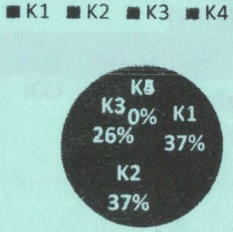
6	Explain the principles and methods of microbiological assay for the standardization of antibiotics.	5	CO4	K1, K2, K3	PO1 PO2
7	What are the sources and types of microbial contaminants?	5	CO4	K1, K2	PO1
8	Explain transformed cell cultures in the pharmaceutical industry and write its application	5	CO5	K1, K2, K3	PO1 PO2 PO4
9	Discuss the various system of classification of virus.	5	CO1	K1, K2, K3	PO1
10	Write a detailed note on the working principle of a HEPA filter, explaining the three main mechanisms.	5	CO4	K1, K2, K3	PO1
11	Briefly explain the general procedure for culturing animal cells in a laboratory and write the application of cell culture.	5	CO5	K1, K2, K3	PO1 PO2
12	Describe the procedure for sterility testing of ophthalmic products according to Indian Pharmacopoeia (IP)	5	CO2	K1, K2, K3	PO1 PO2
13	What are disinfectants? Describe their classification and mode of action.	5	CO3	K1, K2	PO1

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

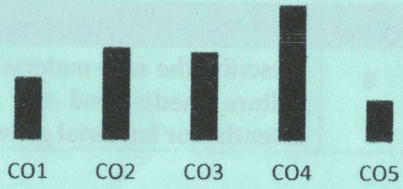
Course Outcomes	CO1	Remember the historical development and scope of microbiology
	CO2	Apply the knowledge to control the microbe by physical and chemical methods.
	CO3	Understand the communicable diseases, sewage and sewage disposal, food spoilage and prevention of food from microbes.
	CO4	Apply microbiological standardization of Pharmaceuticals.
	CO5	Understand the cell culture technology and its applications in pharmaceutical industries

GRAPHICAL REPRESENTATION

Bloom's Level Wise Marks Distribution



Course Outcome wise Marks Distribution



ARKA JAIN University
Jharkhand

NAAC GRADE A

[24-11-2025]
END SEM EXAMINATION
School of Allied Health Science

Program	**Bachelor of Pharmacy**		
Subject Name	**Pharmaceutical Microbiology**	**Session**	**Odd, 2025-26**
Semester	**III**	**Year**	**Nov, 2025**
Time: 3 Hour Max. Marks : **75**	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any *Two* out of *Three* of Section B** • **Answer Any *Seven* out of *Nine* of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers.**		
Knowledge Level (KL)	**K1** : Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 01 Mark from Q1-i to xx) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	Who was the first to observe "animalcules" under the microscope? a. Antonie van Leeuwenhoek b. Otzi the Iceman c. Marcus Terentius Varro d. Robert Koch	1	CO1	K1, K2	PO1, PO2
ii	Smallpox vaccine was first discovered by a. Robert Koch b. Louis Pasteur c. Lister d. Edward Jenner	1	CO3	K1, K2	PO1, PO2, PO4
iii	Who first discovered the 'wonder drug' penicillin? a. Robert Koch b. Pasteur c. Needham d. Alexander Flemming	1	CO3	K1, K2	PO1, PO2, PO4
iv	Is produced as an end product, when glucose gets oxidized in methyl red test. a. Aldehyde b. Ketone c. Acid d. Alcohol	1	CO2	K1, K2	PO1, PO2
v	Prokaryote is characterized by a. Dispersed DNA and lack of membrane bound organelles b. Absence of nuclear envelope c. Absence of nucleolus d. All of these	1	CO2	K1, K2	PO1, PO2

vi	Aflatoxin is produced by a. Bacteria b. Virus c. Fungi d. Nematode	1	CO3	K1, K2,	PO1, PO2
vii	The time duration for pasteurization of milk is _____. a. 30 mins. b. 20 mins. c. 11 mins. d. 10 mins.	1	CO3	K1, K2, K3	PO1, PO2
viii	Parenteral preparations can be sterilized through? a. Chemical sterilization b. Membrane filtration c. Desiccation d. Dry heat method	1	CO2	K1, K2, K3	PO1, PO2
ix	Which of the following method is used for sterilization? a. Moist heat method b. Staining c. Microbial inoculation d. Incubation	1	CO2	K1, K2	PO1, PO2
x	Which of following are generally applied on living animal tissue? a. Antiseptics b. Disinfectants c. Preservatives d. Sanitizers	1	CO3	K1, K2	PO1
xi	The viral nucleocapsid is the combination of a. Capsid and spikes b. Genome and capsid c. Envelope and capsid d. Capsomere and genome	1	CO3	K1, K2	PO1
xii	The Voges-Proskauer test shows if a bacterium can produce _____. a. Pyruvate from cysteine b. A mix of organic acids from glucose c. Cadaverine d. 2,3-butanediol as a fermentation waste product	1	CO1	K1, K2	PO1
xiii	In Gram staining, if some bacteria retain the crystal violet stain after alcohol treatment, then the bacteria are _____. a. Gram-positive b. Gram negative c. Neutral d. None of the above	1	CO1	K1, K2, K3	PO1, PO2
xiv	Which of the following method is used for the production of vaccines against yellow fever? a. Tissue-culture method b. Chick-embryo method c. Through susceptible animals d. Through appropriate media	1	CO3	K1, K2, K3	PO1
xv	The time from infection until lysis is called as a. Eclipse period b. Rise period c. Latent period d. Burst size	1	CO2	K1, K2	PO1
xvi	An agent that prevents the growth of bacteria is known as _____. a. Bactericide b. Bacteriostatic c. Antimicrobial d. Antibiotic	1	CO2	K1, K2	PO1
xvii	Cetrimide or chlorhexidine in _____ are used for skin disinfectants. a. 10% alcohol b. 70% alcohol c. 90% alcohol d. 100% alcohol	1	CO4	K1, K2	PO2
xviii	The air filtered from laminar air flow is claimed to be _____ free from microbial contamination. a. 80.87% b. 89.67% c. 95.59% d. 99.97%	1	CO4	K1, K2	PO2
xix	DOP (Dioctylphthalate) test is used for validation of _____. a. Membrane filter. b. HEPA filter c. Autoclave d. hot air oven	1	CO4	K1, K2,	PO1
xx	The cocci that form a chain is a. Staphylococci b. Diplococci c. Tetracocci d. Streptococci	1	CO1	K1, K2,	PO1

Section B (Answer any TWO out of THREE) – 20 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	Describe the Gram staining technique, its procedure, and its applications in microbiology.	10	CO2	K1, K2, K3	PO1
3	Define Sterilization .Explain the moist heat Sterilization with proper diagram.	10	CO3	K1, K2, K3	PO1 PO2
4	Discuss the key components of a controlled environment for aseptic filling of parenteral products, and elaborate on the quality control tests performed to ensure the sterility of the final product.	10	CO4	K1, K2, K3	PO1 , PO2

Section C (Answer any SEVEN out of NINE) – 35 Marks
(Each question Carry 05 Marks)

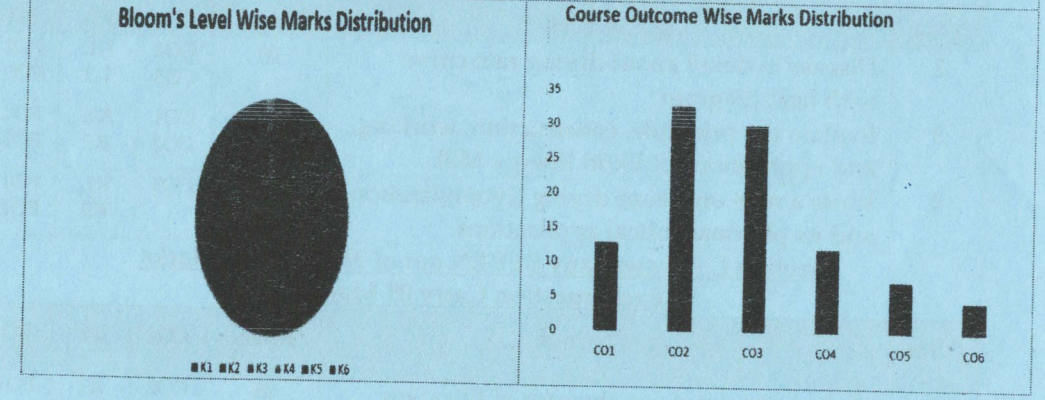
Q. No.	QUESTIONS	Marks	COs	KL	PO
5	Describe the raw materials used for preparing culture media and the physical parameters essential for bacterial growth.	5	CO1	K1, K2, K3	PO1

9	Explain the principle, and working of flash distillation with suitable diagram.	05	CO2 CO3	K1	PO1 PO9
10	Give the classification of materials employed in pharmaceutical plant construction and explain them.	05	CO5	K1	PO1 PO9
11	Give a short notes on planetary mixer in pharmacy.	05	CO3	K1	PO1
12	Write about theories of Corrosion and explain its type.	05	CO5 CO6	K2 K3	PO1
13	Write short notes on Reynolds number	05	CO1 CO2	K1	PO1

CO-Course Outcomes, KL- Knowledge Level **PO** – Program Outcome

Course Outcomes	CO1	Know various unit operations used in Pharmaceutical industries.
	CO2	Understand the material handling techniques.
	CO3	Perform various processes involved in pharmaceutical manufacturing process.
	CO4	Carry out various test to prevent environmental pollution.
	CO5	Appreciate and comprehend significance of plant lay out design for optimum use of resources.
	CO6	Appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

GRAPHICAL REPRESENTATION



ARKA JAIN University Jharkhand — NAAC GRADE A — ACCREDITED UNIVERSITY

[26-11-2025]
END SEM EXAMINATION
School of Allied Health Science

Program	Bachelor of Pharmacy		
Subject Name	Pharmaceutical Engineering	Session	Odd, 2025-26
Semester	III	Year	Nov, 2025
Time: 3 Hour Max. Marks : 75	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any *Two* out of *Three* of Section B** • **Answer Any *Seven* out of *Nine* of Section C** • **Possession of Mobile Phones or any kind of Written Material, Arguments with the Invigilator or Discussing with Co-Student will comes under Unfair Means and will Result in the Cancellation of the Papers.**		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 01 Mark from Q1-i to xx) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	Which mill is preferred for producing very fine particles? a) Hammer mill b) Ball mill c) Fluid energy mill d) Cutter mill	1	CO2	K1,K4	PO1
ii	Sieves used in pharmaceutical industry are standardized as per: a) USP b) BP c) IP d) All of the above	1	CO3	K1,K2	PO10
iii	In lyophilization, water is removed by: a) Evaporation b) Condensation c) Sublimation d) Crystallization	1	CO3	K1	PO1
iv	Which distillation method is used for separating thermo liable compounds like essential oils? a) Steam distillation b) Simple distillation c) Vacuum distillation d) Flash distillation	1	CO2	K1	PO1
v	Which dryer is best suited for heat-sensitive materials? a) Tray dryer b) Drum dryer c) Spray dryer d) Freeze dryer	1	CO3	K2	PO1

vi	Multiple-effect evaporators are used to: a) Save energy b) Increase evaporation rate c) Reduce product degradation d) All of the above	1	CO3	K3,K4	PO1
vii	Soft glass is made of the evaporator best suited for viscous liquids is: a) Climbing film evaporator b) Falling film evaporator c) Forced circulation evaporator d) Rotary evaporator	1	CO1 CO2	K1,K4	PO1
viii	The energy required for size reduction of solid materials is best predicted by: a) Kick's law b) Rittinger's law c) Bond's law d) Newton's law	1	CO1	K1	PO2
ix	Sigma blade mixer is mainly used for: a) Dry powders b) Sticky and plastic materials c) Liquids d) Fine powders	1	CO3	K2	PO1
x	Which of the following dryer is also known as lyophilizers? a) Tray dryer b) Vacuum dryer c) Spray Dryer d) Freeze Dryer	1	CO2 CO3	K2	PO1
xi	The efficiency of a ball mill depends on: a) Speed of rotation b) Size of balls c) Feed rate d) All of the above	1	CO1 CO2	K1	PO1
xii	Colloid mill works on the principle of: a) Cutting b) Impact and attrition c) Shearing d) Compression	1	CO2	K1	PO1
xiii	Which of the following is NOT a mode of heat transfer? a) Sieving b) Conduction c) Convection d) Radiation	1	CO2	K1, K2	PO1
xiv	Role of cyclone separator in climbing film evaporator. a) Prevent precipitation b) Prevents foaming c) Prevent accumulation d) Prevent Fuming	1	CO4	K1	PO1
xv	Multiple extraction is preferred because: a) It saves solvent b) It increases efficieny c) It requires less time d) Both a & b	1	CO3	K2	PO1
xvi	Fractionating column is used in: a) Simple distillation b) Vacuum distillation c) Fractional distillation d) Steam distillation	1	CO3	K1	PO2
xvii	The unit of thermal conductivity is: a) J/s.m.K b) J/mol c) J/kg d) J/s	1	CO2	K1	PO1
xviii	Which one is a size separation equipment? a) Jaw crusher b) Sieve shaker c) Ball mill d) Colloid mill	1	CO1 CO2	K4	PO1
xix	Which is not a filter medium? a) Kieselguhr b) Sintered glass c) Membrane filters d) Sigma blade	1	CO3	K1	PO1
xx	Corrosion is defined as: a) Mechanical wear and tear of metals b) Deterioration of metals due to chemical or electrochemical reaction with the environment c) Loss of metal due to high temperature only d) Removal of surface oxide layer	1	CO6	K1, K2	PO2

Section B (Answer any TWO out of THREE) – 20 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	Discuss in detail about drying rate curve with neat diagram.	10	CO2 CO3	K1, K2	PO1 PO3
3	Explain the principle, construction, working, and applications of Fluid Energy Mill.	10	CO1 CO2	K1, K2	PO1 PO2
4	Write a note on freeze drying (lyophilization) and its pharmaceutical applications.	10	CO3	K1, K2	PO1 PO2

Section C (Answer any SEVEN out of NINE) – 35 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
5	Write a short note on theories of filtration and factors affection rate of filtration.	05	CO2 CO3	K1	PO1
6	Discuss in detail about Principle, Construction and working of Ball mill.	05	CO2 CO3	K1	PO1 0
7	What are various process of heat transfer and shortly explain about heat exchanger.	05	CO3	K1 K2	PO1

JGI	**ARKA JAIN University** Jharkhand	NAAC GRADE A ACCREDITED UNIVERSITY	[28-11-2025] END SEM EXAMINATIO School of Health & Allie Science

Program	**Bachelor of Pharmacy**		
Subject Name	**Communication Skills**	**Session**	**Odd, 2025-26**
Semester	**III**	**Year**	**Nov, 2025**
Time: 1.5 Hour Max. Marks : **35**	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any Five out of Six of Section B** • **Answer Any Two out of Four of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 01 Marks from Q1-i to v) – 05 Marks

Q. N 1	QUESTIONS	Marks	COs	KL
i	Define communication.	01	CO1	K1
ii	Why is communication important for healthcare professionals?	01	CO2	K1
iii	What is encoding?	01	CO2	K2
iv	Define feedback.	01	CO1	K4
v	What is the origin of the word communication?	01	CO2	K1

Section B (Answer any FIVE out of SIX) – 10 Marks
(Each question Carry 02 Marks)

Q. No.	QUESTIONS	Marks	COs	KL
2	What are the essential elements of effective communication?	02	CO2	K1
3	Mention two common barriers to communication in a healthcare setup.	02	CO2	K2
4	Why is active listening important in pharmacist–patient interaction?	02	CO3	K3
5	Suggest two ways a pharmacist can improve their communication with patients.	02	CO3	K2
6	Define formal and informal communication.	02	CO2	K1

7	What is the significance of feedback in the communication process?	02	CO3	K2

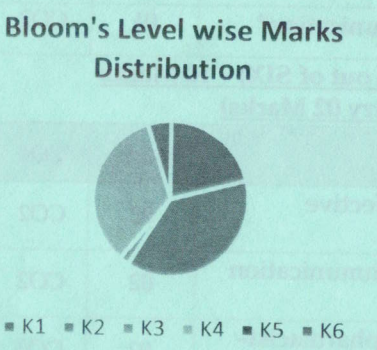
Section C (Answer any TWO out of FOUR) – 20 Marks
(Each question Carry 10 Marks)

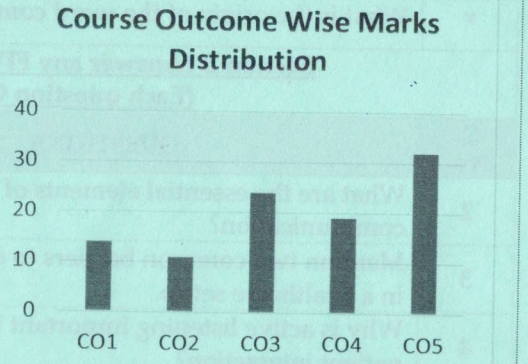
Q. No.	QUESTIONS	Marks	COs	KL
8	Differentiate between verbal and non-verbal communication with examples.	10	CO2	K3
9	What are the characteristics of effective communication? Illustrate with examples from pharmacy practice.	10	CO3	K4
10	Define listening skills. Why is active listening important for a pharmacist? Explain techniques to develop good listening skills.	10	CO4	K3
11	Write a letter to your Dean requesting for a Seminar on Pharmaceutical Industries.	10	CO2	K6

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	To understand the behavioral needs for a Pharmacist to function effectively in the areas of pharmaceutical operation
	CO2	Communicate effectively (Verbal and Non Verbal)
	CO3	Effectively manage the team as a team player
	CO4	To develop interview skills
	CO5	To develop Leadership qualities and essentials

GRAPHICAL REPRESENTATION



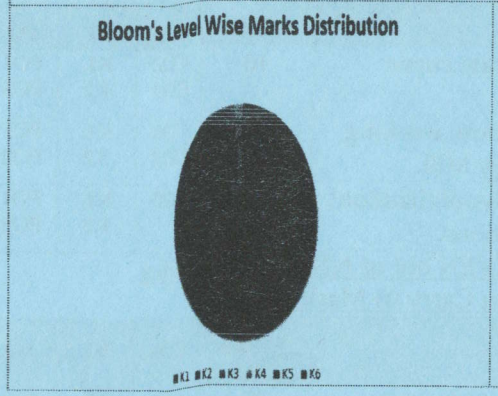


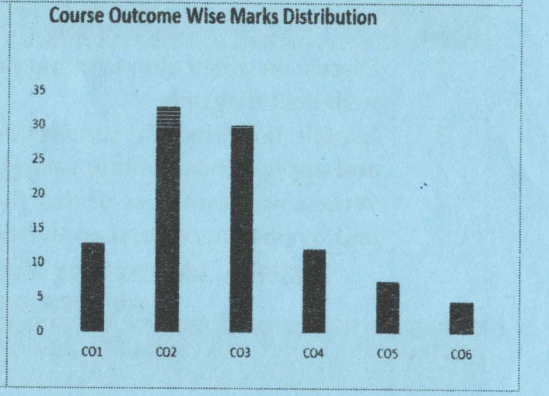
9	Explain the principle, and working of flash distillation with suitable diagram.	05	CO2 CO3	K1	PO1 PO9
10	Give the classification of materials employed in pharmaceutical plant construction and explain them.	05	CO5	K1	PO1 PO9
11	Give a short notes on planetary mixer in pharmacy.	05	CO3	K1	PO1
12	Write about theories of Corrosion and explain its type.	05	CO5 CO6	K2 K3	PO1
13	Write short notes on Reynolds number	05	CO1 CO2	K1	PO1

CO- Course Outcomes, KL- Knowledge Level **PO** – Program Outcome

Course Outcomes	CO1	Know various unit operations used in Pharmaceutical industries.
	CO2	Understand the material handling techniques.
	CO3	Perform various processes involved in pharmaceutical manufacturing process.
	CO4	Carry out various test to prevent environmental pollution.
	CO5	Appreciate and comprehend significance of plant lay out design for optimum use of resources.
	CO6	Appreciate the various preventive methods used for corrosion control in Pharmaceutical industries.

GRAPHICAL REPRESENTATION





ARKA JAIN University
Jharkhand

NAAC GRADE A
ACCREDITED UNIVERSITY

[26-11-2025]
END SEM EXAMINATION
School of Allied Health Science

Program	**Bachelor of Pharmacy**		
Subject Name	**Pharmaceutical Engineering**	**Session**	**Odd, 2025-26**
Semester	**III**	**Year**	**Nov, 2025**
Time: 3 Hour Max. Marks : 75	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any *Two* out of *Three* of Section B** • **Answer Any *Seven* out of *Nine* of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.		
Knowledge Level (KL)	**K1 :** Remembering	**K3 :** Applying	**K5 :** Evaluating
	K2 : Understanding	**K4 :** Analysing	**K6 :** Creating

Section A (Each question Carry 01 Mark from Q1-i to xx) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	Which mill is preferred for producing very fine particles? a) Hammer mill b) Ball mill c) Fluid energy mill d) Cutter mill	1	CO2	K1,K4	PO1
ii	Sieves used in pharmaceutical industry are standardized as per: a) USP b) BP c) IP d) All of the above	1	CO3	K1,K2	PO10
iii	In lyophilization, water is removed by: a) Evaporation b) Condensation c) Sublimation d) Crystallization	1	CO3	K1	PO1
iv	Which distillation method is used for separating thermo liable compounds like essential oils? a) Steam distillation b) Simple distillation c) Vacuum distillation d) Flash distillation	1	CO2	K1	PO1
v	Which dryer is best suited for heat-sensitive materials? a) Tray dryer b) Drum dryer c) Spray dryer d) Freeze dryer	1	CO3	K2	PO1

vi	Multiple-effect evaporators are used to: a) Save energy b) Increase evaporation rate c) Reduce product degradation d) All of the above	1	CO3	K3,K4	PO1
vii	Soft glass is made of the evaporator best suited for viscous liquids is: a) Climbing film evaporator b) Falling film evaporator c) Forced circulation evaporator d) Rotary evaporator	1	CO1 CO2	K1,K4	PO1
viii	The energy required for size reduction of solid materials is best predicted by: a) Kick's law b) Rittinger's law c) Bond's law d) Newton's law	1	CO1	K1	PO2
ix	Sigma blade mixer is mainly used for: a) Dry powders b) Sticky and plastic materials c) Liquids d) Fine powders	1	CO3	K2	PO1
x	Which of the following dryer is also known as lyophilizers? a) Tray dryer b) Vacuum dryer c) Spray Dryer d) Freeze Dryer	1	CO2 CO3	K2	PO1
xi	The efficiency of a ball mill depends on: a) Speed of rotation b) Size of balls c) Feed rate d) All of the above	1	CO1 CO2	K1	PO1
xii	Colloid mill works on the principle of: a) Cutting b) Impact and attrition c) Shearing d) Compression	1	CO2	K1	PO1
xiii	Which of the following is NOT a mode of heat transfer? a) Sieving b) Conduction c) Convection d) Radiation	1	CO2	K1, K2	PO1
xiv	Role of cyclone separator in climbing film evaporator. a) Prevent precipitation b) Prevents foaming c) Prevent accumulation d) Prevent Fuming	1	CO4	K1	PO1
xv	Multiple extraction is preferred because: a) It saves solvent b) It increases efficieny c) It requires less time d) Both a & b	1	CO3	K2	PO1
xvi	Fractionating column is used in: a) Simple distillation b) Vacuum distillation c) Fractional distillation d) Steam distillation	1	CO3	K1	PO2
xvii	The unit of thermal conductivity is: a) J/s.m.K b) J/mol c) J/kg d) J/s	1	CO2	K1	PO1
xviii	Which one is a size separation equipment? a) Jaw crusher b) Sieve shaker c) Ball mill d) Colloid mill	1	CO1 CO2	K4	PO1
xix	Which is not a filter medium? a) Kieselguhr b) Sintered glass c) Membrane filters d) Sigma blade	1	CO3	K1	PO1
xx	Corrosion is defined as: a) Mechanical wear and tear of metals b) Deterioration of metals due to chemical or electrochemical reaction with the environment c) Loss of metal due to high temperature only d) Removal of surface oxide layer	1	CO6	K1, K2	PO2

Section B (Answer any TWO out of THREE) – 20 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	Discuss in detail about drying rate curve with neat diagram.	10	CO2 CO3	K1, K2	PO1 PO3
3	Explain the principle, construction, working, and applications of Fluid Energy Mill.	10	CO1 CO2	K1, K2	PO1 PO2
4	Write a note on freeze drying (lyophilization) and its pharmaceutical applications.	10	CO3	K1, K2	PO1 PO2

Section C (Answer any SEVEN out of NINE) – 35 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
5	Write a short note on theories of filtration and factors affection rate of filtration.	05	CO2 CO3	K1	PO1
6	Discuss in detail about Principle, Construction and working of Ball mill.	05	CO2 CO3	K1	PO1 0
7	What are various process of heat transfer and shortly explain about heat exchanger.	05	CO3	K1 K2	PO1

ARKA JAIN University
Jharkhand

NAAC GRADE A

[19-11-2025]
END SEM EXAMINATION
School of Allied Health Science

Program	**Bachelor of Pharmacy**		
Subject Name	**Pharmaceutical Organic Chemistry II**	**Session**	**Odd, 2025-26**
Semester	**III**	**Year**	**Nov, 2025**
Time: 3 Hour Max. Marks: 75	• Start writing from 2nd page onwards; **don't Write on the 1st Page Backside** • **Answer all Questions of Section A (Compulsory)** • **Answer Any *Two* out of *Three* of Section B** • **Answer Any *Seven* out of *Nine* of Section C** • **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will comes under **Unfair Means** and will **Result** in the **Cancellation of the Papers.**		

Knowledge Level (KL)	**K1**: Remembering	**K3** : Applying	**K5** : Evaluating
	K2 : Understanding	**K4** : Analysing	**K6** : Creating

Section A (Each question Carry 01 Mark from Q1-i to xx) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	When considering electrophilic aromatic substitution reactions, the halides are described as a) Ortho/Para directing and activating b) Ortho/Para directing and deactivating c) Meta directing and activating d) Meta directing and deactivating	1	CO1 CO3	K1	PO9
ii	C-C bonds formed in benzene by: a) Sp-S overlapping b) Sp^2-Sp overlapping c) Sp^2-Sp^2 overlapping d) S-Sp^2 overlapping	1	CO1 CO3	K2, K3	PO1
iii	Benzene reacts with acetyl chloride in presence of Anhyrdous $AlCl_3$ to give a) Chlorobenzene b) Toluene c) Acetophenone d) Acetanilide	1	CO1 CO3	K1	PO2
iv	The carboxylic group of benzoic acid is a) Electron withdrawing and ortho para directing b) Electron releasing and meta directing c) Electron withdrawing and meta directing. d) Electron releasing and ring deactivating	1	CO1 CO3	K1, K2	PO2
v	Treatment of phenol with chloroform in aqueous sodium hydroxide solution followed	1	CO1 CO2 CO3	K1, K2	PO1

	by acid hydrolysis to form salicylaldehyde is known as- a) Kolbe Reaction b) Gattermann Reaction c) Fries rearrangement d) Reimer-Tiemann Reaction				
vi	Benzoic acid reacts with alcohols in the presence of concentrated sulfuric acid to form- a) Amide b) Acid c) Ether d) Ester	1	CO1 CO2 CO3	K1, K2	PO2
vii	Primary aromatic amines reacts with ethanolic potassium hydroxide and chloroform to form- a) Imines b) Salt c) Nitrosoamine d) Carbylamines	1	CO1 CO2 CO3	K2, K3	PO1
viii	Complete hydrolysis of triglycerides yield_____ molecule(s) of glycerol and _____ molecule(s) of fatty acids. a) Three and one b) One and Two c) One and Three d) Three and Two	1	CO4 CO5	K3, K3, K4, K6	PO1
ix	Which one of the following constant is mainly used for the analysis of butter? a) Acid value b) Saponification value c) RM value d) Iodine value	1	CO4 CO5	K1, K2	PO1 0
x	Saponification is hydrolysis _____ a) In digestive tracts of human beings b) By acids c) By alkalis d) By salts	1	CO4 CO5	K1	PO1
xi	Which of the molecular formula given below corresponds to that of an unsaturated fatty acid? a) $C_{16}H_{33}COOH$ b) $C_{19}H_{39}COOH$ c) $C_{18}H_{35}COOH$ d) $C_{17}H_{35}COOH$	1	CO4 CO5	K1, K2	PO2
xii	The number of OH groups in fats can be expressed as _____ a) Reichert-Meissil number b) Iodine number c) Polenske number d) Acetyl number	1	CO4 CO5	K1, K2	PO1
xiii	For the synthesis of naphthalene which two reagents are required? a) Toluene And Succinic Acid b) Toluene And Succinic anhydride c) Benzene and succinic acid d) Benzene and succinic anhydride	1	CO1 CO3 CO5	K2, K3, K4	PO2
xiv	In naphthalene, bond length between C_1 and C_2 (1.36A) has _____ whereas; bond length between C_2 and C_3 (1.42A) has_____ a) more σ character; more π character b) less π character; less σ character c) more π character; more σ character d) less σ character; less π character	1	CO1 CO3 CO5	K3, K4, K6	PO1
xv	Phenanthrene can be prepared from a) Coal tar b) Haworth Method c) Posher Synthesis d) All of the above	1	CO1 CO3 CO5	K1, K2	PO2
xvi	According to Baeyer's strain theory, smaller cycloalkanes are unstable due to: a) Angle strain b) Torsional strain c) Steric strain d) Hyperconjugation	1	CO1 CO3 CO6	K1	PO2
xvii	The actual bond angle of cyclopropane is: a) 109.5° b) 120° c) 60° d) 90°	1	CO1 CO3 CO6	K2, K3	PO2
xvii i	Sachse-Mohr theory explains stability of: a) Cyclopropane b) Cyclobutane c) Cyclopentane d) Cyclohexane	1	CO1 CO3 CO6	K1	PO2
xix	The two main conformations of cyclohexane are: a) Planar and pyramidal b) Chair and boat c) Envelope and twist d) Zig-zag and eclipsed	1	CO1 CO3 CO6	K1, K2, K3, K4	PO1
xx	The high reactivity of cyclopropane and cyclobutane is due to: a) Steric strain b) Ring strain c) Resonance d) Aromaticity	1	CO1 CO3 CO5	K2, K3	PO1

Section B (Answer any TWO out of THREE) – 20 Marks
(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	Explain the reaction and mechanism of nitration, sulfonation of benzene.	10	CO1 CO3	K1, K2, K3	PO1
3	Describe Kolbe-Schmitt reaction, and mechanisms	10	CO1 CO2 CO3	K1, K2,	PO1
4	Explain the process of hydrolysis, hydrogenation, hydrogenolysis and halogenation of fats and oils with suitable chemical equations.	10	CO3 CO4 CO5	K1, K2, K3	PO1

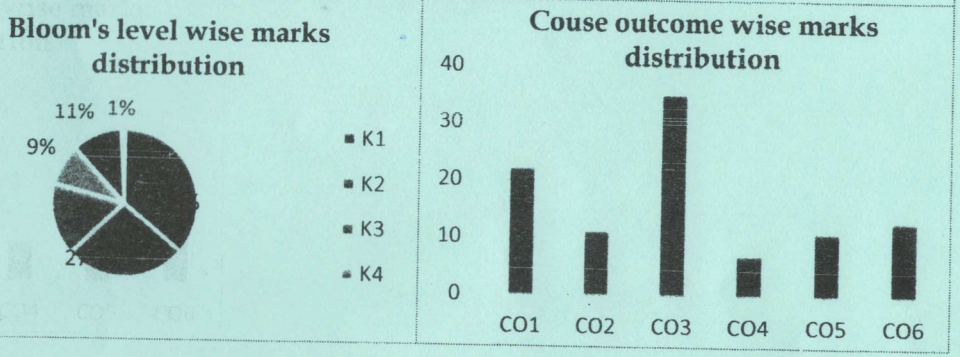
Section C (Answer any SEVEN out of NINE) – 35 Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
5	Describe Friedel-Crafts alkylation reaction of benzene with mechanism. Mention its limitations.	5	CO1 CO3	K1, K3	PO1
6	Draw structures of DDT, Saccharin, BHC Phenol and Chloramine and write their uses.	5	CO1 CO3	K1	PO1, PO4
7	Explain the effect of electron-withdrawing and electron-donating groups on the acidity of benzoic acid.	5	CO2 CO3	K1, K2, K3	PO1
8	Explain the diazotization reaction of aniline and write any two coupling reactions of the diazonium salt.	5	CO2 CO3	K3, K4	PO1, PO2
9	What is the Reichert-Meissl (RM) value? Describe its principle and importance in the analysis of fats/oils.	5	CO4 CO5	K1, K2	PO1
10	Explain the structure and medicinal importance of triphenylmethane and diphenylmethane derivatives.	5	CO3 CO4	K2	PO1, PO10
11	Describe the synthesis reaction of anthracene.	5	CO3 CO4	K1, K3,	PO1, PO1
12	Write the Reaction of Cyclopropane and Cyclo-Butane.	5	CO3 CO6	K1, K3, K5	PO1
13	State Coulson and Moffitt's modification of Baeyer's strain theory. How does it explain the stability of cyclopropane?	5	CO1 CO3 CO6	K1, K2, K3	PO1

CO- Course Outcomes, **KL**- Knowledge Level, **PO** – Program Outcome

Course Outcomes	CO1	Understand the reactions with mechanisms of benzene and orientation of groups in aromatic compounds
	CO2	Understand the reaction the reactions of some aromatic alcohols.
	CO3	Understand the reactions of some aromatic organic compounds.
	CO4	Understand the reactions of Fatty acids with significance and principle involved in their determination.
	CO5	Understand the reactions of Fatty acids with significance and principle involved in their determination.
	CO6	Understand the stability and reactions of cycloalkanes.

GRAPHICAL REPRESENTATION



CO-

ARKA JAIN University
Jharkhand

NAAC GRADE A ACCREDITED UNIVERSITY

[21-11-2025]
END SEM EXAMINATION
School of Allied Health Science

Program	Bachelor of Pharmacy		
Subject Name	Physical Pharmaceutics I	Session	Odd, 2025-26
Semester	III	Year	Nov, 2025

Time: 3 Hour
Max. Marks: 75

- Start writing from 2nd page onwards; **don't Write on the 1st Page Backside**
- **Answer all Questions of Section A (Compulsory)**
- **Answer Any *Two* out of *Three* of Section B**
- **Answer Any *Seven* out of *Nine* of Section C**
- **Possession of Mobile Phones** or any kind of **Written Material, Arguments with the Invigilator or Discussing with Co-Student** will come under **Unfair Means** and will **Result** in the **Cancellation of the Papers**.

Knowledge Level (KL)			
	K1 : Remembering	K3 : Applying	K5 : Evaluating
	K2 : Understanding	K4 : Analysing	K6 : Creating

Section A (Each question Carry 01 Mark from Q1-i to xx) – 20 Marks

Q. N 1	QUESTIONS	Marks	COs	KL	PO
i	The process in which energy is absorbed or released during a change of state is termed as: a) Thermal conductivity b) Latent heat c) Specific heat d) Heat capacity	1	CO2	K2, K1	PO1
ii	The property that determines a solvent's ability to dissolve ionic compounds is its: a) Vapour pressure b) Dielectric constant c) Surface tension d) Refractive index	1	CO1	K2	PO1
iii	Which form of matter simultaneously exhibits the ordered structure of solids and the mobility of liquids? a) Amorphous solids b) Liquid crystals c) Glassy state d) Supercritical fluids	1	CO1	K3	PO2
iv	When a solute forms different crystalline modifications having distinct melting points, the phenomenon is called: a) Polymorphism b) Amorphism c) Eutectic mixture d) Crystallisation	1	CO1	K4	PO2
v	Diffusion of molecules through a membrane increases with: a) Greater membrane thickness b) Reduced surface area	1	CO1	K5	PO2

	c) Higher surface area d) Smaller concentration gradient				
vi	Relative lowering of vapour pressure according to Raoult's law is directly proportional to the: a) Mole fraction of solute b) Mass of solvent c) Temperature d) Volume of solute	1	CO1	K1	PO1
vii	The law describing the distribution of a solute between two immiscible solvents fails when: a) The solute undergoes association or dissociation b) Temperature is constant c) Solvents are immiscible d) Dilute solutions are used	1	CO2	K1	PO1
viii	Which state of matter has a definite volume but assumes the shape of its container? a) Solid b) Liquid c) Gas d) Plasma	1	CO2	K2	PO1
ix	A drug whose solubility decreases with rise in temperature shows: a) Endothermic dissolution b) Polymorphism c) Exothermic dissolution d) Ideal solubility	1	CO2 CO3	K3	PO2
x	The temperature at which two liquid phases become completely miscible is termed: a) Boiling point b) Critical solution temperature c) Melting point d) Eutectic point	1	CO2 CO3	K4	PO10
xi	Which of the following is the correct unit for surface tension? a) dyne/cm b) Pascal c) atm d) N/m^2	1	CO4	K1	PO1
xii	Surfactants lower interfacial tension because they: a) Gather at the phase boundary b) Enhance cohesion between liquid molecules c) Reduce adsorption d) Raise vapour pressure	1	CO4	K2	PO1
xiii	Detergency in pharmaceutical systems mainly results from: a) Micelle formation that removes oily or greasy matter b) Capillary action c) Adsorption on solid surfaces d) Increase in surface energy	1	CO4	K3	PO2
xiv	Which parameter indicates that a liquid will spread over a solid surface? a) Viscosity b) Surface pressure c) Spreading coefficient d) Density	1	CO4	K4	PO2
xv	Identify the most appropriate technique for measuring surface tension: a) Du Nouy ring method b) Potentiometry c) UV spectrophotometry d) Flame photometry	1	CO4	K5	PO2
xvi	To stabilise an oil-in-water emulsion, which surfactant type should be chosen? a) Medium HLB (6–8) b) Low HLB (3–6) c) High HLB (8–18) d) None	1	CO4	K6	PO2
xvii	The interaction between caffeine and chlorogenic acid represents which class of complex? a) Inclusion b) Metal c) Charge-transfer d) Polymeric	1	CO5	K1	PO1
xvii i	Protein binding of drugs mainly influences their: a) Rate of absorption b) Distribution and elimination half-life c) Crystalline stability d) Surface activity	1	CO5	K2	PO
xix	The pH of a buffer system is primarily determined by the: a) Ratio of acid to its conjugate salt b) Solvent type c) Molecular weight of solute d) Temperature alone	1	CO6	K1, K2	PO1
xx	Which concentration of NaCl solution is isotonic with blood plasma? a) 0.45% b) 0.9% c) 1.5% d) 5%	1	CO6	K1	PO1

Section B (Answer any TWO out of THREE) – 20 Marks

(Each question Carry 10 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
2	What is the critical temperature? Explain Refractive index with neat diagram	10	C2	K4, K5	PO1 PO9
3	What is a eutectic mixture? Give an example. Explain the changes in state of matter with the help of a schematic diagram.	10	CO2	K2 K4	PO1 PO10

4	Define and discuss solubility parameters in detail. Compare Hildebrand and Hansen's approaches and explain their pharmaceutical relevance with a suitable graphical representation.	10	CO1	K4, K5	PO1 PO10

Section C (Answer any SEVEN out of NINE) – 35Marks
(Each question Carry 05 Marks)

Q. No.	QUESTIONS	Marks	COs	KL	PO
5	Briefly explain Henry's Law of gas solubility in liquids and discuss its pharmaceutical significance	5	CO1	K2	PO1
6	What are pharmaceutical buffers? Discuss any one pharmaceutical buffer system in detail with its composition, mechanism, and application.	5	CO6	K2	PO1 PO10
7	Describe Sørensen's pH Scale and explain its importance in formulating pH-sensitive dosage forms.	5	CO6	K1, K2	PO1
8	Write a short note on Fick's First Law of Diffusion and its effect on drug solubility.	5	CO1	K2	PO1
9	Classify surfactants with examples and outline their applications in pharmaceutical formulations.	5	CO4	K1, K2	PO1
10	Define Critical Micelle Concentration (CMC). State the factors influencing it and mention its role in improving drug solubility.	5	CO1	K2	PO1
11	What are Chelates? Discuss the pharmaceutical applications of Chelation.	5	CO5	K4	PO1
12	Calculate the HLB value of potassium palmitate [$C_{16}H_{31}KO_2$] or [CH_3–(CH_2)$_{14}$–COO^-K^+] using the group contribution method. (Given: –CH_2– = 0.475, –CH_3 = 0.475, –COO^-K^+ = 19.1).	5	CO4	K3	PO1 PO9 PO10
13	Discuss the importance of cyclodextrins in pharmaceutical applications.	5	CO5	K3	PO1 PO2

Course Outcomes, KL- Knowledge Level, PO – Program Outcome

Course Outcomes	CO1	Acquire knowledge about solubility phenomena and its application in pharmaceutical practice.
	CO2	Acquire knowledge about physical principles of states of matter
	CO3	Understanding various physicochemical properties of drug molecules and its application.
	CO4	Illustrate the knowledge and concept of surface tension and interfacial tension and its importance in dispersion stabily
	CO5	Acquire knowledge about drug complexes, protein binding in pharmacy.
	CO6	Acquire knowledge about the PH, buffers, isotonicity and its application in biological and pharmaceutical field.

GRAPHICAL REPRESENTATION