Chemistry: All About You

Module 1. Background information

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Since time immemorial chemistry has been part and parcel of our lives. It has been called "The science of what things are" or "The central science" because it connects physics with other natural sciences such as astronomy, geology and biology. It has neither a beginning nor an end as it has been present ever since the creation of the universe.

"*The science of chemistry is the study of matter and the chemical changes that matter undergoes. Research in chemistry not only answers basic questions about nature but also affects people's lives. Chemistry has been used, for example, to make stronger metals, to enrich soil for growing crops, to destroy harmful bacteria, and to measure levels of pollution in the environment. It has also made possible the development of such new substances as plastics, fibres, and new medicines*".[1]

Chemistry today stands on the verge of a new era. A century ago, chemistry was barely beginning to find its way to large scale solutions for human well-being. But now, chemistry must take on a much crucial role than ever before, for the whole world relies on new discoveries and solutions for the most challenging problems human society is facing.

It is essential to so many of our global concerns: water, food, energy, the environment and health – to name but a few, for there are so many fields that need attention in order to maintain a normal, comfortable life. Yet to meet these complex and truly global challenges, we must not only build upon what we have learned in the past, but we also endeavour to reinvent chemistry for the future.

Chemistry applications are present in many areas and have a great impact on the way we live. Here are a number of examples of contributions by chemical science to society:

- Chemistry is the key to an abundant supply of **food**. Fertilizers promote crop growth and help replenish the soil. New forms of crop protection not only fend off pests and plant diseases, but also allow crops to achieve higher yields. Plastic pipes make irrigation easier to install. This means more people have access to nutritious fruit and vegetables.
- In the field of **medicine**, more and more people are being treated thanks to many discoveries made in the last century, for example the first sulphamide (sulphuricdiamide) drug. Then, the number and type of drugs started to range from antibiotics and analgesics to antipyretics and antitumorals. Cures and remedies for many diseases have been found and we can say that life expectancy has improved significantly thanks to the discoveries of chemistry.

[1] *Britannica Online for Kids*, article "chemistry", http://kids.britannica.com/comptons/article-9273618/chemistry. Accessed 22.08.2011.

- Modern materials used for **textiles** are made of a mix of natural and artificial (synthetic) textile fibres with more practical use, that last longer and are easy to wash; specialists have replaced natural fibres (cotton, wool), with synthetic ones (acryl, polyester and viscose).
- **Cosmetic products**, **shampoo** and **soap** (composition, methods to obtain them), all these are the result of chemists' work and investigations. Have you ever wondered what toothpaste would look like if it did not have its composition and properties of being soluble and stable in water?
- Food **packaging** is made of polystyrene and polyolefins. The thickness of packaging has decreased by 30% in the last 10 years, which means less material used, more freshness and durability of food, and so more security when thinking about what you are eating.
- The low density polystyrene and polyolefins used in various **packaging** applications have enabled the industry to decrease energy consumption and reduce the carbon dioxide emissions associated with power generation (which add to the greenhouse effect).
- Your door is made of melamine – a material with a great resistance to scratches, and easy to clean; your chairs are made of acrilonitrile-butadien-styrene (ABS), with a vinyl cushion.
- Polypropylene is used as a **fibre** to make carpets, rugs, ropes, even sport clothes. A carpet made of acrylic fibres is more resistant to dirt.
- Most of the pigments used in **painting** processes are produced by synthesis, are varied in colour, and have a great resistance to external agents such as light, humidity and washing. Paints are a combination of four main classes of chemicals: resins, pigments, solvents and additives.

General technology has advanced enormously thanks to inventions such as vulcanised rubber, nylon, Kevlar and aluminium production. Materials which can be processed to form products are provided by the chemical industries. Today the major role of chemistry in technological advance also lies in new materials research, the study of electrochemical processes such as corrosion, finding cheaper production processes for materials, etc. If you look closely around you, every human-made object you can see takes advantage of some prior chemical research.

These are just a few examples of how chemistry rules our lives and modern society. Indeed, it can be said that without it, nothing would really exist. Chemistry is the essence that gives us substance. Everything around us is the result of chemical processes, not only matter, but also thoughts, feeling, emotions. We live because of chemistry and chemistry lives through us.