The cosmetics and personal care products industry has a $60 billion market worldwide, and future growth is expected. In the US the market breaks down roughly into: hair care-20%, fragrances-20%, skin care-14%, makeup-17%, deodorants and skin and body lotions-10%, and oral care products-10%. Growth is expected in products targeting ethnic markets and working women.

**Cosmetic Industry $ 60 Billion Market World Wide**

This multibillion dollar industry relies on chemists (and others) to accomplish a multitude of key functions (see “Industry Overview”).


**Product Development**

*Product-development, or formulating, chemists* create products designed to meet specific consumer needs. These include cosmetics (hair- and skin-care products) as well as certain over-the-counter (OTC) drugs, such as toothpastes and antiperspirants. To accomplish this task, formulators identify raw materials with the desired functionalities and combine these materials in the proper ratios.
to yield an acceptable *finished product* that *performs as intended and remains stable*.

**Knowledge base:** Formulating chemists must have a solid knowledge of general chemistry, particularly surfactants and emulsification. They must also have a thorough appreciation of the specific chemistry and functionality of the thousands of cosmetic raw materials available. In addition, they often require a specialized knowledge of specific product types, such as aerosols, or drug categories, such as fluoride treatments.

Beyond basic cosmetic science, formulators must be aware of how marketing decisions, cost constraints, manufacturing conditions and aesthetic concerns, such as appearance and odor, can impact product development.

**Duties:** Research useful raw materials (reviewing trade literature and supplier information), create innovative formulations, prepare actual batches, and test them for functionality and stability.

**Professional backgrounds:** Formulators come from a variety of backgrounds. Some enter straight from college. Typically these folks hold a B.S. in chemistry. Some have degrees in biology or biochemistry. Only a few U.S. colleges offer specialized cosmetic programs (table 1).

**Table 1: Cosmetic Science programs in the U.S.**

<table>
<thead>
<tr>
<th>Program 1</th>
<th>Program 2</th>
<th>Program 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arnold and Marie Schwartz College, Pharmacy and Health Sciences, NY</td>
<td>The City College of New York, Dept. of Chemistry, NY</td>
<td>Fairleigh Dickinson University, NJ</td>
</tr>
<tr>
<td>Rutgers University, College of Pharmacy, NJ</td>
<td>St. John’s University, NY</td>
<td>Univ. of Cincinnati, College of Pharmacy, OH</td>
</tr>
<tr>
<td>Univ. of Missouri-Rolla, Dept. of Chemistry, MO</td>
<td>Univ. of Oklahoma, College of Pharmacy, OK</td>
<td>Univ. of Rhode Island, College of Pharmacy, RI</td>
</tr>
<tr>
<td>Univ. of Southern Mississippi, Dept. of Polymer Science, MS</td>
<td>Monell Chemical Senses Center, Univ. of Pennsylvania, PA</td>
<td>Univ. of Minnesota, College of Pharmacy, MN</td>
</tr>
<tr>
<td>Univ. of Southern California, School of Pharmacy, CA</td>
<td>Massachusetts College of Pharmacy, MA</td>
<td>University of Maryland, School of Pharmacy, MD</td>
</tr>
<tr>
<td>Univ. of South Florida, College of Pharmacy, FL</td>
<td>Univ. of Tennessee, College of Pharmacy, TN</td>
<td>-----------------------------</td>
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</tbody>
</table>
Table 2: Industry Overview: Companies that Comprise the Cosmetics Industry

**Raw material suppliers:** Cosmetic products are made up of ingredients supplied by raw material vendors. These vendors use various chemical and physical processes to convert feedstocks, such as petroleum distillates and natural oils, into materials useful in cosmetic products. The thousands of chemical suppliers in this industry make everything from salt to vitamins.

**Fragrance vendors:** A specialized subcategory of raw material suppliers are the vendors who design and manufacture the fragrances used in cosmetic products.

**Finished-goods marketers:** These companies make finished cosmetic products such as makeup, shampoo, deodorant, skin lotion and fragrance. They generate product ideas, create and test prototypes, and manufacture finished goods, which are ultimately sold to consumers via retail outlets, salons, wholesale clubs or some form of direct marketing.

**Contract manufacturers:** Many finished-goods marketers do not have the ability nor the desire to make all the products they want to sell. Instead, they use the services of contract manufacturers, who specialize in batching and filling finished products.

**Testing Laboratories:** For a variety of reasons, finished-goods manufacturers may choose to have their products tested by outside laboratories. For example, it may be easier to have an outside lab conduct skin-moisturization testing because the test protocol requires careful monitoring of human panelists. Similarly, it may be advantageous to have an outside lab run particle-size analysis because the equipment is expensive. Testing labs perform these and many other vital functions in the cosmetic industry.

*All of these companies employ a variety of chemists, biologists, engineers, and other professionals*

**Quality**

**QC/QA:** Quality control/quality assurance (QC/QA) chemists work for finished-product manufacturers, raw materials suppliers and contract manufacturers. They ensure that products meet specified company standards by evaluating incoming raw materials and outgoing finished products.
The duties of QC/QA chemists include sampling chemicals from storage containers and performing various analyses, such as for pH, viscosity, IR, solids and percent trace minerals. They can also check labels, calibrate and maintain instruments, and document batch histories.

Since QC/QA chemists are integral to the ongoing manufacturing process, it is critical that they perform their work on a timely, efficient basis to avoid costly production delays. To this end, they must have thorough knowledge and experience in performing tests used to analyze samples.

QC/QA chemists, typically trained as analytical chemists, come from different educational backgrounds with varying levels of experience. Because production lines run around the clock, this work often involves working in shifts.

**Analytical methods development:** Develop methods for QC/QA chemists use to test raw materials and finished products. Methods include: wet-chemical tests and instrumental analyses, titration, spectrophotometric analysis, HPLC, gas chromatography and NMR. Many of these chemists have advanced graduate degrees.

**Microbiology:** Microbiologists function like QC chemists in many ways. However, their focus is on whether materials are acceptably free from microbial contamination. They typically sample incoming chemicals and finished batches, then inoculate and conduct plate counts to establish bacteria count.

They also play an important role in formulation development. They often help select the optimal preservative system for a product. They are especially important when developing and testing products with proclaimed antimicrobial activity.

Microbiologists require detailed knowledge of the types of microorganisms that may infiltrate cosmetic products as well as conditions of manufacturing, storage and usage that may promote microorganism growth. They must also have a detailed knowledge of chemical preservatives and understand the effects raw materials have on preservatives. For example, nonionic surfactants can inactivate parabenoic acid derivative. Microbiologists typically hold degrees in biology, but they may also be chemists or biochemists.

**Process Engineering**

Chemists (or their engineering cousins, the chemical engineers) who specialize in process engineering solve problems encountered when “scaling up” – they process of transferring a formula from laboratory-sized batches to production-size quantities. Problems often occur during scale up due to drastic differences in the impact of the physical forces that are experienced in the laboratory vs. the manufacturing plant.
Process engineers understand how heat transfer and mixing conditions can impact the quality of finished goods. Their duties include working with chemists to understand the idiosyncrasies of specific formulations while keeping up with current technology of production equipment, such as mixers, pumps, and heating and cooling systems. Process engineers usually hold degrees in chemical or mechanical engineering.

**Regulatory**

**Claims support:** Another specialization is substantiating product performance claims. Claims appear on television and radio, and in package copy, print advertising and sales materials, such as brochures and pamphlets. Claims-support scientists must be familiar with the basic properties of cosmetic raw materials and skilled at interpreting claims language.

In addition, claims-support chemists must develop creative testing criteria. In some cases, preestablished test methodology may already be in place, such as standard “regression tests” which quantify skin moisturization. However, other areas are more subjective, such as evaluating shine on hair. Everyone has a preferred method; there is no one universally accepted way to substantiate such claims. For this reason, claims-support scientists must be knowledgeable of the many tests available.

**Safety/toxicology:** Many companies have specialists who deal with chemical safety or government regulations. For example, environmental specialists ensure that a company and its products comply with current environmental regulations.

Other regulatory chemists make sure that the company complies with employee health, safety rules, labeling requirements, etc. These scientists are increasingly important as more companies begin to operate globally and must be aware of the regulations in every country where they do business.

Regulatory scientists have degrees in various areas and, typically, a wide range of experience. Because rules and regulations are constantly changing, this job is quite dynamic.

**Ingredients Suppliers**

**Synthesis chemists:** Just as finished-goods manufacturers hire formulating chemists to create finished products, ingredient suppliers employ synthesis chemists to develop raw materials. These chemists derive chemical reactions that convert coconut oil, petroleum and other feedstocks into functional, salable raw materials.
Synthesis chemists must have a strong background in organic chemistry and be able to creatively develop novel reaction pathways to produce new raw materials. They should also have a general ideal of the properties a finished raw material will have and how they will be economically useful.

Synthesis chemists usually have advanced degrees in specialized areas of organic synthesis, such as esterification reactions or polymerization.

**Technical applications development:** Once raw materials are developed, the manufacturer must understand their properties to sell them effectively. To this end, many suppliers employ applications chemists that determine how finished-product manufacturers might use a raw material.

Essentially, the duties and background of this job are the same as of the product-development chemist, except that these chemists work for an ingredient supplier. Applications chemists may also work across several industries – personal care, detergents, paints and coatings and so forth.

**Technical Sales:** Raw-material suppliers frequently employ chemists on their sales teams because people with technical backgrounds are more likely to suggest meaningful applications. Generally, they communicate more effectively with formulating chemists and their internal technical support.

Technical salespeople perform the same type of tasks as other salespeople, such as meeting with clients, giving presentations and providing support to accounts. While a degree in chemistry or related field usually suffices, an MBA or marketing experience is often required as well.

**Perfumery**

Chemists who specialize in formulating fragrances are known as “perfumers.” Perfumers have a large palette of organic chemicals with which to formulate fragrances; some perfumes contain as many as 600 materials. Perfumers must have a thorough understanding of the potential interaction between fragrance raw materials and other ingredients to help formulators create finished products with appropriate fragrance characteristics.

In addition to the required technical skills, perfumers must have a highly developed sense of smell and the ability to commit smells to memory. Most fragrance vendors provide perfumers with extensive training programs to cultivate these specialized skills. Many perfumers are employed exclusively by fragrance vendors. However, many finished-goods companies employ fragrance coordinators to administrate the process of fragrance selection.
The cosmetic industry is an arena providing a wealth of jobs for scientists. All are critical to the success of product development, manufacturing, sales and, ultimately the company and the industry.

*The average salary of a chemist in the industry is $52,890; and for the biochemical engineers is $72,490.*

*Job growth will be concentrated in manufacturing and in scientific R&D services.*