UNIVERSITY OF LUCKNOW
LUCKNOW
M.Sc. Pharmaceutical Chemistry (Core)
Spectroscopic Methods In Pharmaceutical Chemistry Syllabus
Semester III, Paper I, PH3CO7

Unit I

1. Ultraviolet-Visible and Chirooptical Spectroscopy

a. Energy levels and selection rules, Woodward-Fieser and Fieser-Kuhn rules. Influence of substituent, ring size and strain on spectral characteristics. Solvent effect, Stereochemical effect, non-conjugated interactions.

b. Chirooptical properties-ORD, CD, octant rule, axial haloketone rule, Cotton effect. Poblems based on the above topics.

Unit II

2. Infrared Spectroscopy

a. Fundamental vibrations, characteristic regions of the spectrum (fingerprint and functional group regions), influence of substituent, ring size, hydrogen bonding, vibrational coupling and field effect on frequency, determination of stereochemistry by IR technique. IR spectra of different groups. Problems on spectral interpretation with examples.

Unit III

3 Nuclear Magnetic Resonance Spectroscopy

a. Magnetic nuclei with special reference to 1H and13C nuclei.

   i. Chemical shift and shielding/deshielding, factors affecting chemical shift, relaxation processes, chemical and magnetic non-equivalence, local diamagnetic shielding and magnetic anisotropy.

   ii. Proton and 13C NMR scales. Spin-spin splitting: AX, AX2, AX3, A2X3, AB, ABC, AMX type coupling, first order and non-first order spectra,

   iii. Pascal's triangle, coupling constant, mechanism of coupling, Karplus curve, quadrupole broadening and decoupling, diastereomeric protons, virtual coupling, long range coupling-epi, peri and bay effects.

   iv. NOE. NOE and cross polarization. Simplification non-first order spectra to first order spectra: shift reagents, spin decoupling and double resonance, off resonance decoupling.

v. Chemical shifts and homonuclear/heteronuclear couplings. Basis of heteronuclear decoupling.

vi. 2D NMR and COSY, HOMOCOSY and HETEROCOSY Polarization transfer. Selective Population Inversion. DEPT, INEPT and RINEPT. Sensitivity enhancement and spectral editing, MRI. Problems on spectral interpretation with examples.

Unit IV

4 Mass Spectrometry

a. Molecular ion: ion production methods (EI). Soft ionization methods: SIMS, FAB, CA, MALDI, PD, Field Desorption Electrospray Ionization. Fragmentation patterns-nitrogen and ring rules.

b. McLafferty rearrangement and its applications.

c. HRMS, MS-MS, LC-MS, GC-MS.

d. Problems on spectral interpretation with examples.

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M.Sc. Pharmaceutical Chemistry (Core)
Medicinal Chemistry I
Semester III, Paper II, PH3CO8

Unit I

1. **Drugs acting on ANS**
    a. Adrenergic stimulants: Phenyl ethanolamine derivatives-adrenaline, isoprenaline, salbutamol, ephedrine, and phenylephrine. Imidazole derivatives-naphazoline, xylometazoline and oxymetazoline.
    b. Adrenergic blockers: Ŭ and ƀ adrenoreceptor antagonists-ergot akaloids, phenoxybenzamine, phentolamine, tolazoline, DCI, propranolol, atenolol, labetolol. Neurone blockersï Bretilium and Xylocholine.
2. **Cholinergic stimulants**
    a. Nicotinic and muscarinic receptors, acetyl choline and analogues, pilocarpine, bethanechol and carbachol.
3. **Cholinergic blockers**
    a. Tertiary and quaternary antimuscarinics, antispasmodic drugs-dicyclomine, glycopyrrolate, antiulcer drugs-pirenzepine, cycloplegic drugs-tropicamide, homatropine

UNIT II

4. **Anticholinesterases**
    a. Competitive inhibitors-physostigmine and neostigmine. Non competitive inhibitors: organophosphorus compounds, Nerve gases, Cholinesterase regenerators-2 PAM.
    b. Ganglion blocking agents: mecamylamine and trimethophan
5. **Synthesis of the following drugs**
    - Bretilium
    - Carbachol
    - Gallamine
    - Mecamylamine
    - Naphazoline
    - Propranolol
    - Salbutamol
    - Tolazoline

Unit III

6. **Drugs acting on CVS**
    a. **Cardiotonic drugs**
        i. Cardiac glycosides-their chemistry and stereochemistry,
        ii. Digoxin and digitoxin.
    b. **Antiarrhythmic drugs**
        i. Quinidine, disopyramide, lidocaine, phenytoin and procainamide, ƀ-blockers-propranolol.
    c. **Calcium channel blockers**

i. Verapamil, nifedipine and Neurone blockers-bretilium.

d. Antihypertensive Drugs

i. Peripheral antiadrenergics-prazosin and terazosin.

e. Centrally acting drugs

i. Reserpine, clonidine and methyl dopa.

f. β-blockers

i. Propranolol, atenolol and labetalol.

g. Calcium channel blockers

i. Nifedipine and amlodipine.

h. ACE inhibitors

i. Captopri. Angiotensin receptor blockers-losartan.

i. Diuretics

i. Thiazide diuretics.

j. Antianginal drugs

i. vasodilators-nitrites and nitrates,

k. Anticoagulants

i. Heparin, coumarin derivatives and indane dione derivatives.

l. Antilipidemic agents

i. Atherosclerosis (mention only), Statins-lovastatin,simvastatin, fluvastatin, Fibrates-clofibrate.

7. Synthesis of the following drugs

- Amlodipine
- Captopril
- Disopyramide
- Fluvastatin
- Procainamide
- Verapamil

Unit IV

8. Chemotherapy

a. Sulphonamides

i. sulphanilamide, N-substituted sulphanilamide derivatives, mechanism of action, sulphones-dapsone, dihydrofolate reductase inhibitorstrimethoprim and cotrimoxazole.

b. Antitubercular agents

i. First line drugs-isoniazid, rifampicin, pyrazinamide, ethambutol, and streptomycin.

ii. Second line drugs-ethionamide, paraaminosalicylic acid and fluoroquinolones.

c. Antifungal agents

i. Antibiotics- amphotericinB, griseofulvin and nystatin.

ii. Azole derivatives- ketoconozole, terconozole, fluconozole and clotrimazole.

iii. Pyrimidine derivatives- 5 Flucytosine.

d. Antiviral drugs

i. Amantidine, interferon and ribavirin.

ii. Anti HIV agentszidovudine, and abacavir.

iii. Anti herpes simplex agents-brivudine, vidarabin and acyclovir.

iv. Anti-influeza agents-oseltamivir(tamiflu).

v. Antiprotozoal agents: Amoebicides-metranidazole and tinidazole.

e. Antimalarials

i. Chloroquine, primaquine, mefloquine, quinacrine and proguanil.

f. Anthelmintics

i. Piperazines and benzimidazoles. .

9. Synthesis of the following drugs

- Acyclovir
- Ampicillin
- Cephalexin
- Chloramphenicol
- Clotrimazole
- Dapsone
- Ethambutol
- Griseofulvin
- Mebendazole
- Metranidazole
- Primaquine
- Sulphamethoxazole
- Trimethoprim

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Medicinal Chemistry II
Semester III, Paper I, PH3CO9
Unit I

1. **Antineoplastic Drugs**
    a. Neoplasm-cause therapeutic approaches.
    b. Alkylating agents-nitrogen mustards, nitrosourea, aziridines and aryl sulphonates.
    c. Antimetabolites-folic acid. Antagonists-purine and pyrimidine antagonists.
    d. Antibiotics- anthracyclines, actinomycinD, bleomycin.
    e. Plant products-vinca alkaloids, taxol derivatives.
2. **Hormones and their antagonists**
    a. Tamoxifen.
3. **Synthesis of the following drugs**
    - Carmustin
    - Chlorambucil
    - 5-Fluoro Uracil
    - Methotrexate
    - Procarbazine
    - Thiotepa

Unit II

4. **Psychopharmocological Agents**
    a. Tranquilisers
        i. Rauwolfia alkaloids, meprobamate, oxazepim, benzodiazepines, chlordiazepoxide, phenothiazene derivatives.
    b. Antidepressants
        i. MAO inhibitors-Isocarboxazide, tranylcypromine and phenelzine. Tricyclic compounds-imipramine, trimipramine, amitriptynine, doxepine, amoxapine.
    c. Antipsychotics
        i. Phenothiazine and thiothixene derivatives, butyrophenoneshaloperidol, droperidon, rauwolfia alkaloids
    d. Hallucinogens
        i. Triptaminederivatives- DMT, psilocybin, phenylalkylamines mescaline, lysergic acid derivatives-LSD.
5. **Synthesis of the following drugs**
    - Chlordiazepoxide
    - Chlorpromazine
    - Haloperidol
    - Meprobamate
    - Imipramine
    - Tranylcypromine

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Unit III

6. Diuretics

a. Common diuretics and their mechanism of action-mercurial and nonmercurial diuretics, carbonic anhydrase inhibitors- acetazolamide and methazolamide, thiazide derivatives-hydrochlorothiazide, Loop diuretics furosemide and ethacrynic acid, potassium sparing diuretics-amiloride, spironolactone.

7. Antihistaminic drugs

a. Histamine and its biological role, H1 antagonistsaminoalkyl ethers, diphenhydramine and doxylamine, ethylenediamine derivatives-pyrilamine, phenothiazines-promethazine, trimeprazine, piperazine derivatives-cyclizines, miscellaneous compounds-cetrizine and cyproheptadine.

8. Hypogycemic agents

a. Type 1 and type 2 diabetes, insulin, suphonyl ureastolbutamide, acetohexamide and glibenclamide, biguanides-metformin, thiazolidinediones-rosiglitazone.

UNIT IV

9. Local anaesthetics

a. Clinical application of local anaesthesia, coca and cocaine, hexylcaine, paraaminobenzoic acid derivative-benzocaine, procaine, tetracaine, chloroprocaine, anilides, lidocaine, etiodacaine and prilocaine.

10. Antitussives

a. Centrally acting antitussives-
    i. Opium alkaloids and synthetic substitutes-codaine, noscapine, pholcodine, ethylmorphine, dextromethorphan,
    ii. Non narcotic antitussives- diphenhydramine,
    iii. Expectorants-terpin hydrate, guaicol and bromhexine.

11. Synthesis of the following drugs

- Acetazolamide
- Amiloride
- Diphenhydramine
- Benzocaine
- Chlorthiazide
- Dextromethorphan
- Ethacrynic Acid
- Furosemide
- Lidocaine
- Omeprazole
- Phenformin
- Procaine
- Promethazine
- Pyrilamine
- Tolbutamide