



INTERNATIONAL COLLEGE
OF PHARMACEUTICAL
INNOVATION

国际创新药学院

Introduction to Medicines: Pharmaceuticals 2

Course BSc(Pharm) & BSc (ATT)

Year 2024-2025 II

Module Medicines 2

Lecturer Prof. Zhiyuan Zhong

MEDICINES 2

- **Module Lecturer**
 - Dr. Zhiyuan Zhong (ICPI)
 - Dr. Congcong Xu (ICPI)
 - Dr. Shi Du (ICPI)
- **Lab Instructor**
 - Dr. Congcong Xu (ICPI)
 - Dr. Shi Du (ICPI)
- **Moodle Technical Support**
 - Yifei Qu (RCSI)

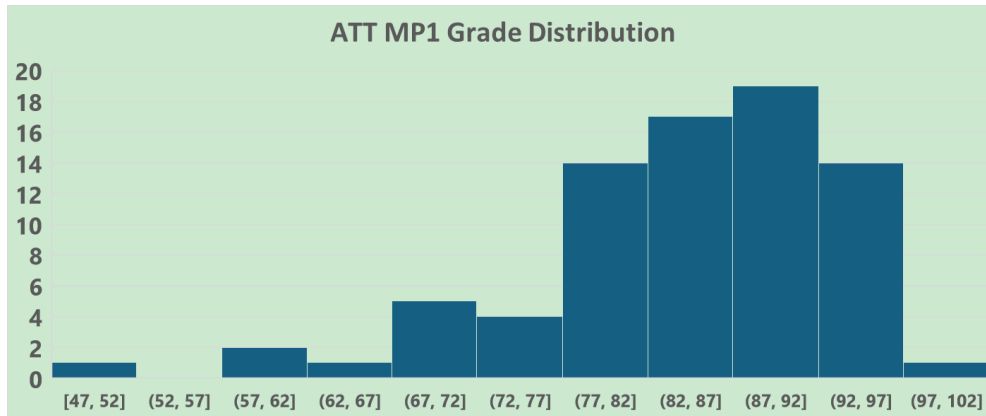


MODULE CONTENT

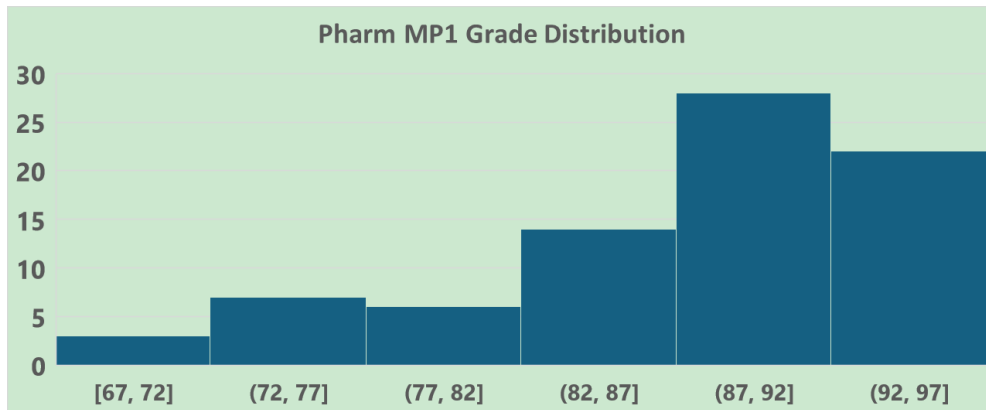
- Lectures (1h × 25)
 - On campus (Academic Exchange Room 401)
- Laboratory practicals (6 × 3 h)
 - On campus (ICPI building, third floor)
- Tutorials (1 h × 5)
 - On campus (Academic Exchange Room 401)



QUICK REVIEW OF MP1 MODULE



Highest grade: 99
Average = 84.7
4 Failed (<70)



Highest grade: 97
Average = 87.8
2 Failed (<70)



IMPORTANT STATEMENT ON INTEGRITY

ICPI has **ZERO** tolerance on academic misconduct.

Two students were found to cheat on MP1 final exam, their final exam was directly scored as 0.

We found that several students might copy other students' lab reports. Starting this semester, once the duplicate reports or assignments were found, **ALL** of them will be **scored as 0** and the involved students will be interrogated by college academic committee.



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THEMES

- Theme 1: Pharmaceutical dispersions
-
- Theme 2: Solution dosage forms and Excipients
-
- Theme 3: Interfacial Phenomena and surfactant science
-
- Theme 4: Disperse systems (colloids, suspensions, emulsions)
-
- Theme 5: Solid dosage forms and Tableting technology



LECTURES

Introduction to Pharmaceutics: Medicines 2

Solution Dosage Forms 1

Solution Dosage Forms 2

Physical and Chemical Properties of Pharmaceutical Solutions 1

Physical and Chemical Properties of Pharmaceutical Solutions 2

Physical and Chemical Properties of Pharmaceutical Solutions 3

Pharmaceutical Excipients in Solution Dosage Forms 1

Pharmaceutical Excipients in Solution Dosage Forms 2

Chemical and Microbiological Stability in Solution Dosage Forms

Disperse Systems

Interfacial Phenomena 1

Interfacial Phenomena 2

Interfacial Phenomena 3

Surfactants 1

Surfactants 2

Surfactants 3

Oral Solid Dosage Forms: From Drug to Tablet

The Influence of Physical Form on Tablet Behaviour

Material Properties of Importance in Oral Solid Dosage Forms

Particle Technology

Mixing and Flowability

Granulation

Drying

Compaction

Excipients in Solid Dosage Forms



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SUPPORT

UPLOADED MATERIALS, CLASS QUESTIONS & TUTORIALS

- Questions can be asked during lectures or the 10 minutes at the end of each lecture.
- If you are having difficulty with material, review the online materials of the session on Moodle.
- If you would like content revisited in a tutorial, email revision topics to the module lead or the class representative

Solution dosage forms Tutorial

Dispersions, interfacial phenomena, surfactants Tutorial

Solid dosage form Tutorial

Module Review Tutorial



LABORATORY PRACTICALS



- Requirements:
 - Laboratory coat
 - Safety glasses
 - Calculator
- Location
 - 6 × 3 h ICPI building (Third Floor)
 - Lab manuals will be provided in advance of the first practical
 - All finished laboratory practicals must be submitted by the due time and will be graded formatively
 - Attendance of lab practicals is compulsory



LABORATORY PRACTICAL DATES

For Pharm students:

DAY	TITLE	LECTURER
2025/3/27	Molecular Dispersions: Extemporaneous Compounding of an Unlicensed Solution Dosage Form	Xu C & Du S
2025/4/10	Coarse Dispersions: Extemporaneous Compounding of an Suspension	Xu C & Du S
2025/4/24	Estimation of the CMC	Xu C & Du S
2025/5/8	Extemporaneous Compounding of an Oral Emulsion	Xu C & Du S
2025/5/22	Dissolution Rate Test of Acetylsalicylic Acid Tablets	Xu C & Du S
2025/6/5	Preparation of ointments	Xu C & Du S

For ATT students:

DAY	TITLE	LECTURER
2025/3/28	Molecular Dispersions: Extemporaneous Compounding of an Unlicensed Solution Dosage Form	Xu C & Du S
2025/4/11	Coarse Dispersions: Extemporaneous Compounding of an Suspension	Xu C & Du S
2025/4/25	Estimation of the CMC	Xu C & Du S
2025/5/9	Extemporaneous Compounding of an Oral Emulsion	Xu C & Du S
2025/5/23	Dissolution Rate Test of Acetylsalicylic Acid Tablets	Xu C & Du S
2025/6/6	Preparation of ointments	Xu C & Du S



ASSESSMENT

- 30% Lab Practical
- 10% In-class Quiz
- 60% Summative Assessment



LAB PRACTICAL (30%)



Post Practical Quizzes & lab reports (30%)

- 10 MCQ per lab
- 6 lab practicals (each Quiz accounts for 5%)
- You are required to submit the lab report by the due date, *late submission will cause deduction in marks* (e.g., one day late submission will deduct 1 mark from the total mark).
- ***Only students that attend lab practicals can achieve marks for lab practicals****



END OF SEMESTER EXAMINATIONS (60%)



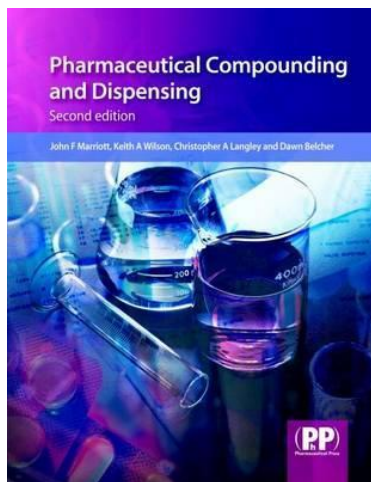
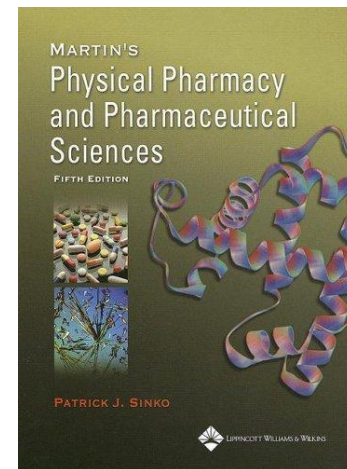
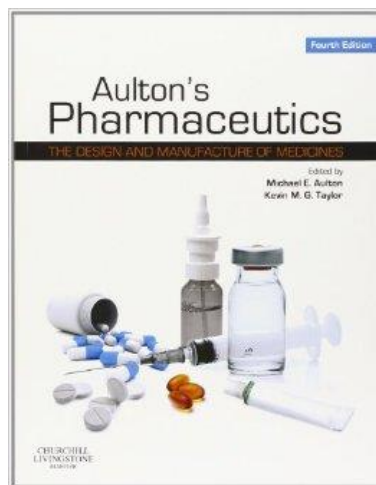
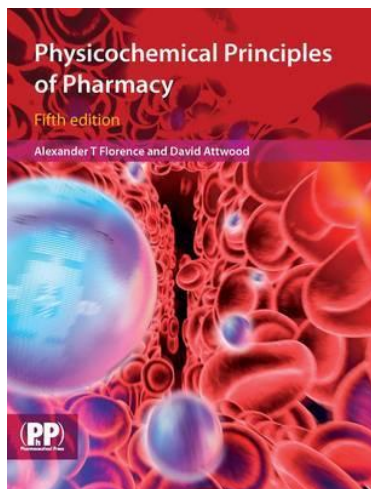
Type	Question and time	Module %
	Section B (Pharmaceutics)	
MCQs	40 (1.5 min per MCQ)	40 %
VSAQ/SAQ	10 (2.5 min per VSAQ/SAQ)	20 %

SUMMATIVE ASSESSMENT DATE: TBC



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RECOMMENDED READING



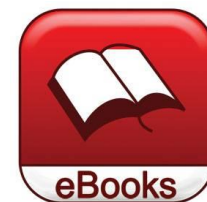
Our lecture contents are adapted from different chapters in these textbooks.

To deepen your understanding of lecture, please find the related chapters and read them.



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EBOOKS



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RCSI UNIVERSITY OF MEDICINE AND HEALTH SCIENCES

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- Save searches and create alerts
- View full search results - some databases only show results when you are signed in

<https://library.suda.edu.cn/>

Resources can be found at RCSI library or Soochow University library.

苏州大学图书馆 Soochow University Library

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AI TOOLS TO EXPLORE

We are in an era of AI, please embrace AI tools for your learning!

e.g., When we ask different AI model the same question: what is the definition of prodrug?

deepseek
Into the unknown

KIMI

ChatGPT

What can I help with?

what is the definition of prodrug

+ Search Reason

A **prodrug** is a pharmacologically inactive compound that is metabolized in the body into an active drug. Prodrugs are designed to improve the drug's properties, such as solubility, stability, bioavailability, or targeted delivery, and to minimize side effects. The conversion of a prodrug into its active form typically occurs through enzymatic or chemical processes, such as hydrolysis or metabolic reactions, within the body.

Key Characteristics of Prodrugs:

1. **Inactive or Less Active**: The prodrug itself has little or no therapeutic effect.
2. **Bioconversion**: It undergoes chemical or enzymatic transformation in the body to release the active drug.
3. **Improved Properties**: Prodrugs are designed to overcome limitations of the active drug, such as poor absorption, rapid metabolism, or toxicity.

Examples of Prodrugs:

- **Enalapril**: Converted to enalaprilat (active ACE inhibitor).
- **Levodopa**: Converted to dopamine (used in Parkinson's disease).
- **Valacyclovir**: Converted to acyclovir (antiviral agent).

Prodrugs are a valuable tool in drug design, enabling the optimization of drug delivery and therapeutic outcomes.

A prodrug is a bioreversible derivative of a pharmacologically active drug that must undergo an enzymatic and/or chemical transformation in vivo to release the active parent drug, which can then elicit its desired pharmacological effect. Prodrugs are designed to overcome challenges related to the pharmaceutical, pharmacokinetic, and pharmacodynamic properties of the parent drug. They are often used to improve solubility, permeability, stability, and bioavailability of the active drug. Additionally, prodrugs can help in targeting the drug to specific tissues or organs, thereby reducing side effects and improving therapeutic efficacy.

A **prodrug** is a compound that, when administered, is metabolized inside the body into an active drug. Essentially, it's an inactive or less active precursor of a drug that requires biotransformation to become pharmacologically active. Prodrugs are often designed to improve the absorption, distribution, or half-life of the active drug, or to reduce side effects.



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WHAT IS THE FOCUS OF MP2 DISPERSIONS



MOLECULAR
DISPERSION
(MP2)



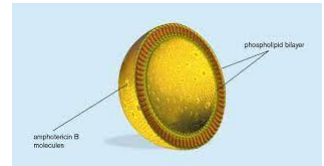
COARSE
DISPERSIONS



DISPERSIONS



**COLLOIDAL
DISPERSIONS**



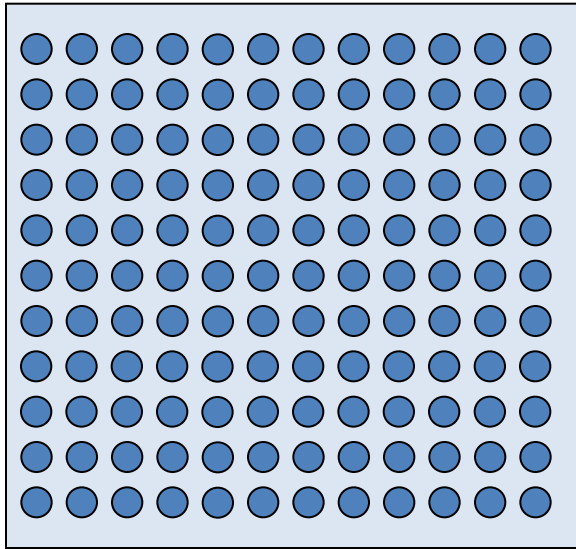
Tableting Technology



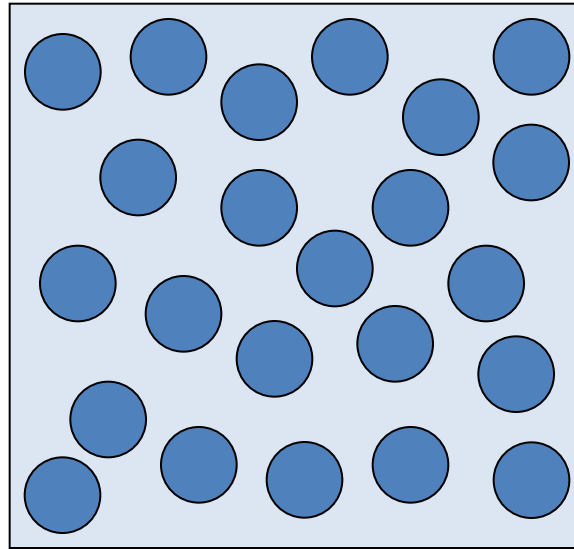
PHARMACEUTICAL DOSAGE FORMS BROADLY FALL INTO THREE KEY CATEGORIES OF PHYSICAL DISPERSION



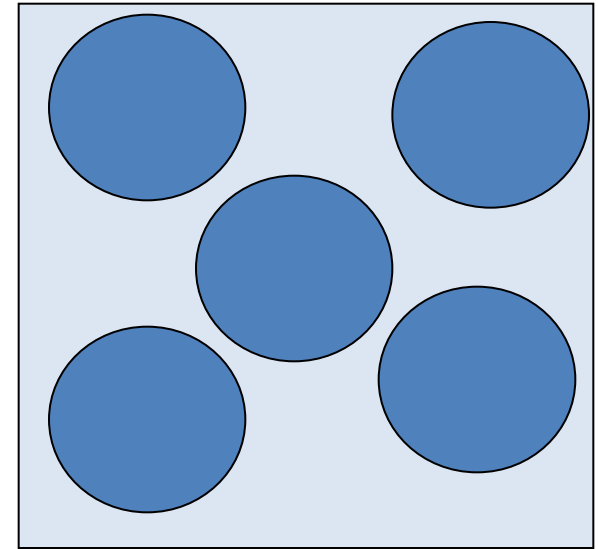
PHARMACEUTICAL DISPERSIONS



Solution: Is a mixture of two or more components that form a single phase that is homogeneous down to the molecular level (dimensions $<1\text{nm}$)



Colloid: Fine dispersions where dispersed particles fall within the size range of 10^{-9}m (1nm) to about 10^{-6}m ($1\mu\text{m}$)



Suspension: Coarse dispersions of finely divided discrete solid particles dispersed in a second solid/liquid continuous phase (dimensions $>1\mu\text{m}$)

Emulsion is a coarse dispersion of liquid droplets dispersed with a second liquid continuous phase (dimensions $>1\mu\text{m}$)

A drug must go into solution in order to be absorbed and act on its target receptor.

COLLOIDS

Colloidal systems are best classified into three groups—lyophilic, lyophobic, and association.

Lyophilic Colloids:

colloidal particles that interact to an appreciable extent with the dispersion medium.

Lyophobic Colloids:

colloidal particles that have little attraction, if any, for the dispersion medium.

Association Colloids:

colloids that exhibit colloidal behavior at high concentrations and operate as an electrolyte at low concentrations are known as associated colloids.



KINETIC PROPERTIES OF COLLOIDS

Brownian Motion

Brownian motion describes the random movement of colloidal particles. The erratic motion was explained as resulting from the bombardment of the particles by the molecules of the dispersion medium. The velocity of the particles increases with decreasing particle size. Increasing the viscosity of the medium decreases and finally stops the Brownian movement.

Diffusion

Particles diffuse spontaneously from a region of higher concentration to one of lower concentration until the concentration of the system is uniform throughout. Diffusion is a direct result of Brownian movement.

Osmotic Pressure

The osmotic pressure, Π , of a dilute colloidal solution is described by the van't Hoff equation:

$$\Pi = iMRT$$

i is the van't Hoff factor, M is the solute molar concentration, R is the ideal gas constant, and T is the absolute temperature



TYPES OF COARSE DISPERSIONS

Table 3.4 Types of coarse dispersions		
Dispersed phase	Continuous phase	Examples
Liquid	Gas	Liquid aerosols
Solid	Gas	Powder aerosols
Gas	Liquid	Foams
Liquid	Liquid	Creams (emulsions)
Solid	Liquid	Suspensions

Suspensions – mixtures of solid in liquid – may be used orally, topically, subcutaneously or intramuscularly.

Emulsions – mixtures of liquid dispersed in liquid – are used topically, parenterally, and occasionally orally.

Aerosols – mixtures of liquids or solids in gases – are used topically and applied to the nose or the lungs.



EMULSION AND SUSPENSION

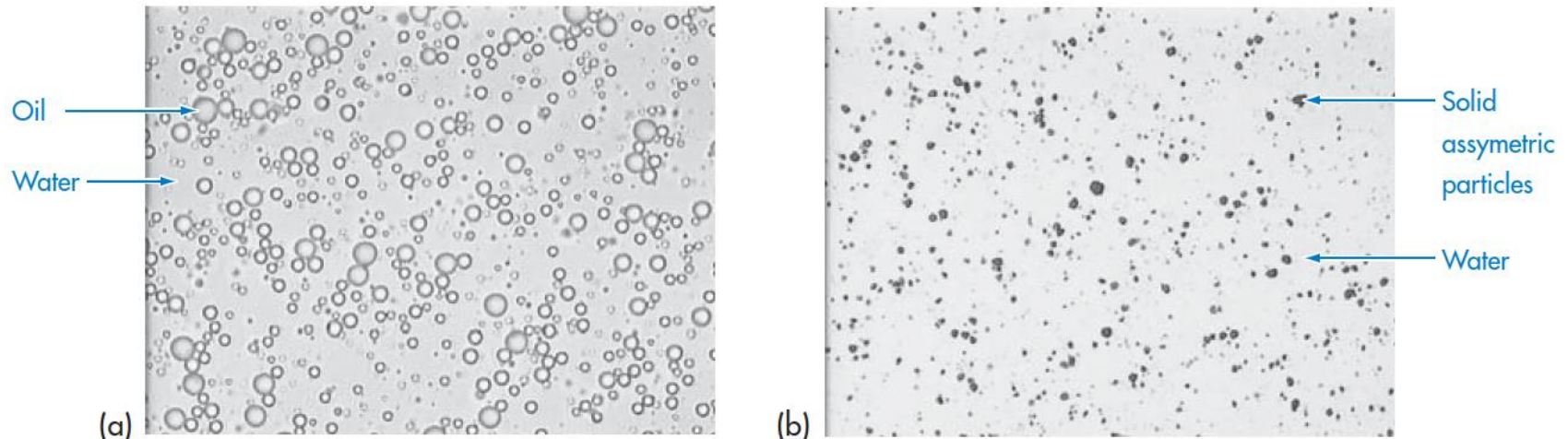


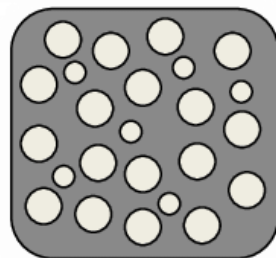
Figure 7.1 Photomicrographs of (a) an oil-in-water emulsion and (b) a suspension.

Classification of emulsions

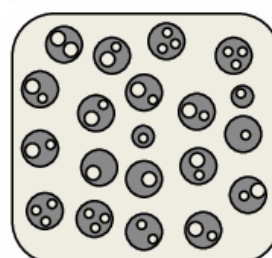
Water phase Oil phase



O/W



W/O



W/O/W



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