Third Year- Course Description 2025-2026

1. Course Name:
Inorganic Pharmaceutical Chemistry
2. Course Code:
325ChPIP
3. Semester / Year:
First Semester / Third Year
4. Description Preparation Date:
9-2025
5. Available Attendance Forms:
On campus
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hours Theoretical + 2 hours Practical (75) /4 units
7. Course administrator's name (mention all, if more than one name)
Theory: Assistant Lecturer: Iman Muneeb Malik Email: imad.muneeb@bcms.edu.iq Practical: Lecturer Salsal Kamal Abdulrahman Email: salsal.kamal.abdulrahman@bcms.edu.iq
8. Course Objectives

Course Objectives	**1)** This course examines the clinical application of inorganic compounds, focusing on the relationship between chemical structure and therapeutic or diagnostic function. **2)** Students will study the roles of key metals in medicine, including platinum anticancer agents and chelation therapy. **3)** A significant component is dedicated to radiopharmacy, covering the principles, safe handling, and application of radiopharmaceuticals in advanced medical imaging and treatment.
9. Teaching and Learning Strategies	
Strategy	1- Theoretical Lectures 2- Conducting Scientific Experiments 3- Study Circles/Seminars 4- Daily Assignments 5- Written Examinations 6- Methodological and Supplementary Books 7- Illustrative Videos

10. Course Structure					
Week	**Hours**	**Required Learning Outcomes**	**Unit or subject name**	**Learning method**	**Evaluation method**
1	2	Lithium, Sodium, Potassium: Electron configuration, chemical properties of metals, Advantages and disadvantages using lithium-based drugs, Sodium as an essential ion in the human body, Active transport of sodium ions, Drugs, diet and toxicity of sodium ions, Potassium and its clinical application.	Alkali Metals:	Lectures	Oral and Written Exam
2	2	Magnesium, Calcium: Electron configuration of metals, Major uses and Chemical properties, Magnesium Biological importance and clinical applications and preparations. Calcium: the key to many human functions.	Alkaline Earth Metals:	Lectures	Oral and Written Exam
3-4	4	Aluminum, Boron and Gallium: General chemistry of group 13 elements, pharmaceutical	Group 13:	Lectures	Oral and Written Exam

		applications of boric acid, Bortezomib, Biological importance of Aluminum its adjuvants, Antacids, Aluminum-based therapeutics, Phosphate binders, Antiperspirant. Gallium Introduction, Chemistry, Pharmacology of gallium-based drugs and their uses			
5	2	General chemistry of group 14 elements, Silicon-based drugs versus carbon-based analogues, Introduction of silicon groups, Silicon isosteres, Organosilicon drugs.	The Carbon Group:	Lectures	Oral and Written Exam
6-7	4	Electronic configurations, platinum anticancer agents, Iron and its role in biological systems, clinical applications. Copper-containing drugs, Silver: the future of antimicrobial agents? Gold: the fight against rheumatoid arthritis and zinc and its role in	Transition Metals and d-Block Metal Chemistry:	Lectures	Oral and Written Exam

		biological systems, clinical applications and toxicity.			
8	2	What is heavy-metal poisoning? What is chelation? Chelation therapy, Calcium disodium edetate, Dimercaprol (BAL), Dimercaptosuccinic acid (DMSA), 2,3-Dimercapto-1-propanesulfonic acid (DMPS), and Lipoic acid (ALA).	Chelation Therapy:	Lectures	Oral and Written Exam
9-11	6	Protective adsorbents Topical agents Dental agents	Protective adsorbents Topical agents Dental agents	Lectures	Oral and Written Exam
12	2	What is organometallic chemistry and metallocenes? Ferrocene derivatives as potential antimalarial agent and antibreast cancer, Titanocenes in titanium-based anticancer agents and Vanadocene dichloride as anticancer agents, Further vanadium-based drugs: insulin mimetics.	Organometallic Chemistry:	Lectures	Oral and Written Exam
13-	4	dispensing and	Radioactive		

14		protection, Therapeutic use of radiopharmaceuticals.	Compounds and Their Clinical Application, Radiopharmacy:		
15	2	Radiopharmaceuticals for imaging	Radiopharmaceuticals for imaging	Lectures	Oral and Written Exam

- 20° Theoretical Part
- (Seminar + attendance + quiz + mid-term exam)
- 20 degrees practical part (practical technique + cob + presence)
- 60 Final Exam Marks
- Total 100 Marks

12.Learning and Teaching Resources

Required textbooks (curricular books, if any)	**1)** Essentials of Inorganic Chemistry for Students of Pharmacy, Pharmaceutical Sciences and Medicinal Chemistry by KATJA A. STROHFELDT, School of Pharmacy, University of Reading, UK **2)** Inorganic Medicinal and Pharmaceutical Chemistry by Block, Roche Soine and Wilson, latest edition
Main references (sources)	
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Third Year- Course Description 2025-2026

1. Course Name:	
Pharmacognosy II (Theoretical+ Practical)	
2. Course Code:	
326 ChPP2	
3. Semester / Year:	
1st Semester/3rd year	
4. Description Preparation Date:	
9-2025	
5. Available Attendance Forms:	
On campus	
6. Number of Credit Hours (Total) Number of Units (Total):	
2 Theoretical Hours + 2 Practical Hours (60 Hours College) / 3 Units	
7. Course administrator's name (if more than one name)	
Prof. Maha Noori Hamad Email: mahanoori@bcms.edu.iq Lab instructors: Assist. Lect. Huda Saaran Hosny Email: Hsaaz16@bcms.edu.iq	
8. Course Objectives	
Course Objectives	Introducing students to the importance of medicinal plants and their scientific names and how to extract the active substances found in the most important medicinal plants And methods of separation, purification and detection to prepare them in the laboratory and make chemical changes to increase their effectiveness and reduce their side effects.
9. . Teaching and Learning Strategies	

Strategy	● Presentation and presentation ● Interactive discussions ● Brainstorming ● Small aggregates ● Research and induction ● Panel discussions ● Field visits to institutions and bodies associated with the work of the pharmacist ● Volunteer work, seminars, workshops and exhibitions.

10. Course Structure

week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning method	Evaluation method
1	2	recognize the general pathways of biosynthesis of natural by-products and their importance,	Introduction to biosynthesis by-product biosynthesis	On campus lectures	Weekly and daily exams
2	2	Clarify and complete biosynthesis pathways in detail	Follow biosynthesis	On campus lectures	Weekly and daily exams
3	2	understand the chemical composition and pharmacological properties of carbohydrates and glycosides,	Carbohydrates and glycosides	On campus lectures	Weekly and daily exams
4	2	recognize the medicinal properties and uses of cardiac glycosides and anthraquinone glycosides	Cardiac glycosides and anthraquinone glycosides	On campus lectures	On paper Exams
5	2	Study of saponins and cyanophore glycosides and their medicinal	Saponins and cyanoforic glycosides	On campus lectures	On paper Exams

		properties			
6	2	Identify flavonoid glycosides and their therapeutic importance	Flavonoid glycosides	On campus lectures	On paper Exams
7	2	understand the composition and uses of isothiocyanates, alcohols, lactones, and phenol glycosides,	Isothiocyanate, Aldehyde, Alcohol, Lactone, Phenol Glycosides	On campus lectures	On paper Exams
8	2	Identify the chemistry and properties of volatile oils and their uses	Definition of volatile oils	On campus lectures	On paper Exams
9	2	Understand the chemical extraction processes and chemical composition of volatile oils	Extraction methods and chemistry of volatile oils	On campus lectures	On paper Exams
10	2	Distinguishing between types of volatile oils in terms of source and medical use	Types of volatile oils	On campus lectures	On paper Exams
11	2	Explain the methods of lipid biosynthesis and its importance in pharmaceutical applications,	Fat biosynthesis	On campus lectures	On paper Exams
12	2	Identify chemical and analytical evaluation methods for oils and fats	Analytical chemistry and evaluation of oils and fats	On campus lectures	On paper Exams

13	2	Study the importance of fixed oils and waxes and their pharmaceutical uses	Fixed oils and candles	On campus lectures	On paper Exams
14	2	Understand the chemical composition of resins compounds, their groups and their medical significance,	Resins and resins groups, toxic non-medicinal plants	On campus lectures	On paper Exams
15	2	Recognize vitamins, their classification, therapeutic and nutritional functions	Vitamins	On campus lectures	On paper Exams
16	2	Review and summarize all the vocabulary of the subject and prepare the student for the final exam	Comprehensive review	On campus lectures	Semester and final exams

. Course Evaluation

- 20° Theoretical Part
- (Seminar + attendance + quiz + mid-term exam)
- 20 degrees practical part (practical technique + cob + presence)
- 60 Final Exam Marks
- Total 100 Marks

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Pharmacognosy 9th edition Varro E.Tyler, Lynn R.Brady.
Main references (sources)	Pharmacognosy 16th edition Trease &Evans.
Recommended books and references (scientific journals, reports...)	Phytochemical methods 3th edition A guide to modern techniques of plant analysis 1998
Electronic References, Websites	Thin layer chromatography 2nd edition Egon Stahl. 1990

Third Year- Course Description 2025-2026

1. Course Name:
Pharmaceutical Technology (Theoretical+ Practical)
2. Course Code:
327 PhPT
3. Semester / Year:
1st Semester/3rd year
4. Description Preparation Date:
9-2025
5. Available Attendance Forms:
Students' signature on attendance sheet
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hours Theoretical + 2 hours Practical (75) /4 units
7. Course administrator's name
Theory: Lecturer Eman Gameel Email: eman.gameel@bcms.edu.iq Practical: Assistant Lecturer Ruwayda Mohammed Email: ruwayda.mohamd@bcms.edu.iq
8. Course Objectives
1) Understand the fundamentals of **pharmaceutical preformulation**, including solubility, partitioning, powder, and compaction properties. **2)** Learn the **formulation, preparation, and administration** of various **solution dosage forms**, both oral and topical. **3)** Explore the **principles and techniques** involved in developing **suspensions**, including stability, rheology, and compounding methods. **4)** Study the formulation and delivery mechanisms of **aerosols and foams**, with focus on metered-dose inhalers and topical/vaginal applications. **5)** Gain knowledge of **parenteral dosage forms**, including types of injections, sterilization methods, and production standards.

6) Develop an understanding of **storage, packaging, and labeling** practices across all listed dosage forms to ensure quality and patient safety.

9. Teaching and Learning Strategies

Strategy	Lecturing Seminars Homework Quiz Practical laboratory demonstrations

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-3	9+6	• The concept of preformulation • Solubility • Molecular dissociation • Partitioning • Dissolution rate • Hygroscopicity • Physical form • Powder properties • Compaction properties **Practical:** Introduction: Laboratory Safety and Good Laboratory Practice (GLP) Calibration curve and saturated solubility determination (UV and HPLC)	Pharmaceutical preformulation (Chapter 23) (Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022)	Theoretical lectures. Laboratory experiments	Paper-based exams
4-6	9+6	• Some Solvents for Liquid Preparations • Preparation of solutions • Mixing oral liquids • Oral solutions and	Solutions (Chapter 13) (Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th	Theoretical lectures. Laboratory demonstration.	Paper-based exams

		preparations for oral solutions • Syrups • Elixirs • Tinctures • Proper administration and use of liquid peroral dosage forms • Topical Solutions and Tinctures • Vaginal and rectal solutions • Topical tinctures • Topical oral (dental) solutions • Miscellaneous solutions • Nonaqueous solutions • Extraction methods for preparing solutions **Practical:** Oral solutions: preparation methods and quality evaluation Syrups: materials, preparation methods and quality evaluation	edition, 2017)		
7-9	9+6	• Reasons for suspension • Features of desired in a pharmaceutical suspension • Sedimentation rate of the particles of a suspension • Physical features of the	Suspensions (Chapter 14: Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017)	Theoretical lectures. Laboratory demonstration.	Paper-based exams

		dispersed phase • Dispersion medium • Rheology of suspensions • Preparation of suspensions • Sustained-release suspensions • Extemporaneous compounding of suspensions • Mixing solids in liquids • Packaging and storage of suspensions • Examples of pharmaceutical suspensions • Dry powders for oral suspension **Practical:** Elixirs: materials, preparation methods and quality evaluation Tinctures: materials, preparation methods and quality evaluation	(Chapter 26: Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022)		
10-11	6+4	• Types of aerosols • Advantages of the aerosol dosage form • The aerosol principle • Aerosol systems • Aerosol container and valve assembly	Aerosols and foams (Chapter 14) (Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017)	Theoretical lectures. Laboratory demonstration.	Paper-based exams

		• Metered-dose inhalers • Filling operations • Packaging, labeling, and storage • Proper Administration and Use of • Proper administration and use of pharmaceutical aerosols • Examples of aerosols • Topical aerosols • Vaginal and rectal aerosols • Foams: Their types and preparation **Practical:** Aromatic waters: materials, preparation methods and quality evaluation Suspensions: materials, preparation methods and quality evaluation- **continued**			
12-15	12+8	• Injections • Parenteral routes of administration • Official types of injections • Solvents and vehicles for injections • Colligative properties for injections • Methods of sterilization • Validation/verification of	Parenterals (Chapter 15: Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017) (Chapter 38: Aulton's Pharmaceutics; The Design and	Theoretical lectures. Laboratory experiments.	Paper-based exams

		sterility • The industrial preparation of parenteral products • Packaging, labeling, and storage of injections • Available injections (examples) • Small volume parenteral • Large volume parenteral • Special considerations associated with parenteral therapy • Irrigation and dialysis solutions **Practical:** Suspensions: materials, preparation methods and quality evaluation Quality evaluation of parenteral preparations	Manufacture of Medicines; 6th edition, 2022)		

11. Course Evaluation
• 20 M Theoretical assessment. • (paper-based mid-term exam + quiz + attendance + seminar) • 20 M practical assessment (attendance + quiz + practice) • 60 M paper-based theoretical final exam • 100 M total

12. Learning and Teaching Resources	
Required textbooks	1) Aulton's Pharmaceutics; The Design and Manufacture of Medicines; 6th edition, 2022. 2) Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition,

	2017.
Main references (sources)	1) Handbook of Extemporaneous Preparation by Mark Jackson and Andrew Lowey; 1st edition; 2010. 2) British Pharmacopeia (BP); 2025 edition. 3) United States Pharmacopeia- National Formulary (USP-NF); 2025 edition.
Electronic References, Websites	

Third Year- Course Description 2025-2026

1. Course Name:
Biochemistry I
2. Course Code:
328 AClBc1
3. Semester / Year:
1st Semester / 3rd year
4. Description Preparation Date:
9-2025
5. Available Attendance Forms:
In-person attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hours Theoretical + 2 hours Practical (75) /4 units
7. Course administrator's name (mention all, if more than one name)
Assistant Professor Zainab A. Alshamma (Z.alshamma@bcms.edu.iq) Lecturer. Nawfal Ayad Mahmood (nawfal.ayad@bcms.edu.iq)
8. Course Objectives

Course Objectives	• Providing students with the principles of important biological molecules and preparation metabolism of these molecules. • Providing students with the necessary tech biochemistry.
9. Teaching and Learning Strategies	
Strategy	• Presentation and recitation • Interactive discussions • Brainstorming • Research and induction

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	3	Familiarity with what biochemistry studies and the description of important macromolecules.	Biological molecules: An introduction	Lectures; Discussions and Reports	Exam and classroom activities
2	3	Structure, classification, properties, and forms of amino acids.	Amino Acids	=	=

3	3	Chemical reactions, zwitterion, titration equation and calculation of the isoelectric pH, non- proteogenic amino acids, and clinical importance	Amino Acids	=	=
4	3	Peptide bond, backbone torsion angles, nomenclature of peptides, structure and function of some important peptides in human.	Peptides	=	=
5	3	Order of protein structure, bonds in proteins of different order of structure, classification of proteins based on the function, chemical nature, and nutritional value.	Proteins	=	=
6	3	Determination of the amino acids sequence in primary order proteins, determination of the N and C termini.	Proteins	=	=
7	Mid-term examination				
8	3	Chemistry, classification of carbohydrates, stereochemistry of monosaccharides, physiological importance.	Carbohydrates	=	=
9	3	Clinical importance and classification, saturated and unsaturated fatty acids nomenclature, physical properties, the effects of free radicals on body tissues, the effects of free radical scavengers in protection of lipids.	Lipids	=	=

10	3	Enzymes structure, nomenclature, and classification, how enzymes work, models of enzyme-substrate interaction, clinical applications of enzymes.	Enzymes	=	=
11	3	General principles, factors affecting the rate of enzyme catalyzed reaction (substrate concentration, temperature, and pH), Michaelis-Menten equation and Lineweaver-Burk plot, Michaelis constant.	Enzymes kinetics	=	=
12	3	The competitive and noncompetitive inhibitors, irreversible inhibition, the kinetic effects of inhibitors and how to determine the mechanism of inhibition.	Enzyme inhibitors	=	=
13	3	The effect of substrate concentration on regulation, the effect of compartmentation in facilitating the regulation, the ideal enzyme-catalyzed step for regulation of a metabolic pathway, regulation of enzyme amount, regulation of enzyme efficiency via reversible and irreversible covalent modifications.	Enzymes regulation	=	=
14	3	The basic principles of endocrine hormone action, the broad diversity and mechanisms of action of endocrine hormones, the complex steps involved in the production,	The diversity of the Endocrine system	=	=

		transport, and storage of hormones.			
15	3	The roles of stimulus, hormone release, signal generation, and effector response in hormone-regulated physiological processes, the role of receptors and guanosine nucleotide-binding G- proteins in hormone signal transduction, coordinating the work of hormones and their effect on physiological outcomes, the mechanism of the hormone's effect on cells	Hormone action	=	=

23.Course Evaluation
Mid-term examination (15 marks) Quiz and homework (5 marks) Practical work (20 marks) Final examination (60 marks)

24.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Harper's Illustrated Biochemistry, 32 ed.
Main references (sources)	Lippincott Illustrated Reviews: Biochemistry Lehninger Principles of Biochemistry, 8th ed.
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Third Year- Course Description 2025-2026

1. Course Name:
Pathophysiology
2. Course Code:
329 AClPa
3. Semester / Year
1st Semester/ 3rd Year
4. Description Preparation Date:
9-2025
5. Available Attendance Forms:
In-person attendance
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hours Theoretical + 2 hours Practical (75) /4 units
7. Course administrator's name (mention all, if more than one name)
Theory and Practical: Assistant Lecturer Zainab Nazar Email: zainab.nazar@bcms.edu.iq
8. Course Objectives

Course Objectives	• Providing students with theoretical and practical knowledge and technical skills necessary in the field of studying and understanding pathophysiology.
9. Teaching and Learning Strategies	
Strategy	• Presentation and recitation • Interactive discussions • Brainstorming • Research and induction

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit	Learning method	Evaluation method

1	3	Introducing pathophysiology and its relationship to related sciences such as immunity and histology; and presenting some terms used in describing pathological cellular changes In the practical part, identifying the histopathological Changes in cell necrosis	Introduction to pathophysiology	Lectures; Discussions and Reports	Exam and classroom activities
2	3	Disturbances of electrolytes and water distribution, alkalosis and acidosis	Electrolytes and water	=	=
3	3	Pathophysiology of the heart and vascular system disorders in the practical part, identifying the histopathological changes in some cardiovascular diseases In the practical part, identifying the histopathological changes in some cardiovascular diseases	The circulatory system diseases	=	=
4	3	Pathophysiology of the respiratory system diseases. In the practical part, identifying the histopathological changes in some respiratory diseases	Respiratory system diseases	=	=
5	3	Pathophysiology of the urinary system diseases In the practical part, identifying the histopathological changes in some urinary diseases	Urinary system diseases	=	=

6	3	Pathophysiology of digestive system diseases In the practical part, identifying the histopathological changes inthe gastrointestinal tract	Digestive system diseases	=	=
7	Mid-term examination				
8	3	Disorder of the liver, pancreas, gall bladder, and salivary glands In the practical part, identifying the histopathological lesions in some liver and pancreatic diseases	Diseases of organs and glands associated with the digestive system	=	=
9	3	Endocrine disorders and autoimmune diseases: thyroid disorder, diabetes mellitus, and metabolic syndrome in the practical part, identifying the histopathological lesions in some endocrine glands	Autoimmune and glandular disorder	=	=
10	3	Pathophysiology of some neurological disorders In the practical part, identifying the histopathological lesions in neuro- endocrine tissue	Disease of the nervous system	=	=
11	3	Pathophysiology of some male and female reproductive system diseases	Disease of the reproductive system	=	=

12	3	Pathophysiology of blood disease In the practical part, identifying the histopathological lesions in blood cells	Blood diseases	=	=
13	3	Pathophysiology of some skin and musculoskeletal system diseases In the practical part, identifying the histopathological lesions in muscles, ligaments, tendons, and bone	Disease of skin and muscle- skeletal system	=	=
14	3	Theories and pathophysiology of cancer In the practical part, identifying the histopathological lesions in some tumor tissues	Cancerous diseases	=	=
15	3	Pathophysiology of cellular changes In the practical part, identifying the histological changes in apoptosis, necrosis, hyperplasia, atrophy, and metaplasia	Cellular changes	=	=

47.Course Evaluation
Mid-term examination 20 marks Practical work 20 marks Final examination 60 marks

48.Learning and Teaching Resources	
Required textbooks (curricular books, if any)	

Main references (sources)	-Study Guide for Understanding Pathophysiology 7th Ed; 2021 Pathophysiology of Disease, An Introduction to Clinical Medicine, 6th Ed;2010
Recommended books and references (scientific journals, reports...)	McCance & Huethers Pathophysiology ,9th Ed 2022
Electronic References, Websites	

Third Year- Course Description 2025-2026

1. Course Name:	
Organic Pharmaceutical Chemistry I	
2. Course Code:	
330 ChPOp1	
3. Semester / Year:	
Second Semester / Third Year	
4. Description Preparation Date:	
9-2025	
5. Available Attendance Forms:	
On campus	
6. Number of Credit Hours (Total) / Number of Units (Total)	
3 hours Theoretical + 2 hours Practical (75) /4 units	
7. Course administrator's name (mention all, if more than one name)	
Theory: Asst. Prof. Dr. Marwan Imad (marwan.imad.jihad@bcms.edu.iq)	
Theory: Asst. Lecturer Farah Abdulhaleem(farah.abdulhaleem@bcms.edu.iq)	
Practical: Lecturer Salsal Kamal Abdulrahman (salsal.kamal.abdulrahman@bcms.edu.iq)	
8. Course Objectives	
Course Objectives	1. Highlighting the concept of drug journeys inside the body (ADME) 2. Studying drug and chemical metabolism 3. Studying factors affecting drug metabolism 4. Studying Stereochemical Aspects of Drug Metabolism.
9. Teaching and Learning Strategies	
Strategy -	1. Theoretical Lectures 2. Conducting Scientific Experiments 3. Study Circles/Seminars 4. Daily Assignments 5. Written Examinations 6. Methodological and Supplementary Books 7. Illustrative Videos

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1–2	2	Introduction to drug journeys inside the body	Drug distribution	Lecture	Oral & written exam
3	4	Effect of drug pKa vs. environmental pH	Acid-base properties of drugs	Lecture	Oral & written exam
4	2	Basic knowledge of drug design	Computer-aided drug design	Lecture	Oral & written exam
5	3	Influence of forces and drug-receptor interaction	Molecular forces in drug-receptor interaction	Lecture	Oral & written exam
6	4	Spatial features of drugs	Stereochemical complementarity to receptor	Lecture	Oral & written exam
7	4	Effect of isosteric replacements on drug structure	Bioisosterism	Lecture	Oral & written exam
8–12	1	Types & sites of metabolism	General drug metabolism pathways & biotransformation sites	Lecture	Oral & written exam
	1	Role of Cytochrome P450 monooxygenase	Oxidative biotransformation via CYP450	Lecture	Oral & written exam
9	—	Oxidation of benzene-containing compounds	Oxidative reactions Lecture		Oral & written exam
	—	- Olefin oxidation- Benzylic carbon oxidation- Allylic carbon			Oral & written exam

		oxidation			
	—	- α-carbon to carbonyl/imine oxidation- Aliphatic and alicyclic carbon oxidation			Oral & written exam
	—	- Heteroatom oxidation (C-N, C-O, C-S)- Alcohol & aldehyde oxidation- Misc. oxidation pathways			Oral & written exam
13	2	Reduction of carbonyls, nitro & azo compounds- Misc. reduction reactions	Reductive metabolism	Lecture	Oral & written exam
	—	Hydrolysis of esters/amides- Misc. hydrolytic reactions- Prodrug activation	Hydrolytic reactions & bioactivation	Lecture	Oral & written exam
14	2	- Glucuronidation- Sulfation- Conjugation with glycine, glutathione, amino acids	Phase II metabolism (conjugation reactions)	Lecture	Oral & written exam
15	—	Study of factors affecting drug metabolism	Influencing factors on metabolism	Lecture	Oral & written exam
	2	Study of stereochemistry's impact on metabolism	Stereochemical aspects of metabolism	Lecture	Oral & written exam
	—	Study of pharmacologically active metabolites	Active drug metabolites	Lecture	Oral & written exam
11. Course Evaluation					
• 20 M Theoretical assessment.					

▪ (paper-based mid-term exam + quiz + attendance + seminar) • 20 M practical assessment (attendance + quiz + practice) • 60 M paper-based theoretical final exam • total100 M
12. Learning and Teaching Resources

Required textbooks (curricular books any)	Wilson and Gisvold Textbook of Organic medicinal and Pharmaceu chemistry, Delgado JN, Remers WA, (Eds); 12th ed, 2011
Main references (sources)	Wilson and Gisvold Textbook of Organic medicinal and Pharmaceu chemistry, Delgado JN, Remers WA, (Eds); 12th ed, 2011
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	https://www.sciencedirect.com/book/9780128128381/organic-chemistry

Third Year- Course Description 2025-2026

1. Course Name	
Pharmacology I	
2. **Course Code**	
330 AClph1	
3. Semester / Year	
2nd semester/ 3rd year	
4. Description Preparation Date:	
9-2025	
5. Available Attendance Forms	
In campus.	
6. Number of Credit Hours (Total) / Number of Units (Total)	
3 hours theoretical (45 hours) / 3 units	
7. Course administrator's name (if more than one name)	
Lecturer: Humam Tawfiq Hadi (humam.hadi@bcms.edu.iq)	
8. Course Objectives	
Course Objectives	Introduce pharmacy students to general pharmacokinetics, drug receptor interaction, pharmacodynamics including the autonomic nervous system (ANS), cholinergic system, adrenalinergic system, antimicrobial drugs, and various drug groups used in the treatment of infections. Furthermore, the course will cover antibacterial drugs, antifungal drugs, antiprotozoal drugs, and anthelmintic drugs.
9. **Teaching and Learning Strategies**	
Strategy	Types of teaching methods include lecture-based teaching, group learning, individual learning, and interactive/participatory methods using point solution devices.

10. **Course Structure**

week	Hours	Required Learning Outcomes	Unit or Subject Name	Learning method	Evaluation method

1	3	Introducing pharmacy students to general pharmacokinetics.	Pharmacokinetics.	Types of teaching methods include lecture-based teaching, group learning, individual learning, and interactive/participatory methods with point solution devices.	Exams and tests with the point solution device and reports on practical experiences.
2	3	Introducing pharmacy students to drug receptor interaction and pharmacodynamics.	Drug receptor interaction and pharmacodynamics		
3-4	6	Introducing pharmacy students to the autonomic nervous system (ANS), cholinergic system, and adrenaline.	Autonomic nervous system (ANS), cholinergic and adrenaline systems		
5	3	Introducing pharmacy students to the basics of antimicrobial therapy.	Head of antimicrobial therapy.		

6-7	6	Introducing pharmacy students to beta-lactam antibiotics and other antibiotics that inhibit cell wall synthesis.	Beta-lactam and other antibiotics that inhibit cell wall formation		
8		Introducing pharmacy students to protein synthesis inhibitors.	Protein synthesis inhibitors		
9		Introducing pharmacy students to quinolone, antifolate and urinary tract disinfectants.	Quinolones, folic acid antagonists, urinary tract disinfectants.		
10	3	Introducing pharmacy students to antibacterial drugs.	Antibacterial drugs		
11	3	Introducing pharmacy students to antifungal drugs.	Antifungal drugs.		
12	3	Introducing pharmacy students to anti-protozoal drugs.	Antiprotozoal drugs.		
13	3	Introducing pharmacy students to anthelmintic drugs.	Anthelminthic drugs.		
11. **Course Evaluation**					

25 marks depending on the midterm exam score 5-degree daily preparation and daily exams Final exams score 70 Total = 100	
12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Pharmacology Lippincott Latest Edition
Main references (sources)	Pharmacology by Ren Latest Edition
Recommended books and references (scientific journals, reports...)	• British Pharmacopoeia • Pharmacopoeia in the United States • European Pharmacopoeia
Electronic References, Websites	

Third Year- Course Description 2025-2026

1. Course Name:
Pharmaceutical and Cosmetic Preparation
2. Course Code:
332 PhPc
3. Semester / Year:
2nd Semester/3rd year
4. Description Preparation Date:
9-2025
5. Available Attendance Forms:
Students' signature on attendance sheet
6. Number of Credit Hours (Total) / Number of Units (Total)
3 hours Theoretical + 2 hours Practical (75) /4 units
7. Course administrator's name
Theory: Lecturer Eman Gameel Email: eman.gameel@bcms.edu.iq Practical: Assistant Lecturer Ruwayda Mohammed Email: ruwayda.mohamd@bcms.edu.iq
8.Course Objectives
1) Understand the principles, preparation, and stability of pharmaceutical emulsions, including surfactant systems and microemulsions. 2) Study the formulation, compounding, and use of semisolid dosage forms such as ointments, creams, gels, and dermatologic preparations. 3) Explore the design and clinical applications of suppositories, vaginal inserts, and medication sticks, including manufacturing and quality control. 4) Learn the physicochemical and therapeutic considerations for selecting appropriate bases and packaging for topical and rectal formulations. 5) Examine the formulation strategies and clinical uses of cosmetic products, including sunscreens, exfoliants, and anti-aging preparations. 6) Apply knowledge of formulation science to ensure safety, effectiveness, and patient acceptability

of pharmaceutical and cosmetic products.

9.Teaching and Learning Strategies

Strategy	Lecturing, Seminars, Homework, Quiz, and Practical laboratory demonstrations

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-3	9	• Purpose of emulsion and emulsification • Theories of emulsification • Gibbs free energy in an emulsion • Preparation of emulsions • Emulsifying agents • HLB system • Blending of surfactants • Surface area of globules • Methods of emulsion preparation • Mixing immiscible liquids • Microemulsions • Stability of emulsions • Examples of oral emulsions • Examples of topical emulsions	Emulsions (Chapter 14) (Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017)	Theoretical lectures. Laboratory experiments	Paper-based exams
4-6	9	• Ointments • Ointment bases • Selection of the appropriate base • Compendial requirements for ointments • Preparation of ointments • Creams • Preparation of creams	Ointments, creams and gels (Chapter 10) (Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A.	=	=

		• Gels: preparation, packaging and storage • Miscellaneous semisolid preparations: pastes, plasters, and glycerogelatins • Packaging semisolid preparations • Examples of ointments, creams and gels • Features and uses of dermatologic preparations • Features and uses of ophthalmic ointments and gels • Features and uses of nasal ointments and gels • Features and uses of rectal preparations • Features and uses of vaginal preparations • Drug release from semisolid dosage forms	Ansel; 11th edition, 2017)		
7-9	9	• Suppositories • Uses and applications • Some factors of drug absorption from rectal suppositories • Suppository bases • Formulation variables • Preparation of suppositories (dose replacement calculations) • Manufacturing suppositories	Suppositories, inserts and sticks (Chapter 12) (Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th		

		• Quality control • Packaging and storage • Stability • Rectal suppositories (with examples) • Urethral suppositories (with examples) • Vaginal inserts • Vaginal inserts (tablets) • Medication sticks • Special types of suppositories • Clinical considerations	edition, 2017)		
10	3	Physical incompatibilities, chemical incompatibilities, correction of incompatibilities	Pharmaceutical Incompatibilities (chapter 21) (Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017)		
10-15	16	• Introduction • Cosmetic formulation of skin care products (Chapter 1) • Toners and astringents (Chapter 5) • Antiperspirants (Chapter 8) • Sunscreens (Chapter 9) • Anti-aging skin care formulations (Chapter 11) • Topical exfoliation—clinical	Cosmetic Formulations (Cosmetic Formulation of Skin Care Products; by Zoe Diana Draelos and Lauren A.		

		effects and formulating considerations (Chapter 15) Herbs in cosmeceuticals (Chapter 19)	Thaman; Taylor and Francis Group; 2006)		

11. Course Evaluation
• 20 M Theoretical assessment (paper-based mid-term exam + quiz + attendance + seminar) • 20 M practical assessment (attendance + quiz + practice) • 60 M paper-based theoretical final exam • total100 M

12. Learning and Teaching Resources	
Required textbooks	1) Pharmaceutical Dosage Forms and Drug Delivery Systems by Howard A. Ansel; 11th edition, 2017. 2) Cosmetic Formulation of Skin Care Products; by Zoe Diana Draelos and Lauren A. Thaman; Taylor and Francis Group; 2006
Main references (sources)	
Electronic References, Websites	

Third Year- Course Description 2025-2026

1. Course Name:

Biochemistry II

2. Course Code:

333 AClBc2

3. Semester / Year:

Second Semester / Third year

4. Description Preparation Date:

9-2025

5. Available Attendance Forms:

In-person attendance

6. Number of Credit Hours (Total) / Number of Units (Total)

3 hours Theoretical + 2 hours Practical (75) /4 units

7. Course administrator's name (mention all, if more than one name)

Assistant Professor Zainab A. Alshamma (Z.alshamma@bcms.edu.iq)
Lecturer. Nawfal Ayad Mahmood (nawfal.ayad@bcms.edu.iq)

8. Course Objectives

Course Objectives	• Learning of the fundamentals of cellular metabolism of carbohydrates, lipids, and amino acids and their association with various metabolic diseases. • Providing students with the necessary technical skills in the field of biochemistry.

9. Teaching and Learning Strategies

Strategy	• Presentation and recitation • Interactive discussions • Brainstorming • Research and induction

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit	Learning method	Evaluation method
1	1	The application of the laws of thermo-dynamics in biological systems, the relationship between endothermic and exothermic reactions, the function of	Bioenergetics: The Role of ATP	Lectures, Discussions, and Reports	Exam and classroom activities

		adenosine triphosphate as the "energy currency" for cells.			
1	2	Explain what is meant by anabolic, catabolic and combined metabolic pathways; A description of the metabolic process at the tissue, organ, and subcellular levels; Methods of regulating of the flow of metabolites through metabolic pathways; How to provide metabolic fuel supply in both the fed and the fasting states.	Overview of metabolism and the provision of metabolic fuels	=	
2	3	Description of the pathway of glycolysis, its regulation, and the possibility of its occurrence under anaerobic conditions. The differences between the roles of glucokinase and hexokinase in glycolysis; Description of the pyruvate dehydrogenase reaction and its regulation.	Glycolysis and the oxidation of pyruvate	=	
3	3	Description of the citric acid cycle reactions, its regulation, and emphasizing the reactions that lead to the production of reducing equivalents; Explain the import- ance of vitamins in citric acid cycle; Explain how the cycle provides a pathway for amino acid catabolism and a pathway for their synthesis.	The citric acid cycle	=	=

4	3	Description of the four protein complexes involved in the transfer of electrons through the respiratory chain; How electron transfer through the respiratory chain generates ATP through the process of oxidative phosphor-arylation; List examples of the common toxins that interfere with electron transport or oxidative phosphorylation and identify their sites of action.	The respiratory chain and oxidative phosphorylation	=	=
5	3	Description of the structure of glycogen and its importance as a carbohydrate store; The synthesis and catabolism of glycogen and how the two processes are regulated; Description of the different types of glycogen storage diseases.	Metabolism of glycogen	=	=
6	3	The importance of gluconeogenesis in glucose homeostasis; the pathway of gluconeogenesis, and how glycolysis and gluconeogenesis are mutually regulated; how plasma glucose concentration is maintained within certain limits in the fed and the fasting states.	Gluconeogenesis and the control of blood glucose	=	=
7	Mid-term examination				
8	3	The pentose phosphate pathway and its importance; the uronic acid pathway and its importance; the consequences of consuming large amounts of fructose; the structure and physiological importance of galactose; the consequences of genetic	The Pentose Phosphate Pathway and other pathways of hexose	=	=

		defects of glucose-6- phosphate dehydrogenase deficiency, the uronic acid pathway, and fructose and galactose metabolism.	metabolism		
9	3	Indicate the intermediate compounds of the citric acid cycle and glycolysis that are precursors of certain amino acids, the key role of transaminases in amino acid metabolism. Explain the process by which 4-hydroxyproline, 5-hydroxylysine and the synthesis of some amino acids through the selenocysteine are formed in some proteins. assimilation of free ammonia; the synthesis of some amino acids using other amino acids.	Biosynthesis of nutritionally nonessential amino acids Catabolism of proteins and of amino acid nitrogen Catabolism of the carbon skeletons of amino acids Conversion of amino acids to specialized products	=	
9	2	Description of protein metabolism, its functions, its speed determinants, and cellular protein catabolism pathways. The central roles of transaminases, glutamate dehydrogenase, and glutaminase in nitrogen metabolism; description of the cycle of urea synthesis, its regulation, and its metabolic defects.			=

10	1	Illustration of the catabolic pathways of amino acids' carbon skeletons and their major metabolic fates; the clinically important metabolic disorders in this regard.	Porphyrins and bile pigments	=	=
10	2	The involvement of amino acids as precursors in the biosynthesis variety of biological molecules other than proteins. The structure and nomenclature of porphyrin. the pathway of heme synthesis and its catabolism. the causes and general clinical features of different porphyries.		= =	=
11	3	Fatty acids transportation in the blood. activation of fatty acids and their transportation into mitochondria for oxidation. the beta oxidation pathway. ketone bodies formation and the pathological conditions that accompany their excessive formation.	Oxidation of fatty acids	=	
12	3	Description of the acetyl-CoA acetylase reaction and the mechanisms of regulating its activity to control the rate of fatty acid synthesis; the synthesis of long-chain fatty acids and required cofactors; the synthesis of polyunsaturated fatty acids.	Biosynthesis of fatty acids and eicosanoids	=	
13	3	The catabolism of triacylglycerols and	Metabolism of	=	

		the fate of the resulting metabolites; the synthesis of triacylglycerols, inositol phosphoglycerols, cardiolipin, triacylglycerols, plasmogens, and platelet-activating factor; the role of different phospholipases in the degradation and remodeling of phospholipids; the synthesis of sphingolipids.	acylglycerols and sphingolipids		
14	3	Description of the four main plasma lipoproteins and their structure; the transport of lipoproteins to and from the liver and the role of the liver in their metabolism; the metabolism of lipoproteins in the blood and the delivery of cholesterol from the liver to extrahepatic tissues. the mechanisms by which cholesterol is delivered from extrahepatic tissues and returned to the liver by reverse cholesterol transport; The processes by which fatty acids are released from triacylglycerol stored in adipose tissue and the role of brown adipose tissue in generating body heat.	Lipid transport and storage	=	=
15	3	The importance of cholesterol as a basic structural component in the body, and its pathological role; the pathway of cholesterol biosynthesis and its regulation. the role of plasma lipoproteins in transporting cholesterol among tissues.	Cholesterol synthesis, transport, and excretion	=	=

11. Course Evaluation
Mid-term examination (15 marks) Quiz and homework (5 marks) Practical work (20 marks) Final examination (60 marks)

12. Learning and Teaching Resources	
Required textbooks (curricular books, if any)	Harper's Illustrated Biochemistry, 32 ed.
Main references (sources)	Lippincott Illustrated Reviews: Biochemistry, 7th ed. Lehninger Principles of Biochemistry, 8th ed.
Recommended books and references (scientific journals, reports...)	
Electronic References, Websites	

Third Year- Course Description 2025-2026

1. Course Name:	
Pharmacognosy and medicinal plants III	
2. Course Code:	
334 ChPP3	
3. Semester / Year:	
2nd semester/ 3rd year	
4. Description Preparation Date:	
9-2025	
5. Attendance:	
On campus	
6. Number of Credit Hours (Total) / Number of Units (Total)	
2 hours Theoretical + 2 hours Practical (60) /3units	
7. Course administrator's name (mention all, if more than one name)	
Prof. Maha Noori Hamad Email: mahanoori@bcms.edu.iq Lab instructors: Assist. Lect. Huda Saaran Hosny Email: Hsaaz16@bcms.edu.iq	
8. Course Objectives	
Course Objectives	Studying some groups of secondary metabolites chemically, biologically, pharmacologically & their biosynthesis pathway & uses.
9. Teaching and Learning Strategies	

Strategy	• Presentation and recitation • Interactive discussions • Brainstorming • Small groups • Research and induction • Flipped rows • Discussions • Field visits to institutions and entities related to fishing work • Volunteer work, seminars, workshops and exhibitions

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1	2	Describe alkaloid classification, basic physicochemical traits, and extraction techniques	Alkaloids: Introduction, Physical & Chemical Properties & Extraction	Didactic lecture + demonstration	Written quiz + oral Q&A
2	2	Identify structural features and pharmacological roles of pyridine-piperidine and tropane alkaloids	Pyridine-piperidine, Tropane Alkaloids	Case-based discussion + lecture	MCQs + case-based short answers
3	2	Compare biosynthetic pathways and therapeutic uses	Tropane Alkaloids (Cont.), Quinoline Alkaloids	Interactive lecture + flowchart mapping	Structured short essay
4	2	Analyze Isoquinoline biosynthesis and medicinal relevance	Isoquinoline Alkaloids	Concept mapping + guided lecture	Written exam + fill-in-the-blanks

5	2	Distinguish between types of indole alkaloids and correlate with clinical uses	Indole Alkaloids	Lecture + group discussion	MCQs + matching exercises
6	2	Describe structural diversity And physiological activity	Imidazole & Steroidal Alkaloids	Lecture + molecular modeling	Spot test + oral presentation
7	2	Explain occurrence, structure, and role in therapy	Lupinane Alkaloids, Alkaloidal Amines	Case study analysis + lecture	Assignment + MCQs
8	2	Define purine alkaloids and outline antibiotic origins	Purine Bases, Antibiotics: Introduction	Interactive session + flipped classroom	Quiz + peer assessment
9	2	Outline natural product sources and basic purification steps	Natural Sources, Production, Isolation & Purification	Practical demonstration + lecture	Practical report + oral exam
10	2	Classify biosynthetic routes of natural products	Production (Cont.), Biosynthesis Pathways, Classification	Flowchart creation + lecture	Flowchart-based evaluation
11	2	Compare biosynthetic origins of antibiotic classes	Biosynthesis of Different Classes of Antibiotics	Integrated lecture + animation	Written quiz + short answer
12	2	Discuss basic concepts and regulatory aspects of phytotherapy	Phytotherapy: Introduction, Principles	Lecture + seminar	Reflective writing + MCQs

13	2	Examine ethnobotanical approaches in various health systems	Medicinal Plants in Selected Health Care Systems	Seminar + case study	Group project + presentation
14	2	Identify key phytochemicals with therapeutic application	Important Natural Products & Phytomedicines Used in Pharmacy & Medicine	Problem-based learning	OSPE + written report
15	2	Evaluate evidence-based use of remaining phytomedicines	Important Natural Products (Cont.)	Lecture + literature review	Take-home assignment

11. Course Evaluation

- 20° Theoretical Part
- (Seminar + attendance + quiz + mid-term exam)
- 20 degrees practical part (practical technique + cob + presence)
- 60 Final Exam Marks

Total 100 degrees

12. Learning and Teaching Resources

Required textbooks (curricular books, if any)	Pharmacognosy 9th edition Varro E.Tyler, Lynn R.Brady.
Main references (sources)	Pharmacognosy 16th edition Trease &Evans.
Recommended books and references (scientific journals, reports...)	Phytochemical methods 3th edition A guide to modern techniques of plant analysis 1998
Electronic References, Websites	Thin layer chromatography 2nd edition Egon Stahl. 1990

Third Year- Course Description 2025-2026

1. Course Name:	
Pharmacy Ethics	
2. Course Code:	
335 AClPE	
3. Semester / Year:	
2nd semester/ Third	
4. Description Preparation Date:	
9-2025	
5. Available Attendance Forms:	
On campus	
6. Number of Credit Hours (Total) / Number of Units (Total)	
1 Hour (15) /1 Units	
7. Course administrator's name (mention all, if more than one name)	
Name: Assistant Lecturer Zainab Nazar Email: zainab.nazar@bcms.edu.iq	
8. Course Objectives	
Course Objectives	The course will provide an overview of ethical issues facing practicing pharmacists to enable the student to understand the basic concepts of ethics which formulate the relationship of pharmacists with the patient, colleges, and other health personnel to deliver his pharmaceutical services in a good way...
9. Teaching and Learning Strategies	
Strategy	Enable students to understand ethical issues and common ethical dilemma which may face pharmacists in the pharmacy, hospital, and community.

10. Course Structure

Week	Hours	Required Learning Outcomes	Unit or subject name	Learning method	Evaluation method
1-2	2	History and definition of ethics in pharmacy	Introduction to Pharmacy Ethics (Theoretical considerations).	Power point lecture	Quiz

3	1	Principals of code of pharmacy ethics	Code of Ethics for Pharmacists	Power point lecture	Quiz
4-5	2	Definitions and examples about ethical considerations	Common Ethical Considerations in Pharmaceutical Care Practice (Beneficence, Autonomy, Honesty, Informed Consent, Confidentiality, Fidelity.....).	Power point lecture	Quiz
6	1	Definitions and examples of ethical considerations	Other ethical considerations	Power point lecture	Quiz
7-8	2	How to build good Interprofessional considerations	Interprofessional Relations.	Power point lecture	Quiz
9	1	Types of ethical decisions	Making ethical decisions.	Power point lecture	Quiz
10	1	Understand how ethics play an important role before making research	Ethical issues related to clinical pharmacy research.	Power point lecture	Quiz
11	1	Definition of misuse and abuse, prevention, treatment and complications	Preventing misuse of medicines.	Power point lecture	Quiz
12-15	3	1-Apply ethical considerations on some clinical cases. 2-The main ethical dilemma in clinical cases.	Case studies in pharmacy ethics.	Power point lecture	Quiz

11. Course Evaluation.

Theoretical midterm exam (25%), Quizzes (2%) , and attendance (3%), and the end semester exam will be assessed for 70% of the final mark

12. Learning and Teaching Resources.

Required textbooks (curricular books, if any)	Robert J. Cipolle, Linda M. Strand, Peter C. Morley. Pharmaceutical Care Practice: The Clinician's Guide.

Main references (sources)	
Recommended books and references (scientific journals, reports...)	• Course notes in medical ethics and low • Compelling_Ethical_Challenges_in_Critical_Care_and_Emergency_ Medicine
Electronic References, Websites	Review articles