



**Benha University
Faculty of Science
Department of Chemistry**

Applied Chemistry B.Sc. Program

2021



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Benha University
Faculty of Science
Department of Chemistry



Applied Chemistry B.Sc. Program Specification



Applied Chemistry B.Sc. Program Specification

A. Basic Information

Program Title:	Applied Chemistry B.Sc. Program
Program Type:	Single (undergraduate)
Department:	Chemistry Department
Coordinator:	Prof. Dr. Mohammed El-Sayed Behalo
Internal Evaluator	Assistant Professor Eman Gad El-Karim, Chem. Dept., Faculty of Science, Benha Univ.
External Evaluator	Prof. Dr. Adel Nassar, Dean of Faculty of Science, Menoufia Univ.

The most recent date of the program specification approval: 9/12/2015 (faculty member council meeting no. 390), updated 10/ 1/2018 (Faculty council; meeting number, 419), updated 8/ 3/2023 (Faculty council; meeting number, 484).

B. Professional Information

1. Program Aims

The overall aims of the program are to provide the graduate with the following:

- Demonstrate chemical compounds and reactions to understand their properties and behaviors.
- Research current advancements in applied chemistry and their applications in technology and industry.
- Apply principles on the facts and theories of chemistry to solve and evaluate real-world chemical problems in various industries.
- Evaluate the environmental impact of chemical processes and propose sustainable alternatives.
- Implement safety protocols and ethical standards in laboratory practices.
- Manage risks and demonstrate proficiency in using analytical instruments and data analysis software.

2. Intended Learning Outcomes (ILO's)

a. Knowledge and Understanding

On successful completion of the program, the graduate will be able to:

- Explain fundamental concepts of chemistry, including atomic structure, chemical bonding, and reaction mechanisms.
- Describe the properties and behaviors of various chemical substances and their interactions.
- Identify key principles of thermodynamics, kinetics, and equilibrium in chemical systems.
- Summarize the major theories and models that underpin modern chemistry.
- Differentiate between organic, inorganic, physical, and analytical chemistry disciplines.
- Discuss the role of chemistry in addressing global challenges such as climate change, energy production, and public health.



- a.7. Illustrate the significance of safety, ethics, and regulations in chemical research and industry practices.
- a.8. Interpret data from chemical experiments and relate it to theoretical principles.
- a.9. Recognize advancements in applied chemistry and their implications for technological innovation.
- a.10. Articulate the interdisciplinary connections between chemistry and other scientific fields, such as biology, materials science, and environmental science.

b. Intellectual Skills

By the end of the program, the graduate will be able to:

- b.1. Critique scientific literature and research findings to assess validity and reliability.
- b.2. Integrate theoretical knowledge with practical applications in laboratory settings.
- b.3. Formulate hypotheses based on observations and existing scientific knowledge.
- b.4. Solve complex chemical problems using quantitative and qualitative methods.
- b.5. Evaluate experimental designs and methodologies for effectiveness and accuracy.
- b.6. Develop logical arguments and reasoned conclusions from experimental data.
- b.7. Reflect on personal learning and problem-solving strategies in chemistry.
- b.8. Justify the choice of methods and materials used in experiments and analyses.
- b.9. Explore new concepts and techniques in chemistry through independent research.
- b.10. Adapt existing theories and principles to new contexts or innovative applications.

c. Professional and Practical Skills

By the end of the program, the graduate will be able to:

- c.1. Demonstrate proficiency in laboratory techniques and instrumentation relevant to applied chemistry.
- c.2. Conduct experiments following established protocols, ensuring accuracy and safety.
- c.3. Utilize analytical tools and software to interpret and present data effectively.
- c.4. Execute proper procedures for chemical handling, disposal, and environmental compliance.
- c.5. Collaborate effectively in team settings to plan and implement research projects.
- c.6. Manage time and resources efficiently to meet project deadlines and objectives.
- c.7. Communicate technical information clearly in both written and oral formats to diverse audiences.
- c.8. Adapt to new technologies and methodologies in laboratory and fieldwork settings.
- c.9. Negotiate and resolve conflicts in collaborative projects to achieve desired outcomes.
- c.10. Reflect on practical experiences to identify areas for improvement and professional development.



d. General Skills

By the end of the program, the graduate will be able to:

- d.1 Utilize computers and the internet for communication, data management, and word processing.
- d.2 Collaborate effectively with teamwork members to maintain independent and critical thinking, effective time-management and positive communication and cooperation with other members of the teamwork.
- d.3 Solve issues with a scientific approach.
- d.4 Effectively manage tasks, time, and resources.
- d.5 Search for information and engage in life-long self-learning discipline.
- d.6 Assist in enhancing public knowledge on the advantages of safeguarding intellectual property rights and scientific patents for individuals and communities.



3- Academic standards of the program

The program outcomes are derived from the Academic Reference Standards (ARS) for Single programs in Science Faculties (Chemistry), December, 2017.

4- Reference indices (Benchmarks): Not utilized

5- Curriculum structure and contents of program

a-Program duration:

The period of study to obtain a B.Sc. degree is four academic years. The academic year is divided into two semesters. Each semester extends to 17 weeks. A summer semester extended for 8 weeks is a subject for approval by the faculty council.

b- Program structure:

Program	Credit hours
Compulsory	92
Optional	6
Elective	32
Other	6
Total	136

Program	Credit hours	Percentage
Basic sciences	28	21%
Humanities (including language)	8	6 %
Specialized courses	88	65%
Computer and IT	6	4%
Research and graduation project	3	2%
Other	3	2%
Total	136	100 %

Field training: 6 weeks

c-Program Courses:

- Symbols in the list and their meanings

Connotation	Symbol
University requirement	Uni
Botany	Bot
Chemistry	Chm
Entomology	Ent
Geology	Geo
Mathematics	Mat
Physics	Phy
	Zoo



A. First level:

1. The student studies (8 credit hours) in first level from the following table (University requirement courses):

Code	Prerequisite	Course Title	Hours		
			Lect.	T/P	Cred.
Uni 100	-	Scientific Thinking	2	-/-	2
Uni 115	-	English Language (1)	2	-/-	2
Uni 151	-	Human Rights and Anticorruption	1	-/-	-

Code	Prerequisite	Course Title	Hours		
			Lect.	T/P	Cred.
Uni 105	-	Information Technology	2	-/-	2
Uni 142	-	History of Science	2	-/-	2
Uni 152	-	Healthy Nutrition	2	-/-	2

2. The student studies (28 credit hours) in first level from the following table (Faculty requirement courses):

Code	Prerequisite	Course Title	Hours		
		Compulsory Courses: 28 hours	Lect.	T/P	Cred.
Bio 101	-	Biology (1)	1	-/2	2
Chm 100	-	General Chemistry (1)	2	1/2	3
Com 101	-	Introduction to Computer Science	1	-/2	2
Mat 101	-	Algebra and Geometry	1	2/-	2
Phy 101	-	Heat and Properties of Matter	2	1/2	3
Bio 102	-	Biology (2)	1	-/2	2
Chm 105	-	General Chemistry (2)	2	1/2	3
Com 102	-	Introduction to Computer Programming	1	-/2	2
Mat 102	-	Statistics	1	2/-	2
Phy 102	-	Optics, Electricity and Magnetism	2	1/2	3
Mat 103	-	Differentiation and Integration	1	2/-	2
Mat 104	-	Dynamics	1	2/-	2

T/ P =Tutorial/ Practical



B. Second level:

The student studies the following credit hours in second level from the following table:

Level 2 / Semester 1		Course Title	Hours		
Code	Prerequisite	Compulsory Courses: 10 hours	Lect.	T/P	Cred.
Chm 211	Chm 105	Aliphatic Organic Chemistry	2	-/3	3
Chm 213	Chm 105	Petroleum and Petrochemicals	2	-/-	2
Chm 231	Chm 105	Chemical Thermodynamics	2	-/-	2
Chm 241	Chm 100	Analytical Chemistry (1)	2	-/3	3
Elective Courses: (The student chooses 4 hours)					
Chm 217	Chm 105	Industrial Chemistry and Economic Studies	2	-/-	2
Chm 219	Chm 105	Cyclic Aliphatic Chemistry	2	-/-	2
Chm 221	Chm 100	Industrial Inorganic Chemistry (1)	2	-/-	2
Free Optional Courses: (The student chooses 2 hours)					
Mat 201	-	Ordinary Differential Equations (1)	1	2/-	2
Geo 231	-	Crystallography and Optical Mineralogy (2)	1	-/3	2
Total: 10+4+2 = 16 Hours					

Level 2 / Semester 2		Course Title	Hours		
Code	Prerequisite	Compulsory Courses: 10 hours	Lect.	T/P	Cred.
Chm 222	Chm 100	Chemistry of Representative Elements	2	-3	3
Chm 232	Chm 105	Electrochemistry (1)	2	-/-	2
Chm 234	Chm 105	Photo and Kinetic Chemistry	2	-/3	3
Chm 238	Chm 105	Basis of Chemistry of catalysis technology	2	-/-	2
Elective Courses: (The student chooses 4 hours)					
Chm 216	Chm 105	Organic Environmental Green Chemistry (1)	2	-/-	2
Chm 242	Chm 241	Chemistry of Water Treatment (1)	2	-/-	2
Chm 292	Chm 105	Phase Rule (2)	2	-/-	2
Free Optional Courses: (The student chooses 2 hours)					
Com 224	-	Operating Systems	1	2/-	2
Phy 245	-	Introduction to Physical Optics	1	-/3	2
Total: 10+4+2= 16 Hours					



C. Third level:

The student studies the following credit hours in third level from the following table:

Level 3 / Semester 1		Course Title	Hours		
Code	Prerequisite	Compulsory Courses: 10 hours	Lect.	T/P	Cred.
Chm 313	Chm 212	Reaction Mechanism and StereoChemistry	2	-/3	3
Chm 323	Chm 222	Chemistry of Transition Metals	2	-/-	2
Chm 343	Chm 241	Analytical Chemistry (2)	2	-/3	3
Chm 369	Chm 211	Basis of polymer chemistry	1	-/3	2
Elective Courses: (The student chooses 5 hours)					
Chm 311	Chm 211	Chemistry of pesticides and toxins	2	-/3	3
Chm 321	Chm 222	Industrial Inorganic Chemistry (2)	2	-/3	3
Chm 325	Chm 222	Applied RadioChemistry	2	-/-	2
Chm 335	Chm 241	Electrochemical Instrumental Analysis	2	-/-	2
Free Optional Courses: (The student chooses 2 hours)					
Phy 237	-	Physics of Metals	2	-/-	2
Phy 391	-	X-ray and Crystallography	2	-/-	2
Total: 10+3+2+2= 17 Hours					

Level 3 / Semester 2		Course Title	Hours		
Code	Prerequisite	Compulsory Courses: 10 hours	Lect.	T/P	Cred.
Chm 314	Chm 211	Chemistry of Carbohydrates, Lipids, Amino Acids and Natural Products (1)	2	-/3	3
Chm 316	Chm 212	Organic Spectroscopy (1)	2	-/3	3
Chm 324	Chm 323	Co-ordination Chemistry	2	-/-	2
Chm 332	Chm 222	Surface Chemistry	2	-/-	2
Elective Courses: (The student chooses 5 hours)					
Chm 318	Chm 212	Applied Organic Chemistry (selected topics)	3	-/-	3
Chm 320	Chm 222	Chemistry of ceramics industry	2	-/-	3
Chm 326	Chm 222	Chemistry of inorganic pigments	2	-/3	3
Chm 336	Chm 241	Analytical Photochemistry	2	-/-	2
Training: 3 hours					
Chm 302	-	Applied and Field Training	-	-/-	3
Total: 10+3+2+3= 18 Hours					



D. Fourth level:

The student studies the following credit hours in fourth level from the following table:

Level 4 / Semester 1		Course Title	Hours		
Code	Prerequisite	Compulsory Courses: 10 hours	Lect.	T/P	Cred.
Chm 421	Chm 324	Nuclear and Radiation Chemistry	2	-/-	2
Chm 429	Chm 324	Polymer Chemistry and Applications (1)	2	-/3	3
Chm 439	Chm 222	Basis of Quantum and Statistical Dynamics Chemistry	2	-/-	2
Chm 441	Chm 105	Instrumental Analysis (1)	2	-/3	3
Elective Courses: (The student chooses 6 hours)					
Chm 413	Chm 313	Chemistry of Petroleum Additives	2	-/3	3
Chm 415	Chm 313	Chemistry of Dyes and Textiles	2	-/3	3
Chm 417	Chm 324	Advanced polymer chemistry	2	-/3	3
Total: 10+6= 16 Hours					

Level 4 / Semester 2		Course Title	Hours		
Code	Prerequisite	Compulsory Courses: 10 hours	Lect.	T/P	Cred.
Chm 410	Chm 316	Chemotherapy and heterorganic chemistry	2	-/-	2
Chm 414	Chm 316	Technology of Industrial Detergents (Applications of Group Theory)	2	-/3	3
Chm 424	Chm 222	Chemistry of Lanthanides and Actinides (2)	2	-/-	2
Chm 486	Chm 222	Materials Science (1)	2	-/3	3
Elective Courses: (The student chooses 4 hours)					
Chm 400	Chm 222	Nanochemistry and Applications	2	-/-	2
Chm 416	Chm 314	Technology of Paints	2	-/-	2
Chm 434	Chm 343	Chemistry of Catalysis Technology	2	-/-	2
Research: 3 hours					
Chm 402	-	Research and Essay	3	-/-	3
Total: 10+4+3 = 17 Hours					



6- Contents of the Courses

See course specification forms (Appendix 5)

7- Program admission requirements:

- Faculty of Benha Science accepts students who have a high school (the scientific branches) or equivalent according to the admission requirements specified by the Supreme Council of Universities.
- Faculty of Benha Science accepts transfer students from other science faculties; provided that the number of credit hours that were studied not more than 50% of the total number of credit hours necessary for his graduation. The student is exempt from the courses studied by successfully whatever their level.

8- Regulations for progression and program completion:

According to the bylaw of the faculty of Benha Science, the regulations for progression and program completion are:

▪ Joining the Program:

1. Vice Dean for Education and Student Affairs supervises on the implementation of the registration rules and procedures and prepare menus for each of the study groups, schedule, distribute students gentlemen academic advisers, processing cards courses for students which is about cards individual for each course as well as cards total for each student, that academic record data in accredited private records, and the completion of enrollment of students in the first week of the start of the semester.
2. Students may register early, after announcing the results of the spring.
3. Take into account when you log decision student success in Prerequisite if any.
4. A student who was not able to register for compelling reasons approved by the
5. Student Affairs Committee and approved by the College Board to register record late in the additional period for registration (the second week).
6. Students select one branch to research and essay from two specialized branches.

▪ Study load:

Students are allowed to register in at least 14 credit hours and no more than 19 credit hours per semester. With the exception of the following cases:

1. A student can superior (who has a cumulative average of 3 or more) that adds to its two hours, certified in one semester and a maximum of 8 credit hours throughout the study period in decisions, additional optional requirements, specialization departments, college different, that is added appreciation where to CGPA It is not permitted to be an elective requirement for another decision.
2. The College Board may increase the maximum for the academic workload in the last semester of the student up to a maximum of four credit hours to complete graduation requirements.
3. Not allows the student who has a cumulative rate (1) to register in more than 12 credit hours in a semester.



▪ **Additions, deletions, withdraw and modify the path:**

1. Any student after the approval of the academic advisor to add or delete scheduled or two until the end of the second week only study and without prejudice to the burden stipulated.
2. Students may withdraw from the study any decision until the end of the seventh week of the start of registration for the semester with the approval of the academic advisor. The record of this decision in the student's academic record estimate "withdrawn" on the condition that the student does not have absenteeism overruns before the withdrawal. In addition, cases before the forced withdrawal over this period the Commission Education and Student Affairs for consideration and approval of the Faculty Council on the withdrawal shall be without prejudice boarding school student.
3. A student may alter the course of the specialization subject to the completion of the requirements of specialization desirable and not counting credit hours, which the student obtained by not located in the area of the requirements of the new specialization and after the approval of the academic advisor and the Committee on Education and Student Affairs and the College Board on this amendment.

▪ **Stop registration or drop out**

1. Stop registration: the student can apply to stop his registration for one semester and a maximum of four separate classes are connected and for compelling reasons approved by the College Board.
2. Dropout: the student can re-record if he drops out for maximum two semesters and for compelling reasons approved by the College Board.

▪ **Attendance:**

1. The instructor shall register the presence of students at the start of each lecture theory or process in a practical period Prepared for by the Student Affairs and delivers this record at the end of the semester to manage the affairs of Students.
2. When the student exceeds the absence of 10% of the scheduled hour's instructor shall notify the Department of Affairs Students to guide the first warning to the student.
3. When the student exceeds the proportion of the absence of 20% of the scheduled hour's instructor shall notify the Department Student Affairs to direct second and final warning to the student.
4. If increased absenteeism 25% of the total scheduled hours and the absence of a student without an acceptable excuse Student Affairs Committee and approved by the College Board, student records estimate" deprived" decision and intervention as a result of failure to calculate the cumulative average of the student.
5. If increased absenteeism was 25% and the absence of the student excuse acceptable to the Commission, Education and Student Affairs and approved by the College Board, student records would withdraw from the course.
6. In the case of a request student, add a new decision attendance is calculated from the date of registration.



9- Methods and rules of evaluation of students in rolled in the program:

Rating: The exam is evaluated each course at 100 degrees and distributed degrees scheduled as the follows:

9.1- Courses, which do not include the part "practical":

Method of Assessment	Marks	learning outcomes assessed	Weighting
Midterm exam	10	Knowledge and understanding (a1-a7); intellectual (b1-b5); professional and general skills (c5, d1-d4)	10%
Final Oral Exam	10	Knowledge and understanding (a1- a10); intellectual skills (b1-b10)	10 %
Semester work	20	Knowledge and understanding (a1- a10); intellectual skills (b1-b10)	20%
Final Term Examination	60	Knowledge and understanding (a1- a10); intellectual skills (b1-b10).	60%
	100		100 %

9.2-Courses practical separate

Method of Assessment	Marks	learning outcomes assessed	Weighting
Midterm exam	5	Knowledge and understanding (a1-a7); intellectual (b1-b5); professional and general skills (c5, d1-d4)	5%
Semester work	15	Knowledge and understanding (a1- a10); intellectual skills (b1-b10)	15%
Final practical Examination	25	Intellectual (b6, b7); professional (c1-c5) and practical; and general skills (d3).	25%
Final Oral Exam	5	Knowledge and understanding (a1-a10); intellectual skills (b1-b10)	5 %
Final Examination	50	Knowledge and understanding (a1- a10); intellectual skills (b1-b10).	50%
Total	100		%100



9.3 Courses, which include part "practical":

Part	Marks	Method of Assessment	Learning outcomes assessed	Weighting
Practical part	25	Final practical Examination	(c1-c10)	25%
Theoretical part	75	Semester work	Knowledge and understanding (a1-a7); intellectual (b1-b5); professional and general skills (c5, d1-d6)	15%
		Midterm exam	Knowledge and understanding (a1-a7); intellectual (b1-b5); professional and general skills (c5, d1-d6)	5%
		Final Oral Exam for theoretical part	Knowledge and understanding (a1-a11); intellectual skills (b1-b6)	5%
		Final Term Examination	Knowledge and understanding (a1-a10); intellectual skills (b1- b10).	50%
	100			100



9.4 Course search and essay

1. 50% of the total score for the search and essay course of the various activities and reports carried out by the student during his study of the course.
2. 50% of the total scores for the course of the discussion (25%) and the presentation (25%) sessions. **updated 8/ 3/2023 (Faculty council; meeting number, 484).**

The following grading system is applied:

Grades	Symbols	No. of points	Degree
Excellent	A ⁺	4.000	100 >- 90
Excellent	A	3.667	90 >- 85
Very Good	B ⁺	3.333	85 >- 80
Very Good	B	3.000	80 >- 75
Good	B ⁻	2.667	75 >- 70
Good	C ⁺	2.333	70 >- 65
Pass	C	2.000	65 >- 60
Fail	F	0.000	60 >- 0
Postponed	P	0.000	60 >- 0
Incomplete	IC	0.000	60 >- 0
Denial	DN	0.000	60 >- 0
Withdrawn	W	0.000	60 >- 0

10- Teaching and learning strategies used in the program:

- a. Direct teaching strategy.
- b. Cooperative learning strategy.
- c. Brainstorming strategy.
- d. Problem-solving strategy.
- e. Effective discussion strategy.
- f. Independent Study strategy.
- g. E-learning strategy.



11- Methods of program evaluation: (Appendix 6)

Samples	Tool	Evaluators
1- Senior Students	Questionnaire	100%
2- Alumni	Questionnaire	100%
3- External Evaluators	Reports	

Program Coordinator: Prof. Dr. Mohammed Behalo

Head of the Department: Prof. Dr. Wafaa Baioumy

updated 8/ 3/2023 (Faculty council; meeting number, 484).