

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. I Year Pharmaceutical Chemistry (July 2019 - June 2020)

Subject:Pharmaceutical Organic Chemistry (Paper -I)**Teacher - Dr. Mukesh Gupta**

Day/Lecture	Unit	Topic
1	Unit 1	Historical development of Pharmaceutical chemistry ,
2		Atomic and molecular orbital
3		Covalent bond, inter molecular forces,
4		hybrid orbital, Bond dissociation energy(homolysis and heterolysis)
5		Polarity of bonds and molecules,structure and physical properties
6		Resonance
7		hyperconjugation,
8		hydrogen bonding,introduction,types,
9		effect of hydrogen bonding
10		Inductive effect, field effect
11		Acids and bases, arrhenius concept
12		Bronsted-Lowry concept,
13		strength of acids and bases, Lewis concept,
14		Bond dissociation energy
15		pH,pKa,pKb Values,
16		buffers,buffers in pharmaceutical
17		buffers in biological system,Buffered isotonic solution
18	Unit 2	Physicochemical properties and molecular constitution,
19		surface and interfacial tension
20		refractive index,optical rotation
21		dielectric constant
22		dipole moment,density,Viscosity
23		molar refraction and parachor,
24		stereo isomerism,
25		Optical isomerism-optical activity
26		Optical isomerism-optical activity
27		enantiomerism,diastereoisomerism,
28		meso compounds
29		elements of symmetry
30		DL system of nomenclature of optical isomers
31		Chiral and achiral molecules
32		RS system of nomenclature of optical isomers,
33		Reaction of chiral molecules
34		sequence rule
35		Racemic modification and resolution of racemic mixture
36	Geometrical isomerism, nomenclature of geometrical isomers	
37	Methods of determination of configuration of geometrical isomers	
38	Unit 3	Types of organic reaction,
39		mechanism of organic reaction
40		electrophiles and nucleophiles
41		Curved arrow notation,drawing electron movement with arrow
42		Half headed and double headed arrow,
43		Reaction intermediates,formation ,structure,stability and reactivity of carbocation
44		Reaction intermediates,formation ,structure,stability and reactivity of carbocation
45		Reaction intermediates,formation ,structure,stability and reactivity of carboanion
46		Reaction intermediates,formation ,structure,stability and reactivity of carboanion
47		Reaction intermediates,formation ,structure,stability and reactivity of free radical
48		Reaction intermediates,formation ,structure,stability and reactivity of free radical
49		Nucleophilic aliphatic substitution
50		SN1 and SN2 reaction,mechanism
51		kinetics,order of reactivity and stereochemistry of nucleophile,Elimination reaction
52		Elimination reaction

53		E1 and E2 reaction,mechanism
54		kinetics,order of reactivity and stereochemistry of electrophile
55		kinetics,order of reactivity and stereochemistry of electrophile
60	Unit 4	Classification of drugs on the basis of biological sources
61		Classification of drugs on the basis of Geographical sources
62		Classification of drugs on the basis of Marine and Minerals sources
63		Theories of drug action,biological defenses
64		Theories of drug action,chemical defenses
65		Surface active agents,metabolic antagonism
66		Enzyme neutralizers,drug receptor interactions and receptor theories
67		drug receptor interactions and receptor theories
68	Unit 5	Introduction to dosage forms,classification and definition
69		Route of drug administration
70		Aromatic waters and syrups
71		Tinctures and infusion
72		Introduction to medicinal system,Ayurvedic,Unani,
73		Introduction to medicinal systemSiddha
74		Introduction to medicinal system,Homeopathic,Allopathic
75		Weight and measures,Imperial and metric system
76		Calculation involving percentage solutions,allegation
77		Proof spirit and isotonic solution based on freezing point and molecular weight

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. I Year Pharmaceutical Chemistry (July 2019 - June 2020)

Subject: Inorganic Pharmaceutical analysis (Paper -II)**Teacher - Dr. Mukesh Gupta**

Day/Lecture	Unit	Topic	
1	Unit 1	Impurities in pharmaceutical substances.	
2		history of pharmacopoeia	
3		Sources and types of impurities	
4		effect of impurities	
5		Permissible impurities in pharmaceutical substances	
6		Methods used to purify inorganic substances	
7		Test of purity, introduction of limit test	
8		Principle of limit test, limit test for chloride	
9		Limit test for Sulphate,	
10		Limit test for Iron	
11		Limit test for Arsenic,	
12		Limit test for Lead	
13		Limit test for Heavy metals	
14	Unit 2	Pharmaceutical analysis,	
15		different techniques of analysis	
16		Methods of expressing concentration	
17		Primary and secondary standard solution,	
18		preparation of solution	
19		Preparation and standardization of various molar and normal solution	
20		Oxalic acid, Sodium hydroxide,	
21		hydrochloric acid, Sodium hydroxide,	
22		Sodium sulphate, Sulphuric acid	
23		potassium permanganate and ceric ammonium sulphate	
24		Errors, sources of errors, types of errors	
25		Methods of minimizing errors	
26		Accuracy, precision and significant figures	
27		Unit 3	Acid base titration,
28			theories of acid base titration
29	Classification of acid base titration and theory involved		
30	titration in strong acid and strong base,		
31	titration very weak acid and base		
32	titration weak acid and base		
33	Neutralization curves		
34	Non aqueous titration, solvents,		
35	acidimetry and alkalimetry titration		
36	Estimation of sodium benzoate and Ephedrine HCl		
37	Redox titration,		
38	concept of oxidation and reduction		
39	Types of redox titration		
40	Principle and application of Cerimetry, Iodimetry		
41	Iodometry titration with potassium iodate		
42	Unit 4	precipitation titration,,	
43		Mohr's method	
44		Volhard's method	
45		sodium chloride Fajans method, estimation of	
46		complexometric titration, classification	
47		Metal ion indicators,	
48		masking and demasking reagents	

49		Estimation of Magnesium sulphate
50		Estimation of Calcium gluconate
51		Gravimetryanalysis
52		Principle,step involved in gravimetric analysis
53		Purity of precipatate,
54		co-precipitation and post precipitation
55		Estimation of barium sulphate
56		Basic principle,method and application of diazotisation titration
57	Unit 5	Preparation and uses of Alum
58		Preparation and uses of Aluminium hydroxide gel
59		Preparation and uses of Antimony potassium tartrate
60		Preparation and uses of Aromatic spirit of ammonia
61		Preparation and uses of boric acid
62		Preparation and uses of Potassium citrate
63		Praparation and uses of Sodium benzoate,
64		Praparation and uses ofmilk of Magnesia
65		preparation and uses of Magnesium carbonate,
66		preparation and uses ofZinc Oxide
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Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Biosciences

Lesson Plan - B. Sc. I Year Pharmaceutical Chemistry (July 2019 - June 2020)

Subject - Pharmaceutical Chemistry Practical**Teacher - Dr. Mukesh Gupta**

Day/Lecture	Unit	Topic
1		Identification of elements and groups present in organic compounds
2		Identification of elements and groups present in organic compounds
3		Identification of elements and groups present in organic compounds
4		Identification of elements and groups present in organic compounds
5		Identification of elements and groups present in organic compounds
6		Determination of solubility of benzoic acid over a range of temperature
7		Determination of surface tension of the given liquids
8		Determination of Viscosity of the given liquids
9		Preparation of aromatic Waters
10		preparation of Syrup
11		Preparation of Tinctures
12		Preparation of buffer solutions and measurement of pH
13		Identification of the unknown compound from the literature using MP/BP.
14		Limit test of chloride
15		Limit test of Sulphate
16		Limit test of Iron
17		Limit test of Lead
18		Preparation of inorganic pharmaceutical Alum
19		Preparation of inorganic pharmaceutical Aluminium hydroxide gel
20		Preparation of inorganic pharmaceutical milk of magnesia
21		Preparation of inorganic pharmaceutical ferrous ammonium sulphate
22		Preparation of inorganic pharmaceutical antimony potassium tartarate
23		Preparation and standardization of sodium hydroxide, Oxalic acid
24		Assay of Ammonium chloride
25		Assay of borax
26		Assay of Zinc Oxide
27		Assay of Sodium carbonate
28		Assay of Copper Sulphate by Iodometry
29		Volumetric estimation of ferrous sulphate using oxalic acid,
30		Potassium permanagnate and potassium dichromate.
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Maharaja Ranjit Singh College of Professional Sciences, Indore
 Department of Chemical Science
 Lesson Plan - B.Sc. II Year Pharmaceutical Chemistry(July 2019 -June 2020)
 Subject - Medicinal chemistry Paper I
 Teacher - Dr Mukesh Gupta

Day/Lecture	Unit	Topic
1	Unit 1	Physicochemical properties in relation to biological action
2		Ionization, solubility, partition coefficient
3		Hydrogen bonding-introduction, types, condition for hydrogen bonding
4		effect of hydrogen bonding, examples
5		protein binding introduction, definition, examples,
6		protein binding applications
7		chelation introduction, definition, examples
8		importance of chelation
9		bioisosterism
10		optical and geometrical isomerism introduction, classification
11		optical isomerism introduction, reason of optical isomerism, examples
12		geometrical isomerism introduction, reason of geometrical isomerism
13		geometrical isomerism in various compounds
14	Unit 2	General Anesthetics: Definition, Stages of Anesthesia
15		Classification and Theories of General Anesthetics
16		Mechanism of action of general anesthetics
17		Synthesis of nitrous oxide
18		Synthesis of halothane
19		Synthesis of thiopental sodium
20		Synthesis of Chloroform
21		local anesthetics introduction
22		local anesthetics classification
23		mechanism of action of local anesthetics
24		SAR of local anesthetics
25		synthesis of procaine hydrochloride
26		synthesis of procaine hydrochloride
27		synthesis of Benzocaine
28		synthesis of Benzocaine
29		synthesis of lignocaine hydrochloride
30		synthesis of lignocaine hydrochloride
31	Unit 3	Hypnotics and Sedatives introduction, examples
32		Definition and Classification of hypnotics and sedatives
33		Mechanism of action of hypnotics and sedatives
34		SAR of Barbituric acid derivatives
35		Synthesis of Barbitol
36		Synthesis of Barbitol
37		Synthesis of allobarbitol
38		Synthesis of allobarbitol
39		Synthesis of hexobarbitol
40		Synthesis of hexobarbitol
41		SAR of benzodiazepines

42		Synthesis of diazepam
43		Synthesis of diazepam
44		Synthesis of alprazolam
45		Synthesis of alprazolam
46		Synthesis of zolpidem
47		Synthesis of zolpidem
48		Anti-convulsants introduction,definition,examples etc.
49		classification of anti-convulsants
50		mechanism of action of anti-convulsants
51		Synthesis of phenobarbital
52		Synthesis of phenobarbital
53		Synthesis of phenytoin sodium
54		Synthesis of phenytoin sodium
55	Unit 4	Analgesics and antipyretics introduction, classification
56		Mechanism of action and SAR of morphine analogue
57		Mechanism of action and SAR of Salicylic acid
58		Mechanism of action and SAR of aryl alcanoic acid derivatives
59		Synthesis of Aspirin
60		Synthesis of paracetamol
61		Anti-histaminics drugs introduction, classification
62		Mechanism of action and SAR of ethanolamine derivatives
63		Synthesis of diphenhydramine hydrochloride
64		Synthesis of diphenhydramine hydrochloride
65		Synthesis of promethazine hydrochloride
66		Synthesis of promethazine hydrochloride
67	Unit 5	Diuretics introduction, classification
68		Mechanism of action and SAR of diuretics
69		Synthesis and uses of hydrochlorthiazide
70		Synthesis and uses of hydroflumethiazide
71		Synthesis and uses of ethacrynic acid
72		Synthesis and uses of furosemide
73		Synthesis and uses of acetazolamide
74		Antihypertensives drugs introduction,classification
75		Mechanism of action and SAR of antihypertensive drugs
76		Synthesis of captopril
77		Synthesis of propranolol hydrochloride

Maharaja Ranjit Singh College of Professional Sciences, Indore

Department of Chemical Science

Lesson Plan - B.Sc. II Year Pharmaceutical Chemistry(July 2019 - June 2020)

Subject - Chemistry of Natural Products Paper II

Teacher - Dr Mukesh Gupta

Day/Lecture	Unit	Topic
1	Unit 1	Heterocyclic Compounds
2		Nomenclature,
3		Structural formula and chemistry of Imidazoles,
4		Structural formula and chemistry of Imidazoles
5		Structural formula and chemistry of Oxazoles
6		Structural formula and chemistry of Oxazoles
7		Structural formula and chemistry of Pyrazoles
8		Structural formula and chemistry of Pyrazoles
9		Structural formula and chemistry of Pyran
10		Structural formula and chemistry of Pyran
11		Structural formula and chemistry of Pyrimidine,
12		Structural formula and chemistry of Pyrimidine,
13		Structural formula and chemistry of Indole
14		Structural formula and chemistry of Indole,
15		Structural formula and chemistry of Isoquinoline
16		Structural formula and chemistry of purine
17		Structural formula and chemistry of pirine
18	Unit2	Carbohydrates: Classification of Carbohydrates
19		Monosaccharides
20		Glucose, Fructose and their reactions
21		Glucose, Fructose and their reactions
22		Cyclic structure of D-glucose
23		Mutarotation. Diasaccharides
24		Maltose
25		Lactose,
26		Sucrose.
27		Polysaccharides : Starch,
28		Polysaccharides : Starch
29		Polysaccharides : Cellulose
30		Polysaccharides : Cellulose
31		Polysaccharides : dextran,
32		Polysaccharides : dextran
33		Polysaccharides : glycogen
34		Polysaccharides : glycogen
35		Polysaccharides : insulin
36		Polysaccharides : insulin
37		Fats,Oils,Waxes,fatty acids
38		Physico-chemical properties
39		Phospholipids
40		lecithenes
41		cephalins
42		plasmogenes
43		glycolipids

44	Unit 3	Amino acids, classification
45		Structure and stereochemistry of aminoacids
46		properties of amino acids
47		properties of amino acids
48		Protein, Classification
49		properties of proteins
50		primary secondary and tertiary structure of proteins
51		primary secondary and tertiary structure of proteins
52		Nucleic acids introduction
53		Structure of DNA and RNA
54	Unit 4	Alkaloids : Classification
55		general introduction, composition
56		chemistry and chemical classes, biosources
57		Therapeutic uses and commercial application of Quinine
58		Therapeutic uses and commercial application of Quinine
59		Therapeutic uses and commercial application of morphine
60		Therapeutic uses and commercial application of morphine
61		Therapeutic uses and commercial application of reserpine
62		Therapeutic uses and commercial application of reserpine
63		Glycosides: Classification
64		general introduction, composition
65		chemistry and chemical classes, biosources
66		Therapeutic uses and commercial application of senna
67		Therapeutic uses and commercial application of senna
68		Therapeutic uses and commercial application of aloes
69		Therapeutic uses and commercial application of aloes
70		Therapeutic uses and commercial application of bitter almond
71		Therapeutic uses and commercial application of bitter almond
72	Unit 5	Terpenes:Classification. Isolation
73		general introduction, composition
74		chemistry and chemical classes, biosources
75		Therapeutic uses and commercial application of citral
76		Therapeutic uses and commercial application of citral
77		Therapeutic uses and commercial application of carvone
78		Therapeutic uses and commercial application of carvone
79		Therapeutic uses and commercial application of menthol
80		Therapeutic uses and commercial application of menthol
81		Therapeutic uses and commercial application of thymol
82		Therapeutic uses and commercial application of
83		Steroides : Isolation, Nomenclature
84		Chemistry of Cholesterol
85		Chemistry of Cholesterol
86		Chemistry of ergosterol
87		Chemistry of ergosterol
88		Chemistry of stigmasterol
89		Chemistry of stigmasterol
90		Chemistry of cartosone
91		Chemistry of cartosone
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Department of Chemical Science

Lesson Plan - B.Sc. II Year Pharmaceutical Chemistry(July 2019 - June 2020)

Subject - Pharmaceutical Chemistry Practical

Teacher - Dr Mukesh Gupta

Day/Lecture	Unit	Topic
1		Purification of pharmaceutical organic compounds:Decolorization,recrystallization,sublimation
2		Purification of pharmaceutical organic compounds:Decolorization,recrystallization,sublimation
3		Purification of pharmaceutical organic compounds:Decolorization,recrystallization,sublimation
4		Preparation of Benzocaine
5		Preparation of phentoin
6		Preparation of aspirin
7		Preparation of paracetamol
8		Determination of partition coefficient for any two drugs
9		Isolation of caffeine from tea
10		Isolation of casein from milk
11		Determination of Iodine value
12		Determination of acid value
13		Determination of saponification value
14		Separation of amino acids by npaper chromatography
15		Identification test of carbohydrate, proteins
16		Separation of sugars by thin layer chromatography
17		Separation of plant pigments by column chromatography
18		Synt5hesis of benzyl
19		Synt5hesis of thalimide
20		Synt5hesis of sulphanic acid

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Department of Chemical Sciences

Lesson Plan - B.Sc. III Year Pharmaceutical Chemistry (July 2019 - June 2020)

Subject - Medicinal Chemistry Paper I

Teacher - Dr. Mukesh Gupta

Day/Lecture	Unit	Topic
1	Unit 1	Adrenergic- classification
2		Mechanism of action and SAR of ethylamine analogue
3		Mechanism of action and SAR of ethylamine analogue
4		Synthesis of adrenalin
5		Synthesis of epinephrine
6		Synthesis of norepineprine
7		Synthesis of ephedrine
8		Synthesis of dopamine
9		Anticoagulants-classification
10		Mechanism of action
11		Synthesis and uses of haparin
12		Synthesis and uses of haparin
13		Synthesis and uses of dicoumarol
14		Synthesis and uses of dicoumarol
15		Expectorants and anti-tussives,classification
16		Mechanism of action
17		Synthesis of acetylcystein
18		Synthesis of guaifensin
19		Synthesis of noscapine
20	Unit 2	Antibiotics, historical background
21		Structure activity relationship
22		Chemical classification of beta-lactam antibiotics
23		Penicillin
24		cephalosporins
25		Aminoglycosides
26		Streptomycin and neomycin
27		Tetracyclines: tetracycline
28		macrolide
29		Azithromycin
30		Constitution and synthesis of chloramohenicol
31		Constitution and synthesis of chloramohenicol
32		Sulphonamide: classification
33		Mechanism of action
34		Synthesis ans uses of suphacetamide
35		Synthesis ans uses of suphacetamide
36		Synthesis ans uses of sulphaguianide
37		Synthesis ans uses of sulphaguianide
38		Synthesis ans uses of Dapsone
39		Synthesis ans uses of Dapsone
40	Unit 3	Anti-malarial: classification
41		Mechanism of action

42		SAR of 4-aminoquinolines
43		Synthesis of chloroquine phosphate
44		Synthesis of chloroquine phosphate
45		Synthesis of amidiquine hydrochloride
46		Synthesis of amidiquine hydrochloride
47		Synthesis of primquine phosphate
48		Synthesis of primquine phosphate
49		Anti-tubercular drugs: classification
50		Mechanism of action
51		Synthesis and uses of para amino salicylic acid
52		Synthesis and uses of para amino salicylic acid
53		Synthesis and uses of Isoniazid
54		Synthesis and uses of Isoniazid
55		Synthesis and uses of rifampicin
56		Synthesis and uses of rifampicin
57		Anti-amoebic: classification
58		Mechanism of action
59		Synthesis and uses of metronidazole
60		Synthesis and uses of metronidazole
61	Unit 4	Anti-diabetic : classification
62		Mechanism of action
63		Synthesis and uses of metformin
64		Synthesis and uses of metformin
65		Synthesis and uses of sitagliptin
66		Synthesis and uses of sitagliptin
67		Synthesis and uses of glimiperide
68		Synthesis and uses of glimiperide
69		Anti-neoplastic: types of cancer, classification
70		Mechanism of action
71		Synthesis and uses of 5-fluoro uracil
72		Synthesis and uses of 5-fluoro uracil
73		Synthesis and uses of 6-mercaptopurine
74		Synthesis and uses of 6-mercaptopurine
75		Synthesis and uses of thiotepa
76		Synthesis and uses of thiotepa
77		Synthesis and uses of busulphan
78		Synthesis and uses of busulphan
79	Unit 5	Drug design : Various approaches used in drug design
80		Physicochemical parameters used in quantitative structure activity
81		Physicochemical parameters used in quantitative structure activity
82		Relationship (QSAR) such as partition coefficient
83		Hammett's electronic parameter
84		Taft's steric parameter and Hansch analysis
85		Taft's steric parameter and Hansch analysis
86		Free Wilson analysis
87		introduction to 3D QSAR approaches
88		introduction to 3D QSAR approaches

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Department of Chemical Sciences

Lesson Plan - B.Sc. III Year Pharmaceutical Chemistry (July 2019 - June 2020)

Subject - Instrumental Chemistry Paper II

Teacher - Dr. Mukesh Gupta

Day/Lecture	Unit	Topic
1	Unit 1	Conductometry- introduction, conductivity cell
2		Conductometric titrations, applications
3		Potentiometry- Electrochemical cell
4		Construction and working of reference Standard hydrogen electrode
5		Construction and working of reference Silver chloride electrode
6		Construction and working of reference Calomel electrode
7		Indicator electrode- metal electrode
8		Indicator electrode- Glass electrode
9		Methods to determine end point of potentiometric titration and application
10		Methods to determine end point of potentiometric titration and application
11		Polarography- principle
12		Ilkovic equation
13		Construction and working of dropping mercury electrode,application
14		Construction and working of rotating platinum electrode,application
15	Unit 2	UV Spectroscopy- Principle
16		Instrumentation of UV Spectroscopy
17		Application of UV Spectroscopy
18		IR Spectroscopy- Principle
19		Instrumentation of IR Spectroscopy
20		Application of IR Spectroscopy
21	Unit 3	NMR Spectroscopy- Principle
22		The spinning nucleus
23		Magnetic and non-magnetic nuclei
24		Rules to find nuclear spin
25		Effect of external magnetic field
26		Precession motion and frequency
27		Chemical shift: measurement
28		Shielding and deshielding effect
29		Factors affecting spin-spin coupling
30		Coupling constant
31		Instrumentation of NMR spectroscopy
32		Interpretation of NMR spectra
33		Mass spectroscopy : principle, instrumentation
34		Types of ions and use of mass spectrometry in determination of molecular weight
35		Types of ions and use of mass spectrometry in determination of molecular weight
36	Unit 4	Chromatography: introduction to chromatography
37		Absorption and partition column chromatography- methodology
38		Absorption and partition column chromatography-advantage,disadvantage
39		Absorption and partition column chromatography-application
40		Thin layer chromatography-introduction,principle
41		Thin layer chromatography-methodology,Rf-values
42		Thin layer chromatography-advantage,disadvantage and application
43		Paper chromatography--introduction,principle
44		Paper chromatography-methodology, development techniques
45		Paper chromatography-advantage,disadvantage and application
46	Unit 5	Gas chromatography-introduction,theory
47		Instrumentation of Gas chromatography
48		Derivatization temperature programming
49		Gas chromatography- advantage,disadvantage and application
50		High performance liquid chromatography (HPLC)-introduction,theory
51		High performance liquid chromatography (HPLC)- Instrumentation
52		High performance liquid chromatography (HPLC)- advantage and application

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Lesson Plan - B.Sc. III Year Pharmaceutical Chemistry (July 2019 -June 2020)

Subject - Pharmaceutical Chemistry Practical

Teacher - Dr. Mukesh Gupta

Day/Lecture	Unit	Topic
1	Unit 1	Preparation of N-phenyl azo beta- naphthol
2		Preparation of diphenyl thiourea
3		Preparation of methyl orange
4		Preparation of phenolphthalein
5		Interpretation of given UV spectrum
6		Interpretation of given IR spectrum
7		Determination of absorption maxima and effect of solvents on absorption maxima of Org.copm.
8		Assay of Paracetamol by UV spectroscopy
9		Estimation of dextrose by colorimetry
10		Weight variation test of given tablets
11		Hardness test of given tablets
12		Friability test of given tablets
13		Disintegration test of given tablets
14		Systematic separation and identification of organic binary mixture
15		Systematic separation and identification of organic binary mixture
16		Systematic separation and identification of organic binary mixture
17		Systematic separation and identification of organic binary mixture
18		Systematic separation and identification of organic binary mixture
19		Separation of mixture of amino acid and determination of Rf value by thin layer chromatography
20		Separation of mixture of amino acid and determination of Rf value by thin layer chromatography
21		Demonstration experiment on HPLC
22		Demonstration experiment on Gas chromatography