Pharmaceutical Chemistry (Theory)
Course Code: ER20-12T
75Hours(3Hours/week)

Scope

This course is designed to impart basic knowledge on the chemical structure, storage conditions and medicinal uses of organic and inorganic chemical substances used as drugs and pharmaceuticals. Also, this course discusses the impurities, quality control aspects of chemical substances used in pharmaceuticals.

Course Objectives

This course will discuss the following aspects of the chemical substances used as drugs and pharmaceuticals for various disease conditions

1. Chemical classification, chemical name, chemical structure
2. Pharmacological uses, doses, stability and storage conditions
3. Different types of formulations / dosage form available and their brand names
4. Impurity testing and basic quality control tests

Course Outcomes:

Upon successful completion of this course, the students will be able to

1. Describe the chemical class, structure and chemical name of the commonly used drugs and pharmaceuticals of both organic and inorganic nature
2. Discuss the pharmacological uses, dosage regimen, stability issues and storage conditions of all such chemical substances commonly used as drugs
3. Describe the quantitative and qualitative analysis, impurity testing of the chemical substances given in the official monographs
4. Identify the dosage form & the brand names of the drugs and pharmaceuticals popular in the marketplace

Pharmaceutical Chemistry (Practical)
Course Code: ER20-12P
75Hours(3Hours/week)

Scope

This course is designed to impart basic training and hands-on experiences to synthesis chemical substances used as drugs and pharmaceuticals. Also, to perform the quality control tests, impurity testing, test for purity and systematic qualitative analysis of chemical substances used as drugs and pharmaceuticals.

Course Objectives

This course will provide the hands-on experience on the following aspects of chemical substances used as drugs and pharmaceuticals

1. Limit tests and assays of selected chemical substances as per the monograph
2. Volumetric analysis of the chemical substances
3. Basics of preparatory chemistry and their analysis
4. Systematic qualitative analysis for the identification of the chemical drugs

Course Outcomes

Upon successful completion of this course, the students will be able to

1. Perform the limit tests for various inorganic elements and report
2. Prepare standard solutions using the principles of volumetric analysis
3. Test the purity of the selected inorganic and organic compounds against the monograph standards
4. Synthesize the selected chemical substances as per the standard synthetic scheme
5. Perform qualitative tests to systematically identify the unknown chemical substances

Practicals

1. **Limit test for**
- Chlorides; sulphate; Iron; heavy metals
2. **Identification tests** for Anions and Cations as per Indian Pharmacopoeia
3. **Fundamentals of Volumetric analysis**

   Preparation of standard solution and standardization of Sodium Hydroxide, Potassium Permanganate
4. **Assay of the following compounds**
- Ferrous sulphate- by redox titration
- Calcim gluconate-by complexometric
- Sodium chloride-by Modified Volhard's method
- Ascorbic acid by iodometry
- Ibuprofen by alkalimetry

5. **Fundamentals of preparative organic chemistry**

   Determination of Melting point and boiling point of organic compounds

6. **Preparation of organic compounds**

   Benzoic acid from Benzamide

   Picric acid from Phenol

7. **Identification and test for purity** of pharmaceuticals

   Aspirin, Caffeine, Paracetamol, Sulphanilamide

8. **Systematic Qualitative analysis** experiments (4 substances)

Topic wise marks and question Weightage- D. Pharm Part-1 (ER 2020)
Subject: Pharmaceutical Chemistry (Theory)

Chapter no.	Name of the Topics	Allocate Hours	% Marks based on Allocated hrs	Actual Marks	Actual % weightage of Marks	Questions distribution		
						1M	3M	5M
1	**Introduction to Pharmaceutical chemistry:** Scope and objectives **Sources and types of errors:** Accuracy, precision, significant figures **Impurities in Pharmaceuticals:** Source and effect of impurities in Pharmacopoeial substances, importance of limit test, Principle and procedures of Limit tests for chlorides, sulphates, iron, heavy metals and arsenic.	8	10.66	6	6.81	1		1
2	**Volumetric analysis:** Fundamentals of volumetric analysis, Acid-base titration, non-aqueous titration, precipitation titration, complexometric titration, redox titration **Gravimetric analysis**: Principle and method.	8	10.66	6	6.81	1		1

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Chapter no.	Name of the Topics	Allocate Hours	% Marks based on Allocated hrs	Actual Marks	Actual % weightage of Marks	Questions distribution		
						1M	3M	5M
3	**Inorganic Pharmaceuticals: Pharmaceutical formulations, market preparations, storage conditions and uses of** ● Haematinics: Ferrous sulphate, Ferrous fumarate, Ferric ammonium citrate, Ferrous ascorbate, Carbonyl iron ● Gastro-intestinal Agents: Antacids :Aluminium hydroxide gel, Magnesium hydroxide, Magaldrate, Sodium bicarbonate, Calcium Carbonate, Acidifying agents, Adsorbents, Protectives, Cathartics ● Topical agents: Silver Nitrate, Ionic Silver, ChlorhexidineGluconate, Hydrogen peroxide, Boric acid, Bleaching powder, Potassium permanganate ● Dental products: Calcium carbonate, Sodium fluoride, Denture cleaners, Denture adhesives, Mouth washes ● Medicinal gases: Carbon dioxide, nitrous oxide, oxygen	**7**	9.33	9	10.22	3	2	
4	Introduction to nomenclature of organic chemical systems with particular reference to heterocyclic compounds containing up to Three rings	**2**	2.66	2	2.27	2		

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Chapter no.	Name of the Topics	Allocate Hours	% Marks based on Allocated hrs	Actual Marks	Actual % weightage of Marks	Questions distribution		
						1M	3M	5M
5	**Drugs Acting on Central Nervous System** • Anaesthetics: **Thiopental Sodium***, **Ketamine Hydrochloride***, Propofol • Sedatives and Hypnotics: **Diazepam***, Alprazolam*, Nitrazepam, **Phenobarbital*** • Antipsychotics: Chlorpromazine Hydrochloride*, Haloperidol*, Risperidone*, Sulpiride*, Olanzapine, Quetiapine, Lurasidone • Anticonvulsants: Phenytoin*, Carbamazepine*, Clonazepam, Valproic Acid*, Gabapentin*, Topiramate, Vigabatrin, Lamotrigine • Anti-Depressants: Amitriptyline Hydrochloride*, Imipramine Hydrochloride*, Fluoxetine*, Venlafaxine, Duloxetine, Sertraline, Citalopram, Escitalopram, Fluvoxamine, Paroxetine	**9**	12.00	9	10.22	**1**	**1**	**1**
6	**Drugs Acting on Autonomic Nervous System** • Sympathomimetic Agents: Direct Acting: NorEpinephrine*, Epinephrine, Phenylephrine, Dopamine*, Terbutaline, Salbutamol (Albuterol), Naphazoline*, Tetrahydrozoline. Indirect Acting Agents: Hydroxy Amphetamine, Pseudoephedrine. Agents With Mixed Mechanism: Ephedrine, Metaraminol • Adrenergic Antagonists: Alpha Adrenergic Blockers: Tolazoline, Phentolamine • Phenoxybenzamine, Prazosin. Beta Adrenergic Blockers: Propranolol*, Atenolol*, Carvedilol • Cholinergic Drugs and Related Agents: Direct Acting Agents: Acetylcholine*, Carbachol, And Pilocarpine. Cholinesterase Inhibitors: Neostigmine*, Edrophonium Chloride, Tacrine Hydrochloride, Pralidoxime Chloride, Echothiopate Iodide • Cholinergic Blocking Agents: Atropine Sulphate*, Ipratropium Bromide Synthetic Cholinergic Blocking Agents: Tropicamide, CyclopentolateHydrochloride, Clidinium Bromide, Dicyclomine Hydrochloride*	**9**	12.00	9	10.22	1	1	1

Topic wise marks and question Weightage- D. Pharm Part-1 (ER 2020)
Subject: Pharmaceutical Chemistry (Theory)

Chapter no.	Name of the Topics	Allocate Hours	% Marks based on Allocated hrs	Actual Marks	Actual % weightage of Marks	Questions distribution		
						1M	3M	5M
7	**Drugs Acting on Cardiovascular System** ● Anti-Arrhythmic Drugs: Quinidine Sulphate, Procainamide Hydrochloride, Verapamil, Phenytoin Sodium*, Lidocaine Hydrochloride, Lorcainide Hydrochloride, Amiodarone and Sotalol ● Anti-Hypertensive Agents: Propranolol*, Captopril*, Ramipril, Methyldopate Hydrochloride, Clonidine Hydrochloride, Hydralazine Hydrochloride, Nifedipine, ● Antianginal Agents: IsosorbideDinitrate	**5**	6.66	10	11.36	2	1	1
8	**Diuretics: Acetazolamide**, Frusemide*, Bumetanide, Chlorthalidone, Benzthiazide, Metolazone, Xipamide, Spironolactone	**2**	2.66	5	5.68	2	1	
9	**Hypoglycemic Agents:** Insulin and Its Preparations, Metformin*, Glibenclamide*, Glimepiride, Pioglitazone, Repaglinide, Gliflozins, Gliptins	**3**	4.00	5	5.68	2	1	

Topic wise marks and question Weightage- D. Pharm Part-1 (ER 2020)
Subject: Pharmaceutical Chemistry (Theory)

Chapter no.	Name of the Topics	Allocate Hours	% Marks based on Allocated hrs	Actual Marks	Actual % weightage of Marks	Questions distribution		
						1M	3M	5M
10	**Analgesic And Anti-Inflammatory Agents:** Morphine Analogues, Narcotic Antagonists; NonsteroidalAntiInflammatory Agents (NSAIDs) - Aspirin*, Diclofenac, Ibuprofen*, Piroxicam, Celecoxib, Mefenamic Acid, Paracetamol*, Aceclofenac	**3**	4.00	5	5.68	2	1	
11	**Anti-Infective Agents** ● Antifungal Agents: Amphotericin-B, Griseofulvin, Miconazole, Ketoconazole*, Itraconazole, Fluconazole*, Naftifine Hydrochloride ● Urinary Tract Anti-Infective Agents: Norfloxacin, Ciprofloxacin, Ofloxacin*, Moxifloxacin, ● Anti-Tubercular Agents: INH*, Ethambutol, Para Amino Salicylic Acid, Pyrazinamide, Rifampicin, Bedaquiline, Delamanid, Pretomanid* ● Antiviral Agents: Amantadine Hydrochloride, Idoxuridine, Acyclovir*, Foscarnet, Zidovudine, Ribavirin, Remdesivir, Favipiravir ● Antimalarials: Quinine Sulphate, Chloroquine Phosphate*, Primaquine Phosphate, Mefloquine*, Cycloguanil, Pyrimethamine, Artemisinin ● Sulfonamides: Sulfanilamide, Sulfadiazine, Sulfamethoxazole, Sulfacetamide*, Mafenide Acetate, Cotrimoxazole, Dapsone*	**8**	10.66	9	10.22	1	1	1

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Subject: Pharmaceutical Chemistry (Theory)

Chapter no.	Name of the Topics	Allocate Hours	% Marks based on Allocated hrs	Actual Marks	Actual % weightage of Marks	Questions distribution		
						1M	3M	5M
12	**Antibiotics:** Penicillin G, Amoxicillin*, Cloxacillin, Streptomycin, Tetracyclines: Doxycycline, Minocycline, Macrolides: Erythromycin, Azithromycin, Miscellaneous: Chloramphenicol* Clindamycin	8	10.66	9	10.22	1	1	1
13	**Anti-Neoplastic Agents:** Cyclophosphamide*, Busulfan, Mercaptopurine, Fluorouracil*, Methotrexate, Dactinomycin, Doxorubicin Hydrochloride, Vinblastine Sulphate, Cisplatin*, Dromostanolone Propionate	**3**	4.00	4	4.54	1	1	