

## ROLE OF CHEMISTRY IN EVERYDAY LIFE AND SOME ENGINEERING STREAMS

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### ABSTRACT

We all are made of chemicals and everything around us is made of chemicals. Everything we hear, see, smell, taste, and touch involve chemistry and chemicals (matter). Hearing, seeing, tasting, and touching all involve intricate series of chemical reactions and interactions in our body. Many of the changes we observe in the world around are caused by chemical reactions. Chemistry is not limited to beakers and laboratories. It is all around us, and the better we know chemistry, the better we know our world. Chemistry is present in every aspect of life. Syllabus of Chemistry in engineering stream extend the knowledge acquired at Jr. College level. The subject is offered as 'Engineering Chemistry' for the students in their first year of engineering and it is common for all branches of engineering. Engineering Chemistry forms a bridge between basic sciences and engineering subjects. Engineering branches need the basics of Chemistry directly or indirectly.

**KEYWORDS:** nano-tubes (CNT), wavelength, Oxytocin, Adenosine, Carotenoids, Hydrophobic, Simulation.

### INTRODUCTION

We all are made of chemicals and everything around us is made of chemicals. Everything we hear, see, smell, taste, and touch involve chemistry and chemicals (matter). Hearing, seeing, tasting, and touching all involve intricate series of chemical reactions and interactions in our body. Many of the changes we observe in the world around are caused by chemical reactions. Chemistry is not limited to beakers and laboratories. It is all around us, and the better we know chemistry, the better we know our world. Chemistry is present in every aspect of life.

Chemistry is the branch of science which deals with the study of composition and properties of matter. Chemistry plays an important role in engineering. Mathematics, Physics and Chemistry are the basic sciences learnt by a student in school and at Jr. College level. Engineering students must have basic understanding of these subjects.

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Chemistry in daily life examples are

#### 1. Sky is Blue

An object is colored because of the light that it reflects. The white light from the sun contains all the wavelengths, but when it impacts on an object some of its wavelengths are absorbed and some reflected. The

blue color of the sky can be explained considering phenomena named Rayleigh scattering that consists of the scattering of light by particles much smaller than its wavelength. This effect is especially strong when light passes through gases.



#### 2. Ice Float on Water

Ice is less dense than liquid water. The heavier water displaces the lighter ice, so ice floats on top.



#### 3. How Sunscreen Works?

Sunscreen combines organic and inorganic chemicals to filter the light from the sun so that less of it reaches the deeper layers of your skin. The reflective particles in sunscreen usually consist of Zinc oxide or titanium oxide.



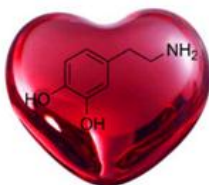
#### 4. Meals are cooked faster in a Pressure Cooker

A pressure cooker has a more elaborated lid that seals the pot completely. When we heat water it boils and the steam cannot escape, so it remains inside and starts to build up the pressure. Under pressure, cooking temperatures raise much higher than under normal conditions, hence the food is cooked much faster.



#### 5. Chemistry of Love

The role of chemistry is at the bottom of every step in a relationship. When we fall in love, our brain suffers some changes and also certain chemical compounds are released. Love is driven by these hormones oxytocin, vasopressin, endorphins.



#### 6. Coffee keeps us awake

Coffee keeps us awake because of the presence of a chemical called adenosine, in your brain. It binds to certain receptors and slows the nerve cell activity when sleep is signaled.



#### 7. Vegetable is colored

Many vegetables and fruits are strongly colored because they contain a special kind of chemical compound named carotenoids. These compounds have an area called chromophore, which absorbs and gives off particular wavelengths of light, generating the color that we then perceive.



#### 8. How Soap Cleans?

Soap is formed by molecules with a 'head' which likes water (hydrophilic) and a long chain that hates it (hydrophobic). Then when soap is added to the water, the long hydrophobic chains of its molecules join the oil

particles, while the hydrophilic heads go into the water. An emulsion of oil in water is then formed, this means that the oil particles become suspended in the water and are liberated from the cloth. With the rinsing, the emulsion is taken away.



#### 9. We cry while cutting onions

Onions make you cry due to the presence of sulfur in the cells which break after the onions are cut. This sulfur gets mixed with moisture and thus irritates your eyes.



#### Application of 'Engineering Chemistry' for various streams of Engineering.

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#### ELECTRICAL ENGINEERING & ELECTRONICS AND TELECOMMUNICATION ENGINEERING

##### 1. To select proper material for fabrication of electronic devices

Electronics is nothing but a control or influence on electrons. One must know how to manipulate an electron. For that knowledge of chemistry is necessary with reference to elements, its properties, valency electrons etc. Engineering Chemistry helps ECE and EE students in all aspects. It helps to understand what happening in conductor, semi-conductor and insulator. For the fabrication of electronic devices, knowledge of chemistry helps to choose the material for it. i.e. for manipulation of electrons.

##### 2. To design Electronic chips

Electronic chips are very important for an electronic device, selection of materials for making a chip is based on chemistry of that materials. Nanotechnology is emerging technology by which nano-tubes (CNT) are used for electronic communication. These nano-tubes can be synthesized in bulk through chemical synthesis only.

##### 3. To prepare VLSI IC's and Bio-sensors

Chemical vapor deposition method is used for the fabrication of VLSI IC's where  $n^+$  electrons are induced into the silicon wafers, Electronic sensors and Bio-

sensors are available for various detecting or diagnosing purposes. To fabricate/ design a sensor or bio-sensor one must have knowledge of chemistry. Especially in bio-sensor, an electronic device receives signal only through the chemical reactions. For this purpose also chemistry is needed in engineering.

#### **4. Replacement of traditional silicon based materials by conducting polymers**

Now a day there is a great research on conducting polymers, which have several advantages and applications over traditional silicon based materials. To design or fabricate a device an electronics engineer must have fundamentals of chemistry then only he/she can select a right material for that particular purpose.

#### **5. Fabrication of LCD and LED**

Display systems are well developed, we have LCD and LED etc. In LCD i.e liquid crystal display, liquid crystals are nothing but organic molecules. To study LCD how it is working and how the properties can be enhanced, one must know the concepts of chemistry.

#### **6. To invent or discover a efficient material for the fabrication of solar cells**

Day to day consumption of electricity is being increased; accordingly, we should plan to meet the demands. From this view photo voltaic cells being developed to get the electricity in a conventional way. Many countries are concentrating on the production, fabrication of solar cells and their related material to get efficient and low cost solar panels. One should have knowledge of chemistry to invent or discover a efficient material for the fabrication of solar cells.

#### **7. To choose a material for a battery**

Batteries are widely use in various electronic devices all over the world. Now there is a great research on battery materials to increase the efficiency, the backup, reduction in weight, volume and its cost etc. Battery materials are mainly anode, cathode and electrolyte. To choose a material for a battery, basics of chemistry is mandatory.

Not only the above said points, but also many a number of applications in the field and research, engineering chemistry play a significant role in ECE & EE at present and in coming future.

### **➤ MECHANICAL ENGINEERING**

#### **1. To know material science**

The pillars of Mechanical engineering were made by the basic sciences and we can see the role of chemistry everywhere in mechanical engineering. A mechanical engineer must know material science that comprises of physics and chemistry, properties of metal and alloys, composition of alloys, its stability, reactivity etc that are related to chemistry. Without a fuel no machine or vehicle runs, the efficiency, quality and other properties of a fuel can be studied only by chemistry.

#### **2. To select proper fuel for engine**

In research of finding a new, suitable and efficient fuel, chemistry needs a lot. Even after production of exhausts or residues from the operation of an engine, chemistry is necessary to treat that and making it harmless to the environment. If a mechanical engineer chooses a fuel which is suitable for an engine, he/she has to think of its exhausts also, there their knowledge of chemistry helps a lot.

#### **3. To know the nature and properties of a lubricant**

Lubricants are necessary to reduce the friction between two metal surfaces when they are in contact with each other. A mechanical engineer must know the suitable lubricant for that purpose at their environment. To know the nature and properties of a lubricant knowledge of chemistry is necessary. Like that many of the things related to chemistry must be known by the mechanical engineer, which will be helpful to him/she at their student life, professional life and even in research.

### **COMPUTER SCIENCE AND ENGINEERING & INFORMATION TECHNOLOGY**

#### **1. To know fundamentals of chemistry**

Computers have found their entry into every field now-a-days and this computerization needs software that should be developed by a computer engineer. There are many a number of software being used in the field of chemistry either in research or in analysis. Software is required to interpret the data obtained from the experiments of research to get the output, it may be in the form of graphs or chemical structures etc. Field of chemistry is vast, in future there is a need of developing software packages that would be useful in the field of chemistry. If a software engineer has the fundamentals of chemistry, it is easy to him/her to develop software to the required task.

#### **2. To design and develop simulation software**

Some software packages are being developed for designing new molecules. Before going to do the practical work in chemistry, now we can guess or estimate the final result using simulation software. Simulation software helps to know the getting possibilities for the final result which reduces the time taken for the chemical process, reduces the waste of chemicals which also reduces the pollution etc. To design and develop simulation software, software professional must have the knowledge on chemistry. So there is a need of chemistry in engineering also for the CSE & IT Branches, it may not help for their core subjects, but it will be helpful to do their projects and also in their professional life. For the development of super computers, one must have knowledge on chemistry.

**CIVIL ENGINEERING****1. To manufacture a required ceramics or refractory for suitable purposes**

Like Mechanical engineering, ECE and EEE; Civil engineering also has a great significance of chemistry. It starts from the manufacture of cement, making of concrete, selection of material for reinforcement. Chemistry of setting and hardening of cement, decides the stability of it. To meet the challenges and requirements of civil engineer for a construction can be made on the basis of chemical reactions occurring in the materials incorporated. Now a day many a varieties of ceramics and refractories are available, to meet the manufacturing of a required ceramics or refractory for suitable purposes, one must have the knowledge of chemistry.

**2. To select a place or area for a construction**

To select a place or area for a construction, a civil engineer must analyses the nature and properties of the soil. Soil analysis must be done and to understand it knowledge of chemistry is must. Even water analysis has to be done at that area to understand the interactions between the construction and the surrounding which may be soil or water.

**3. To know and develop the upcoming technologies**

To know and develop the upcoming technologies in civil engineering in a better way, knowledge of chemistry will be great source of knowledge to a civil engineer. Thus, Engineering chemistry is significant not only for the above said braches but also to the other engineering branches like Automobile engineering, Petrochemical engineering, Agriculture engineering, Food technology, Ocean engineering etc.

**Every engineer must study the following topics from Chemistry as well as from Physics.**

Topics of Engineering Chemistry	Topics of Engineering Physics
Water Treatment and Analysis	Semiconductors
Corrosion & its Control	Laser
Engineering Materials (Cement, Lubricants, ceramics, refractories, Polymer etc.)	Magnetic field
Engineering Thermodynamics	Thin film interference
Metallurgy	Fiber optics
Environmental Chemistry	Fluid dynamics
Battery Technology	Material science

**ENVIRONMENTAL ISSUE**

Chemistry is at the heart of environmental issues. What makes one chemical a nutrient and another chemical a pollutant? How we can clean up the environment? What processes can produce the things our need without harming the environment? We're all chemists. We use chemicals every day and perform chemical reactions without thinking much about them. Chemistry is important because everything you do is chemistry! Even our body is made of chemicals. Chemical reactions occur when we breathe, eat, or just sit there reading. All matter is made of chemicals, so the importance of chemistry is that it's the study of everything.

**REFERENCE**

1. <http://chemistry.about.com/od/chemistry101/f/importanceofchemistry.htm> Chemistry is present in every aspect of life, and here we can see a few examples. There are articles about the chemistry of everyday life, and also a few about physics, as it's also present in our daily life
2. <http://www.novapdf.com>