

**Academic Reference Standards (ARS)**  
**for**  
**Petrochemicals and their Applications**  
**B. Sc. Program**  
**Faculty of Science, Mansoura University**

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**2<sup>nd</sup> Edition**

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## **Introduction**

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.

Petrochemicals are those chemicals derived from petroleum. The two most common petrochemical classes are olefins (including ethylene and propylene) and aromatics (including benzene, toluene and xylene isomers). Oil refineries produce olefins and aromatics by fluid catalytic cracking of petroleum fractions. Chemical plants

produce olefins by steam cracking of natural gas liquids like ethane and propane. Aromatics are produced by catalytic reforming of naphtha. Olefins and aromatics are the building-blocks for a wide range of materials such as solvents, detergents, and adhesives. Olefins are the basis for polymers and oligomers used in plastics, resins, fibers, elastomers, lubricants, and gels. Petrochemicals have had a dramatic impact on our food, clothing, shelter and leisure. Some synthetics, tailored for particular uses, actually perform better than products made by nature because of their unique properties.

The B.Sc. in Petrochemicals and their applications aims to provide a graduate able to recognize the role of Petrochemicals in the development of society, develop Petrochemical approaches that meet community needs considering economic, environmental, social, ethical, and safety requirements, utilize scientific facts and theories to analyze and interpret practical Petrochemical data, collect, analyze, and present Petrochemical data using appropriate formats and techniques, postulate concepts and choose appropriate solutions to solve Petrochemical problems on scientific basis, apply effectively information technology relevant to Petrochemicals, 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, and adopt self and long life-learning and participate effectively in research activities, and deal with scientific data in Arabic, English or other languages.

National Academic Reference Standards (NARS)  
for **Basic Sciences**

**Attributes of the Graduates**

The graduates should be able to:

1. Recognize the role of Basic Sciences in the development of society.
2. Develop scientific approaches that meet community needs considering economic, environmental, social, ethical, and safety requirements.
3. Utilize scientific facts and theories to analyze and interpret practical data.
4. Collect, analyze, and present data using appropriate formats and techniques.
5. Postulate concepts and choose appropriate solutions to solve problems on scientific basis.
6. Apply effectively information technology relevant to the field.

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.
8. Adopt self and long life-learning and participate effectively in research activities.
9. Deal with scientific data in Arabic, English or other languages.

### **1. Knowledge and Understanding**

The graduates must acquire knowledge and understanding of:

- 1.1. The related basic scientific facts, concepts, principles and techniques.
- 1.2. The relevant theories and their applications.
- 1.3. The processes and mechanisms supporting the structure and function of the specific topics.
- 1.4. The related terminology, nomenclature and classification systems.
- 1.5. The theories and methods applied for interpreting and analyzing data related to discipline.
- 1.6. The developmental progress of the program-related knowledge.
- 1.7. The relation between the studied topics and the environment.

### **2. Intellectual Skills**

The graduates should be able to:

- 2.1. Differentiate between subject-related theories and assess their concepts and principles.

- 2.2. Analyze, synthesize, assess and interpret qualitatively and quantitatively science relevant data.
- 2.3. Develop lines of argument and appropriate judgments in accordance with scientific theories and concepts.
- 2.4. Postulate and deduce mechanisms and procedures to handle scientific problems.
- 2.5. Construct several related and integrated information to confirm, make evidence and test hypotheses.

### **3. Practical and Professional Skills**

The graduates should be able to:

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

### **4. General and Transferable Skills**

The graduates should be able to:

- 4.1. Use information and communication technology effectively.
- 4.2. Identify roles and responsibilities, and their performing manner.
- 4.3. Think independently, set tasks and solve problems on scientific basis.
- 4.4. Work in groups effectively; manage time, collaborate and communicate with others positively.
- 4.5. Consider community linked problems, ethics and traditions.

- 4.6. Acquire self- and long life–learning.
- 4.7. Apply scientific models, systems, and tools effectively.
- 4.8. Deal with scientific patents considering property right.
- 4.9. Exhibit the sense of beauty and neatness.

### Curriculum Structure

<b>Subject Areas</b>	<b>Percentage</b>	<b>Tolerance</b>
Basic Science	28 %	27 – 29 %
Humanities (including language)	6 %	5 – 7 %
Specialty (professional)	50 %	48 – 52 %
Computer and IT	6 %	5 – 7 %
Research and graduation project	2 %	1 – 3 %
Others (Discretionary)	8 %	7 – 9 %
<b>Total</b>	<b>100 %</b>	<b>100 %</b>

## **Academic Reference Standards (ARS) for Petrochemicals and their Applications**

### **The Attributes of Petrochemicals and their Applications Graduates**

In addition to the attributes of Basic Sciences graduates, the Petrochemicals and their Applications graduates should be able to:

1. Recognize the basis and principles of the different Petrochemicals exploration methods in different environmental problems.
- 2 - Use the principles of Petrochemicals, physical and mathematical background and utilizing computer software in analyzing and interpretation of the relevant data.
- 3 - Work professionally in the fields of Petrochemicals exploration.
- 4 - Use the gained information in the fields of Petrochemicals.

#### **1. Knowledge and Understanding**

In addition to the knowledge and understanding acquired by Basic Sciences graduates, the Petrochemicals and its Applications graduates should demonstrate knowledge and understanding of:

- 1.1. The principles and basics of Petrochemicals exploration methods and manual and computerized interpretations of Petrochemicals data.

- 1.2. Different Petrochemicals methods and information used in interpretation and solving environmental problems.
- 1.3. The theory, principles and techniques in Petrochemicals field and the use of the related data in solving the problems in this field.
- 1.4. The theoretical bases, procedures and techniques used for Petrochemicals field studies and related laboratory analysis.

## **2. Intellectual Skills**

In addition to the intellectual skills acquired by Basic Sciences graduates, the graduates of Petrochemicals and its Applications program should be able to:

- 2.1. Predict Petrochemical problems, and analyze the data to solve these problems by suitable ways.
- 2.2. Analyze the Petrochemical data using different computer software, integrate and evaluate information and data from different sources in order to gain a coherent understanding of theory and practice.
- 2.3. Test, display and interpret Petrochemicals data.

## **3. Practical and Professional Skills**

In addition to the practical and professional skills acquired by Basic Sciences graduates, the graduates of the Petrochemicals and its Applications program should be able to:

- 3.1. Use tools of Petrochemicals in the filed surveys, choose and classify the investigation targets and select the reliable methods.
- 3.2. Perform experimental and computer software in interpretation of the Petrochemicals field data.
- 3.3. Apply different techniques of field and laboratory work in order to achieve the Petrochemicals information and use computational tools, computer software and statistics.
- 3.4. Interpret Petrochemicals data derived from field survey and laboratory techniques in terms of their significance and the theory underlying them.

#### **4. General and Transferable Skills**

In addition to the general and transferable skills acquired by Basic Sciences graduates, the graduates of the Biotechnology and its Applications program should be able to:

- 4.1. Use information and communication technology effectively.
- 4.2. Identify roles and responsibilities, and their performing manner.
- 4.3. Think independently, set tasks and solve problems on scientific basis.
- 4.4. Work in groups effectively; manage time, collaborate and communicate with others positively.
- 4.5. Consider community linked problems, ethics and traditions.

- 4.6. Acquire self- and long life–learning.
- 4.7. Apply scientific models, systems, and tools effectively.
- 4.8. Deal with scientific patents considering property right.
- 4.9. Exhibit the sense of beauty and neatness.

## Glossary

### 1. Institution

A University, Faculty or higher institute providing education programs leading to a first university degree or a higher degree (Master's or Doctorate).

### 2. Attributes of the Graduates

Competencies expected from the graduates based on the acquired knowledge and skills gained upon completion of a particular program.

### 3. National Academic Reference Standards (NARS)

Reference points designed by NAQAAE to outline/describe the expected minimum knowledge and skills necessary to fulfill the requirements of a program of study.

### 4. Academic Standards

Reference points defined by an institution comprising the collective knowledge and skills to be gained by the graduates of a particular program.. The academic standards should surpass the NARS, and be approved by NAQAAE.

### 5. Subject Benchmark Statements

Guideline statements that detail what can be expected of a graduates in terms of the learning outcomes to satisfy the

standards set for the program.. They enable the outcomes to be compared, reviewed and evaluated against agreed upon standards.

## **6. The Program**

A set of educational courses and activities designed by the institution to determine the systematic learning progress.. The program also imparts the intended competencies required for the award of an academic degree.

## **7. Intended Learning Outcomes (ILOs)**

Subject-specific knowledge, understanding and skills intended by the institution to be gained by the learners completing a particular educational activity. The ILOs emphasize what is expected that learners will be able to do as a result of a learning activity.

## **8. Knowledge and Understanding**

Knowledge is the intended information to be gained from an educational activity including facts, terms, theories and basic concepts. Understanding involves comprehending and grasping the meaning or the underlying explanation of scientific objects.

## **9. Intellectual Skills**

Learning and cognitive capabilities that involve critical thinking and creativity. These include application, analysis, synthesis and evaluation of information.

## **10. Professional and Practical Skills**

Application of specialized knowledge, training and proficiency in a subject or field to attain successful career development and personal advancement.

## **11. General and Transferable Skills**

Skills that are not subject-specific and commonly needed in education, employment, life-long learning and self development. These skills include communication, team work, numeracy, independent learning, interpersonal relationship, and problem solving... etc.