

**DEVI AHILYA VISHWAVIDYALAYA, INDORE**  
**UNDER GRADUATE SEMESTER WISE SYLLABUS**  
**Syllabus of B.Sc. Pharmaceutical Chemistry**  
**Session 2015-2016 & Onwards**

**SCHEME OF MARKS**

**B.Sc. II Year**

**Semester III**

Medicinal Chemistry 100 marks  
 Practical 50 marks

**Semester IV**

Chemistry of Natural Products 100 marks  
 Practical 50 marks

15 Marks CCE + 85 Marks Semester Examination = 100 Marks for Each Paper

**B.Sc. Semester III**

Paper Title	Max. Marks	Min. Marks
Medicinal Chemistry	85	28
Practical	50	17
CCE	15	05

**B.Sc. Semester IV**

Paper Title	Max. Marks	Min. Marks
Chemistry of Natural Products	85	28
Practical	50	17
CCE	15	05

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30/7/2014

बी.एससी (स्नातक) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम

**B.Sc (Graduate) semester wise Syllabus**

**2015-2016 & Onwards**

Max. Marks / अधिकतम अंक : 85

Min. Marks: 28

Class / कक्षा : B.Sc / बी.एससी

Semester / सेमेस्टर : III


Title of Subject Group / विषय समूह का शीर्षक : **Pharmaceutical Chemistry**

Paper Title/प्रश्न पत्र शीर्षक : **MEDICINAL CHEMISTRY**

Compulsory / अनिवार्य : **Compulsory**

Particular / विवरण

<b>UNIT I</b>	<b>General Anesthetics:</b> Definition, Stages of Anesthesia, Classification and Theories of General Anesthetics, Preparation, Mode of action, Therapeutic uses and Adverse Effects of Compounds - Thiopental Sodium, Halothane, Cyclopropane. <b>Local Anesthetics:</b> Definition, Classification and Theories of Local Anesthetics (five Theories), Preparation, Mode of action, Therapeutic uses and Adverse Effects of Compounds - Procaine, Benzocaine, Lignocaine HCl, Dipherodon HCl.
<b>UNIT II</b>	<b>Hypnotics and Sedatives :</b> Definition, Classification and Structure Activity Relationship of barbiturates, Preparation, Mode of action, Therapeutic uses and Adverse Effect of Compounds - Barbitone Sodium, Allobarbiton, Hexabarbitons, Glutethimide. <b>Tranquillizers:</b> Definition, Classification, Preparation, Mode of action, Therapeutic use and adverse effect of Compounds - Chlorpromazine Hcl, Chlordiazepoxide, Diazepam <b>Anticonvulsants:</b> Definition, Classification, Preparation, Mode of action, Therapeutic uses and Adverse Effect of Compounds - Phenobarbital, Phensuximide.
<b>UNIT III</b>	<b>Antihypertensive:</b> General Introduction, Causes and types of hypertension, Classification of antihypertensive, Mode of action of Calcium channel blockers, Preparation, Mode of action, Therapeutic uses and Adverse effect of Compounds – Tolazoline Hcl, Propranolol HCl, Methyl Dopa, Guanithidine sulphate, Captopril <b>Adrenergic Agents:</b> Classification, Adrenergic hormone, Structure Activity Relationship of Phenylethylamine analogs, Ephedrine, Pseudoephedrine HCl, Metarminol, Naphazoline HCl. <b>Cholinergics and Anticholinesterases:</b> Preparation, Mode of action, Therapeutic uses and Adverse effect of Compounds – Acetylcholine, Carbachol, Edrophonium, Pyridostigmine.
<b>UNIT IV</b>	<b>Non Steroidal Anti-Inflammatory Drugs :</b> Definition, Types of Pain, Classification of NSAID, Structure Activity Relationship of Indole Acetic Acid derivatives, Structure Activity Relationship of Salicylic acid derivatives. Preparation, Mode of action, Therapeutic uses and adverse effect of Compounds - Indomethacin, Tolmetin Sodium. <b>Diuretics:</b> Anatomy and Physiology of Kidney, Mechanism of Urine Formation, Classification of Diuretics, Preparation, Mode of action, Therapeutic uses and Adverse effect of Compounds – Furosemide, Acetazolamide, Chlorthiamide, Spironolactone.

  
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<b>UNIT V</b>	<p><b>Drugs Acting on Respiratory Systems</b>, Expectorants and Antitussives : Classification and Mechanism of action, Potassium glucosulphate, Terpene hydrate, Noscopine.</p> <p><b>Antiasthmatics Drugs</b> : Classification, Causes of Asthma, Preparation, Mode of action, Therapeutic uses and Adverse Effect of Compounds – Salbutamol, Terbutaline.</p> <p><b>Autocoids</b> ; Histaminics and Antihistaminics, Chemistry of histamine, Pharmacological action of histamines, Classification of Antihistaminics, Structure Activity Relationship of Ethanolamine derivatives, Diphenylhydramine Hcl, Mepyramine, Pheniramine maleate.</p>
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### BOOKS RECOMMENDED

1. Ashutosh Kar, Medicinal chemistry, New Age International(P)Limited, Publishers.
2. G.R.Chatwal, Pharmaceutical Chemistry Organic Vol. II, Himalaya Publishing House, Bombay.
3. Dr. J.L. Jain, Fundamentals of Biochemistry, S. Chand & Company Ltd. New Delhi.
4. F.S.K.Barar, Essentials of Pharmacotherapeutics, S. Chand & Company Ltd. New Delhi.
5. R.S.Gaud and Dr. G.D.Gupta, Practical Pharmaceutics, CBS Publishers and Distributors, New Delhi.
6. Harkishan sing, V.K. Kapoor, Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
7. Harkishan sing, V.K. Kapoor, Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
8. John H.Block, John m.Beak,Jr., Organic Medicinal and Pharmaceutical Chemistry, Lippincot Williams & Wilkins.
9. Stenlake & Beckett, Practical Pharmaceutical Chemistry Part I, CBS Publishers and Distributors. New Delhi.
10. O.P. Agrawal, Advanced Organic Practical, Goyal Publishing House, Meerut (U.P.)
11. Dr. C.S. Shah, Dr. J.S. Qadry, Pharmacognosy, B.S. Shah Prakashan.
12. R.S. Satoshkar, S.Bhandarkar, S.S. Ainaपुरi, Pharmacology & Pharmacotherapeutics, popular Prakashan, Mumbai
13. Paul M Dewick. Medicinal natural products (A biosynthesis approach)II edition ,
14. Ashutosh kar, Pharmacognosy & Pharmacobiotech, New Age International(P)Limited, Publishers.
15. Vogel, A.I. A Textbook of Practical Organic Chemistry. ELBS/ Longman, London

JOB  
30/7/2014

बी.एससी (स्नातक) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम

**B.Sc (Graduate) semester wise Syllabus**

**2015-2016 & Onwards**

Max. Marks / अधिकतम अंक : 50

Min. Marks: 17

Class / कक्षा

: B.Sc / बी.एससी

Semester / सेमेस्टर :

: III

Title of Subject Group / विषय समूह का शीर्षक

: **Pharmaceutical Chemistry**

Paper Title/प्रश्न पत्र शीर्षक

: **Practical**

Compulsory / अनिवार्य

: **Compulsory**

Particular / विवरण

**Examination: 4 hours**

- I Preparation of Organic Compounds: 12 Marks**
- (a) Phenyl Benzoate (b) 1-Phenyl Azo- $\beta$ -naphthol (c) Phthalimide  
(d) Benzanilide (e) Hippuric Acid (f) Naphthyl acetate (g) Succinic anhydride  
(h) Di-azo-amino benzene (i) 2,4-Dinitro toluene (j) 2,4,6-Tribromo aniline  
(k) p-acetanisidide.
- II Isolation: 12 Marks**
- (a) Starch from potatoes (b) Hippuric from Cow's urine  
(c) Calcium citrate from Lemon juice. (d) Solanin from Potatoes.
- III Identification of Plant Products: 06 Marks**
- III Identification of Drugs: 06 Marks**
- IV Viva -voce 06 Marks**
- V Practical record 08 Marks**

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30/7/2014

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**B.Sc (Graduate) semester wise Syllabus**  
**2015-2016 & Onwards**

Max. Marks / अधिकतम अंक : 85

Min. Marks: 28

Class / कक्षा

: B.Sc / बी.एससी

Semester / सेमेस्टर :

: IV

Title of Subject Group / विषय समूह का शीर्षक : **Pharmaceutical Chemistry**

Paper Title / प्रश्न पत्र शीर्षक

: **CHEMISTRY OF NATURAL PRODUCTS**

Compulsory / अनिवार्य

: **Compulsory**

Particular / विवरण

<b>UNIT I</b>	<b>Heterocyclic Compounds:</b> Nomenclature, Structural formula and chemistry of Imidazoles, Oxazoles, Pyrazoles, Pyran, Pyrimidine, Indole, Isoquinoline. <b>Terpenes:</b> Isolation, Classification. General methods of determining structure with references to Citral, Terpeneol, Carvone, Menthol, Camphor.
<b>UNIT II</b>	<b>Carbohydrates:</b> Classification of Carbohydrates, Monosaccharides : Glucose, Fructose and their reactions, Cyclic structure of D-glucose, Mutarotation. Disaccharides: Maltose, Lactose, Sucrose. Polysaccharides : Starch, Cellulose. <b>Glycosides:</b> Classification, Chemistry of Salicin, Arbutin, Amygdalin, Sinigrin, Anthraquinone glycosides, Tannin, Cardiac glucosides, Saponins.
<b>UNIT III</b>	<b>Alkaloids:</b> Classification. General methods of determining structure of an Alkaloid. A general study of structure of Quinine, Morphine, Reserpine, Atropine. <b>Purines :</b> Uric acid, Caffeine, Theobromine, Theophylline
<b>UNIT IV</b>	<b>Proteins and Amino Acids:</b> Isolation and classification of protein, Hydrolysis of proteins, Fibrous and Globular proteins, Methods of synthesis, Properties and Classification of amino acids. Nucleoproteins, Nucleic acids. <b>Lipids:</b> Fats, Oils, Waxes, Fattyacids, Physio-chemical properties, Phospholipids, Lecithines, Cephalines, Plasmogens, Glycolipids.
<b>UNIT V</b>	<b>Polynuclear Aromatic Hydrocarbon:</b> Chemistry of Naphthalene, Anthracene and Phenanthracene. <b>Steroides:</b> Isolation, Nomenclature, Chemistry of Cholesterol, Ergosterol, Stigmasterol

*JOB*  
 30/7/2014

## BOOKS RECOMMENDED

1. Ashutosh Kar, Medicinal chemistry, New Age International(P)Limited, Publishers.
2. G.R.Chatwal, Pharmaceutical Chemistry Organic Vol. II, Himalaya Publishing House, Bombay.
3. Dr.J.L.Jain, Fundamentals of Biochemistry, S. Chand & Company Ltd. New Delhi.
4. F.S.K.Barar, Essentials of Pharmacotherapeutics, S. Chand & Company Ltd. New Delhi.
5. R.S.Gaud and Dr. G.D.Gupta, Practical Pharmaceutics, CBS Publishers and Distributors, New Delhi.
6. Harkishan sing, V.K. Kapoor, Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
7. Harkishan sing, V.K. Kapoor, Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
8. John H.Block, John m.Beak,Jr., Organic Medicinal and Pharmaceutical Chemistry, Lippincot Williams & Wilkins.
9. Stenlake & Beckett, Practical Pharmaceutical Chemistry Part I, CBS Publishers and Distributors. New Delhi.
10. O.P.Agrawal, Advanced Organic Practical, Goyal Publishing House, Meerut (U.P.)
11. Gurdeep Raj, Advanced Inorganic Practical, Goyal Publishing House, Meerut (U.P.)
12. Paul M Dewick, Medicinal natural products: A biosynthesis approach, II edition, John Wiley & Sons,
13. Ashutosh kar, Pharmacognosy & Pharmacobiotech, New Age International (P) Limited, Publishers.

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30/7/2014

बी.एससी (स्नातक) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम

**B.Sc (Graduate) semester wise Syllabus**

**2015-2016 & Onwards**

Max. Marks / अधिकतम अंक : 50

Min. Marks: 17

Class / कक्षा : B.Sc / बी.एससी

Semester / सेमेस्टर : IV

Title of Subject Group / विषय समूह का शीर्षक : **Pharmaceutical Chemistry**

Paper Title/प्रश्न पत्र शीर्षक : **Practical**

Compulsory / अनिवार्य : **Compulsory**

Particular / विवरण

**Examination: 4 hours**

<b>I</b>	<b>Assay:</b>	<b>12 Marks</b>
	(a) Ampicillin	
	(b) Aspirin	
	(c) Benzoic acid	
	(d) Citric acid	
	(e) Sodium Bicarbonate	
<b>II</b>	<b>Isolation:</b>	<b>12 Marks</b>
	(a) Casein from Milk	
	(b) Lactose from Milk	
	(c) Hesperdin from Orange peel	
	(d) Lycopene from Tomatoes	
<b>III</b>	<b>TLC of Drugs:</b>	<b>12 Marks</b>
<b>IV</b>	<b>Viva - voce</b>	<b>06 Marks</b>
<b>V</b>	<b>Practical record</b>	<b>08 Marks</b>

*J.P.*  
30/7/2014

**DEVI AHILYA VISHWAVIDYALAYA, INDORE**  
**UNDER GRADUATE SEMESTER WISE SYLLABUS**

**Syllabus of B.Sc. Pharmaceutical Chemistry**  
**Session 2016-2017 & Onwards**

**SCHEME OF MARKS**

**Semester V**

**Max. Marks**

Paper: Medicinal chemistry  
Practical

100 marks  
50 marks

**Semester VI**

**Max. Marks**

Drug Analysis  
Practical  
Internship (Project)

100 marks  
50 marks  
100 marks

*15 Marks CCE+ 85 Marks Semester Examination= 100 Marks for Each Paper*

**B.Sc. Semester V**

<b>Paper Title</b>	<b>Max. Marks</b>	<b>Min. Marks</b>
Medicinal Chemistry	85	28
Practical	50	17
CCE	15	05

**B.Sc. Semester VI**

<b>Paper Title</b>	<b>Max. Marks</b>	<b>Min. Marks</b>
Drug Analysis	85	28
Practical	50	17
CCE	15	05
Internship (Project)	100	

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*30/7/2014*



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**B.Sc (Graduate) semester wise Syllabus**  
**2016-2017 & Onwards**

Max. Marks / अधिकतम अंक : 85

Min. Marks: 28

Class / कक्षा

:B.Sc / बी.एससी

Semester / सेमेस्टर :

: V

Title of Subject Group / विषय समूह का शीर्षक : **Pharmaceutical Chemistry**

Paper Title/प्रश्न पत्र शीर्षक

: **MEDICINAL CHEMISTRY**

Compulsory / अनिवार्य

: **Compulsory**

Particular / विवरण


<b>UNIT I</b>	<b>Drug Design and Drug Metabolism:</b> Biotransformation, Factors Affecting Drug Metabolism, Pathway of Drug Metabolism- Phase-I, Phase-II and Conjugation Reaction, Significance of Drug Metabolism in Medicinal Chemistry. : A general study of the Physio-Chemical properties in relation to biological activities. Stereochemistry and Drug Action. Isosterism and Bioisosterism, Concept of Lead Compound. Computer Aided Drug Design and Molecular Modeling.
<b>UNIT II</b>	<b>(a) Antibiotics:</b> Introduction, Classification and uses of Penicillin and Semisynthetic Penicillins! Study of structures and uses of Streptomycin, Neomycin, Kanamycin. Tetracycline - SAR and uses. <b>(b) Antitubercular Drugs:</b> Introduction, Synthesis and Mode of action of PAS, INH, Ethambutol. Ethionamide. <b>(c) Classification of Antibiotics:</b> like macrolides, Aminoglycosides , Fluoroquinolones and broad-spectrum antibiotics.
<b>UNIT III</b>	<b>(a)Cardiovascular Drugs:</b> Introduction, Classification of Cardiovascular Drugs, Cardiovascular Diseases, Synthesis, Mode of Action, Uses and Side Effects of Amyl Nitrate, Sorbitrate, Verapamil, Atenolol. <b>(b)Drugs acting on cardiovascular system:</b> Cardiac glycoside, Anti-Arrhythmic agents, Anti-Anginal drugs, Anti-Hypertensive, Anti-Hyperlipidemic drugs.

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 30/1/2017

<b>UNIT IV</b>	<p><b>(a)Antiviral:</b> Introduction, Replication and Transformation, Classification. Synthesis and Uses of Amantidine HCl, Idoxuridine, Methisazone, Anti-HIV agents.</p> <p><b>(b)Antimalarials:</b> Classification, SAR of 4-Aminoquinolines and 8-Aminoquinolines. Synthesis, Mode of action and uses of Chloroquine, Amidoquine, Pamaquine, Pyrimethamine.</p>
<b>UNIT V</b>	<p><b>(a)Antineoplastic Agents:</b> Classification, pathophysiology of cancer. Synthesis and Mode of action of 5-Flouroureacil, 6-Thioguanine, Thiotepa, Melaphalan, Busulfan.</p> <p><b>(b)Antiamoebics:</b> Synthesis and uses of Biallyl Unical, Metronidazole, Mentamide, Iodoquinol</p>

### Books Recommended

1. Harkishan Singh, V.K. Kapoor, Medicinal and Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
2. John H. Block, John M. Beak, Jr., Organic Medicinal and Pharmaceutical Chemistry, Lippincott Williams & Wilkins.
3. Harkishan Singh, V.K. Kapoor, Organic Pharmaceutical Chemistry, Vallabh Prakashan, Delhi.
4. Pandya, Text book of Medicinal Chemistry, Vol-I & II.
5. Ashutosh Kar, Medicinal chemistry, New Age International(P)Limited, Publishers.
6. O.P. Agrawal, Advanced Organic Practical. Goyal Publishing House, Meerut (U.P.)
7. Gurdeep Raj, Advanced Inorganic Practical, Goyal Publishing House, Meerut (U.P.)
8. Stenlake and Beckett, Practical Pharmaceutical Chemistry Part I, CBS Publishers and Distributors. New Delhi.
9. Ashutosh Kar, Medicinal chemistry, New Age International(P)Limited, Publishers.
10. G.R. Chatwal, Pharmaceutical Chemistry Organic Vol. II, Himalaya Publishing House, Bombay.

  
 30/7/2014

बी.एससी (स्नातक) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम  
**B.Sc (Graduate) semester wise Syllabus**  
**2016-2017 & Onwards**

Max. Marks / अधिकतम अंक : 50

Min. Marks: 17

Class / कक्षा

:B.Sc / बी.एससी

Semester / सेमेस्टर :

: V

Title of Subject Group / विषय समूह का शीर्षक

: **Pharmaceutical Chemistry**

Paper Title/प्रश्न पत्र शीर्षक

: **PRACTICAL**

Compulsory / अनिवार्य

: **Compulsory**

Particular / विवरण

**Examination: 4 Hours**

**I. Preparations and Synthesis:**

**12 Marks**

- (i) Vicks.
- (ii) Eosin.
- (iii) Cold Cream.
- (iv) 7-Hydroxy-4-Methyl Coumarin.
- (v) Sodium Chloride Injection.

**II. Assay:**

**12 Marks**

- (i) Lithium Carbonate.
- (ii) Ammonium Chloride.
- (iii) Citric Acid

**III. Analysis of Solid dosage forms by Instrumentation:**

**06 Marks**

- (i) Friability,
- (ii) Dissolution Time,

**IV. Chromatography:**

**06 Marks**

- (i) TLC
- (ii) Column Chromatography.

**V. Viva-voce:**

**06 Marks**

**VI. Practical Record:**

**08 Marks**

*J. K. Singh*  
*20/7/2014*

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**B.Sc (Graduate) semester wise Syllabus**  
**2016-2017 & Onwards**

Max. Marks / अधिकतम अंक : 85

Min. Marks: 28

Class / कक्षा

: B.Sc / बी.एससी

Semester / सेमेस्टर :

: VI

Title of Subject Group / विषय समूह का शीर्षक : **Pharmaceutical Chemistry**

Paper Title/प्रश्न पत्र शीर्षक

: **Drug Analysis**

Compulsory / अनिवार्य

: **Compulsory**

Particular / विवरण

<b>UNIT I</b>	<b>Chromatography:</b> Principles of Separation Processes and Application of such Techniques Viz Thin Layer Chromatography, Gas Chromatography, Paper Chromatography, Ion Exchange Chromatography and HPLC.
<b>UNIT II</b>	<b>Instrumental Techniques:</b> Definition, Principles, Instrumentation, Pharmaceutical Applications of Amperometry, Nephelometry and Turbidimetry. Potentiometry, Conductometry, Polarography, Colorimetry.
<b>UNIT III</b>	<b>Spectroscopic Method:</b> Principle, Instrumentation and Applications of NMR and Mass Spectroscopy, UV-Vis, IR.
<b>UNIT IV</b>	<b>Statistical Validation:</b> Errors: Introduction, Classification. Statistical Validation: Distribution of Random Numbers, Significant Figures, Comparison of Results, Methods of Least Square, method of collection of data, graphical representation of data, frequency, polygon, histogram, measure of central tendency, mean, median, mode, dispersion, standard deviation, variance.
<b>UNIT V</b>	<b>Methods for determination of purity of pharmaceutical compounds:</b> Introduction, types of impurity, methods of checking purity. Volumetric and Gravimetric Assay Procedures of following Compounds from Pharmacopoeia of India, Acetazolamide, Adrenaline, Amitryptaline Dichloride, Amidoquine, Chloquinephosphate, Diazepam, Ethacrynic acid, Griseofulvin, Hydrazine Hydrochloride, Isoniazid, Calcium Gluconate and Ferrous Fumarate

*J. J. Joshi*  
 30/7/2014

### Books Recommended

1. F.S.K.Barar, Essentials of Pharmacotherapeutics, S.Chand and Company Ltd. New Delhi.
2. Stenlake & Beckett, Practical Pharmaceutical Chemistry Part I, CBS Publishers and Distributors. New Delhi.
3. R.S. Satoshkar, S.Bhandarkar, S.S. Ainapuri, Pharmacology & Pharmacotherapeutics, Mumbai popular prakashan.
4. O.P.Agrawal, Advanced Organic Practical, Goyal Publishing House, Meerut (U.P.)
5. Gurdeep Raj, Advanced Inorganic Practical, Goyal Publishing House, Meerut (U.P.)
6. Stenlake and Beckett, Practical Pharmaceutical Chemistry Part I, CBS Publishers and Distributors. New Delhi.
7. Gurdeep Raj Chatwal and Sham K. Anand, Instrumental methods of chemical analysis, Himalya Publishing House.
8. J.M. Hollas, Modern Spectroscopy, John Wiley
9. G.W Ewing, Instrumental Methods of Chemical Analysis, Mc Graw Hill Book Company.
10. G. Aruldas, Molecular structure and spectroscopy, Phi Learning Pvt. Ltd.

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बी.एससी (स्नातक) कक्षाओं के लिये सेमेस्टर अनुसार पाठ्यक्रम  
**B.Sc (Graduate) semester wise Syllabus**  
**2016-2017 & Onwards**


Max. Marks / अधिकतम अंक : 50

Min. Marks: 17

Class / कक्षा : B.Sc / बी.एससी  
Semester / सेमेस्टर : VI  
Title of Subject Group / विषय समूह का शीर्षक : **Pharmaceutical Chemistry**  
Paper Title/प्रश्न पत्र शीर्षक : **Practical**  
Compulsory / अनिवार्य : **Compulsory**  
Particular / विवरण

**Examination: 4 Hours**

- I. Preparations and Synthesis: 12 Marks**
- (i) Methyl Red.
  - (ii) Benzil
  - (iii) Benzoic Acid
  - (iv) Dextrose Injection
  - (v) Calamine Lotion
  - (vi) Vanishing Cream
- II. Assay: 12 Marks**
- (i) Milk of Magnesia.
  - (ii) Ascorbic Acid
- III. Analysis of Solid dosage forms by Instrumentation: 06 Marks**
- (i) Weight Variation,
  - (ii) Hardness.
  - (iii) Disintegration Time.
- IV. Chromatography: 06 Marks**
- (i) o and p - Nitro Aniline by TLC.
  - (ii) Inorganic ions by Radial Chromatography.
- V. Viva-voce: 06 Marks**
- VI. Practical Record: 08 Marks**

  
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