

## 1. National Academic Reference Standards

### 1.1. General Attributes of the Graduates of Basic Sciences

#### The graduates must be able to:

- 1.1.1. Recognize the role of Basic Sciences in the development of society.
- 1.1.2. Develop scientific approaches that meet community needs considering economic, environmental, social, ethical, and safety requirements.
- 1.1.3. Utilize scientific facts and theories to analyze and interpret practical data.
- 1.1.4. Collect, analyze, and present data using appropriate formats and techniques.
- 1.1.5. Postulate concepts and choose appropriate solutions to solve problems on scientific basis.
- 1.1.6. Apply effectively information technology relevant to the field.
- 1.1.7. Participate effectively in a multidisciplinary teamwork and be flexible for adaptation, decision making and working under contradictory conditions as well as exhibiting the sense of beauty and neatness.
- 1.1.8. Adopt self and long life-learning and participate effectively in research activities.
- 1.1.9. Deal with scientific data in Arabic, English or other languages.

### 1.2. Knowledge and Understanding

#### Graduates must acquire knowledge and understanding of:

- 1.2.1. The related basic scientific facts, concepts, principles and techniques.
- 1.2.2. The relevant theories and their applications.
- 1.2.3. The processes and mechanisms supporting the structure and function of the specific topics.
- 1.2.4. The related terminology, nomenclature and classification systems.
- 1.2.5. The theories and methods applied for interpreting and analyzing data related to discipline.
- 1.2.6. The developmental progress of the program-related knowledge.
- 1.2.7. The relation between the studied topics and the environment.

### 1.3. Practical and Professional Skills

#### The graduates must be able to:

- 1.3.1. Plan, design, process and report on the investigated data, using appropriate techniques and considering scientific guidance.
- 1.3.2. Apply techniques and tools considering scientific ethics.
- 1.3.3. Solve problems using a range of formats and approaches.
- 1.3.4. Identify and criticize the different methods used in addressing subject related issues.

### 1.4. Intellectual Skills

#### The graduates must be able to:

- 1.4.1. Differentiate between subject-related theories and assess their concepts and principles.
- 1.4.2. Analyze, synthesize, assess and interpret qualitatively and quantitatively science relevant data.
- 1.4.3. Develop lines of argument and appropriate judgments in accordance with scientific theories and concepts.
- 1.4.4. Postulate and deduce mechanisms and procedures to handle scientific problems.
- 1.4.5. Construct several related and integrated information to confirm, make evidence and test hypotheses.

### 1.5. General and Transferable Skills

#### The graduates must be able to:

- 1.5.1. Use information and communication technology effectively.
- 1.5.2. Identify roles and responsibilities, and their performing manner.

- 1.5.3. Think independently, set tasks and solve problems on scientific basis.
- 1.5.4. Work in groups effectively; manage time, collaborate and communicate with others positively.
- 1.5.5. Consider community linked problems, ethics and traditions.
- 1.5.6. Acquire self- and long life-learning.
- 1.5.7. Apply scientific models, systems, and tools effectively.
- 1.5.8. Deal with scientific patents considering property right.
- 1.6.9. Exhibit the sense of beauty and neatness.

## 2. National Academic Reference Standards For Chemistry

Chemistry is the science which provides the concepts, knowledge, principles and theories necessary for the intellectual framework of understanding the properties of atoms and molecules as well as the relationship between structure and reactivity from fundamentals to the frontiers of current research. The study of chemistry focuses strongly on a wide range of analytical and practical skills required to practice the subject. Chemistry enables students to examine changes of materials during physical and chemical processes, and learn how to observe and measure results. Chemistry in turn, draws on the facts and theory of physics and mathematics as tools necessary to evaluate and express quantitative chemical information. Therefore, knowledge of the dynamic and the evolving science of chemistry is essential to the discovery, understanding and development of other sciences such as biology, medicine, pharmacy, materials science, engineering and many other related sciences.

Studying for a degree in Chemistry is a sound basis for the students where they can extend their knowledge of the subject and develop many of the scientific and employability skills which are necessary for most occupations. Therefore, chemists can have opportunities to work as scientists in research activities in governmental agencies and private laboratories. They can be employed as product developers and quality control of manufactures in the industrial sectors. Chemists can utilize their wide chemistry knowledge and skills in other areas such as sales representative for chemical products, pharmaceuticals or laboratory equipment. In addition, chemistry graduates can be involved in educational institutions.

The Academic Reference Standards represent general expectations about the standards for the award of qualifications at the B.Sc degree in chemistry, and articulate the attributes and capabilities that the graduates should be able to demonstrate. Regardless of the institution, the undergraduates of chemistry programs should provide students with an education in the main branches of chemistry, namely:

1. Analytical chemistry: study of the structure, composition and analysis of substances,
2. Inorganic chemistry: study of non-carbon-based compounds,
3. Organic chemistry: study of carbon-based compounds,
4. Physical chemistry: application of concepts and laws to study the characteristics of atoms and molecules as well as chemical reactions,
5. Computational chemistry: study of the principles and theories of quantum mechanics.

### 2.1 The Attributes of a Chemist

**In addition to the general attributes of the basic science graduates, the chemist must develop a group of attributes which are the ability to:**

- 2.1.1 Design and conduct experimental work, critically evaluate the outcomes, review and report on practice.
- 2.1.2 Have knowledge and experience of working with relevant and advanced laboratory techniques.
- 2.1.3 Participate in and review quality control processes, manage risks and organize time to finish jobs.
- 2.1.4 Demonstrate wide background knowledge related to the different branches of chemistry.

### 2.2 Knowledge and Understanding

**In addition to the general knowledge acquired by the basic science graduates, the chemist should be able to demonstrate knowledge and understanding of:**

- 2.2.1 Chemical concepts, nomenclature, formulae and units.
- 2.2.2 Characteristics of the different states of the matter and elements including trends within

- the periodic table and the related theories.
- 2.2.3 The principles, procedures and techniques used in chemical analysis, characterization and structural investigations of different chemical compounds.
- 2.2.4 The major types of chemical reactions, their characteristics and mechanisms as well as then- kinetics including catalysis.
- 2.2.5 The principles of thermodynamics and quantum mechanics including their applications in chemistry.
- 2.2.6 The constitution and properties of the different chemical compounds, including the main synthetic pathways and the relation between the properties of individual atoms and molecules.
- 2.2.7 The current issues of chemical research and technological development.

### **2.3 Practical and Professional skills:**

#### **The Graduates of Chemistry Program must be able to:**

- 2.3.1 Assess risk in laboratory work taking into consideration the specific hazards associated with the use of chemical materials as well as the safe and proper operation of the laboratory techniques.
- 2.3.2 Conduct standard laboratory procedures involved in analytical and synthetic work.
- 2.3.3 Monitor by observation and measurements the chemical properties or changes, including systematic recording and technical reporting.
- 2.3.4 Use computational packages and tools in chemical investigations.

### **2.4 Intellectual skills**

#### **The Graduates of Chemistry Program must be able to:**

- 2.4.1 Differentiate between the different states of the matter, elements and compounds based on the recognition and quantification of the properties.
- 2.4.2 Employ computational software's and data- processing skills in handling of chemical information and analysis of chemical data.
- 2.4.3 Explain concepts and determine the efficiency of chemical systems by applying mathematical expressions.
- 2.4.4 Analyze chemical data to identify and confirm chemical structures as well as determine chemical composition.
- 2.4.5 Propose and conclude mechanisms for physical and chemical processes.