

# PHYSICAL SCIENCES

## CHEMISTRY

### What is Chemistry

Chemistry is the study of matter and energy and the interactions between them

The world we live in is hardly imaginable without the contributions of chemists. The manufacturer of most of the articles that we use every day (clothes, plastics, computers, cars, construction materials), the synthesis of medicines, production of foods, fuels and cosmetics, the purification of water, detection and mopping up of environmental contamination, all of these and many more, depend heavily on ongoing chemical research work.

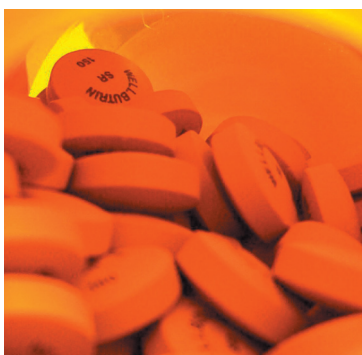
Broadly speaking, chemistry can be defined as the study of matter, either natural or man-made. Chemists are interested to know which elements occur in materials (their composition), how materials are put together (their structure), how materials are turned into a different kind of matter (their reactions), and the energy accompanying such changes. It is only when these questions have been properly answered that chemists are able to apply their knowledge to the synthesis of new materials, which may further enhance the quality of life.

### Career opportunities

- Agricultural Chemistry
- Analytical Chemistry
- Biochemistry
- Biotechnology
- Catalysis
- Chemical Education
- Chemical Engineering
- Chemical Information Specialists
- Chemical Sales
- Chemical Technology
- Colloid and Surface Chemistry
- Consulting
- Consumer Product Chemistry
- Environmental Chemistry
- Food and Flavor Chemistry
- Forensic Chemistry
- Geochemistry
- Hazardous Waste Management
- Inorganic Chemistry
- Materials Science



- Medicinal Chemistry
- Organic Chemistry
- Oil and Petroleum
- Physical Chemistry
- Polymer Chemistry
- Pulp and Paper Chemistry
- R&D Management
- Science Writing
- Textile Chemistry
- Water Chemistry



### Organic Chemistry

Organic chemists study the reactions of carbon compounds and the production of new compounds.

### Inorganic Chemistry

Inorganic chemists study the reactions of compounds not formed by carbon.

### Physical Chemistry

Physical chemists investigate the fundamental aspects of chemical reactions.



### Analytical Chemistry

Analytical chemists determine which substances are present in a sample and in what quantities. They also develop new methods of analysis.

### Theoretical Chemistry

Theoretical chemists attempt to refine existing theories and develop new theories.



### Biochemistry

Biochemists study the chemical reactions in living materials.

### Industrial Chemistry

Industrial chemists apply their chemical knowledge to the manufacturing of essential products in everyday life.



### What subjects should be taken at school

Mathematics, Biology and Physical Science

Chemical technologists and technicians assist chemists in all the above fields. Chemists are involved in a wide range of activities. Their work includes research and the development of new products and processes.

# PHYSICAL SCIENCES

## PHYSICS

The most basic of all the sciences is physics. It has often been said that the whole of engineering is only applied physics and, in jest, “*all good chemistry is physics*”.

Many of the basic principles of physics have been understood for such a long time that some people tend to forget that they are actually part of physics. As the world has become more specialised, physics has tended to pass on the applications of some of its integral parts to other disciplines and hence it has become more and more specialised. The latest areas which physicists tend to study include nuclear and elementary particle physics, lasers and their applications and the nanotechnological world.

Nanotechnology refers to the materials, structures and machines made on a scale where the unit is a nanometer – one thousand millionth of a metre. In laser technology the lasers now deliver their energy in pulses that last only a femtosecond (one thousand millionth of a second).

Eventually the world will probably have to look at the latest type of nuclear power stations when our fossil fuels have been used up (probably within the lifespan of learners that are at school today).

### What does the work involve?

Physicists study the structure and behaviour of individual atoms and their components, the different forces of nature and their relationships, the physical properties of matter and also phenomena such as electricity and magnetism.

Like a detective they assemble all the clues and then construct a theory when the facts become available. These theories are re-examined when new facts emerge and are improved if the predictions were incorrect. In this way progress is achieved to a better in sight into nature’s secrets.

Physicists usually specialise in theoretical or experimental physics. Experimental physicists supply the fundamental data on which physics is founded.

They spend a lot of time in the laboratory where new phenomena are examined through systematic, exact measurement and experiments are performed to test existing theories.



### What is Physics

Physics has many sub-fields which include:

- Applied Physics
- Astronomy and Astrophysics
- Bio, medical & health physics
- Computational Physics
- Cosmology
- Electromagnetism
- Environmental Physics
- Fluid Mechanics
- Geophysics
- Mechanics
- Meteorology
- Nuclear, particle and radiation physics
- Plasma and Space Physics
- Spectroscopy

### Employment opportunities

- Lecturing
- Research
- Process Management
- Project Management,
- Patent Law
- Policy research and development
- Synthesis

### What subjects should be taken:

Mathematics and Physical Science

## NUCLEAR ENGINEERING

### What is Nuclear Engineering

It is the field of physics that studies the building blocks and interactions of atomic nuclei. The most commonly known applications of nuclear physics are nuclear power and nuclear weapons, but the research has provided wider applications, including those in medicine (nuclear medicine, magnetic resonance imaging),

Masters Degree in Nuclear Energy (MSONE) materials engineering (ion implantation) and archeology (radio-carbon dating) .

### Career opportunities

- Nuclear medicine physicists
- Nuclear engineer
- Nuclear physicists
- Health (Radiation) Physicist
- Nuclear physicists

### What subjects should be taken:

Mathematics and Physical Science

### Further studies:

Masters Degree in Nuclear Energy