Time: 3 hours **Marks: 80**

Please check whether you have got the right question paper.

N.B: (1) All questions are **compulsory**.
(2) Figures to the right indicate **full marks**.
(3) **Use of scientific calculator is permitted.**

Q.1		Answer the following:	
	a.	Define: Bioequivalence, Pharmacokinetics	**2**
	b.	Justify "Biomembranes act as a semi permeable barrier"	**2**
	c.	Enlist factors affecting topical administration.	**2**
	d.	Explain the difference between real and apparent volume of distribution.	**2**
	e.	What are mechanisms of direct enzyme inhibition?	**2**
	f.	Write a note on Salivary excretion of drugs.	**2**
	g.	Explain term "Highly permeable" as per BCS classification.	**2**
	h.	Draw a one compartment open model for IV bolus administration.	**2**
	i.	Under what circumstances is the value of Ka computed from method of residuals incorrect?	**2**
	j.	Calculate relative bioavailability of tablet containing drug Y if dose administered is 530mg and [AUC] zero to infinity is 425mg.hr/lit against solution of drug Y if dose administered is 125mg and [AUC] zero to infinity is 222mg.hr/lit.	**2**
Q.2	a.	Enlist the difference between active and passive transport.	**4**
	b.	Explain the effect of particle size of API and diluents on drug absorption.	**4**
	c.	Explain why glucuronidation is the commonest and most important of all phase II reactions.	**4**
Q.3	a.	Describe the physiological factors affecting the distribution of drugs in tissues.	**4**
	b.	What is the effect of protein binding on the apparent volume of distribution?	**4**
	c.	Describe the method of residuals for the calculation of absorption rate constant.	**4**
		OR	
		Explain the equation used for calculation of nonlinear kinetic behavior of drugs.	**4**
Q.4	a.	What are the effects of enzyme induction on drug metabolism? Describe in detail.	**4**
	b.	Write a note on hepatic clearance of drugs.	**4**
	c.	Describe the effect of renal disease state on drug elimination.	**4**

Q.5 a. State the factors affecting dissolution rate of a drug according to the modified Noyes-Whitney's equation. **4**

b. Describe an official method for the estimation of dissolution rate of coated tablets. **4**

c. What are the methods for enhancement of bioavailability of poorly permeable drugs? **4**

OR

Write a note on IVIVC. **4**

Q.6 a. How are the elimination rate constant, elimination half-life and clearance determined after an IV bolus injection? **4**

OR

What is an 'optimal dosage regimen'? For a one-compartment model, state the mathematical expressions for maximum, minimum, and steady-state concentrations of drug in the plasma following multiple IV injections.

Q.6 b.(i) An intravenously administered bolus dose of 25mg of a drug following one compartment kinetics has a half-life of 14hrs. If the plasma concentration at zero time is 25mg/L, calculate

i.) Elimination rate constant and volume of distribution **01**

ii.) AUC(zero to infinity) and total clearance of the drug **01**

iii.) Plasma concentration of the drug after 8 hours **01**

iv.) Amount of drug left in the body after 12 hours **01**

b.(ii) A single oral dose of 75mg of a drug (F=0.6) was given to a 70 kg patient. The plasma concentration-time profile can be described by:

$$C_p = 12(e^{-0.45t} - e^{-1.73t})$$

where, C_p = mg/L, t=hours.

Calculate:

A. Volume of distribution **01**

B. Tmax **01**

C. Cmax **02**

Q.P. Code: 34857

Duration: 3 Hours Total marks 70

N.B (1) All questions are compulsory
(2) Figures to the right indicate full marks
(3) Answer all sub questions together
(4) Draw neat labeled diagrams wherever necessary

Q.1	A)	Answer the following (any SEVEN)	07M
	i.	Name two excitation sources used in Atomic Emission Spectroscopy	
	ii.	Give the approximate wavenumbers for fundamental absorption band of nitrile and hydroxyl group.	
	iii.	Define Absorbance	
	iv.	Name any one material transparent to IR radiation.	
	v.	Name two types of filters used in colorimeter	
	vi.	Define the unit Curie used in radiochemistry	
	vii.	Calculate the absorbance of solution giving transmittance of 10 %	
	viii.	Define the term absorption spectrum	
Q.1	B)	Answer the following (any FOUR)	08M
	i.	Explain the terms excited singlet and excited triplet state	
	ii.	What is wavelength maxima? How is it determined?	
	iii.	Fluorimetric analysis is more specific as compared to UV Visible spectroscopic analysis.State whether true or false. Justify your answer.	
	iv.	What are spectral interferences in Atomic Absorption Spectroscopy?	
	v.	What is α decay and β decay?	
Q2	A)	Answer the following (any TWO)	08M
	i.	What role does a wavelength selector play in a UV-Visible spectrophotometer? Enlist types of monochromators. With the help of suitable diagram explain working of any one monochromator.	
	ii.	Draw a neat labelled diagram of X-ray diffractometer. Discuss its working.	
	iii.	Give four points of differences between IR and Raman spectroscopy. Draw a labelled, block diagram of Raman spectrophotometer.	
Q2	B)	Explain the terms radiochemical and radionucleidic purity. How are they determined?	03M
Q3	A)	Answer the following (any TWO)	08M
	i.	What are thermal methods of analysis? With the help of an example discuss TG curve.	
	ii.	Give two advantages of FTIR over dispersive IR spectrophotometer. Draw a diagram of Michelson's Interferometer and describe its working.	
	iii.	Differentiate between AAS and AES based on the principle involved .Give one advantage , one disadvantage and one application of AAS	
Q3	B)	Enlist three factors influencing vibrational frequencies in IR spectroscopy with examples.	03M

Q4 A) Answer the following (any TWO) 08M

i. Derive Beer Lambert's law. Give its limitations.

ii. In a spectrophotometric assay following results were obtained. Perform linear regression to determine slope and intercept of calibration line with the data

Concentration of analyte(µg/ml)	Absorbance at λmax
5	0.17
10	0.31
15	0.50
20	0.72
25	0.91

iii. In standardization of 0.1 N NaOH, burette readings obtained were as follows

Day 1	15.6	15.5	15.7	15.9	15.3
Day2	15.3	15.5	15.4	16	-

Are the mean burette readings on the two days significantly different from each other at 5%? (Tabulated 't value' is 2.365)

Q4 B) Distinguish between DSC and DTA with reference to principle involved, instrumentation and applications 03M

Q5 A) Answer the following (any TWO) 08M

i. With the help of an energy level diagram describe the excitation and relaxation processes involved in fluorescence spectroscopy.

ii. Explain fundamental bands and overtones with reference to IR spectroscopy with suitable diagram. Give one pharmaceutical application of Near IR spectroscopy.

iii. Enlist methods for analysis of single component using UV-Visible spectroscopy. Discuss any one method in detail.

Q5 B) Derive Bragg's Law for X ray diffraction. 03M

Q6 A) Answer the following (any two) 08M

i. Discuss the UV spectrophotometric method for determination of equillibria constant

ii. Draw block diagram of Spectroflourimeter. Explain role of each of its components in brief.

iii. Enlist reflectance methods in IR spectroscopy. Explain any one in detail.

Q6 B) Absorbance of 15 µg/ml solution of drug X (Molecular weight 204) in a 1 cm pathlength cell at its λmax was found to be 0.76. Calculate its molar absorptivity 03M

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3 Hours **80 Marks**

N.B:

1. All questions are compulsory
2. Answer all sub questions together
3. Draw neat labelled diagrams wherever necessary
4. Figures to the right indicate full marks

Q.1. A. Do as directed (Answer any EIGHT questions) **8 M**

i. Give two examples of auxochromes.
ii. Name any two agents used for chemical derivatization to convert non fluorescent compounds to fluorescent ones.
iii. Name recent sample handling technique used in IR spectroscopy
iv. Name one source used in Raman spectrophotometer
v. Name two types of plasma sources used in atomic spectroscopy
vi. Write one application of X ray diffraction technique
vii. Name any one radionuclide used for diagnostic purposes
viii. Name one reference electrode used in potentiometric measurements
ix. Define the term glass transition temperature

Q.1.B. Do as directed (Answer any THREE) **6 M**

i Define wavelength maxima? How is it determined?
Ii Explain the term correlation coefficient
Iii Define the term 'singlet state'. Give formula for quantum yield.
iv Glass cuvettes cannot be used for UV spectrophotometric analysis, State whether true or false. Justify

Q.1.C Solve the following: (Answer any TWO) **6 M**

i Give IR frequencies for following functional groups

1. Carbonyl stretch of aliphatic aldehyde
2. Hydroxyl group of alcohols
3. CΞC stretch of alkenes

ii A (1%, 1cm) value for drug A at λ max of 290 nm is 680. An injection of this drug when diluted by a factor of 2000 gave an absorbance of 0.682 when measured in 1 cm cell at λ max of 290 nm. Calculate the concentration of drug A in the original injection.

Iii Calculate concentration in microgram per ml of solution of drug X (Molecular weight=202.4) in 0.1 M NaOH, giving as absorbance of 0.723 in a 2 cm path length cell at λ max of 310 nm. Reported molar absorptivity of drug X at λ max 310 nm is 4352.

Q.2 Answer the following: (Answer any THREE) **12 M**

A Enlist three methods for quantitative UV spectrophotometric assay of single component formulation. Explain any one in detail.
B With the help of suitable diagram explain construction and working of a photon multiplier tube use in Uv-Visible spectrophotometer.
C Choice of solvent and concentration of analyse play an important role in UV Visible spectrophotometric analysis. Justify
D Draw block diagram of a double bean UV spectrophotometer. Explain its working.

Q.3 Answer the following: (Answer any THREE) **12 M**

A Explain any four factors that affect the fluorescence of a compound

B How many filters are employed in a photofluorimeter? What are they called as? Write role of each of them in fluorimetric analysis.

C Differentiate between atomic absorption and atomic emission spectroscopy based on principle and components of instrumentation. Give one advantage and one disadvantage of atomic absorption spectroscopic technique over atomic emission technique.

D Discuss various types of interferences encountered in flame photometry

Q.4 Answer the following: (Answer any THREE) **12 M**

A Explain the term overtones with reference to near IR with suitable diagram. Discuss any one application of near IR spectroscopy.

B Enlist any four detectors in IR spectroscopy. Discuss any one in detail

C With the help of suitable diagram explain various types of scattering studies in Raman spectroscopy

D Give any four points of differentiation between IR spectroscopy and Raman spectroscopy

Q.5 Answer the following: (Answer any THREE): **12 M**

A Give Braggs Law and its mathematical derivation

B Discuss construction and working of glass electrode with suitable diagram

C Give principle involved in differential scanning calorimetry. Enlist any two pharmaceutical applications of the same.

D Draw a typical thermogravimetric curve. Discuss factors affecting the same

Q.6 Answer the following: (Answer any THREE): **12 M**

A Discuss any one instrument used in measurement of radioactivity

B Write a note on isotope dilution analysis

C Nine paracetamol tablets were analysed. The mean of paracetamol content was found to be 508 mg with a standard deviation of 4.5 mg. Calculate the 95% confidence interval for the true paracetanol content in the tablet. [Tabulated 't value' for 8 degrees of freedom is 2.306]

D Quantitative estimation of paracetamol tablets was to be performed by UV spectrophotometric analysis. Absorbance values obtained with increasing concentration of paracetamol are as follows

Concentration (µg/ml)	Absorbance at 257nm
20	0.251
40	0.550
60	0.759
80	1.080
100	1.200

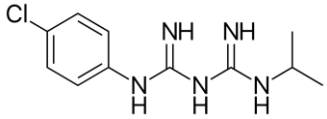
Give the equation of line that best fit the data. What could be the concentration of the solution in µg/ml giving an absorbance of 0.748 at 257 nm

Time: 3 Hours **Marks : 80**

NOTE: All questions are compulsory
Write structures and reactions wherever necessary

Q.1.A. Answer the following (Any Eight): (08)

i. Give an example of a bacterial enzyme and its inhibitor
ii. Give an example of a drug that targets a nucleic acid
iii. 'logP influences biological activity'-explain with a suitable example
iv. Write the generic name and structure for: 2-Ethylthioisonicotinamide
v. Identify the forces that are involved in stabilization of the DNA helix
vi. Explain-'Hydrophobic interactions'
vii. Give an example of a drug that intercalates with DNA
viii. Identify the structure given below and write the active form:



ix. Write the structure and generic name of:
(S)-[2,8-bis(trifluoromethyl)quinolin-4-yl]-[(2R)-piperidin-2-yl]methanol

B. Answer in brief: (08)

i. Using a suitable example bring out the influence of geometric isomerism on biological activity
ii. Explain the following terms: a) Efficacy b) Agonist
iii. Discuss the metabolic pathways for – CHO functional group.
iv. Identify two mechanistic classes of drugs that target nucleic acids. Give one example each

C. Match column A with B and C: (04)

	A	B	C
i	Conjugation with amino acid	3'-Phosphoadenosine-5'-phosphosulfate	S-Adenosylmethionine
ii	Sulfate conjugation	Methyltransferase	Mercapturic acid derivative
iii	Methylation	ϒ-Glutamylcysteinylglycine	Activation of -COOH group
iv	Conjugation with Glutathione	Glycine	Potential biotoxification

Q.2. Answer the following (Any six): (12)

i. "Proteins act as targets for many drugs"- discuss using suitable examples
ii. Compare and contrast Un-competitive and non-competitive enzyme inhibition
iii. What are monoclonal antibodies, give example
iv. Illustrate the signal transduction pathway for GPCR involving adenylate cyclase
v. Give structure, generic name and enzyme inhibited by:
3- [(o-Chlorophenyl) -5-methyl-4-isoxazolyl] penicillin.
vi. Enlist the chemical features of polyene antifungal antibiotics and give example
vii. Give structure and use of Thiabendazole

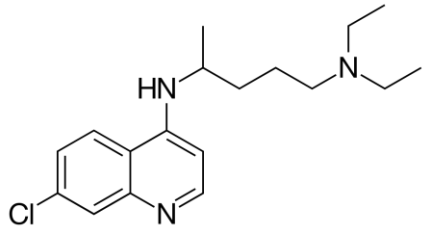
Q.3.A. Classify the Cephalosporins given below based on generation and suggest the suitable route of administration. (04)
Cefadroxil, Cefamandole, Cefuroxime, Ceftriaxone

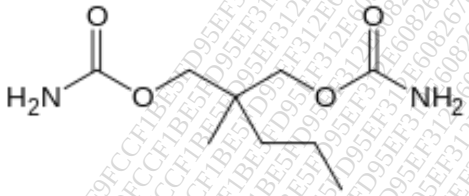
B)

i) Methicillin is given through parenteral route. Justify

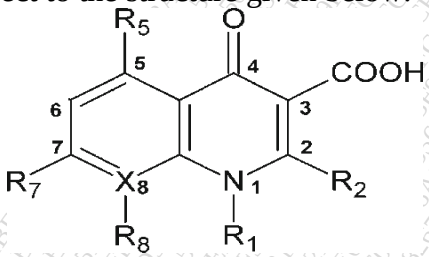
ii) Give the structures and names of any two degradation products of tetracycline

C) Predict any two Phase-I metabolites for each of the following: (04)

i. 

ii. 

Q.4.A. Answer the following with respect to the structure given below: (04)



i. Name any one drug containing the above basic structure and enzyme inhibited by it

ii. Annelation of R_1 and R_8 leads to which active drug.

iii. Indicate any one substitution at R7 that gives potent compound

iv. Comment on the substituents that influence phototoxicity

B. Indicate to which mechanistic class the following drugs belong to (04)
(Structures to be written)

i. Flucytosine
ii Griseofulvin
iii. Naftifine
iv. Miconazole

C. Write a note on anti-leprotic drugs (04)

Q.5. A. Name the strongest and weakest drug-receptor interactions.
Briefly discuss "ionic interactions" and their role in drug receptor binding (04)

B. List different types of receptors and discuss "Ion channel receptors" in detail (04)

C. Discuss Kinase linked receptors with respect to : i) structure ii) signal transduction (04)

Q.6. Outline the synthetic pathway for any four of the following drugs along with necessary reagents and reaction conditions. (12)

i) Cloxacillin ii) Dapsone v) Mebendazole
iii) Pyrimethamine iv)Diloxanide furoate

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3 Hours **80 Marks**

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Time: 3 Hours **Total Marks : 80**

N.B.: 1) All questions are compulsory.
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Q.1 Answer the following.

a) What are the goals of tablet preformulation studies? 2
b) Write the steps in sugar coating process with a formula for each step. 2
c) Justify the addition of disintegrant in pre granulation and post granulation step. 2
d) Classify film coating polymers with suitable examples. 2
e) Differentiate between chewable and effervescent tablet. 2
f) Write various applications of soft gelatin capsules. 2
g) Give a flow chart for manufacturing of hard gelatin capsule shell. 2
h) Calculate shelf life of a product at 25°C given the following parameters: 2
Ea= 12Kcal/mol R= 2 degradation rate at 60°C= 0.0156/min
i) Write the responsibilities of QA department. 2
j) Explain the importance of documentation. 2

Q.2 a) Elaborate on the formulation of chewable tablet. 4
b) Describe any one perforated coating pan. 4
c) Discuss the principle and methodology for accelerated stability testing in shelf life determination. 4

Q.3 a) Draw the layout for large scale manufacturing of tablets. 4
b) Discuss batch manufacturing record for any one solid oral formulation. 4
c) Explain the physics of tablet compression. 4

Q.4 a) State the causes of sticking and weight variation in tablet and suggest remedies for the same 4
b) Describe steps and mechanism involved in hard gelatin capsule filling machine based on independent dosing system. 4

OR

b) Discuss the QC tests for hard gelatin capsules. 4
c) Elaborate on sampling and sampling plan. 4

Q.5 a) List out film coating defects of the coated tablets and suggest methods to rectify these defects. 4
b) Describe the Rotary Die process for large scale manufacture of soft gelatin capsules. 4
c) Explain hydrolytic degradation in pharmaceuticals and the methods for minimising/ preventing such degradation. 4

Q.6 a) Elaborate on packing of capsules. 4

OR

a) Discuss DT and Dissolution testing of tablets. 4
b) Describe the process of fluidized bed coating. 4
c) Write a note on environmental and microbiological controls practised in a pharmaceutical manufacturing facility. 4

(3 Hours) **(Total Marks : 80)**

Please check whether you have got the right question paper.

N.B.: **1)** **All** questions are **compulsory**.

2) Draw **relevant chemical structures** and **diagrams** wherever **applicable**.

1. a) Answer the following : **(10)**

i) Give any two examples of substitution of crude drugs.

ii) Give any two methods with suitable examples for extraction of volatile oils.

iii) State whether following statement is true of false with suitable justification:

"Cholesterol is the precursor molecule for biosynthesis of Citral".

iv) Give biological source and therapeutic uses of any one sesquiterpene containing drug.

v) Give the biological source and chemical constituent with structure of any one wood-based volatile oil drug.

vi) Write the biological sources of any two sweeteners.

vii) Give the biological source and commercial significance of palmarosa oil.

viii) Write the biological source and chemical constituent oleo-gum-resin.

ix) Write biological source of and chemical constituent of any one condensed tannin-containing drug.

x) Name any one flavorant and perfume each along with their biological sources.

b) Answer the following: **(10)**

i) With the help of examples, write a note on adulteration of crude drugs.

ii) Outline general extraction scheme of any one drug, based on its chemical property.

iii) Write in brief about processing and preparation of Ginger for market.

iv) Write in brief about commercial application of tannins in synthesis of drug.

v) What are edible vaccines? Give an example with its use.

2. i) Give source, chemistry, cultivation and collection of clove. **(04)**

ii) With suitable structures, illustrate shikimic acid pathway. **(04)**

iii) Write a note on different methods of manipulation of secondary metabolites. **(04)**

3. i) Write a note on chemical methods of evaluation of crude drugs, as per WHO guidelines. **(04)**

ii) Write a note on isolation, identification and analysis of menthol. **(04)**

iii) Give a detailed account of curcuminoids. **(04)**

4. i) Explain the principle involved, procedure and application of soxhlet extraction. **(04)**

ii) Compare and contrast pale and black catechu. **(04)**

iii) Write a note on colorants of natural origin. **(04)**

5. i) Write a note on natural drugs containing oraganosulfur compounds. **(04)**

ii) Give source, chemistry, chemical test and uses of vanillin and oil of wintergreen. **(04)**

iii) Give source, preparation, chemistry, chemical test and uses of Benzoin. **(04)**

6. i) Give an account of two alcohol containing volatile oil drugs. **(04)**

ii) Write a note on green tea. **(04)**

iii) Write a note on supercritical fluid extraction. **(04)**