



**PIYUSH®**

# **SYNOPSIS FOR 'GPAT'**

**GRADUATE PHARMACY APTITUDE TEST**  
*A COMPREHENSIVE REFERENCE SOURCE*  
**FOR**  
*GPAT EXAMINATION*

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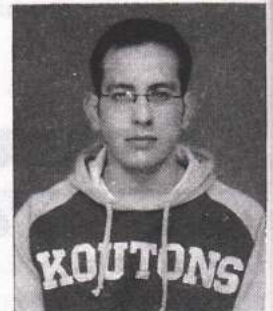
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### UNIT-I PHARMACEUTICS (Munish Ahuja and Sanjay Gupta)

1-119

#### 1. Physical Pharmacy and Unit Operations

1-11

(Munish Ahuja and Sanjay Gupta)

- **Micromeritics:** Particle size and size distribution, particle size determination methods, Stoke's law, particle shape and surface area and methods for determination, derived properties of the powder, Carr's compressibility index, Hausner ratio.
- **Surface and Interfacial Tension:** Surface tension, interfacial tension, methods of determination, surface active agents, hydrophilic lipophilic balance, methods to estimate HLB.
- **Rheology:** Newtonian system, Newtonian law of flow, viscosity, Newtonian fluids, non-Newtonian system, thixotropy, rheopexy, determination of viscosity.
- **Evaporation:** Evaporative equilibrium, factors influencing the rate of evaporation.
- **Distillation:** Raoult's law, types of distillation, applications.
- **Corrosion:** Classification of corrosion, protection against corrosion.
- **Dehumidification and Humidity Control:** Definitions, dehumidification, dehumidifiers.

#### 2. Dosage Forms, Designing and Evaluation

12-119

(Munish Ahuja and Sanjay Gupta)

- **Pharmaceutical Dosage Forms:** Solid, liquid and semisolid dosage forms, suppositories, desirable properties of dosage form.
- **Formulations, Materials, Packaging and Quality Testing of Dosage Forms:** Parenterals, solutions, tablets, capsules, aerosols, monophasic liquid dosage forms, emulsion, suspension, ophthalmic preparations, sustained release dosage form and topical semisolids.
- **Microencapsulation:** Coating material, properties of coating material, methods of microencapsulation, polymerization.
- **New Drug Delivery Systems:** Neosomes, nanoparticles, resealed erythrocytes, antibody-targeted systems, Zydis system, Oros osmotic pump, mucoadhesive drug delivery systems, hydrodynamically balanced systems or floating drug delivery systems, transdermal drug delivery systems, iontophoretic drug delivery systems.
- **Pharmaceutical Ingredients:** Anticaking agents, acidifying agent, aerosol propellant, antimicrobial preservative, antioxidant, alkalizing agent, buffering agent, capsule lubricant, chelating agent, coating agent, emulsifying agent, filtering aid, etc.
- **Cosmetics:** Lipstick, shampoo, nail preparations, dentifrices.
- **Pharmaceutical Calculations.**

## UNIT-II PHARMACEUTICAL MICROBIOLOGY

(Munish Ahuja)

120-162

### 3. Importance of Microbiology in Pharmacy

120-162

- **Microorganisms:** Classification of microorganisms, microbial flora of human pathogenicity, bacteria, fungi, protozoa, and viruses.
- **Identification of Microorganisms:** Morphological characteristics, cultural characteristics, staining reactions, simple staining, negative staining, differential staining, gram staining, acid fast staining, nutritional requirements, biochemical reactions, serological reactions.
- **Microbiological Assays:** Cylinder-plate method, turbidimetric assay method.
- **Sterilization:** Sterility assurance level, Z-value or thermal destruction value, Q or temperature coefficient, sterilization methods.
- **Test for Sterility:** Testing procedure, membrane filtration and direct inoculation methods, pyrogens.
- **Immunology:** immune system, antigen, antibody, cell-mediated immunity, antigen-antibody reactions, immunological preparations, vaccines, sera, serological tests.
- **Biological Products:** Alpha amylase, chorionic gonadotrophin, dextran, heparin, hyaluronidase, insulin, oxytocin, pancreatin, pepsin, protamine sulphate, streptokinase, urokinase, vasopressin.
- **Pharmaceutical Applications of Microbiology**
- **Bioconversions**
- **Immunological products at glance**

## UNIT-III PHARMACEUTICAL JURISPRUDENCE AND ETHICS

(Vijay Juyal)

163-184

### 4. Pharmaceutical Legislations

163-184

- Different legislations Acts, schedules to the rules, manufacture of drugs, wholesale and retail sale of the drugs, offences and penalties, labelling and packing of drugs, drug inspectors, different forms for manufacture, sale, repackaging and import of drugs, the Pharmacy Act, Pharmacy Council of India, education regulations, State Pharmacy Councils, registration of pharmacists.

## UNIT-IV BIOPHARMACEUTICS AND PHARMACOKINETICS

(Munish Ahuja)

185-195

### 5. Biopharmaceutics and Pharmacokinetics

185-195

- Mechanisms of absorption, factors affecting absorption, distribution, plasma protein binding, factors affecting drug distribution, biotransformation, excretion, bioavailability, bioequivalence, methods of determining bioavailability, methods for enhancement of bioavailability, pharmacokinetic parameters: C<sub>max</sub>, T<sub>max</sub>, AUC, zero order, first order and mixed order kinetics, pharmacokinetic calculations, equations for dose adjustments for renal patients, biopharmaceutic classification system, prodrugs.

## UNIT-V CLINICAL PHARMACY

(Sanjay Gupta and Munish Ahuja)

196-250

### 6. Therapeutic Drug Monitoring

(Sanjay Gupta)

196-199

- Minimum effective concentration, maximum safe concentration, therapeutic index, indications for TDM, steps in TDM.

## **Dosage Regimen in Special Category of Patients**

(Sanjay Gupta)

200-211

- Drugs used in pregnancy, FDA classification of drugs used in pregnancy, drugs prescribing during pregnancy, list of drugs contraindicated in pregnancy, drugs used by nursing mothers, list of drugs contraindicated in breast-feeding mothers, drugs used in pediatrics and geriatrics, physiological factors affecting pharmacokinetics of drugs, calculations of child's dose, dosage regimen in renal impairment.

## **Adverse Drug Reactions and Drug Interaction**

(Sanjay Gupta and Munish Ahuja)

212-228

- **Adverse Drug Reactions:** Types of ADR, mechanism of adverse drug reactions, ADR detection and monitoring, list of drugs withdrawn from the market because of adverse drug reactions.
- **Drug Interactions:** Factors contributing drug interactions, mechanisms of drug interaction, pharmacokinetic interaction, pharmacodynamic interactions, minimising the risk of drug interaction, list of common drug interactions.

## **Biochemical Role of Hormones, Vitamins, Enzymes and Nucleic Acids**

(Munish Ahuja)

229-244

- Hormones, hormone synthesis and secretion, mechanism of hormone action, hormones with second messengers, vitamins, water soluble and fat soluble vitamins, enzymes, biochemical role of enzymes, enzyme inhibitors, classification of enzymes, assays of enzymes, nucleic acids, functions of nucleic acids.

## **Principle Involved and Apparatus Used in the Analysis of Blood, Urine, Gastric Juice and Faeces**

(Munish Ahuja)

245-250

- Anticoagulants and preservatives for blood, principles of common analytical instruments used in clinical laboratories (pH meter, colourimeter, spectrophotometer, flame photometer, autoanalyser), hematologic tests, serum enzyme tests, liver function tests, serological tests, urine tests, gastric juice and stool examination.

## **UNIT-VI PHARMACEUTICAL CHEMISTRY** (Vijay Juyal and Rajesh Choudhary)

251-270

### **I. Pharmaceutical Chemistry**

251-270

(Rajesh Choudhary)

- **Importance of Inorganic Compounds in Pharmacy and Medicine:** GIT agents, topical agents, gas and vapors, dental products, anti-oxidants.
- **Limit Tests:** Pharmacopoeial methods for limit tests of chloride, sulphates, iron, lead, arsenic and heavy metals.
- **Radiopharmaceuticals:** Dosage form, preparation of radiopharmaceuticals, properties of an ideal radiopharmaceutical, production of radioisotopes, chemical processing of radioisotopes, radiation hazards and protection, storage of radiopharmaceuticals, clinical applications of radiopharmaceuticals.

### **Pharmaceutical Physical Chemistry**

(Vijay Juyal)

- **Gas Behavior:** General properties of gas, ideal gas law, gas kinetics, postulates of KMT.

- **Solutions:** Different forms of solutions, important formulas and terms, colligative properties, Raoult's law, ideal and non ideal solution.
- **Thermodynamics:** Laws of thermodynamics, chemical kinetics, rate and orders of reaction.

**Pharmaceutical Organic Chemistry**  
(Rajesh Choudhary)

- Important Name Reactions

**UNIT-VII PHARMACEUTICAL BIOCHEMISTRY**  
(Sanjay Gupta)

271-339

**12. Bioenergetics**

271-273

- Free energy, standard Gibbs free energy, adenosine triphosphate, functions of ATP, production of ATP.

**13. Enzymes and Vitamins**

274-289

- **Enzyme:** Classification, chemical nature, properties, enzyme kinetics, enzyme inhibition, coenzymes, mechanism of enzyme action, units of enzyme activity, applications of enzymes.
- **Vitamins:** Biochemical role of fat-soluble vitamins (A, D, E and K) and water-soluble vitamins (C and B).

**14. Metabolism of Carbohydrates**

290-303

- Glycolysis, citric acid cycle, pentose phosphate pathway, gluconeogenesis, glycogenesis, glycogenolysis, uronic acid pathway, sorbitol pathway, galactosemia.

**15. Metabolism of Lipids**

304-313

- Oxidation of fatty acids ( $\beta$ -Oxidation,  $\alpha$ -Oxidation,  $\omega$ -Oxidation, Peroxisomal Oxidation), ketone bodies, Biosynthesis of fatty acids, generation of cytosolic acetyl CoA and NADPH, biosynthesis of triglycerides, biosynthesis of cholesterol, degradation of cholesterol, abnormalities of plasma cholesterol, lipoproteins, fatty liver.

**16. Biological oxidation**

314-315

- Classification of energy rich compounds, electron transport chain or respiratory chain, etc inhibitors, oxidative phosphorylation inhibitors.

**17. Metabolism of Proteins**

316-323

- Classification of amino acids, biochemical functions, metabolic disorders of amino acids, transamination, deamination, non-oxidative deamination, urea cycle.

**18. Nucleic Acids**

324-327

- Sugars, Base, nucleotide analogs, DNA, RNA, Mutation.

**19. Organ Function Tests**

328-331

- Liver function tests, kidney function tests.

## 20. Hormones

332-339

- Hypothalamic, thyroid, adrenal, and pancreatic hormone.

## UNIT-VIII PHARMACEUTICAL ANALYSIS (Sanjay Gupta and Munish Ahuja)

340-383

## 21. Spectroscopy (Sanjay Gupta)

340-359

- Introduction to Pharmaceutical analysis, ultra violet spectrometry, infrared spectrometry, nuclear magnetic resonance spectroscopy, mass spectrometry.

## 22. Chromatography (Munish Ahuja)

360-368

- High performance liquid chromatography, adsorption chromatography, partition chromatography, paper chromatography, thin layer chromatography (TLC), ion exchange chromatography, gas chromatography.

## 23. Analytical Techniques and Pharmacopoeial Assays (Sanjay Gupta and Munish Ahuja)

369-383

- Potentiometric titrations, conductometry, polarography, Pharmacopoeial Assays (Non aqueous titrations, complexometric titrations, acid base titrations, redox titrations, nitrite titrations, potentiometric titrations, argentometric titrations, iodometry & iodimetry titrations, gravimetric analysis, HPLC, microbiological assays, spectrometry).

## UNIT-IX : MEDICINAL CHEMISTRY (Kamta P. Namdeo)

384-489

## 24. Medicinal Chemistry

384-489

- **Introduction to Drug Design:** Ligand based drug design, structure based drug design, drug discovery methods, molecular docking, quantitative structure-activity relationships (QSAR), pharmacopoeia mapping.
- **Stereochemistry of Drug Molecules:** Atropisomerism, cis-trans isomerism, conformational isomerism, diastereomers, enantiomers, helical chirality, Z/E geometry of double bonds, cis/trans geometry of alicyclic compounds, relative configurations, meso compounds and pseudoasymmetry, stereoselectivity and drug metabolism.
- **Heterocyclic Nuclei.**
- **Synthetic Hormones:** Marker degradation of diosgenin, synthesis of dehydroepiandrosterone, synthesis of estradiol, diethylstilbesterol, stilbesterol, hexestrol, dienolestrol, progesterone, testosterone, cortisone acetate.
- **Synthesis, Mode of Action and Uses of Following Class of Drugs:** Antihistamines, anticonvulsants, tranquilisers, antihypertensives, diuretics, vasodilators, local anesthetics, barbiturates, anticancer drugs, antibiotics, cardiovascular active agents, cholinergic drugs, adrenergic drugs, etc.

## UNIT-X PHARMACOLOGY (Surendra H. Bodakhe and Rajesh Choudhary)

490-649

## 25. Fundamentals of General Pharmacology

490-499

(Surendra H. Bodakhe)

- Drug Administration, pharmacokinetics, pharmacodynamics, variability in drug action, combined effect of drugs, adverse drug reaction, drugs of choice in poisoning, bioassay of drugs, new drug discovery process, toxicology.



- 26. Peripheral Nervous System**  
(Rajesh Choudhary) **500-506**
- Parasympathetic nervous system, parasympathomimetics, parasympatholytics, cholinergic receptors, cholinergic toxicity, sympathetic nervous system, sympathomimetics, sympatholytics, adrenergic receptor, modification of neurotransmission.
- 27. Central Nervous System**  
(Surendra H. Bodakhe and Rajesh Choudhary) **507-546**
- Neurotransmitters, neuropeptides, neuroleptics, antidepressants, anxiolytics, neurodegenerative disorders, Parkinson's disease, Alzheimer's disease, anticonvulsants, analgesics, autacoids, eicosanoids.
- 28. Cardiovascular System and Drug Acting on Blood and Blood Forming Organs**  
(Surendra H. Bodakhe) **547-578**
- Antihypertensives, vasodilators, antiarrhythmics, congestive heart failure, myocardial infarction, anti-hyperlipidemic drugs, drugs used in shock therapy, diuretics.
  - Drug affecting coagulation, antiplatelet drugs, haematinics, plasma volume expanders.
- 29. Drugs Acting on Respiratory System**  
(Surendra H. Bodakhe) **579-581**
- Drugs for cough, drugs for bronchial asthma, respiratory stimulants.
- 30. Drugs Used in GIT**  
(Rajesh Choudhary) **582-587**
- Antacids, antiulcer drugs, mucolytics, laxative, antidiarrheal drugs, carminatives.
- 31. Hormone and Hormone Antagonists**  
(Surendra H. Bodakhe) **588-593**
- Anterior pituitary hormones, posterior pituitary hormones, adrenocortical hormones, male and female hormones, insulin, hormone related drugs.
- 32. Chemotherapy**  
(Surendra H. Bodakhe and Rajesh Choudhary) **594-649**
- Sulphonamides and Cotrimoxazole, Antibiotics (Penicillin's, Cephalosporins, Aminoglycoside antibiotics, Tetracyclines, Macrolide, Lincomycins, Polypeptides) Quinolones, Anticancer agents, Antiviral agents, Antitubercular drugs, Anthelmintics, Antiamoebic agents, Antimalarial drugs.

## UNIT-XI PHARMACOGNOSY (Vijay Juyal & Kiran S. Bodakhe)

650-722

### 33. Natural Product, Pharmacognosy and Phytochemistry (Vijay Juyal and Kiran S. Bodakhe)

650-703

- **Alkaloids:** Chemistry, chemical tests and biosynthesis of different groups of alkaloids (tropane, quinolone, isoquinolone, phenylethylamine, indole alkaloids).
- **Glycosides:** Chemistry, chemical tests and biosynthesis of different groups of glycosides (cardiac glycosides, anthraquinone, glycosides, saponin glycosides, isothiocyanate glycosides).
- **Terpenes:** Hemiterpenes or isoprene, monoterpenes or terpenes, sesquiterpenes, diterpenes, triterpenes, tetraterpenes or carotenoids, polyterpenes or rubber.
- **Steroids:** Sterols, bile acids, steroid hormones (oestrogens, progestogens, androgens), steroidal alkaloids, steroidal glycosides.
- **Bioflavonoids:** Anthocyanins, flavones or anthoxanthins, flavanols, flavanones, leucoanthocyanins.
- **Purines:** Hydroxyl or oxy-purines, aminopurines.
- **Pharmacognosy of Some Plants:** Gugulipid, Senna leaves, Senna pods, Digitalis leaves (Foxglove leaves, Folia digitalis, Digitalis filium), Cinnamon, Rauwolfia, Ergot, Opium, Clove, Belladonna (Belladonna herb, Belladonna root), Ginseng.
- **Standardization of Herbal Drugs:** WHO Guidelines.
- **Microscopy:** Qualitative and quantitative measurement, epidermal trichomes, stomata.
- **Tissue Culture:** Tissue culture media, clone, cybrid.

### 34. Pharmacognosy of Crude Drugs at a Glance (Kiran S. Bodakhe)

704-722

- Senna leaves (Alexandrian senna, Tinnevelly senna), Senna pods (Alexandrian senna, Tinnevelly senna), Rhubarb, *Cascara sagrada*, Aloe (Cape aloe, Curacao or Barbados aloe, Socotrine aloe, Zanzibar aloe), Digitalis (Foxglove leaves), Squill, *Stropanthus dioscorea* (Yam), Asparagus (Shatavar), Liquorice, Quillaia bark, Senega, Ginseng, Bitter almond, Wild cherry bark, Chirata, Gentian, Kalmegh, Picrorhiza (Kutki), Stramonium, Hyoscyamus, Belladonna (Deadly night shade), Belladonna root, Lobelia, Coca, Cinchona, Ipecac, Opium, Rauwolfia, Ergot, Nux-vomica, Vinca, Yew (Taxus), Calabar beans, Vasaka, Aconite, Kurchi, Ephedra (Ma-Huang), Colchicum (*Autumn crocus*), Coriander, Fennel, Dill, Caraway, Jatamansi, Clove, Cardamom, Nutmeg, Anise, Garlic, Cassia, Cinnamon, Cannabis, Ginger, Turmeric, Capsicum, Long pepper, Piplamul, Amla, Myrobalan, Behera.

## UNIT-XII QUESTION PAPERS & GPAT MODEL TEST PAPERS

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Solved Question Papers (2005 to 2012)

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Gpat Model Test Papers (I to IV)

783-817

Online GPAT (2014 & 2015) Solved Question Papers (Based on Memory)

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Online GPAT (2016 & 2017) Solved Question Papers (Based on Memory)

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## PHYSICAL PHARMACY AND UNIT OPERATIONS

—Munish Ahuja and Sanjay Gupta

### MICROMERITICS

#### "Science of the small particles"

- Particle size of the molecules is a very important in the material and the pharmaceutical sciences.
- Particle size of drug can affects the pharmacological response via modulation of drug release pattern, disintegration, dissolution, absorption, etc.
- Control of the particle size is the essential in the achieving of the flow properties.

#### Particle size and Size distribution

If the particles are having different sizes, the three properties are important: (a) size, (b) shape and surface area of the individual particles and (c) size range and size distribution (weight of the particles).

- Micrometer ( $\mu\text{m}$ )/micron ( $\mu$ ) is the unit of the particle size, which is equal to the  $10^{-6}$  m.
- Reduction of particle size increases the surface area.
- If particles are **sphere** in shape it is readily expressed in terms of its diameter.
- If the particles have same diameter then sample is called *monodisperse system*, but having different particle size then it is called *polyddisperse system*.
- Most of the pharmaceutical powder samples are *polyddisperse system*.
- The **Surface diameter**,  $d_s$ , is the diameter of a sphere having the same surface area as the particle.
- The **Volume diameter**,  $d_v$ , is the diameter of a sphere having the same volume as the particle.
- The **Projected diameter**,  $d_p$ , is the projected diameter of a sphere having the same observed area as the particle.
- The **Stokes diameter**,  $d_{st}$ , is the diameter which describes an equivalent sphere undergoing sedimentation at the same rate as the asymmetric particle.
- If the particles in spherical shape then **no. of particles per unit weight (1 g) is:**

$$\frac{(\pi d_v^3 \rho) / 6g}{1 \text{ particle}} = \frac{1 \text{ g}}{N}$$

$$N = \frac{6}{\pi d_v^3 \rho}$$

#### Particle size determined by:

- **Optical microscopy (range: 0.2-100  $\mu\text{m}$ ).**
- **Sieving (range: 40-9500  $\mu\text{m}$ ).**
- **Sedimentation (range: 0.08-300  $\mu\text{m}$ ).**
- **Particle volume measurement (range: 0.5-300  $\mu\text{m}$ ).**

Particle size	Method
<1 m	Electron microscope, ultracentrifuge, adsorption
1 – 100 m	Optical microscope, sedimentation, coulter counter, air permeability
50 m	Sieving

#### Optical microscopy:

- Using microscope equipped with a micrometer eyepiece, which can determined particle-size in the range of 0.2 to about 100  $\mu\text{m}$ .