



Course Specification of Medicinal Chemistry I

I. Course Identification and General Information:					
1.	Course Title	Medicinal Chemistry I			
2.	Course Number & Code:	Ph568			
3.	Credit hours:	C.H			
		Th.	Pr.	Tr.	Seminar.
		2	2		
	Total	3			
4.	Study level/ semester at which this course is offered:	3 rd level /2 nd semester			
5.	Pre –requisite (if any):	General Pharmaceutical chemistry, Pharmaceutical analytical chemistry I&II and Pharmaceutical organic chemistry I, II& III			
6.	Co –requisite (if any):	-			
7.	Program (s) in which the course is offered:	Bachelor of Pharmacy			
8.	Language of teaching the course:	English			
9.	The department in which the course is offered:	Department of Medicinal Chemistry, Pharmaceutical Organic and Analytical Chemistry			
10.	Location of teaching the course:	Faculty of Pharmacy- Sana`a university			
11.	Prepared by:	Associate Prof. Tawfeek Ahmed Alobaidy Assistant Prof. Abdulmoneim Ali Alhakami			
12.	Date of approval:				
II. Course description:					

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 نائب العميد لشؤون الجودة
 ا.د. محمود البريهي
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This course introduces students to basic principles of medicinal chemistry, the quantitative relationship between the physicochemical parameters of the chemical structure to their biological activity. It demonstrates the principles of metabolism and prodrugs. It also covers also the basic principles of the medicinal chemistry of ANS drugs, in addition to the practical determination of some drugs.

III. Intended learning outcomes (ILOs) of the course:

At the end of this course, the students will be able to:

1. Recognize the basic principles of medicinal chemistry.
2. Relate the quantitative physicochemical parameters of drug structure to their biological activity
3. Characterize the basic principles, types and the objectives of prodrugs technique and their uses in optimizing the drug profile.
4. Discuss the types of drug metabolism and their objectives.
5. Discuss the structure activity relationship (SAR), biosynthesis, synthesis, metabolism of the ANS drugs
6. Determine the functional groups in drug structure and their effect on pharmacokinetic profile.
7. Identify the predicted moieties of drug structure that are responsible for pharmacodynamics. 8. Predict the functional groups in the drug structure at which the prodrug will be constructed
9. Diagram the schemes that describe SAR of topics in autonomic nervous system.
10. Apply safety precautions in the laboratory to work in a risk-free environment.
11. Determine the limit of impurities in some raw materials and pharmaceutical preparations.
12. Calculate practically the log p of some pharmaceutical substances.
13. Practice the qualitative and quantitative determination of some autonomic nervous system drugs.
14. Explore and use internet resources to search for up-to-date information in the areas of interest and solve emerging problems.
15. Work independently or collaboratively as a teamwork member to prepare seminars/ presentations or write reports to present some topics in medicinal chemistry.

IV. Intended learning outcomes (ILOs) of the course:

(A) Knowledge and Understanding:

Alignment Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: **Knowledge and Understanding.**

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ا.د. القاسم محمد عباس د.	ا.م.د. هدى العماد	د. خالد الشوبية	ا.م.د. توفيق العبيدي	ا.د. محمود البريهي	ا.م.د. توفيق العبيدي
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Program Intended Learning Outcomes (Sub-PILOs) in: Knowledge and Understanding		Course Intended Learning Outcomes (CILOs) in: Knowledge and Understanding	
After completing this program, students would be able to:		After participating in the course, students would be able to:	
A1-	Recognize the principles of physical, chemical, clinical, social, behavioral, health and pharmaceutical sciences.	a1-	Recognize the basic principles of medicinal chemistry.
A2-	Recognize the physicochemical properties, preparation, structure activity relationship (SAR), toxicity and the modern methods of analysis of various substances of chemical and natural products of therapeutic potential as well as the basic principle of drug discovery, design and development.	a2-	Demonstrate the essential knowledge and understanding about the physicochemical parameters of drug`s structure and their effect on the biological activity.
		a3-	Characterize the basic principles, types and the objectives of prodrugs technique and their uses in optimizing the drug profile.
A3-	Describe the general cellular, biochemical and physiological aspects of human body and recognize the pharmacokinetics, pharmacodynamics, disease pathophysiology, and pharmacogenetic of therapeutic agents to provide pharmaceutical care and facilitate management of patient`s medication, rationalize drug use and overall health needs.	a4-	Discuss the types of drug metabolism and their objectives.
		a5-	Discuss the structure activity relationship (SAR), biosynthesis, synthesis, metabolism of the autonomic nervous system drugs.

Teaching And Assessment Methods For Achieving Learning Outcomes:

Alignment Learning Outcomes of Knowledge and Understanding to Teaching and Assessment Methods:

Course Intended Learning Outcomes (CILOs) in Knowledge and Understanding After participating in the course, students would be able to:		Teaching strategies/methods to be used	Methods of assessment
a1-	Recognize the basic principles of medicinal chemistry.	Lectures methods , Computer based teaching and learning, group discussion and tutorial	Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam.
a2-	Relate the quantitative physicochemical parameters of drug structure to their biological activity.		

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a3-	Characterize the basic principles, types and the objectives of prodrugs technique and their uses in optimizing the drug profile.	
a4-	Discuss the types of drug metabolism and their objectives.	
a5-	Discuss the structure activity relationship (SAR), biosynthesis, synthesis, metabolism of the autonomic nervous system drugs.	

(B) Intellectual Skills:			
Alignment Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: Intellectual skills			
Program Intended Learning Outcomes (Sub-PILOs) in Intellectual skills		Course Intended Learning Outcomes (CILOs) of Intellectual Skills	
After completing this program, students would be able to		After participating in the course, students would be able to:	
B1-	Consolidate the chemical, biochemical and physiological principles to construct the pharmacophores of the structure and their effect on the stability, pharmacokinetic and pharmacodynamic profiles of the drug.	b1-	Determine the functional groups in drug structure and their effect on pharmacokinetic profile.
		b2-	Identify the predicted moieties of drug structure that are responsible for pharmacodynamics.
B2-	Categorize the synthetic and natural drugs according to their mechanism of action, systemic effect, therapeutic uses, contraindication and toxicity.	b3-	Predict the functional groups in the drug structure at which the prodrug will be constructed
		b4-	Diagram the schemes that describe SAR of topics in autonomic nervous system.
Teaching And Assessment Methods For Achieving Learning Outcomes:			
Alignment Learning Outcomes of Intellectual Skills to Teaching Methods and Assessment Methods:			

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Course Intended Learning Outcomes (CILOs) in Intellectual Skills.		Teaching strategies/methods to be used.	Methods of assessment
After participating in the course, students would be able to:			
b1-	Determine the functional groups in drug structure and their effect on pharmacokinetic profile.	Lectures methods, Group Discussion, Problem solving sessions, brainstorming and Computer based teaching and learning	Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam.
b2-	Identify the predicted moieties of drug structure that are responsible for pharmacodynamics.		
b3-	Predict the functional groups in the drug structure at which the prodrug will be constructed		
b4-	Diagram the schemes that describe SAR of topics in autonomic nervous system.		

(C) Professional and Practical Skills.			
Alignment Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: Professional and Practical Skills			
Program Intended Learning Outcomes (Sub- PILOs) in Professional and Practical Skills		Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills	
After completing this program, students would be able to:		After participating in the course, students would be able to:	
C1-	Operate different pharmaceutical equipments and instruments and use emerging technologies in design, synthesis, pre-formulation, formulation, packaging, storage and analysis of pharmaceutical	c1-	Apply safety precautions in the laboratory to work in a risk-free environment.
		c2-	Determine the limit of impurities in some raw materials and pharmaceutical preparations.

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	products according to GLP, GSP and cGMP guidelines.	c3-	Calculate practically the log p of some pharmaceutical substances.
C2-	Handle and dispose chemicals and pharmaceutical preparations including radiopharmaceuticals safely and effectively.	c4-	Practice the qualitative and quantitative determination of some autonomic nervous system drugs.
C5-	Conduct research studies and utilize the results in different pharmaceutical fields.		

Teaching And Assessment Methods For Achieving Learning Outcomes:

Alignment Learning Outcomes of Professional and Practical Skills to Teaching and Assessment Methods:

Course Intended Learning Outcomes (CILOs) in Professional and Practical Skills After participating in the course, students would be able to:		Teaching strategies/methods to be used	Methods of assessment
c1-	Apply safety precautions in the laboratory to work in a risk-free environment.	Lectures methods, practical session, brainstorming and group discussion	Practical works, homework, practical exam and practical reports.
c2-	Determine the limit of impurities in some raw materials and pharmaceutical preparations.		
c3-	Calculate practically the log p of some pharmaceutical substances.		
c4-	Practice the qualitative and quantitative determination of some ANS drugs.		

(D) General / Transferable Skills:

Alignment Course Intended Learning Outcomes (CILOs) to Program Intended Learning Outcomes (PILOs) in: General and Transferable skills

Program Intended Learning Outcomes (PILOs) in General / Transferable skills	Course Intended Learning Outcomes (CILOs) in General / Transferable skills
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After completing this program, students would be able to:		After participating in the course, students would be able to:	
D1-	Practice independent learning needed for continuous professional development	d1-	Explore and use internet resources to search for up-to-date information in the areas of interest and solve emerging problems.
D4-	Take responsibility for adaptation to change needs in pharmacy practice.	d2-	Work independently or collaboratively as a teamwork member to prepare seminars/ presentations or write reports to present some topics in medicinal chemistry.
D5-	Apply information and communication technology and working effectively in a team.		

Alignment Learning Outcomes of General and Transferable skills to Teaching and Assessment Methods.

Course Intended Learning Outcomes (CILOs) in General and Transferable Skills After participating in the course, students would be able to:		Teaching strategies/methods to be used.	Methods of assessment
d1-	Explore and use internet resources to search for up-to-date information in the areas of interest and solve emerging problems.	Small group discussions, Tutorials and Practical session	Homework and reports.
d2-	Work independently or collaboratively as a teamwork member to prepare seminars/ presentations or write reports to present some topics in medicinal chemistry.		

V. Course Content:

1 – Course Topics/Items:

a – Theoretical Aspect

Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Number of weeks	Contact hours
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1.	Introduction to medicinal chemistry	a1, d1,d2	-Important terminology related to medicinal chemistry and its orientation. - Medicinal chemistry and their relations to other sciences.	1	2
2.	Quantitative structure activity relationship (QSAR)	a2,b1, d1, d2	-Definition, -Physicochemical parameters: Hydrophobicity, electronic effect and steric effect	1	2
3.	Application of QSAR	a2,b1,d1, d3	- Calculation of p.c, - Craig plot, - Topless scheme and - Hansch equations and their applications	1	2
4.	Drug-receptor interaction	a2, a2,d1, d2	- Types of bonds in drug receptor interaction. - The applications of D-R interaction	1	2
5.	Prodrug and drug latention	a3,b3, d1, d2	-Types and structural classification of prodrug, -Objectives and mechanisms of prodrug supported with examples	1	2
6.	Mid Exam	a1, a2, a3, b1, b3		1	2

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7.	Drug metabolism	a4,b1,d1, d3	-Site of drug biotransformation, -Factors affecting metabolism, - - Types of drug metabolism; aPhase I (oxidation, reduction and hydrolysis) b-Phase II (conjugation with glucuronic acid, sulfate, glycine, glutamate, glutathione, and acylation and methylation)	3	6
8.	Sympathomimetic (adrenergic agonists)	a1, a5, b14,d1, d2	Classification, SAR, biosynthesis, synthesis metabolism, route of administration and uses.	2	4
9.	Sympatholytic (adrenergic antagonists)	a1, a5, b14,d1, d2	Classification, SAR, synthesis, metabolism, route of administration and uses.	1	2
10.	Parasympathatic	a1, a5, b14,d1, d2	Classification, SAR, biosynthesis, synthesis metabolism, route of administration and uses.	1	2
11.	Parasympatholytic	a1, a5, b14,d1, d2	Classification, SAR, synthesis, metabolism, and uses.	2	4
12.	Final Exam	a1-5, b1-4		1	2
Number of Weeks /and Units Per Semester				16	32

b - Practical Aspect

Order	Tasks/ Experiments	CILOs (symbols)	Number of Weeks	Contact Hours
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1.	Limit Test For Chloride and limit test for chloride in colored compound (potassium permanganate)	c1,c2, d1, d2	2	4
2.	Limit Test For Sulphate limit test for sulphate in sod thiosulphate	c1,c2, d1, d2	2	4
3.	Limit test for Chloride, Sulphate and salicylic acid in aspirin	c1,c2, d1, d2	2	4
4.	Limit Test For iron	c1,c2, d1, d2	1	2
5.	Calculation the log p for some pharmaceutical preparations	c1,c3, d1, d2	3	6
6.	Mid-Exam	c1,c2, c3	1	2
7.	Assay of Adrenaline	c1,c4, d1, d2	1	2
8.	Estimation of Ephedrine	c1,c4, d1, d2	1	2
9.	Assay of Methyldopa Tab.	c1,c4, d1, d2	1	2
10.	Revision	c1-4	1	2
11.	Final Exam	c1-4	1	2
Number of Weeks /and Units Per Semester			16	32

VI. a-Teaching strategies of the course:

Lecture method, Group Discussion, Problem solving sessions and Computer based teaching and learning, tutorials, brainstorming and Practical sessions.

b- Assessment Methods:

Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam Practical works, practical exam and practical reports.

VII. Assignments:

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No.	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1	Homework Assignments	a1-5, b1-3, d1-2	Sporadic through the semester	10
2	Reports	c1-4, d1-2		

I. Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes (CILOs symbols)
1.	Attendance, Participation, reports and quizzes	All Weeks	10	7%	a1-5,b1-4, d1-2
2.	Quizzes and Homework-assignments	Sporadic through the semester	10	7%	a1-5, b1-3, d1-2
3.	Attendance, Practical Reports	All Weeks	15	10%	c1-4
4.	Practical mid-semester exam	11 th	15	10%	c1-3
5.	Theoretical mid-semester exam	6 th	30	20%	a1, a2, a3, b1, b3
6.	Final Exam (theoretical)	16 th	50	33%	a1-4, b1-4
7.	Final Exam (practical)	16 th	20	13%	c1-4
Total			150	100%	

II. Students' Support:

Office Hours/week	Other Procedures (if any)
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Two contact hours per week	None
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III. Learning Resources:

1- Required Textbook(s) (maximum two).

- 1- John M. Beale, Jr. and John H. Block, 2011, "Text book of Organic Medicinal and Pharmaceutical Chemistry" 12th Edition, Wilson and Gisvold, Lippincott Williams and Wilkins, A Wolters Kluwer Company, Philadelphia.
- 2- Graham L. Patrick, 2013, "An Introduction to Medicinal Chemistry" 5th Edition, Oxford University Press Inc, New York.

2- Recommended Books and Reference Materials.

- 1- Thomas Nogrady, Donald F. Weaver, 2005, Medicinal Chemistry A Molecular and Biochemical Approach edition, Oxford University Press, Inc., New York.
- 2- Donald J. Abraham, " BURGER'S Medicinal Chemistry and Drug Discovery" 6th edition, A John Wiley and Sons, Inc, Virginia.
- 3- Thomas L. Lemke, Victoria F. Roche, David A. Willaiams and S. William Zito, 2008, "Foye's Principles of Medicinal Chemistry" 6th, Edition,, Lippincott Williams & Wilkins, a Wolters Kluwer business, Philadelphia.
- 4- Povl Krogsgaard-Larsen, Tommy Liljefors and Ulf Madsen, 2002 , "Textbook of Drug Design and Discovery" Third edition , Taylor & Francis, London.
- 5- K.-H. Hellwich · C. D. Siebert, 2006, "Stereochemistry Workbook" Springer-Verlag Berlin Heidelberg, Berlin.
- 6- Lectures Notes and Practical Manual.

3- Electronic Materials and Web Sites etc.

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- 1- <http://www.chemaxon/marvin>
- 2 - <http://www.webmolecules.com>
- 3-<http://www.acdlabs.com>
- 4-PASS Prediction of Activity Spectra for Substance) (<http://www.ibmh.msk.su/PASS>).

IV. Facilities Required:

1 - Accommodation:	<ul style="list-style-type: none"> - Well-equipped lecture halls with data show facilities, whiteboards, net connection, etc. - Well-equipped laboratories with all required equipment and reagents.
2 - Computing resources:	<ul style="list-style-type: none"> - Computer laboratory with internet facilities.

V. Course Improvement Processes:

1- Strategies for obtaining student feedback on effectiveness of teaching

- Student-based assessment of the effectiveness of teaching using a questionnaire designed by the Quality Assurance Unit at the end of the semester.
- Meeting with students and faculty (once per semester).

2 Other strategies for evaluation of teaching by the instructor or by the department.

- Assessment of the course syllabus and contents by the teachers using a questionnaire designed by the Quality Assurance Unit of the university at the end of the semester.
- Regular meeting and discussion of the course content between the Head of Department and the teaching staff of the course (for theory and practice).

3- Processes for improvement of teaching.

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	<ul style="list-style-type: none"> Revision of the course specification and its teaching strategies every three academic years after consideration of all issues raised by the teachers and/or students during regular meetings and discussions. Exploring any possible defects in the course that might be encountered by the teaching staff and their mitigation in subsequent improved versions of course specification.
4- Processes for verifying standards of students' achievement	
	<ul style="list-style-type: none"> Checking of a sample of students' work by an independent faculty member. Periodic exchange and check marking of a sample of students' assignments with a faculty member from another institution. Adoption of scoring rubrics to assess the students' achievement (both for ongoing or summative assessments). Regular follow-up of laboratory logbooks to assess the practical achievement of students.
5⁵ Procedures for periodically reviewing of course effectiveness and planning for improvement	
	<ul style="list-style-type: none"> Student rating and feedback Peer rating and feedback Regular meeting of the Curriculum Committee of the faculty.
6- Course development plans	
	<ul style="list-style-type: none"> Conducting regular workshops for the staff for improving their course specification skills. Regular revision of course specification and syllabus items.

VIII. Course Policies: (including plagiarism, academic honesty, attendance etc)

The University Regulations on academic misconduct will be strictly enforced. Please refer to -----

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1	Class Attendance: <ul style="list-style-type: none">Attendance of all lectures and practical sessions is required. Unexcused absence exceeding 25% of the lectures or practical sessions will disqualify the student from entering the final exam.
2	Tardy: <p>- Roll will be called in the very beginning of each lecture and practical class. Retardation for more than three weeks without a reasonable excursion, the student involved shall not be allowed to attend the class any longer and consequently shall be considered to be absent.</p>
3	Exam Attendance/Punctuality: <ul style="list-style-type: none">Exam attendance is obligatory unless being excused by the department and faculty.Absence from assignments or exams will be dealt with according to the general policy of the university.
4	Assignments & Projects: <ul style="list-style-type: none">Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator.Projects: Not applicable.
5	Cheating: <ul style="list-style-type: none">Punishment of cheating will be according to the general policy of the university in this respect.
6	Plagiarism: <ul style="list-style-type: none">Plagiarism in written essays, reports, etc. is not accepted, and students who plagiarize the works of others will be punished according to the general policy of the university.
7	Other policies: <ul style="list-style-type: none">General policies of the Students' Affairs of the University and the Quality Assurance Unit.

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د.خالد الشوية
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ا.م.د. هدى العماد
رئيس الجامعة
ا.د. القاسم محمد عباس د.
عبد المنعم الحكمي



Course Plan of _____ of Medicinal Chemistry I

I- Information about Faculty Member Responsible for the Course:

Name of Faculty Member	1.Tawfeek A. Al-Obaidy 2.Abdulmoneim Ali Alhakami	Office Hours					
Location & Telephone No.	770507931	SAT	SUN	MON	TUE	WED	THU
E-mail	Tawfik_93@yahoo.com		4h				

II- Course Identification and General Information:

1-	Course Title:	Medicinal Chemistry I
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 ا.م.د.توفيق العبيدي ا.د. محمود البريهي ا.م.د.توفيق العبيدي د.خالد الشوية ا.م.د. هدى العماد ا.د. القاسم محمد عباس د.
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2-	Course Number & Code:	Ph568				
3-	Credit hours:	C.H				Total
		Th.	Seminar	Pr.	F. Tr.	
		2	-	2		3
4-	Study level/year at which this course is offered:	3 rd level /2 nd semester				
5-	Pre –requisite (if any):	General Pharmaceutical chemistry, Pharmaceutical analytical chemistry I&II and pharmaceutical organic chemistry I, II& III				
6-	Co –requisite (if any):	-				
7-	Program (s) in which the course is offered	Bachelor of Pharmacy				
8-	Language of teaching the course:	English				
9-	System of Study:	Semesters				
10-	Mode of delivery:	Regular				
11-	Location of teaching the course:	Faculty of Pharmacy- Sana`a university				

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III- Course description:

This course introduces students to basic principles of medicinal chemistry, the quantitative relationship between the physicochemical parameters of the chemical structure to their biological activity. It demonstrates the principles of etabolism and prodrugs. It also covers also the basic principles of the medicinal chemistry of ANS drugs, in addition o the practical determination of some drugs.

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IV- Intended learning outcomes (ILOs) of the course:

At the end of this course, the students will be able to:

16. Recognize the basic principles of medicinal chemistry.
17. Relate the quantitative physicochemical parameters of drug structure to their biological activity
18. Characterize the basic principles, types and the objectives of prodrugs technique and their uses in optimizing the drug profile.
19. Discuss the types of drug metabolism and their objectives.
20. Discuss the structure activity relationship (SAR), biosynthesis, synthesis, metabolism of the ANS drugs
21. Determine the functional groups in drug structure and their effect on pharmacokinetic profile.
22. Identify the predicted moieties of drug structure that are responsible for pharmacodynamics. 23. Predict the functional groups in the drug structure at which the prodrug will be constructed
24. Diagram the schemes that describe SAR of topics in autonomic nervous system.
25. Apply safety precautions in the laboratory to work in a risk-free environment.
26. Determine the limit of impurities in some raw materials and pharmaceutical preparations.
27. Calculate practically the log p of some pharmaceutical substances.
28. Practice the qualitative and quantitative determination of some autonomic nervous system drugs.
29. Explore and use internet resources to search for up-to-date information in the areas of interest and solve emerging problems.
30. Work independently or collaboratively as a teamwork member to prepare seminars/ presentations or write reports to present some topics in medicinal chemistry.

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V- Course Content:

1 – Course Topics/Items:

a – Theoretical Aspect

Order	Topic List / Units	CILOs (symbols)	Sub-topic List	Week Due	Contact hours
13.	Introduction to medicinal chemistry	a1, d1,d2	-Important terminology related to medicinal chemistry and its orientation. - Medicinal chemistry and their relations to other sciences.	1	2
14.	Quantitative structure activity relationship (QSAR)	a2,b1, d1, d2	-Definition, -Physicochemical parameters: Hydrophobicity, electronic effect and steric effect	2	2
15.	Application of QSAR	a2,b1,d1, d3	- Calculation of p.c, - Craig plot, - Topless scheme and - Hansch equations and their applications	3	2
16.	Drug-receptor interaction	a2, a2,d1, d2	- Types of bonds in drug receptor interaction. - The applications of D-R interaction	4	2

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17.	Prodrug and drug latention	a3,b3, d1, d2	-Types and structural classification of prodrug, -Objectives and mechanisms of prodrug supported with examples	5	2
18.	Mid Exam	a1, a2, a3, b1, b3		6	2
19.	Drug metabolism	a4,b1,d1, d3	-Site of drug biotransformation, -Factors affecting metabolism, - - Types of drug metabolism: aPhase I (oxidation, reduction and hydrolysis) b-Phase II (conjugation with glucuronic acid, sulfate, glycine, glutamate, glutathione, and acylation and methylation)	7-9	6
20.	Sympathomimetic (adrenergic agonists)	a1, a5, b14,d1, d2	Classification, SAR, biosynthesis, synthesis metabolism, route of administration and uses.	10,11	4
21.	Sympatholytic (adrenergic antagonists)	a1, a5, b14,d1, d2	Classification, SAR, synthesis, metabolism, route of administration and uses.	12	2
22.	Parasympathatic	a1, a5, b14,d1, d2	Classification, SAR, biosynthesis, synthesis metabolism, route of administration and uses.	13	2
23.	Parasympatholytic	a1, a5, b14,d1, d2	Classification, SAR, synthesis, metabolism, and uses.	14,15	4
24.	Final Exam	a1-5, b1-4		16	2

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Number of Weeks /and Units Per Semester		32
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b - Practical Aspect				
Order	Tasks/ Experiments	CILOs (symbols)	Week Due	Contact Hours
1.	Limit Test For Chloride and limit test for chloride in colored compound (potassium permanganate)	c1,c2, d1, d2	1,2	4
2.	Limit Test For Sulphate limit test for sulphate in sod thiosulphate	c1,c2, d1, d2	3,4	4
3.	Limit test for Chloride, Sulphate and salicylic acid in aspirin	c1,c2, d1, d2	5,6	4
4.	Limit Test For iron	c1,c2, d1, d2	7	2
5.	Calculation the log p for some pharmaceutical preparations	c1,c3, d1, d2	8-10	6
6.	Mid-Exam	c1,c2, c3	11	2
7.	Assay of Adrenaline	c1,c4, d1, d2	12	2
8.	Estimation of Ephedrine	c1,c4, d1, d2	13	2
9.	Assay of Methyldopa Tab.	c1,c4, d1, d2	14	2
10.	Revision	c1-4	15	2
11.	Final Exam	c1-4	16	2
Number of Weeks /and Units Per Semester				32

VI- a-Teaching strategies of the course:

Lecture method, Group Discussion, Problem solving sessions and Computer based teaching and learning, tutorials, brainstorming and Practical sessions.

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b- Assessment Methods:

Quizzes, Attendance, Participation, Short answers, reports, homework, and Written exam Practical works, practical exam and practical reports.

VII- Assignments:

No.	Assignments	Aligned CILOs (symbols)	Week Due	Mark
1	Homework Assignments	a1-5, b1-3, d1-2	Sporadic through the semester	10
2	Reports	c1-4, d1-2		

VIII- Schedule of Assessment Tasks for Students During the Semester:

No.	Assessment Method	Week Due	Mark	Proportion of Final Assessment	Aligned Course Learning Outcomes (CILOs symbols)
8.	Attendance, Participation, reports and quizzes	All Weeks	10	7%	a1-5,b1-4, d1-2
9.	Quizzes and Homework-assignments	Sporadic through the semester	10	7%	a1-5, b1-3, d1-2
10.	Attendance, Practical Reports	All Weeks	15	10%	c1-4
11.	Practical mid-semester exam	11 th	15	10%	c1-3
12.	Theoretical mid-semester exam	6 th	30	20%	a1, a2, a3, b1, b3
13.	Final Exam (theoretical)	16 th	50	33%	a1-4, b1-4
14.	Final Exam (practical)	16 th	20	13%	c1-4

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	Total	150	100%	
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IX- Students' Support:	
Office Hours/week	Other Procedures (if any)
Two contact hours per week	None

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X- Learning Resources:

1- Required Textbook(s) (maximum two).

Republic of Yemen
Ministry of Higher Education
and Scientific Research
Sana'a University
Faculty of Pharmacy
Quality Assurance Unit

- 3- John M. Beale, Jr. and John H. Block, 2011, "Text book of Organic Medicinal and Pharmaceutical Chemistry" 12th Edition, Wilson and Gisvold, Lippincott Williams and Wilkins, a Wolters Kluwer Company, Philadelphia.
- 4- Graham L. Patrick, 2013, "An Introduction to Medicinal Chemistry" 5th Edition, Oxford University Press Inc, New York.

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2- Recommended Books and Reference Materials.

- 7- Thomas Nogrady, Donald F. Weaver, 2005, Medicinal Chemistry A Molecular and Biochemical Approach edition, Oxford University Press, Inc., New York.
- 8- Donald J. Abraham, "BURGER'S Medicinal Chemistry and Drug Discovery" 6th edition, A John Wiley and Sons, Inc, Virginia. 9- Thomas L. Lemke, Victoria F. Roche, David A. Willaiams and S. William Zito, 2008, "Foye's Principles of Medicinal Chemistry" 6th, Edition,., Lippincott Williams & Wilkins, a Wolters Kluwer business, Philadelphia.
- 10- Povl Krogsgaard-Larsen, Tommy Liljefors and Ulf Madsen, 2002 , "Textbook of Drug Design and Discovery" Third edition , Taylor & Francis, London.
- 11- K.-H. Hellwich · C. D. Siebert, 2006, "Stereochemistry Workbook" Springer-Verlag Berlin Heidelberg, Berlin.
- 12- Lectures Notes and Practical Manual.

3- Electronic Materials and Web Sites etc.

- 2- <http://www.chemaxon/marvin>
- 2 - <http://www.webmolecules.com>
- 3-<http://www.acdlabs.com>
- 4-PASS Prediction of Activity Spectra for Substance) (<http://www.ibmh.msk.su/PASS>).

XI- Facilities Required:

1 - Accommodation:

- Well-equipped lecture halls with data show facilities, whiteboards, net connection, etc.

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	- Well-equipped laboratories with all required equipment and reagents.
3 - Computing resources:	- Computer laboratory with internet facilities.
II- Course Improvement Processes:	
1- Strategies for obtaining student feedback on effectiveness of teaching	
	<ul style="list-style-type: none"> ▪ Student-based assessment of the effectiveness of teaching using a questionnaire designed by the Quality Assurance Unit at the end of the semester. ▪ Meeting with students and faculty (once per semester).
2- Other strategies for evaluation of teaching by the instructor or by the department.	
	<ul style="list-style-type: none"> ▪ Assessment of the course syllabus and contents by the teachers using a questionnaire designed by the Quality Assurance Unit of the university at the end of the semester. ▪ Regular meeting and discussion of the course content between the Head of Department and the teaching staff of the course (for theory and practice).
3- Processes for improvement of teaching.	
	<ul style="list-style-type: none"> ▪ Revision of the course specification and its teaching strategies every three academic years after consideration of all issues raised by the teachers and/or students during regular meetings and discussions. ▪ Exploring any possible defects in the course that might be encountered by the teaching staff and their mitigation in subsequent improved versions of course specification.
4- Processes for verifying standards of students' achievement	

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	<ul style="list-style-type: none"> ▪ Checking of a sample of students' work by an independent faculty member. ▪ Periodic exchange and check marking of a sample of students' assignments with a faculty member from another institution. ▪ Adoption of scoring rubrics to assess the students' achievement (both for ongoing or summative assessments). ▪ Regular follow-up of laboratory logbooks to assess the practical achievement of students.
5- Procedures for periodically reviewing of course effectiveness and planning for improvement	
	<ul style="list-style-type: none"> ▪ Student rating and feedback ▪ Peer rating and feedback ▪ Regular meeting of the Curriculum Committee of the faculty.
6- Course development plans	
	<ul style="list-style-type: none"> ▪ Conducting regular workshops for the staff for improving their course specification skills. ▪ Regular revision of course specification and syllabus items.

XIII- Course Policies: (including plagiarism, academic honesty, attendance etc)	
The University Regulations on academic misconduct will be strictly enforced. Please refer to -----	
1	<p>Class Attendance:</p> <ul style="list-style-type: none"> ▪ Attendance of all lectures and practical sessions is required. Unexcused absence exceeding 25% of the lectures or practical sessions will disqualify the student from entering the final exam.
2	<p>Tardy:</p> <p>- Roll will be called in the very beginning of each lecture and practical class. Retardation for more than three weeks without a reasonable excursion, the student involved shall not be allowed to attend the class any longer and consequently shall be considered to be absent.</p>

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3	Exam Attendance/Punctuality: <ul style="list-style-type: none">Exam attendance is obligatory unless being excused by the department and faculty.Absence from assignments or exams will be dealt with according to the general policy of the university.
4	Assignments & Projects: <ul style="list-style-type: none">Assignments: Written and oral; Laboratory logbook signed by the responsible demonstrator. ■Projects: Not applicable.
5	Cheating: <ul style="list-style-type: none">Punishment of cheating will be according to the general policy of the university in this respect.
6	Plagiarism: <ul style="list-style-type: none">Plagiarism in written essays, reports, etc. is not accepted, and students who plagiarize the works of others will be punished according to the general policy of the university.
7	Other policies: <ul style="list-style-type: none">General policies of the Students' Affairs of the University and the Quality Assurance Unit.

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