by enzyme
- → high S.A and vascularization
- → rapid onset

effect on

disadvantage

- → personal ~~hygiene~~ higany.
- → sexual intercours.
- → specially gender
- → irritation may be.
- → sensitive vigainal pH. (4-5)

Biological factor.

- Thickness membrain
- age
- pH.
- Chang cycle
- chang hormonal level
- sexual arousal

physio chemical factor

- lipophilicity.
- pH. and pKa.
- ~~viscosity~~ - molecular charg.
- ~~Mw~~ Mwt.
- Chemical natural

↑ absorption

- muco adherance polymer
- Penetration enhancer PEG
- viscosity modifier CMC

Curdacal

10

ention and explain in details the carrier-mediated transport process?

Active

- Therabiotical absorption window
- Competative
- saturation
- need energy
- opposite of Conc. gradiant

Passive

- not need energy
- with Conc. gradiant

according Mechial - menton equation

$$\frac{dA}{dt} = \frac{Vm \cdot A}{Km + A}$$

$Km >>> A$

$$\frac{dA}{dt} = \frac{Vm}{Km} \cdot A$$

$$= Kep \cdot A$$

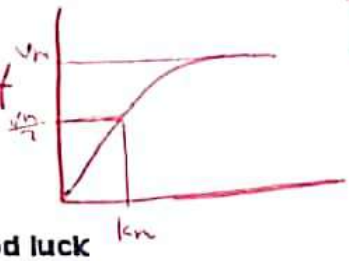
first order kinetic
dose independant

$Km <<< A$

$$\frac{dA}{dt} = \frac{Vm \cdot A}{A}$$

$$\frac{dA}{dt} = Vm$$

Zero order
dose dependant
non linear



Good luck
Dr. Issam abushammala