

AC 27/2/13
Item No. 4.11

UNIVERSITY OF MUMBAI



Syllabus for Sem V & VI
Applied Component
Program: B.Sc.
Course: DRUGS & DYES

(Credit Based Semester and Grading System with
effect from the academic year 2013–2014)

T.Y.B.Sc.
Applied Component
DRUGS & DYES Syllabus
Credit Based Semester and Grading System
To be implemented from the Academic year 2013-2013

SEMESTER V

Theory

COURSE: USACDD501

UNIT	TOPICS	CREDIT	L/WEEK
I	<p>1. 1General Introduction to Drugs (6L)</p> <p>1.1 .1 Definition of a drug, Requirements of an ideal drug, Classification of drugs (based on therapeutic action)</p> <p>1.1.2 Nomenclature of drugs: Generic name, Brand name, Systematic name</p> <p>1.1.3 Definition of the following medicinal terms: Pharmacon, Pharmacophore, Prodrug, Half-life efficiency, LD₅₀, ED₅₀, Therapeutic Index.</p> <p>1.1.3 Brief idea of the following terms: Receptors, Drug-receptor interaction, Drug Potency, Bioavailability, Drug toxicity, Drug addiction, Spurious Drugs, Misbranded Drugs, Adulterated Drugs, Pharmacopoeia.</p> <p>1.2. Routes of Drug Administration and Dosage Froms (2L)</p> <p>1.2.1 Oral and Parenteral routes with advantages and disadvantages.</p> <p>1.2.2 Formulations, Different dosage forms(emphasis on sustained release formulations.)</p> <p>1.3. Pharmacodynamic agents</p> <p>A brief introduction of the following pharmacodynamic agents and the study with respect to their chemical structure, chemical class, therapeutic uses, and side effects.</p> <p>1.3.1 CNS Drugs: (5L)</p> <p>Classification based on pharmacological actions</p> <p>Concept of sedation and hypnosis, anaesthesia.</p> <p>Phenobarbitone (Barbiturates), Phenytoin</p>	2	4

	<p>(Hydantoin), Trimethadione (Oxazolinediones), Piracetam (Pyranones), Midazolam, Alprazolam (Benzodiazepines) Methylphenidate (Piperidines) Chlorpromazine (Phenothiazines) Fluoxetine (Phenyl propyl amines) Synthesis of Trimethadione, Methylphenidate, Phenytoin.</p> <p>1.3.2 Analgesics and Antipyretics (2L) Morphine (Phenanthrene alkaloids), Tramadol (Cyclohexanols), Aspirin (Salicylates), Paracetamol (p-Aminophenols), Synthesis of Tramadol, Paracetamol.</p>		
<p>II</p>	<p>2.1 Anti-inflammatory Drugs (2L) Mechanism of inflammation and various inflammatory conditions. Prednisolone, Betamethasone (Steroids), Aceclofenac (N-Aryl anthranilic acids), Mefanic Acid (N-Aryl anthranilic acids). Synthesis of Aceclofenac</p> <p>2.2 Antihistaminic Drugs (2L) Mechanism of histamine release & its action Diphenhydramine (ethanolamines), Cetirizine (piperazine), Chlorpheniramine maleate (ethyl amines), Omeprazole, pantoprazole (Benzimidazoles) Synthesis of cetirizine</p> <p>2.3 Cardiovascular drugs (3L) Classification based on pharmacological action Enalapril (α-amino acids), Isosorbide dinitrate (Nitrates), Atenolol (Aryloxy propanol amines), Nifedipine (Pyridines), Chlorthiazide (Thiazides), Frusemide / Furosemide (Sulfamyl benzoic acid), Spironolactone (Steroidal-17-β-lactones), Synthesis of Furosemide, Atenolol from 3-Hydroxy phenyl acetamide</p> <p>2.3 Antidiabetic Agents (2L) General idea and types of diabetes; Insulin therapy Glibenclamide (sulphonyl ureas), Metformin (Biguanides),</p> <p>2.5 Antiparkinsonism Drugs (2L) Idea of Parkinson's disease. Procyclidine hydrochloride (Pyrrolidines), Ethopropazine hydrochloride (Phenothiazines) Levodopa (α-amino acids) Synthesis of Levodopa from Vanillin.</p> <p>2.6 Drugs for Respiratory System (2L)</p>		

	<p>General idea of Expectorants; Mucolytes; Bronchodilators Decongestants and Antitussives, Bromhexine (Phenyl methyl amines), Salbutamol, Pseudoephedrine (Phenyl ethyl amines) Oxymetazoline (Imidazolines) Codeine Phosphate (Opiates) Synthesis of Salbutamol 2.7 Mode of Action of the Following Drugs (2L) Barbiturates (As sedatives and hypnotics), Atenolol (As β-1 blocker), Diphenhydramine (As Antihistaminic agent), Glibenclamide (As oral hypoglycemic agent)</p>		
<p>III</p>	<p>3.1 Introduction to Dyestuff Chemistry (5L) 3.1.1 Important landmark in the history of dyes 3.1.1.1 Natural colouring matter and their limitations:e.g.; Heena, Turmeric, kesar, Chlorolphyll, Indigo, Alizarine from roots of madder plants, Logwood. Tyrian Purple. 3.1.1.2 Synthetic Dyes: Important milestones, i.e. Mauve, Diazotization, aniline Yellow, Congo Red, Synthesis and structure of Indigo, disperse Dye, fluorescent Brighteners, procion reactive Dyes, Remazole Dyes. (Emphasis on Name of the Scientist and dyes and the year of the discovery is required and structure is not expected 3.1.2 Definition of dyes, Properties i.e. colour, Chromophore and Auxochrome, Solubility, Linearity, Coplanarity, fastness properties, substantivity, Economic viability 3.1.3 Explanation of nomenclature of commercial dyes with atleast one example .suffixes-G, O, R, B, 6B, GK, 3GK, 6GK, L, S Explanation: naming of dyes by colour index(two examples) 3.2. Classification of dyes based on constitution (3L) (Examples are mention below with structures) (i) Nitro Dyes-Napyhol yellow S (ii) Nitroso Dye-Gambine Y (iii) Azo Dyes- (a) Monoazo Dyes- Metanil yellow (b) DiazoDyes- Naphthol Blue Black (c) Triazodyes - Chloroamine Green B (iv) Diphenymethane Dyes-Auramine G (v) Triphenyl methane Dyes-</p>		

	<p>(a) Malachite Green Series- Naphthalene green V (b) Magenta Series- Acid Magenta (c) Rosolic acid Series-Chrome Violet (vi) Heterocyclic Dyes (a) Xanthene-Rhodamine 6G (b) Acridines-Acriflavine (c) Azines- SafraninB (d) Oxazines-Capri blue (e) Thiazines-Methylene Green (f) Quinolines- Quinoline Yellow (g) Thiazoles-Primuline (vii) Benzoquinones and naphthaquinones- Naphthazarin (viii) Anthraquinone Dyes- Indanthrene, Turquoise Blue 3GK (ix) Indigoids-Indigo Carmine (x) Phthocyanines-Sirius Light green FFGL</p> <p>3.3 Classification Based on Application (6L) Definition, fastness properties & applicability on substrates examples with structures (a) Acid Dyes- Orange II, (b) Basic Dyes-methyl violet, Victoria Blue B (c) Direct cotton Dyes- Benzofast Yellow 5GL (d) Azoic Dyes-Diazo components; Fast yellow G, Fast orange R. Coupling components. Naphtol AS, Naphthol ASG (e) Mordant Dyes-Erichrome Black A, Alizarin. (f) Vat Dyes- Indanthrene brown RRD, Indanthrene Red 5GK. (g) Sulphur Dyes- Sulphur Black T (no structure) (h) Disperse Dyes-Celliton Fast brown 3R, perlon fast blue FFR (i) Reactive Dyes- cibacron Brilliant Red B, procion brilliant Blue HB.</p>		
<p>IV</p>	<p>4.1 Colour and chemical constitution of dyes (5L) 4.1 .1 Absorption of visible light, colour of wavelength absorbed, complementary colour. 4.1.2 relation between colour and chemical constitution. (i) Armstrong theory (quinonoid theory) and its limitations (ii) Valence Bond theory; Comparative study and relation of colour in the following classes of compounds/dyes: Benzene, Nitrobenzene, Nitroanilines, Nitrophenols, Benzoquinones, Azo, Triphenyl methane, Anthraquinones. (iii) Molecular Orbital Theory.</p>		

	<p>4.2. Non-textile Uses of Dyes (6L) Structural features of the substrate, fastness and other property requirements and main classes of dyes used to be mentioned as applicable. (Two examples with structures for each of the following.) . 1. Leather 2. Paper 3. Foodstuff 3. Cosmetics 5. Medicinal 6. Biological Stains 7. Indicator & Analytical Reagents 3. Coloured Smokes & Camouflage colours 3. Laser Dyes</p> <p>4.3 Optical Brighteners (2L) General idea and important characteristics of optical brighteners, one example each with structure of the following classes: Stilbene, Coumarin, Heterocyclic vinylene derivatives, Diaryl pyrazolines, Naphthalimide derivatives.</p> <p>4.4 Organic Pigments (2L) General idea, distinguish between dyes and pigments, important characteristics of organic pigments, Toners, Lakes, Classification of organic pigments with suitable examples, i.e. Ionic pigments-Lake of acid and basic dyes. Nonionic pigments-Azo, Indigoid, Anthraquinone, Quinacridone, Phthalocyanine (Copper phthalocyanine).</p>		
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Practicals

USACHDD5P1

USACHDD 5P1	<p>I) Dye Preparation: 1) Preparation of Orange-II</p> <p>II) Dyes Estimation: 1. Estimation of Primary amino group by diazotisation</p> <p>III) Drug Estimation : 1. Estimation of Ibuprofen 2. Estimation of Acid neutralizing capacity of a drug</p> <p>IV) Preparation of monogram of any one drug from syllabus by I.P. method</p> <p>V) Drug Preparations: 1) Preparation of p-Nitroacetanilide from Acetanilide</p>	<p style="text-align: center;">2</p>	<p style="text-align: center;">4</p>

	2) Preparation of p-Nitroaniline from p-Nitroacetanilide 3) Preparation of Methyl Salicylate from Salicylic Acid		
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SEMESTER VI

Theory

COURSE	UNIT	TOPICS	CREDIT	L/WEEK
USACDD601	I	<p>1.1 Drug Discovery, Design and Development (5L)</p> <p>1.1.1 Discovery of a Lead compound: Screening, drug metabolism studies and clinical observation.</p> <p>1.1.2 Drug development from Natural Sources: Anti infective agents Anti cancer agents CNS agent</p> <p>1.1.3 Development of drug: The Pharmacophore identification, modification of structure or functional group, Structure activity relationship (Benzodiazepines, Sulphonamides).</p> <p>1.1.3 Structure modification to increase potency: Homologation, Chain branching, Ring-chain transformation, Extension of the structure.</p> <p>1.1.5 Computer assisted drug design.</p> <p>1.2 Drug Metabolism (3L) Introduction, Absorption, Distribution, Bio-transformation, Excretion Different types of chemical transformation of drugs with specific examples.</p>	2	4

		<p>1.3 Chemotherapeutic Agents (1L) Study of the following chemotherapeutic agents with respect to their chemical structure, chemical class, therapeutic uses, and side effects.</p> <p>1.3.1 Antibiotics (2L) Definition, Characteristics and properties of :</p> <p>Amoxicillin; Cloxicillin (β-lactum antibiotics) Cephalexin (Cephalosporins) Doxycycline (Tetracyclines) Gentamycin (Aminoglycosides) Ciprofloxacin (Quinolones) Synthesis of Ciprofloxacin</p> <p>1.3.2 Antimalarials (2L) Types of malaria: Symptoms; pathological detection during window period (Life cycle of the parasites not o be discussed) Chloroquine (3-Amino quinolines) Paludrine (Biguanides) Pyrimethamine (Diamino pyrimidines) Artemether (Benzodioxepins) Following combination to be discussed (i) Sulfadosine-Pyrimethamine (ii) Atremether-Lumefantrine (no structure) Synthesis of Paludrine.</p> <p>1.3.3 Anthelmintics (2L) Drugs effective in the treatment of Nematodes and Cestodes intestations. Diethyl carbamazine (Piperazines) Mebandazole; Albendazole (Benzimidazoles) Niclosamide (Amides) Synthesis of Albendazole</p>		
	II	<p>2.1 Antiamoebic Drugs (1L) Types of Amoebiasis Metronidazole; Diloxamide furoate (Furans)</p>		

	<p>Following combination therapy to be discussed: Ciprofloxacin-Tinidazo Synthesis of Metronidazole</p> <p>2.2 Antitubercular and Antileprotic Drugs (3L) Types of Tuberculosis; Symptoms and diagnosis of Tuberculosis. Types of Leprosy. General idea of Antibiotics used in their treatment. PAS (Aminosalicylates) Isoniazide (Hydrazides) Pyrazinamide (Pyrazines) (+) Ethambutol (Aliphatic diamines) Ethionamide (Thioamides) Dapsone (Sulfonamides) Clofazimine (Phenazines)</p> <p>Following combination therapy to be discussed: (i) Rifampin + Ethambutol + Pyrazinamide (ii) Rifampin + Isoniazide + Pyrazinamide (iii) Rifampin + Clofazimine + Ethionamide. Synthesis: (+) Ethambutol, Dapsone.</p> <p>2.3 Anti-Neoplastic Drugs (2L) Idea of malignancy; Causes of cancer, brief idea of Immuno Stimulants, Immuno depressants. (1) Lomoustine (Nitrosoureas) (2) Fluorouracil (Pyrimidines) (3) Estrogen (Steroidal hormones) (3) Mitomycin C (Antibiotics) (5) Vincristine; vinblastine; vindesine (Vica alkaloids-no structures) Synthesis of 5-Fluorouracil from urea.</p> <p>2.3 Anti HIV Drugs (1L) Idea of HIV pathogenecity, Symptoms of AIDS, AZT, Lamivudine, Stavudine</p>		
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	<p>(Pyrimidines), DDI (Purines)</p> <p>2.5 Drug Intermediates: Synthesis and uses (3L)</p> <p>(i) 2-Amino-5-chlorobenzophenone from p-chloronitrobenzene</p> <p>(ii) 2,3,6-Triamino-6-hydroxypyrimidine from Guanidine.</p> <p>(iii) 3-Chloro-5-sulphonyl amino anthranilic acid from 3-Chloro-2-toludine</p> <p>(iv) p-[2'-(5-Chloro-2-methoxy benzamido) ethyl]-benzenesulphonamide from Methyl-5-chloro-2-methoxybenzene</p> <p>(v) 3-(p-Chlorophenyl)-3-hydroxypiperidine from 3-Chloroacetophenone.</p> <p>(vi) p-Acetyl amino benzenesulphonyl chloride from Aniline</p> <p>(vii) Epichlorohydrine from propene.</p> <p>2.6 Nano particles in Medicinal Chemistry (3L)</p> <p>Introduction, Carbon nano particles (structures), Carbon nano tubes:</p> <p>Functionalisation for Pharmaceutical applications</p> <p>Targeted drug delivery</p> <p>In vaccine (Foot and mouth disease)</p> <p>Use in Bio-physical treatment.</p> <p>Gold nano particles in treatment of cancer, Parkinsonism, Alzheimer.</p> <p>Silver nano particles:</p> <p>Antimicrobial activity.</p>		
	<p>III</p> <p>3.1 Intermediates (11L)</p> <p>3.1 A brief idea of Unit processes</p> <p>3.1.1 Introduction of primary intermediates, unit processes</p> <p>3.1.2 (a) Nitration</p> <p>(b) Sulphonation</p>		

	<p>(c) Halogenation (d) Diazotization : 3 different methods, importance (e) Ammonolysis (f) Oxidation N.B.: Definition, Reagents Examples with reaction conditions (mechanism is not expected) 3.2 Preparation of the following Intermediates. 3.2.1 Benzene derivatives: Benzenesulphonic acid; 1,3-Benzenedisulphonic acid; phenol; resorcinol; sulphanilic acid; o-,m-,p-chloronitrobenzenes; o-,m-,p-nitroanilines; o-,m-p- phenylene diamines; Naphthol ASG. 3.2.2 Naphthalene derivatives: α,β-Naphthols; α,β-Naphthylamines; Schaeffer acid, Tobias acid; Naphthionic acid; N.W. acid; Clev-6-acid; H acid; Naphthol As. 3.2.3 Anthracene derivatives: 1-Nitroanthraquinone; 1-Aminoanthraquinone; 2-Aminoanthraquinone; 2-Methylantraquinone; anthraquinone-1-sulphonic acid; Anthraquinone-2-sulphonic acid; 1-Chloroanthraquinone; Chloroanthraquinone; Benzanthrone. 3.3 Dyeing Method of Cotton Fibres (3L) 3.3.1 (i) Direct dyeing (ii) Vat dyeing (iii) Mordant dyeing (iv) Disperse dyeing 3.3.2 Forces binding of dyes to the fibres: Ionic forces, Hydrogen bonds, Van-der-Wall's forces, Covalent linkages.</p>		
	<p>IV</p> <p>4.1 Synthesis of Specific Dyes and their Uses (12L) (i) Orange IV from sulphanilic acid (ii) Eriochrome Black T from β-</p>		

	<p>naphthol</p> <p>(iii) Eriochrome Red B by using ethyl aceto acetate and 1-amino-2-naphthol-4-sulphonic Acid.</p> <p>(iv) Direct Deep Black EW by using benzidine, H acid, aniline, and m-phenylen diamine.</p> <p>(v) Congo Red from nitrobenzene</p> <p>vi) Diamond Black F by using 5-amino salicylic acid, N.W. acid and α-naphthylamine.</p> <p>(vii) Malachite Green by using benzaldehyde and N,N-dimethylaniline.</p> <p>(viii) Auramine O from dimethylaniline</p> <p>(ix) Methylene Blue by using 4-amino-N,N-dimethylaniline and N,N-dimethylaniline</p> <p>(x) Safranin T by using o-toluidine and aniline</p> <p>(xi) Pararosaniline by using p-toluidine and aniline</p> <p>(xii) Alizarine Cyanine Green G by using phthalic anhydride and p-cholorophenol</p> <p>(xiii) Indanthrene from anthraquinone</p> <p>(xiv) Disperse Yellow 6G from benzanthrone</p> <p>(xv) Indigo from aniline</p> <p>(xvi) Eosine by using phthalic anhydride and resorcinol</p> <p>(xvii) Bismark Brown from m-phenylenediamine.</p> <p>4.2 Types of Fibres and Classes of Dyes Applicable to them (1L) Introduction to the following types of fibres with structures and classes of dyes applicable to it. Cotton, Wool, Silk, Polyester.</p> <p>4.3 Ecology and Toxicity of Dyes (2L) With reference to the textile dyes, food colours, benzidine etc.</p>		
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Practicals

USACDD6P1	<p>I) Drug Preparation: 1) Preparation of Aspirin from Salicylic Acid</p> <p>II) Drug Estimation: 1. Estimation of Tincture of Iodine 2. Estimation of Free Acid in Vegetable oil</p> <p>III) Dyeing of fabric (cotton)by Direct Dyeing or by Vat Dyeing</p> <p>IV)Dyes Preparations: 1) Preparation of m-dinitrobenzene 2)) Preparation of m-nitroaniline</p> <p>V) Dye Estimation: 1.Estimation of Methyl Orange/ Eriochrome Black T/Eosin/Congo Red by colorimetry</p>	2	4
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Modality of Assessment :

Theory Examination Pattern:

A) **Internal Assessment - 40%**
40 marks.

Theory

40 marks

Sr No	Evaluation type	Marks
1	One Assignments/Case study/Project	10
2	One class Test (multiple choice questions / objective)	20
3	Active participation in routine class instructional deliveries(case	05

	studies/ seminars//presentation)	
4	Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.	05

B) External examination - 60 %

Semester End Theory Assessment - 60%

60 marks

- i. Duration - These examinations shall be of two hours duration.
- ii. Theory question paper pattern :-
 1. There shall be **five** questions each of **12** marks. On each unit there will be one question & fifth one will be based on all the four units .
 2. All questions shall be compulsory with internal choice within the questions. Each question will be of **24** marks with options.
 3. Questions may be sub divided into sub questions a, b, c & d only, each carrying **six** marks **OR** a, b, c, d,e & f only each carrying **four** marks and the allocation of marks depends on the weightage of the topic.

Practical Examination Pattern:

(A)Internal Examination:-

There will not be any internal examination/ evaluation for practicals.

(B) External (Semester end practical examination) :-

Sr.No.	Particulars	Marks
1.	Laboratory work	80
2.	Journal	10
3.	Viva	10

Assessment pattern for semester end / External practical examination of 80 marks shall be finalized in the workshop of the subject

Semester end practical examination in applied component shall be conducted by the concerned department of the Institute/ College at the end of each semester and the marks of the candidates are to be sent to the University in the prescribed format.

Semester V:

Practical examination will be held at the college / institution at the end of the semester.

The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head of the Department/ Co-ordinator of the department ; failing which the student will not be allowed to appear for the practical examination.

Semester VI

Practical examination will be held at the college / institution at the end of the semester. The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

In case of loss of Journal and/ or Report, a Lost Certificate should be obtained from Head of the Department/ Co-ordinator of the department ; failing which the student will not be allowed to appear for the practical examination.