SEMESTER 6

DRUGS AND COLOUR CHEMISTRY **Course No: S.CHE.6.AC**
FOUR CREDIT COURSE **[60 Lectures]**

Learning Objectives:

1) To familiarize students with the mode of action of drugs.
2) To understand the uses and the side effects of certain drugs for various diseases.
3) To study the synthesis of different drugs
4) To study the nomenclature and characteristics of dyes.
5) To study the concept of colour and its relation to chemical structure.
6) To familiarize the students with the types of fibres, application of dyes and how the dyes are attached to them.
7) To familiarize the students with the synthesis of some representative dyes.
8) To create an awareness of the current concern about the toxicity of dyes and their effect on ecology.

UNIT I **(15 Lectures)**

1.1 General Introduction to drugs. **(7 Lectures)**

1.1.1: Definition of drug, requirement of an ideal drug, classification of drugs (based on Therapeutic action)

1.1.2: Nomenclature of drugs, generic name, brand name, systematic name.

1.1.3: Definition of the following medicinal terms: Pharmacon, Pharmacophore, Prodrug, Half-life efficiency, LecturesD_{50}, ED_{50}, Therapeutic index.

1.1.4: Brief idea of the following terms: receptors, drug-receptor interaction, drug potency, Bioavailability, drug toxicity, drug addiction, spurious drugs, misbranded drugs, Adulterated drugs, Pharmacopoeia.

1.2 Routes of drug administration and dosage forms: **(3 Lecture)**

1.2.1: Oral and parenteral routes with advantages and disadvantages.

1.2.2: Formulations, different dosage forms (emphasis on sustained release formulations.)

1.3 Synthesis of following drugs. **(5 Lectures)**

Paracetamol, Aceclofenac, Salbutamol, Ciprofloxacin, Metronidazole, Mebendazole, Ethambutol , 5-Fluorouracil, Atenolol, Dapsone and Trimethadione.

UNIT II **(15 Lectures)**

2.1 Pharmacodynamic agents **(9 Lectures)**

A brief introduction of the pharmacodynamic agents and study of their chemical class, Chemical structure, therapeutic uses and side effects.

2.1.1: Analgesics (Narcotics and non-narcotics) and Antipyretics: Classification of analgesics: narcotics and non narcotics. Morphine(phenanthrene alkaloids), Tramadol, Aspirin(salicylates) , Paracetamol (p-amino phenol)

2.1.2: Anti-inflammatory drugs: Mechanism of inflammation and various inflammatory conditions: Prednisolone, Betamethasone (steroids), Aceclofenac (aryl acetic acid), Mefenamic acid (N-aryl anthranilic acid.)

2.1.3: Drugs for respiratory system: General idea of Expectorant, Mucolyte, Bronchodilators, Decongestants and Antitussives. Bromhexine (phenyl methyl amines), Salbutamol, Pseudoephedrine (phenyl ethyl amines), Oxymetazoline (imidazolines), Codeine phosphate (opiates)

2.1.4: Drug metabolism: Introduction, absorption, distribution, biotransformation, excretion, different types of chemical transformation of drug with specific examples .

2.2 Chemotherapeutic agents **(6 Lectures)**

A brief introduction of the chemotherapeutic agents and study of their chemical class, chemical structure, therapeutic uses and side effects.

2.2.1: Antibiotics: Definition, characteristics and properties: Amoxicillin, Cloxacillin (β-lactam antibiotic), Cephalexin (cephalosporins), Doxycycline (tetracyclines), Ciprofloxacin (quinolone)

2.2.2: Antitubercular and antileprotic drugs: Study of tuberculosis – types, symptoms, and diagnosis of tuberculosis.

Types of leprosy: General idea of antibiotics used in their treatment: PAS (aminosalicylates), Isoniazid (hydrazides), Pyrazinamide (pyrazine), (+) Ethambutol (aliphatic diamines), Ethionamide (thioamides), Dapsone(sulfonamides), Clofazimine(phenazines) .Combination therapy to be discussed.:

i) Rifampicin + Ethambutol +Pyrazinamide.
ii) Rifampicin + Isoniazid + Pyrazinamide.
iii) Rifampicin + Clofazimine + Ethionamide.

Unit III: (15 Lectures)

3.1 : Introduction to dyestuff chemistry (3 Lectures)

3.1.1 : Definition of dyes, properties (colour and fastness).

3.1.2 : Important milestones in the development of synthetic dyes.

3.1.3 : Nomenclature of commercial dyes with at least one example.
Suffixes – G, O, R, B, 6B, L, S; colour index and colour index number.

3.2 : Classification of dyes based on constitution (3 Lectures)
(Examples as mentioned below with structures)

I : Nitro dyes – Naphthol Yellow S
II : Nitroso dyes – Gambine Y
III : Azo dyes –
  a) Monoazo dyes – Orange IV
  b) Disazo dyes – Congo Red
  c) Trisazo dyes – Direct Deep Black
IV : Diphenylmethane dyes – Auramine O
V : Triphenylmethane dyes –
  a) Diamines – Malachite Green
  b) Triamines – Crystal Violet
  c) Phenols – Phenolphthalein
VI : Heterocyclic dyes –
  a) Xanthenes – Eosine
  b) Azines – Safranine T
  c) Thiazines – Methylene Blue
VII : Anthraquinone dyes - Alizarin, Alizarin Cyanine Green G, Indanthrone
VIII : Indigoid dyes - Indigo
IX : Phthalocyanines - Monastral Fast Blue BS

3.3 : Classification of dyes based on application (6 Lectures)

Definition, fastness properties and applicability on substrates, examples with structures.

a) Acid dyes – Orange II, Alizarin Cyanine Green G.
b) Basic dyes – Crystal Violet, Bismark Brown.
c) Direct Cotton Dyes – Chrysophenine G.
d) Azoic dyes – Diazo components: Fast Red B Base, Fast Blue B Base; Coupling components: Naphthol AS, Naphthol AS-G.
e) Mordant dyes – Eriochrome Black T, Alizarin.
f) Vat dyes – Indigo, Indanthrene.
g) Disperse dyes–Celliton Scarlet B, Disperse Yellow 6G

3.4 : Colour and chemical constitution of dyes (3 Lectures)

3.4.1 Absorption of visible light, colour of wavelength absorbed and complementary colour, chromogen, chromophore, auxochrome, bathochromic and hypsochromic shifts.

3.4.2 : Relation of colour to resonance in the following classes of dyes : Azo, Triphenylmethane, Anthraquinone.

Unit IV:
(15Lectures)

4.1 : Organic Pigments (2 Lectures)

General idea, difference between dyes and pigments. Important characteristics of organic pigments, toners and lakes. Classification of organic pigments with suitable examples, i.e. ionic pigments (lakes of acid and basic dyes), nonionic pigments (azo, indigoids, anthraquinone), uses of pigments.

4.2 : Synthesis of specific dyes and their uses (7 Lectures)

i) Orange IV from sulphanilic acid
ii) Bismark Brown from m-phenylenediamine
iii) Malachite Green by using benzaldehyde and N,N-dimethylaniline
iv) Methylene Blue by using 4-amino-N,N dimethylaniline and N,N dimethylaniline
v) Congo Red from nitrobenzene
vi) Eriochrome Black T from β – naphthol
vii) Alizarin from anthraquinone
viii) Indigo from aniline
ix) Indanthrene from anthraquinone

x) Disperse Yellow 6G from benzanthrone

4.3 : Types of fibres and classes of dyes applicable to it (2 Lectures)
Introduction to the following types of fibres with structures and classes of dyes applicable to these fibres : Cotton, wool, silk, polyester.

4.4 : Forces binding dyes to the fibres: Ionic forces, hydrogen bonds, Van der Waals forces, covalent linkages. **(2 Lectures)**

4.5 : Basic operations involved in a dyeing process (1 Lecture)
Preparation of fibre for dyeing, preparation of the dye bath, application of the dye And finishing

4.6 : Ecology and toxicity of dyes (1 Lecture)
Brief idea of environmental pollution and health effects due to dyes.

REFERENCES

1) Pharmacology and pharmaceutics Vol.I and II, Satoskar
2) Textbook of organic, medicinal, and pharmaceutical chemistry, Wilson and Gisvold
3) Textbook of medicinal chemistry, William O. Foye and David A. William
4) Medicinal chemistry, G. R . Chatwal
5) Chemistry of synthetic dyes, Vol. I to VI, K. Venkataraman
6) Chemistry of synthetic dyes and pigments, H. A. Lubs
7) Colour Chemistry, H. Zollinger
8) Colour Chemistry, R. L. M. Allen
9) Unit process, Groggins
10) Synthetic dyes, M. S. Yadav
11) Physical Chemistry of dyeing, Thomas Vickerstaff
12) Chemistry of dyes and principles of dyeing, V. A. Shenai
13) Practical Organic Chemistry, A. I. Vogel

CIA I : Short answer questions 20 MARKS

CIA II: Questions on syntheses of drugs and dyes 20 MARKS

Template of Question Paper

DRUGS AND COLOUR CHEMISTRY **COURSE: S.CHE.6.AC.01**

OBJECTIVES

UNIT	KNOWLEDGE	UNDERSTANDING	APPLICATION	TOTAL MARKS
I	6	6	3	15
II	6	6	3	15
III	6	6	3	15
IV	6	6	3	15
TOTAL MARKS PER OBJECTIVES	24	24	12	60
% WEIGHTAGE	40	40	20	100

End Semester Paper Pattern :

Total marks : 60 **Maximum time : 2 hours**

Total no. of questions: 4 [all compulsory] of 15 marks each

1 question per unit:

Questions set out of 22 marks [50 % internal choice]

Sub questions will not exceed 5 marks

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SYLLABUS UNDER AUTONOMY
CHEMISTRY

PRACTICAL COURSE IN T.Y.B.Sc. **COURSE: S.CHE.6.AC.01.PR**

I. **PREPARATIONS**

1. Aspirin from Salicylic acid.
2. p-Nitroacetanilide from Acetanilide.
3. p-Nitroaniline from p-Nitroacetanilide.
4. m-Dinitrobenzene from Nitrobenzene
5. Fluorescein from Phthalic Anhydride
6. Anthraquinone from Anthracene

II. **ESTIMATIONS**

1. Estimation of Iodine in Tincture Iodine
2. Estimation of Ibuprofen
3. Estimation of Methyl Orange/Eriochrome Black T/Congo Red by colorimetry

CIA : ESTIMATION OF DRUG/DYE	**15 MARKS**
JOURNAL	**5 MARKS**
END SEMESTER PRACTICAL EXAMINATION	**30 MARKS**
PREPARATION OF DRUG/DYE	

The practical exam will be conducted for 1 session of 3 hours duration.

BATCH SIZE FOR:

REGULAR PRACTICALS	**20 STUDENTS PER IN-CHARGE**
EXAMINATIONS	**MAXIMUM 20 STUDENTS PER BATCH**

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