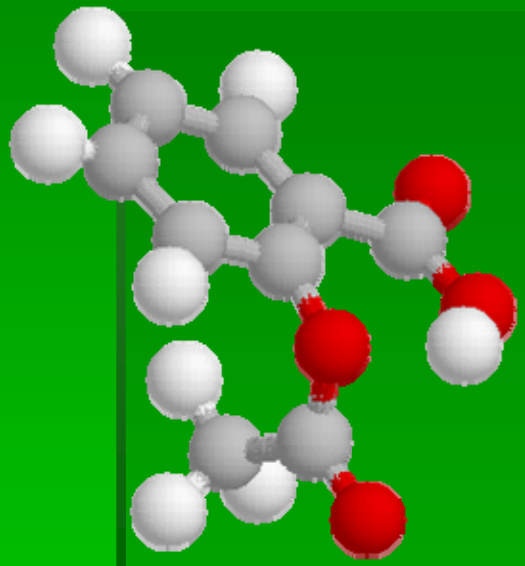
Why Chemistry ?



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Outline

- Chemistry in our life
- Job description
- Specialization
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- Employment
- Employers
- Job Outlook
- Earnings
- The department of Chemistry – KFUPM
  - B.S. Degree in Industrial Chemistry
  - B.S. Degree in pure Chemistry

Chemistry in our life

- Chemists search for and put to practical use new knowledge about chemicals.

- Chemists have developed a tremendous variety of new and improved :

  synthetic fibers, paints, adhesives, pharmaceuticals, cosmetics, electronic components, lubricants, and thousands of other products.

- They also develop processes which save energy and reduce pollution such as improved oil refining and petrochemical processing methods.

- Research on the chemistry of living things supports advances in medicine, agriculture, food processing, and other areas.

Job Description

1. Production and quality control

- Chemists work in production and quality control in chemical manufacturing plants.
- They prepare instructions for plant workers which specify ingredients, mixing times, and temperatures for each stage in the process.
- They also monitor automated processes to ensure proper product yield, and they test samples to ensure they meet industry and government standards.
- Chemists also record and report on test results.

Plastics Industry

Instrumentation

Elemental analysis

Induced coupled plasma

Gas chromatography mass spectrometry

Gas chromatography

Quality control laboratory

2. Research and development

- Chemists work in research and development.
- In basic research, chemists investigate the properties, composition, and structure of matter and the laws that govern the combination of elements and reactions of substances.
- In applied research and development, they create new products and processes or improve existing ones, often using knowledge gained from basic research.

For example, synthetic rubber and plastics resulted from research on small molecules uniting to form large ones (polymerization).

Research Instrumentation

Catalyst testing unit

High pressure reactor

X-ray diffractometer

Nuclear magnetic resonance

3. Education

- School Teachers
- Faculty position in colleges
- Faculty position in universities

4. Marketing

- Others are marketing or sales representatives who sell and provide technical information on chemical products.

Specialization

Chemists often specialize in a subfield:

- ***Analytical chemists*** **determine the structure, composition, and nature of substances and develop analytical techniques. They also identify the presence and concentration of chemical pollutants in air, water, and soil.**
- ***Organic chemists*** **study the chemistry of the vast number of carbon compounds. Many commercial products, such as drugs, plastics, and fertilizers, have been developed by organic chemists.**
- ***Inorganic chemists*** **study compounds consisting mainly of elements other than carbon, such as those in electronic components and catalysts.**
- ***Physical chemists*** **study the physical characteristics of atoms and molecules and investigate how chemical reactions work. Their research may result in new and better energy sources.**

Working conditions

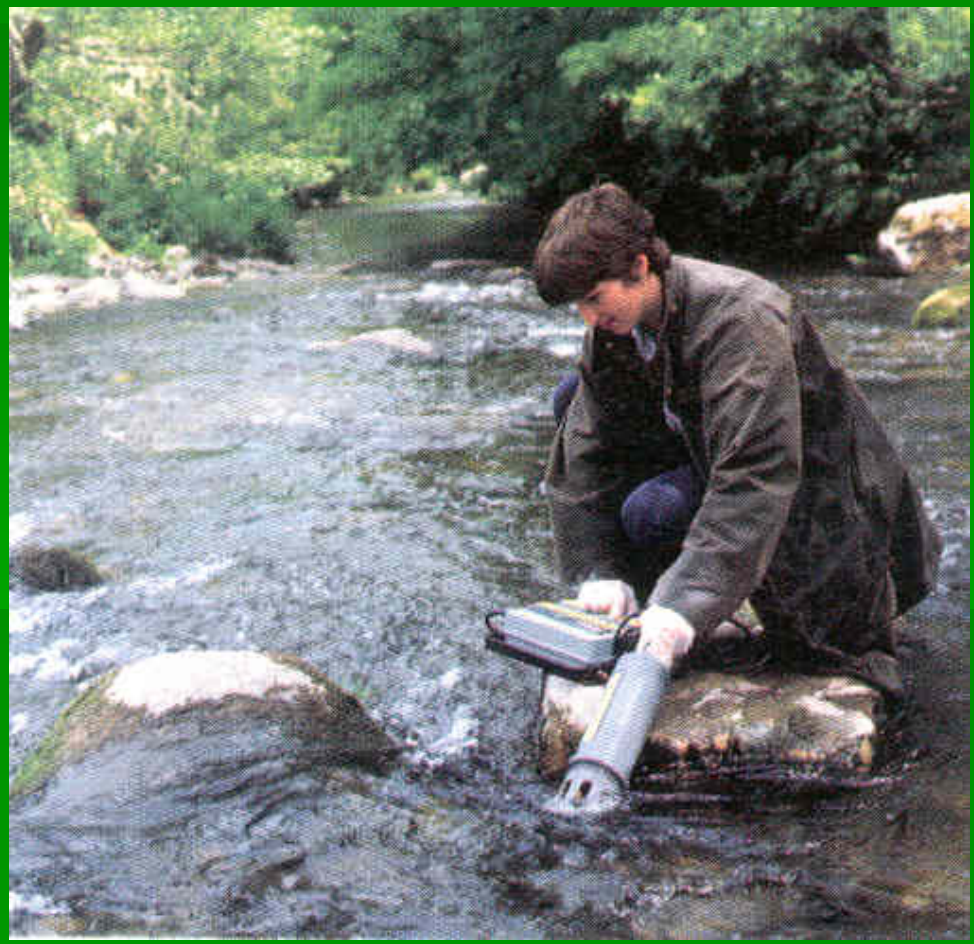
- Chemists usually work regular hours in offices and laboratories.
- Research chemists spend much time in laboratories, but also work in offices when they do theoretical research or plan, record, and report on their lab research.
- Although some laboratories are small, others are large and may incorporate prototype chemical manufacturing facilities as well as advanced equipment.
- Chemists may also do some of their research in a chemical plant or outdoors-while gathering samples of pollutants, for example. Some chemists are exposed to health or safety hazards when handling certain chemicals, but there is little risk if proper procedures are followed.

Employment

The majority of chemists are employed mostly in the chemical manufacturing industry:

- **Firms that produce plastics and synthetic materials, Pharmaceuticals, soaps and cleaners, paints, glass…**
- **Petroleum Refining and Petrochemicals**
- **Water desalination**
- **Mining Industry**
- **Environmental Protection**
- **Others work for research and testing services.**
- **Government, primarily in health, agriculture**
- **In addition, thousands of persons held chemistry faculty positions in colleges and universities.**
- **Chemists are employed in all parts of the country, but they are mainly concentrated in large industrial areas.**

Environmental chemistry
Water pollution



Petroleum Refining and Petrochemicals

Pharmaceutical industry

Employers

- **Saudi Aramco: Dhahran, Jubail, Reyadh, Jeddah, Yanbu**
- **SABIC: Jubail, Reyadh, Yanbu**
- **Desalination plants**
- **Environmental protection agencies**
- **Standards and Specification Bureau**
- **Pharmaceutical firms: Qaseem (Spimaco), Reyadh, Jeddah, Tabook**
- **Cement factories**
- **King Abdulazeez City for Science and Technology**
- **Ministry of Education**

Training, other Qualifications and Advancement

- A bachelor's degree in chemistry or a related discipline is usually the minimum education necessary to work as a chemist.
- Students planning careers as chemists should Enjoy studying science and mathematics
- Working with their hands building scientific apparatus and performing experiments.
- Perseverance, curiosity, and the ability to concentrate on detail and to work independently are essential.
- Laboratory instruments are also computerized and the ability to operate and understand equipment is essential.

Training, other Qualifications and Advancement

- Because research and development chemists are increasingly expected to work on interdisciplinary teams, some understanding of other disciplines, including business and marketing or economics, is desirable
- Along with leadership ability and good oral and written communication skills.
- Experience, either in academic laboratories or through internships or co-op programs in industry, also is useful.
- Students usually need not specialize at the undergraduate level. In fact, undergraduates who are broadly trained have more flexibility when job hunting or changing jobs than if they narrowly define their interests.
- Most employers provide new bachelor's degree chemists with additional training or education.

Job Outlook

- **Employment of chemists is expected to grow for all occupations in the next decade.**

  Oil production to increase by more than 50%

  (up to 15 million barrels, currently 9.5 million)
- **The petrochemical industry is expected to grow contributing to employment opportunities for chemists.**
- **Job growth will also be spurred by the need for chemists to monitor and measure air and water pollutants to ensure compliance with government environmental regulations.**
- **Much employment growth of chemists is expected to relate to refining, petrochemicals, environmental catalysis, analytical and polymer chemistry.**

Earnings

- The average basic starting salary for KFUPM graduated chemists with a bachelor's degree is SR 7,000
- Additional Benefits
- Annual salary increase
- Significant salary increase upon promotion

The department of Chemistry - KFUPM

- B.S in Industrial chemistry
- B.S in pure chemistry
- M.Sc
- Ph.D

Industrial Chemistry Program Chemistry Department - KFUPM

What Professional Skills do you learn in the Program?

- Instrumentation in chemical analysis
- Corrosion
- Chemical Processes
- Catalysts and catalytic action
- Petroleum processes and petroleum testing
- Petrochemical manufacturing
- Unit operation
- Quality control and quality assurance

Requirements for the B.S. Degree in Industrial Chemistry (124 credit hours)

(a) General Education Requirement (55 credit hours)	**Credit Hours**
Communication Skills	9
Computer Programming	3
English	6
Islamic and Arabic Studies	6
Management	3
Mathematics	14
Physical Education	2
Physics	12

Requirements for the B.S. Degree in Industrial Chemistry
(124 credit hours)

- **Core requirements**

Industrial Chemistry (19 credit hours)

- **Introduction to Chemical Engineering 3**
- **Industrial Catalysis 3**
- **Polymer Chemistry 4**
- **Chemistry of Petroleum Processing 3**
- **Industrial Inorganic Chemistry 3**
- **Industrial Organic Chemistry 3**

Requirements for the B.S. Degree in Industrial Chemistry
(124 credit hours)

- **Pure Chemistry (40 credit hours)**
- Analytical Chemistry 6
- General Chemistry 8
- Inorganic Chemistry 4
- Organic Chemistry 11
- Physical Chemistry 8
- Professional Skills 3

Requirements for the B.S. Degree in Industrial Chemistry
(124 credit hours)

- **(c) Elective (8 credit hours)**
- Islamic and Arabic Studies 2
- Free Elective 3
- Engineering Elective 3
- **(d) Summer Training 2**

- **Total Requirement (124 credit hours)**

Requirements for the B.S. Degree in Chemistry

(124 credit hours)

- **(a) General Education Requirement (52 credit hours)**

	Credit Hours
Communication Skills	9
Computer Programming	3
English	6
Islamic/Arabic Studies	6
Mathematics	14
Physical Education	2
Physics	12

Requirements for the B.S. Degree in Chemistry

(124 credit hours)

- **(b) Core Requirements (50 credit hours)**
- Analytical Chemistry 8
- General Chemistry 8
- Inorganic Chemistry 7
- Organic Chemistry 11
- Physical Chemistry 11
- Professional Skills 5

Requirements for the B.S. Degree in Chemistry

c) Electives (20 credits hours)

- Chemistry Electives 6
- Islamic and Arabic Studies 2
- Free Electives 12

(d) Summer Training (CHEM 399, 2 credit hours)

(e) Total Requirement (124 credit hours)

The total requirements for the B.S. degree in Chemistry is 124 semester credit hours.

Old Chemists Never Die- They Just Reach Equilibrium