

Beginning Cosmetic Chemistry

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Instructor:
Perry Romanowski

NYSCC Suppliers Day
Jacob Javits Center
New York, NY
April 30, 2024

NEW YORK Society of Cosmetic CHEMISTS SUPPLIERS' DAY

Welcome!

Beginning Cosmetic Chemistry

An SCC CEP Course

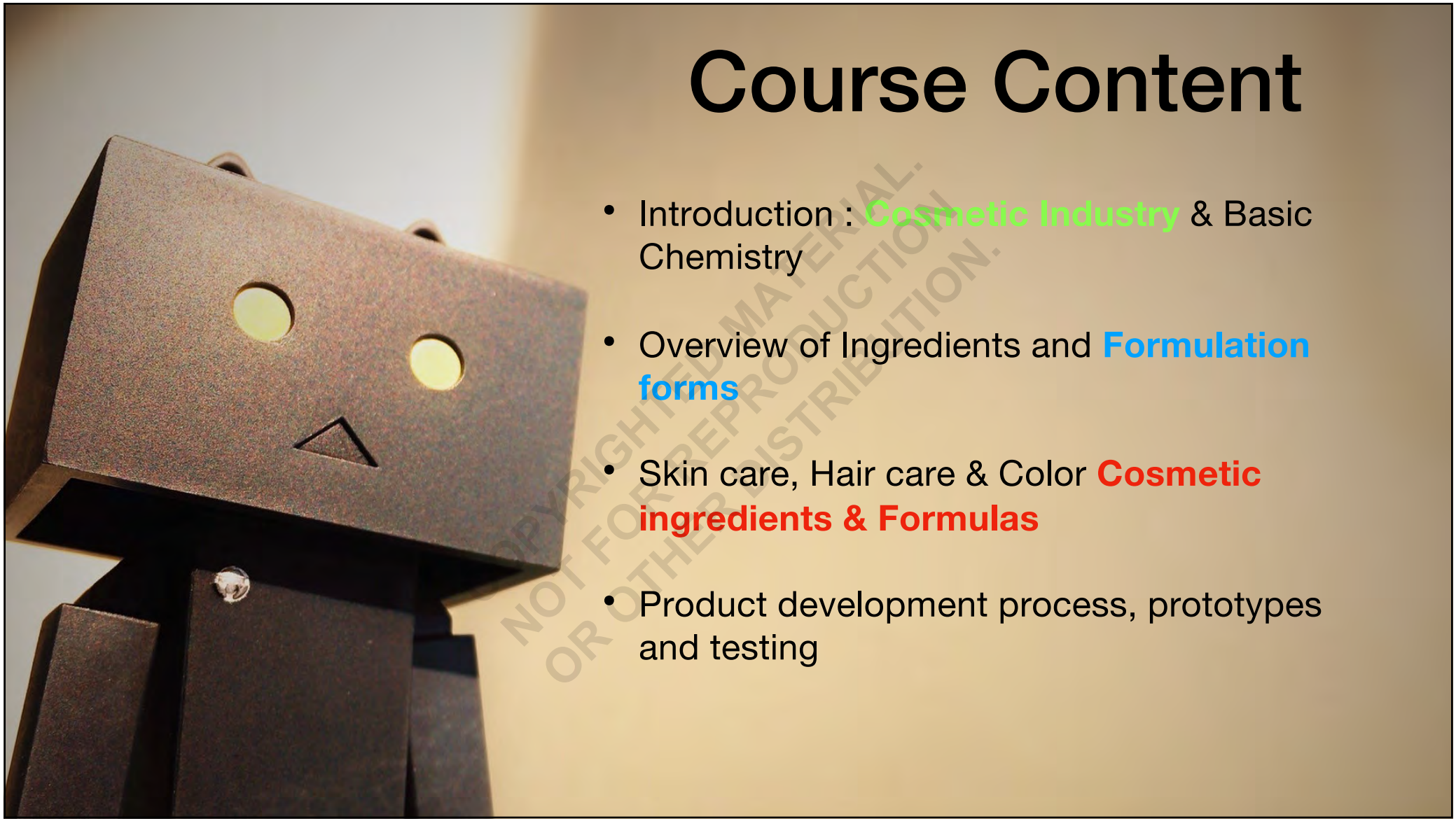


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Perry Romanowski
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Course Content

- Introduction : **Cosmetic Industry** & Basic Chemistry
- Overview of Ingredients and **Formulation forms**
- Skin care, Hair care & Color **Cosmetic ingredients & Formulas**
- Product development process, prototypes and testing

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Approximate Course Schedule

1.	Introduction to the cosmetic industry	9:00 - 9:30
2.	Product Development	9:30 - 10:30
3.	<Break>	10:30 - 10:45
4.	Ingredient naming & types	10:45 - 12:00
5.	Lunch	12:00 - 1:00
6.	Raw materials & their functions	1:00 - 2:30
7.	<Break>	2:30 - 2:45
8.	Prototyping and scale up	2:45 - 3:45
9.	Product claims & testing	3:45 - 4:30
10.	Q&A	4:30 - 5:00

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Course

- Slide presentation
- Quiz questions
- Q & A time



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After This Course You Will…

- Know the general cosmetic industry setup
- Be aware of the most important cosmetic ingredients
- Know how & why raw materials are used in formulas
- Understand the product development process
- Understand how claims & cosmetic products are tested
- Learn some tips for using AI to make your job easier

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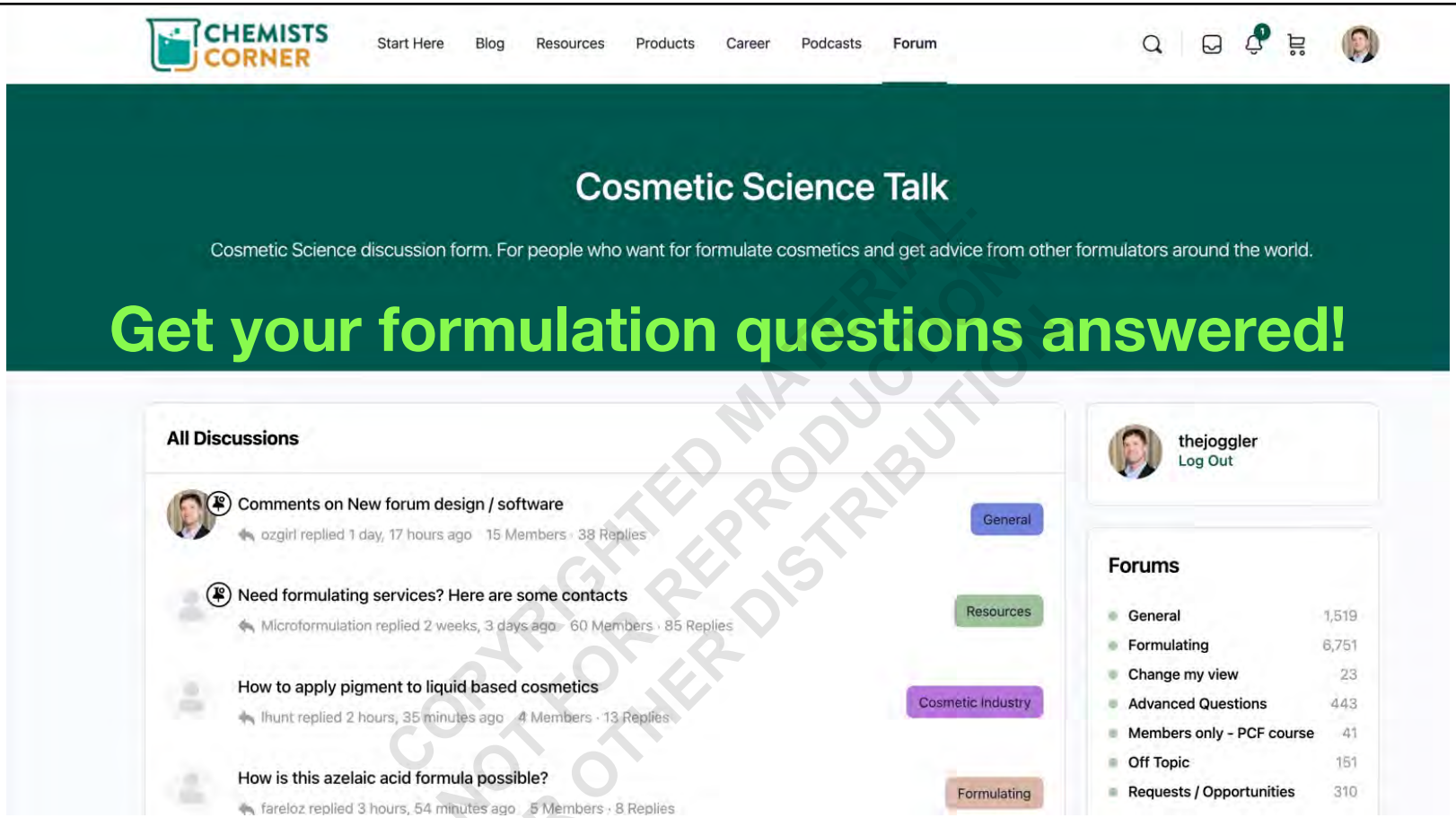
Perry Romanowski

- Chemistry degree DePaul University
  - Biochemistry
- 30+ years Cosmetic Scientist - Formulator
- Alberto Culver
- Past President SCC - 2018
- IFSCC Education Committee chair
- Current company
  - Element 44 Inc.



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https://chemistscorner.com

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http://thebeautybrains.com

The Beauty Brains

Real Cosmetic Chemists answer your beauty questions

HOME ABOUT EPISODES BLOG CONTACT SUBSCRIBE

Learn what is really real, in an industry full of fake

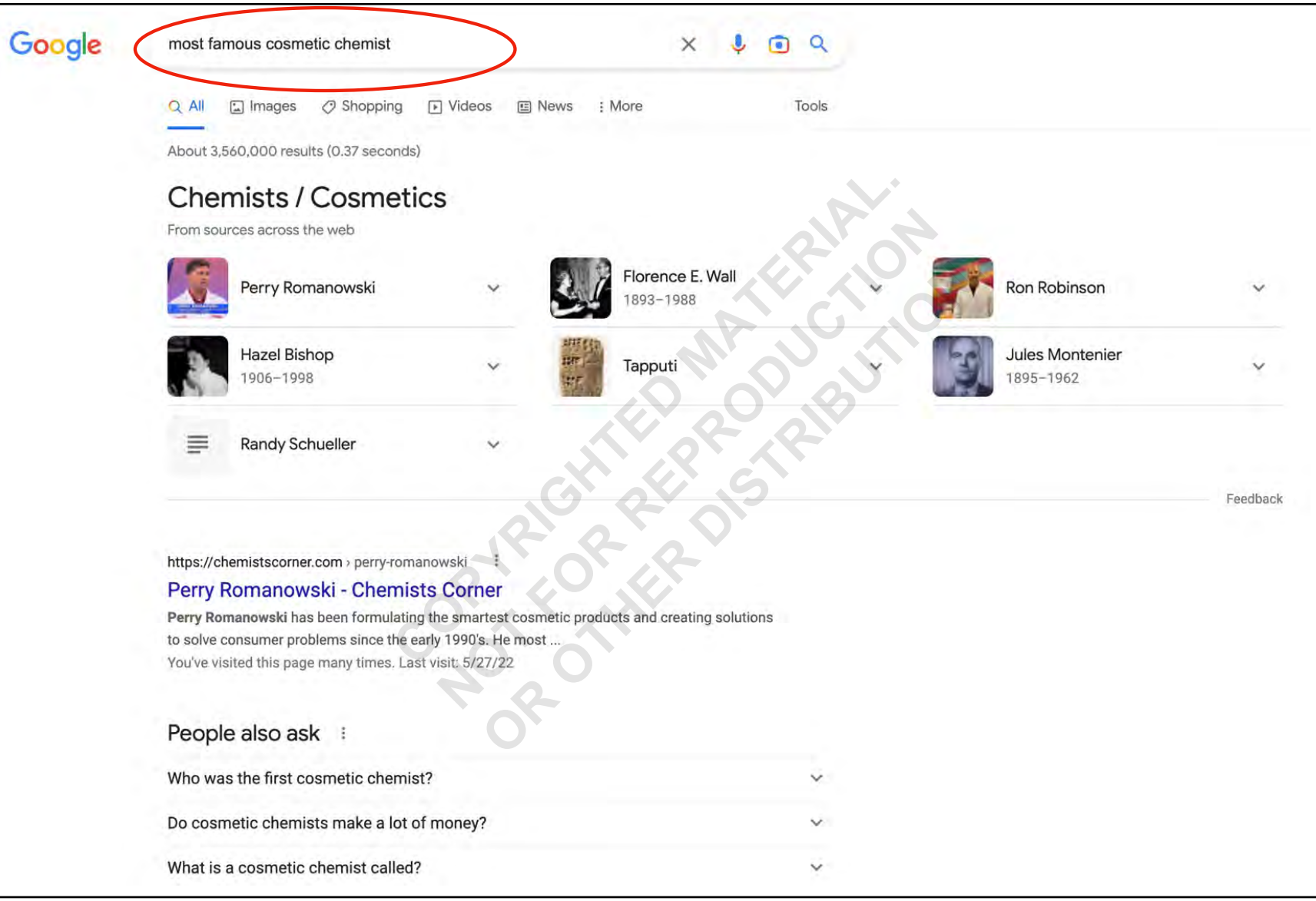






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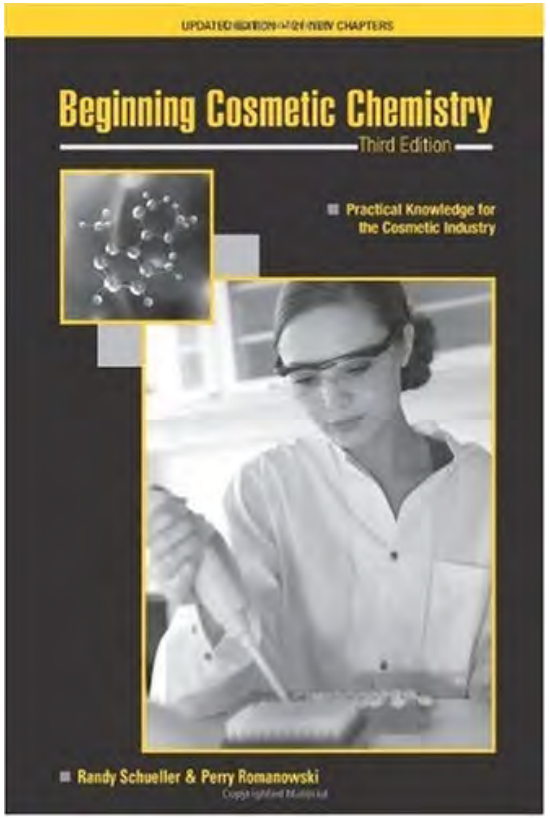












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Contact

Vice President Element 44 Inc.

Email: Perry@chemistscorner.com

LinkedIn: PerryRomanowski

Phone: 708-207-7642

Twitter: chemistscorner

Facebook



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My Mission



Educate



Inspire



Entertain

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What Do You
Want to
Learn?

Introduction to the Cosmetic Industry

- What are cosmetics?
- How are they regulated?
- Types of cosmetics
- Cosmetic industry

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Why Know This?

- Know the regulations to make safe / effective products
- To understand the products consumers use & you'll make
- Know the industry leaders and what they produce
- Learn how to communicate with people in the industry

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What are Cosmetics?



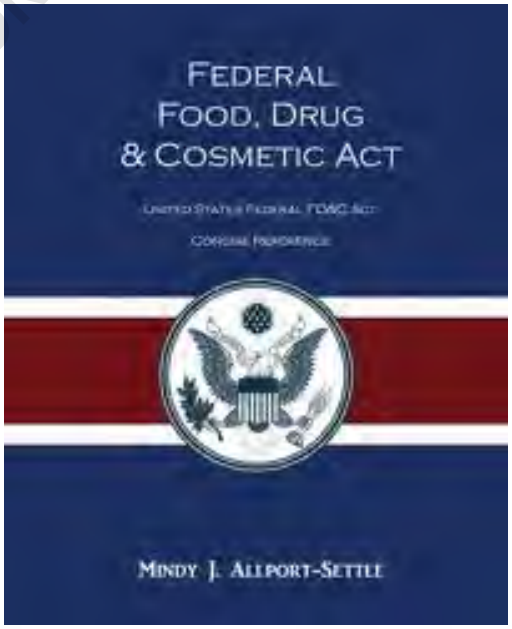
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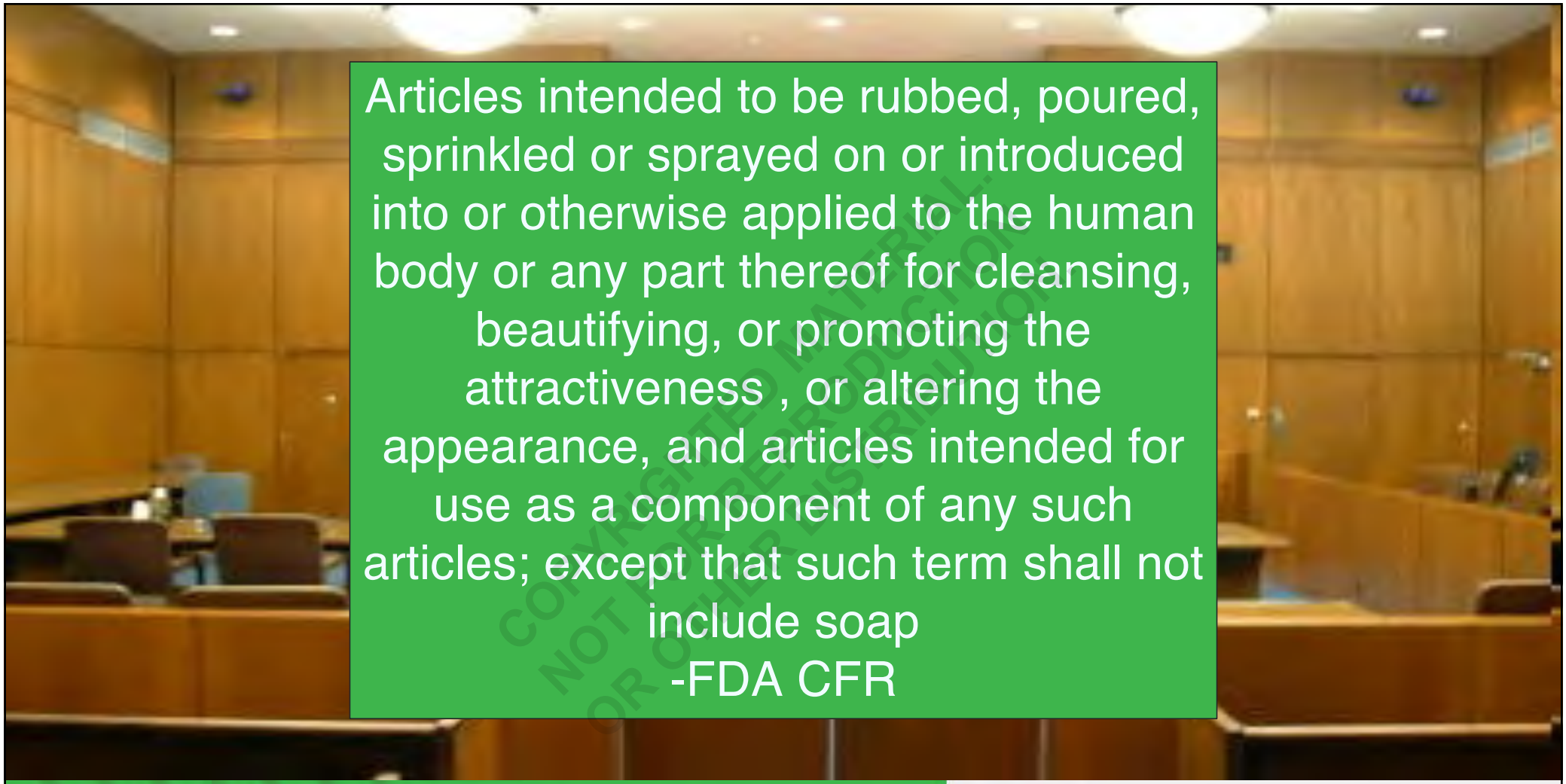
Regulating Cosmetics
FDA - 1938

http://www.fda.gov/Cosmetics



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"substances * or mixtures of substances intended to be placed in contact with the external parts of the human body (epidermis, hair system, nails, etc.) or with the teeth and the mucous membranes of the oral cavity with a view exclusively or mainly to cleaning them, perfuming them, changing their appearance, protecting them, keeping them in good condition or correcting body odours."

EC Council Directive No 1223/2009

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3 Uses of Cosmetics



Appearance



Attraction



Camouflage

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Categories of Cosmetics

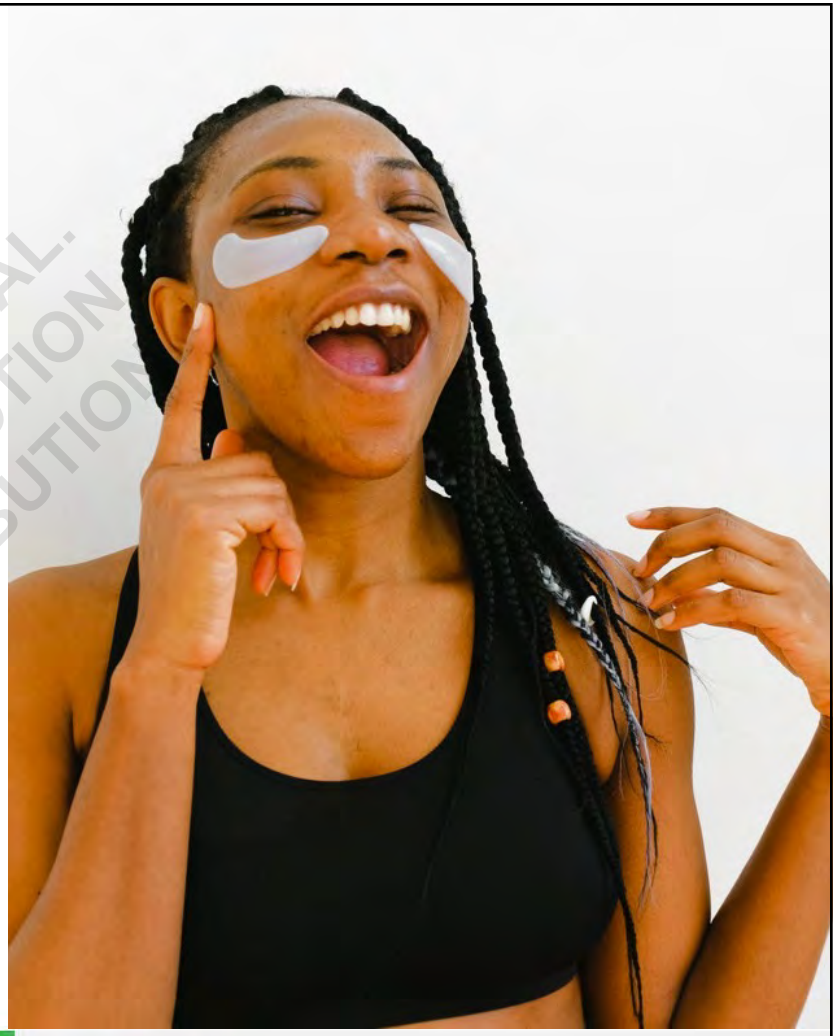
- Skin Care
- Hair Care
- Color Cosmetics
- Fine Fragrances
- Oral Products
- Personal Care Products



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Skin Products

- Moisturizers
- Cleansers / Body wash
- Toners
- Exfoliators
- Anti-aging creams
- Serums / treatments
- Skin lightening products
- Tanning creams



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Hair Products

- Shampoo
- Conditioner -
  - Rinse out / Leave in
- Styling products
- Conditioning Treatments
- Hair color
- Perms / Relaxers



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Color Cosmetics

- Foundation
- Lipstick, lipgloss
- Mascara
- Eye shadow, Eyeliner
- Blush
- Nail polish



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Perfume & Fragrances



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Oral / Personal Care Products

- Toothpaste
- Mouthwash
- Whitening strips
- Deodorant
- Depilatories



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Soap



Not a Cosmetic

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Health Supplements

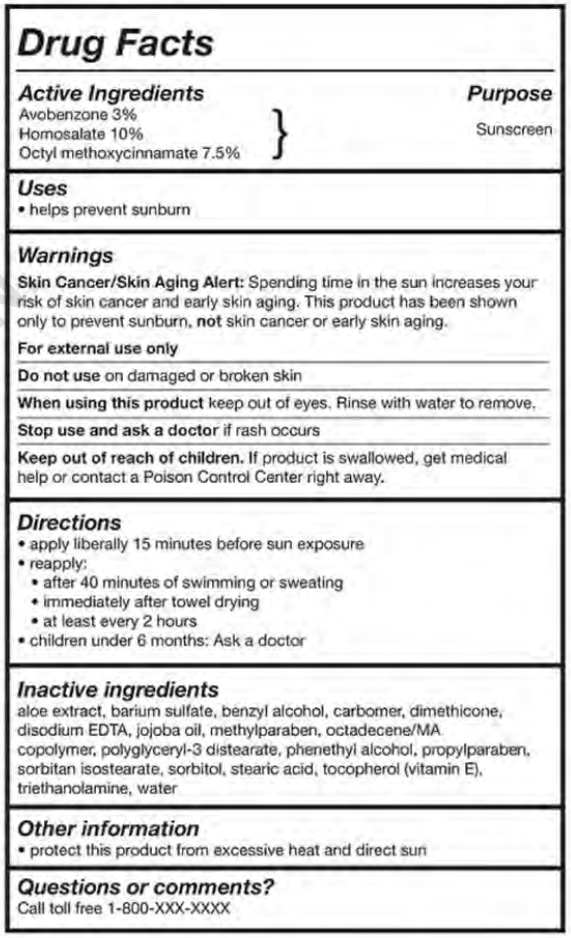


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Cosmetic-type products with FDA Monographs (OTC)

- Restricted Active Ingredients
- Restricted Claims



Drug Facts

Active Ingredients — **Purpose**
Avobenzone 3%
Homosalate 10%
Octyl methoxycinnamate 7.5% } Sunscreen

Uses
• helps prevent sunburn

Warnings
Skin Cancer/Skin Aging Alert: Spending time in the sun increases your risk of skin cancer and early skin aging. This product has been shown only to prevent sunburn, **not** skin cancer or early skin aging.

For external use only

Do not use on damaged or broken skin

When using this product keep out of eyes. Rinse with water to remove.

Stop use and ask a doctor if rash occurs

Keep out of reach of children. If product is swallowed, get medical help or contact a Poison Control Center right away.

Directions
• apply liberally 15 minutes before sun exposure
• reapply:
  • after 40 minutes of swimming or sweating
  • immediately after towel drying
  • at least every 2 hours
• children under 6 months: Ask a doctor

Inactive ingredients
aloe extract, barium sulfate, benzyl alcohol, carbomer, dimethicone, disodium EDTA, jojoba oil, methylparaben, octadecene/MA copolymer, polyglyceryl-3 distearate, phenethyl alcohol, propylparaben, sorbitan isostearate, sorbitol, stearic acid, tocopherol (vitamin E), triethanolamine, water

Other information
• protect this product from excessive heat and direct sun

Questions or comments?
Call toll free 1-800-XXX-XXXX

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What's the Difference?

Drugs

- Treat disease
- Improve condition

Cosmetics

- Improve appearance
- Improve surface feel

Cosmetics are not allowed to have drug effects
Can't change biochemistry or metabolism

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Cosmetic-type Products with FDA Monographs (OTC)

- Sunscreen
- Antiperspirant
- Skin lightening
- Psoriasis treatments
- Wart Removers
- Anti-acne products
- Toothpaste (with fluoride)
- Anti-microbial products
- Topical Analgesics



We won't be covering these in detail

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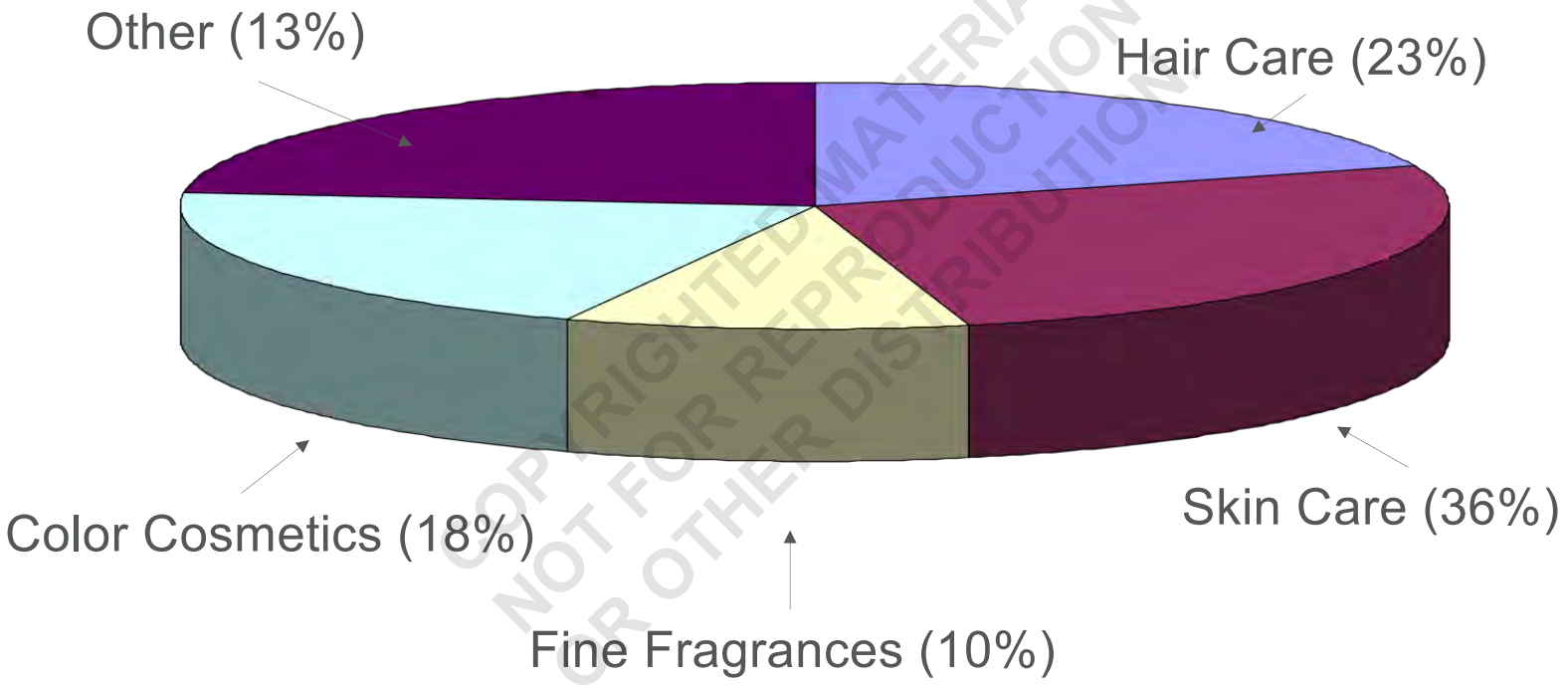
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Cosmetic Industry

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Current Market Distribution
Product Type



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The Cosmetic Industry is Big!

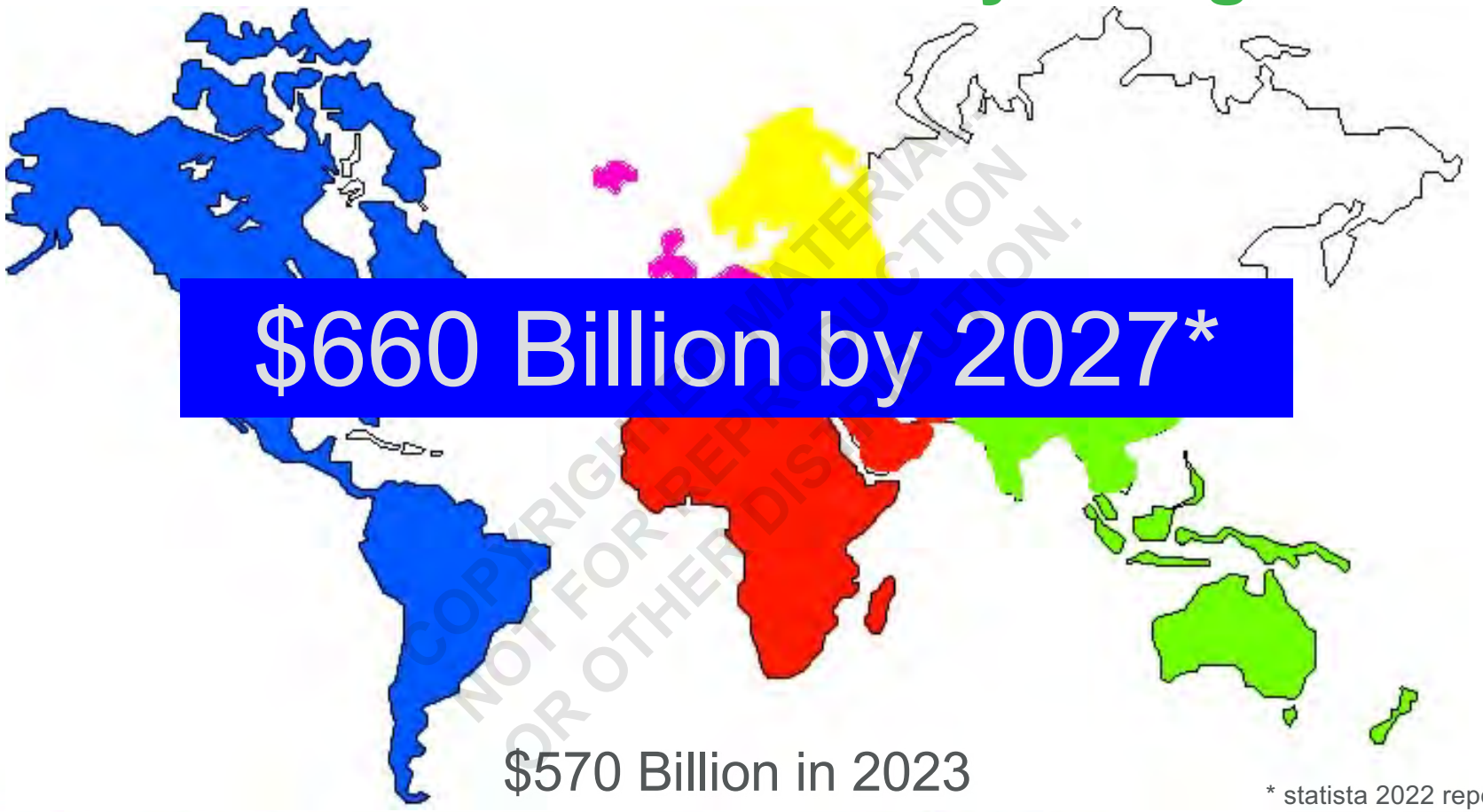


$570 Billion in 2023

* statista 2022 report

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The Cosmetic Industry is Big!



$660 Billion by 2027*

$570 Billion in 2023

* statista 2022 report

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Cosmetic Industry Organization



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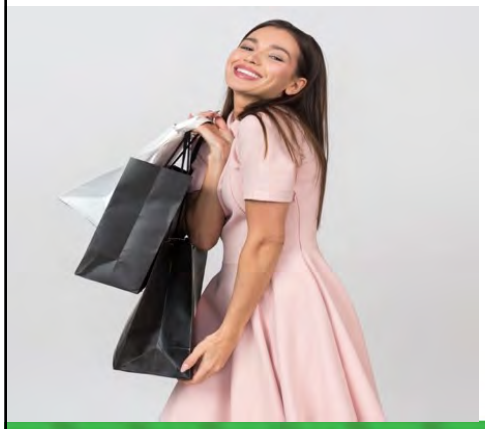
Cosmetic Industry

Testing Labs

Retailers

Finished Goods Manufacturer / Brand Marketer

Online sales



Supplier / Distributor

Contract Manufacturer / Private Labeler

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Retailers

- Places that sell products to consumers
- Customers to product manufacturers
- Food, drug, mass
- Walmart, Target
- Walgreens, CVS
- Grocery Stores
- Departments stores
- Online retailers
- Amazon.com



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Finished Goods Makers

- Companies that make cosmetics
- Industry leaders
- Customer to industry suppliers
- Come up with new products, set prices, marketing, advertising
- Company size depends on annual sales



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Top Cosmetic Companies 2022*



1.	L'Oréal	$37 billion
2.	Unilever	$25 billion
3.	Estée Lauder	$17.7 billion
4.	Procter & Gamble	$14.4 billion
5.	Shiseido	$ 9 billion
6.	Bath & Body Works	$ 7.9 billion
7.	J&J	$ 7.7 billion
8.	LVMH	$ 7.5 billion
9.	Natura & Co.	$ 7.1 billion
10.	Beiersdorf	$ 7 billion

* https://www.beautypackaging.com/heaps/view/10647/1/442155/

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Cosmetic Brands



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Cosmetic Brands

- Industry dominated by brands
- They spend the money on advertising
- Set innovation direction
- Appeal to mass market



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Contract Manufacturers

- Companies that make cosmetics for other companies
- Also make their own brands
- Employ formulators
- Some brands don't have their own manufacturing



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Suppliers

- Raw Materials
- Lab Supplies
- Equipment suppliers
- Packaging
- Innovation partner
- Examples - Suppliers Day!



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Testing Houses

- Independent places to test cosmetics
- Safety testing
- Consumer testing
- Claims testing
- Stability testing



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Who Makes it Happen?



Marketing



R&D



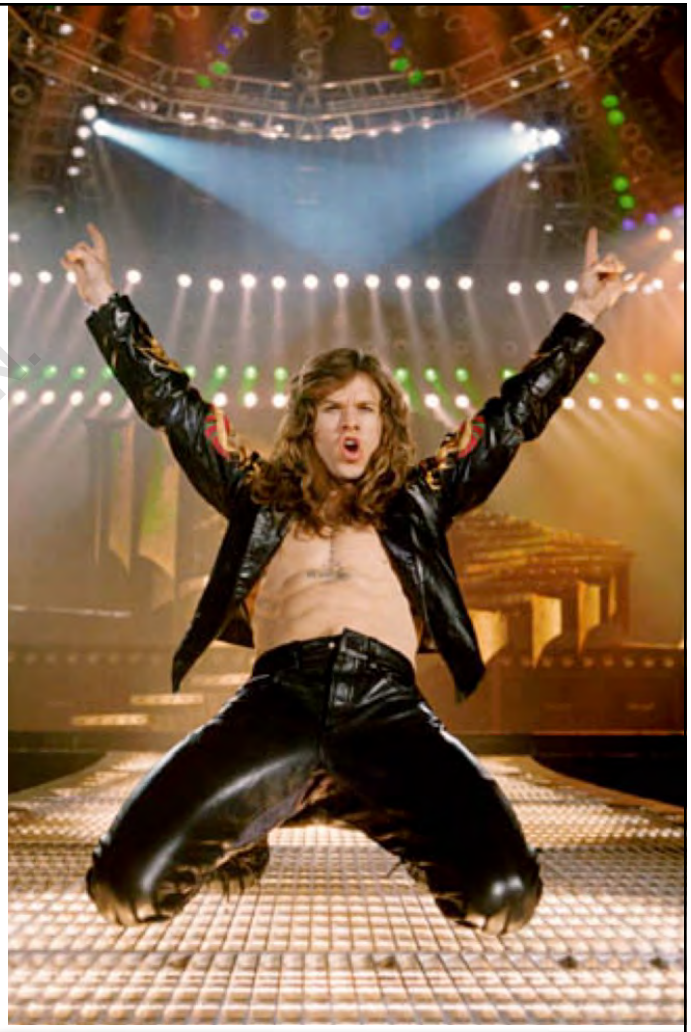
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Formulators

- Idea Generation
- Prototyping
- Scale-up
- Product testing
- Creating Claims
- Regulatory



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Modern Formulating is a little over 80 Years Old



More Art than Science



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Other Chemist Jobs

- **QA / QC** – Ensure quality of raw materials & finished goods
- **Microbiologists** – Ensure product safety
- **Analytical chemists** – Set specifications, troubleshooting
- **Process engineer** – Design facilities, assist in scale-up
- **Regulatory** – Ensure regulations are followed
- **Basic research** – Make useful new discoveries
- **Synthesis chemists** – Create new raw materials
- **Technical Services** – Educate formulators, troubleshoot
- **Sales** – Sell raw materials



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Official Cosmetic Regulatory Organizations

- US Regulatory agencies
- FDA – Food & Drug Administration
- FTC – Federal Trade Commission

- International Organizations
  - European Commission
  - Health Canada
  - Ministry of Health (Japan)
  - ASEAN – Asian countries
  - CFDA - China



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Cosmetic Regulations

- Rules vary by country
- Many follow US or EU guidelines
- Common Rule - Cosmetics must be safe
- No worldwide safety standard
- Rules are open to interpretation
- Know the regulatory agency in your market



- Rule 1 – It is illegal to sell unsafe products
- Rule 2 – It is illegal to promote false advertising

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Natural Cosmetics?



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“FDA has not defined the term “natural” and has not established a regulatory definition for this term in cosmetic labelling.
FDA also does not have regulations for the term "organic" for cosmetics. The U.S. Department of Agriculture (USDA) regulates the use of the term “organic” for agricultural products under the National Organic Program (NOP).”
-US FDA

The EU **does not have a harmonized definition of "natural"** for use in the personal care and cosmetics industry. Similar to the US, there are only general requirements that labels must be true and not misleading.

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Natural has no
legal definition but…
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Potential Legislation

- Natural Cosmetics Act - 2021/2022
- Establishes minimum 70% natural substances (other than water and salt)
- Defines natural or naturally-derived ingredients
- Prohibits some ingredient manufacturing methods
- Requires additional ingredient testing



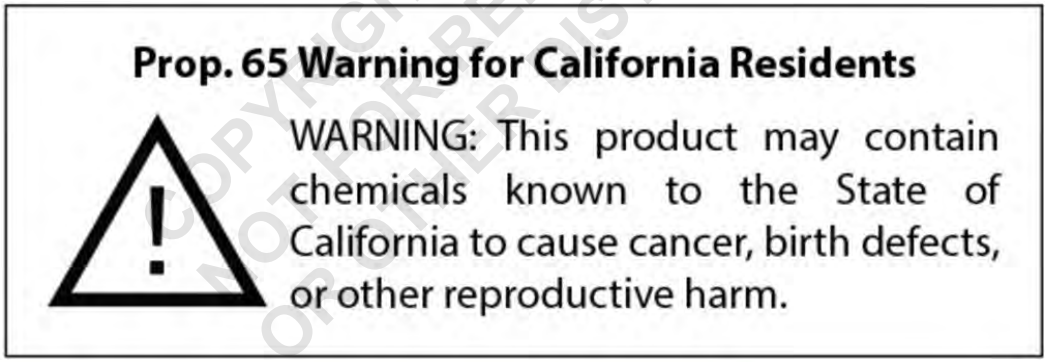
Unlikely to pass however

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Other Regulations

- Prop 65 in California
- CARB VOC regulations
- USDA Organic program
- Safe Cosmetic Act (pending)



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Non-governmental Regulators

- Personal Care Products Council – PCPC
  - Set standards in US
- Cosmetic Ingredient Review board - CIR
  - Safety testing of cosmetic ingredients
- Cosmetics Europe
  - Set standards in EU
- Scientific Committee on Consumer Safety - SCCS
  - Safety testing ingredients in EU
- International Fragrance Association - IFRA

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Other NGOs Affecting Cosmetics

- EWG
- Campaign for Safe cosmetics
- Greenpeace
- David Suzuki foundation
- Animal Liberation
- Leaping Bunny
- COSMOS / Ecocert



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Influencers

- Beauty Bloggers
- YouTubers
- Instagram
- Tik Tok



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Tik Tok Trends Challenge
Which is the fake?

- Shaving eyebrows & drawing better ones in
- Creating false bags under the eyes
- Curling hair with a radiator
- Super gluing mouth to create “duck face” lips

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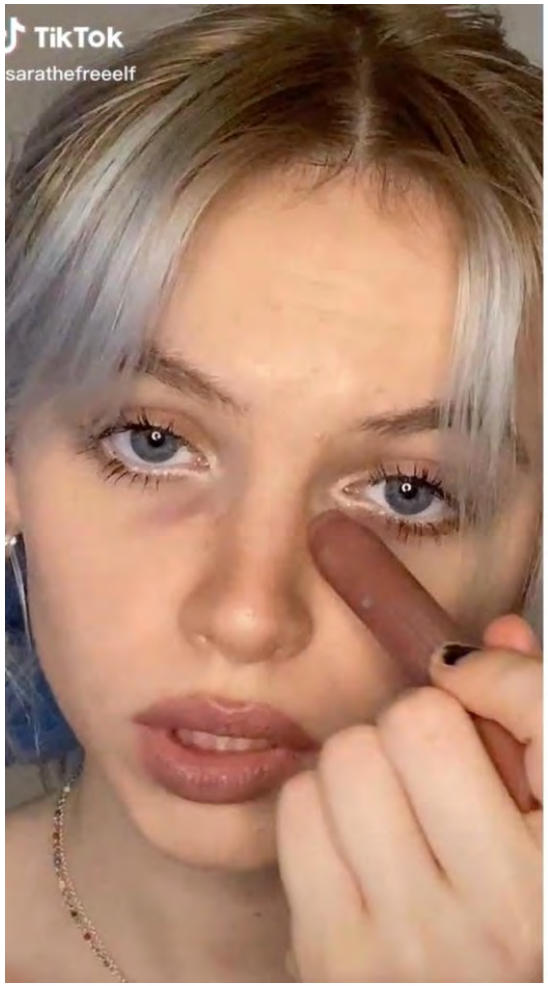
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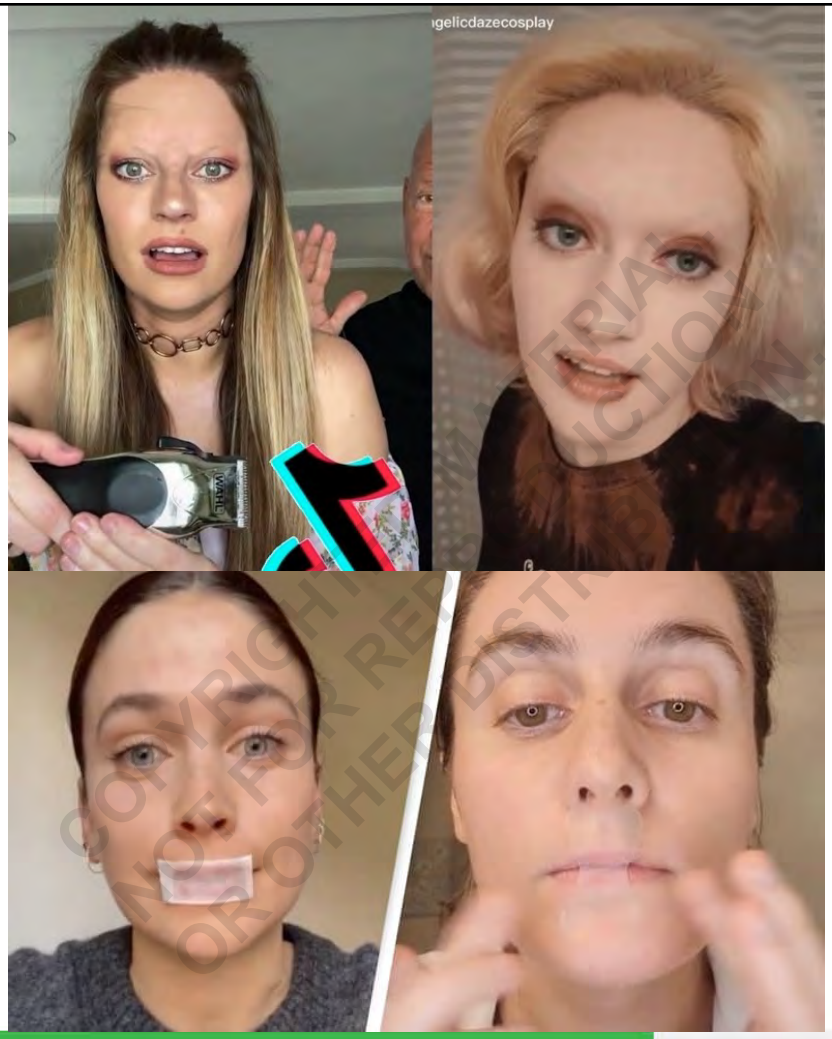
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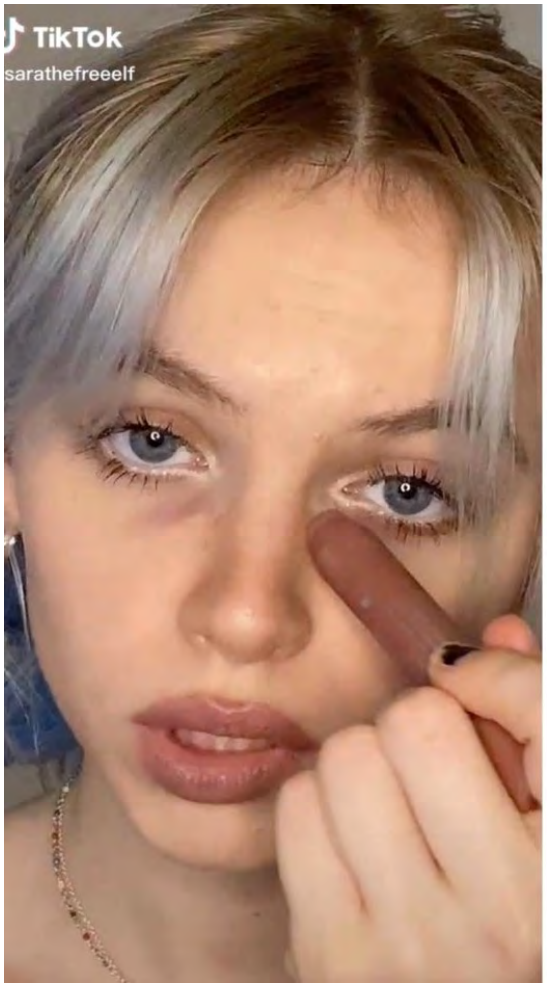


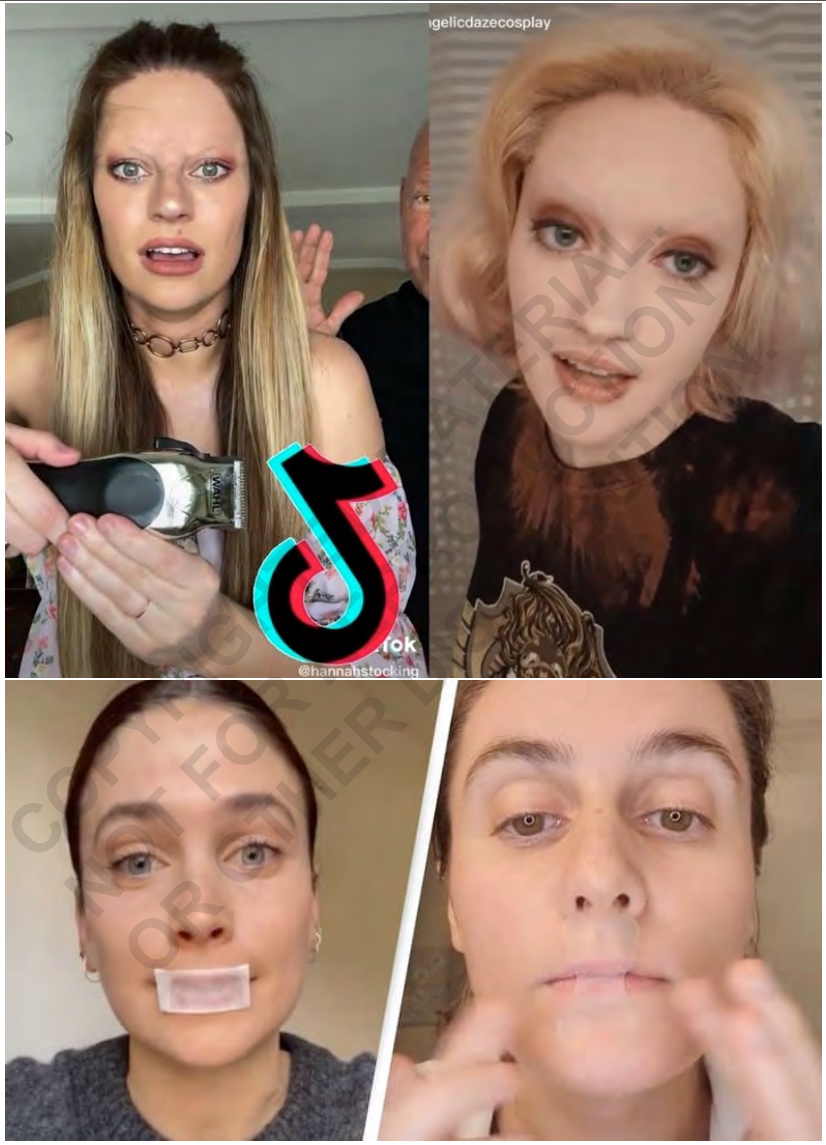




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Quiz #1

1. Which state in the US has the most restrictive cosmetic regulations?

A. California
B. New York
C. Minnesota
D. Hawaii

2. Which of the following would not be considered a cosmetic?

A. Volumizing Shampoo
B. Antiperspirant
C. Skin moisturizer
D. Mascara

3. Which is the most commonly sold beauty product?

A. Hair care
B. Color cosmetics
C. Skin care
D. Oral care

4. Which is the largest cosmetic company?

A. L'Oreal
B. Unilever
C. Shiseido
D. P&G

5. How big is the cosmetic industry (in sales)?

A. $57 billion
B. $60 billion
C. $570 billion
D. $660 billion

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Quiz #1 - Answers

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Section Summary

- Cosmetics defined & regulated by FDA and EU
- Personal care products = cosmetics
- Worldwide industry over $500 billion
- Brands / Marketers steer the industry
- NGOs & online personalities have an effect

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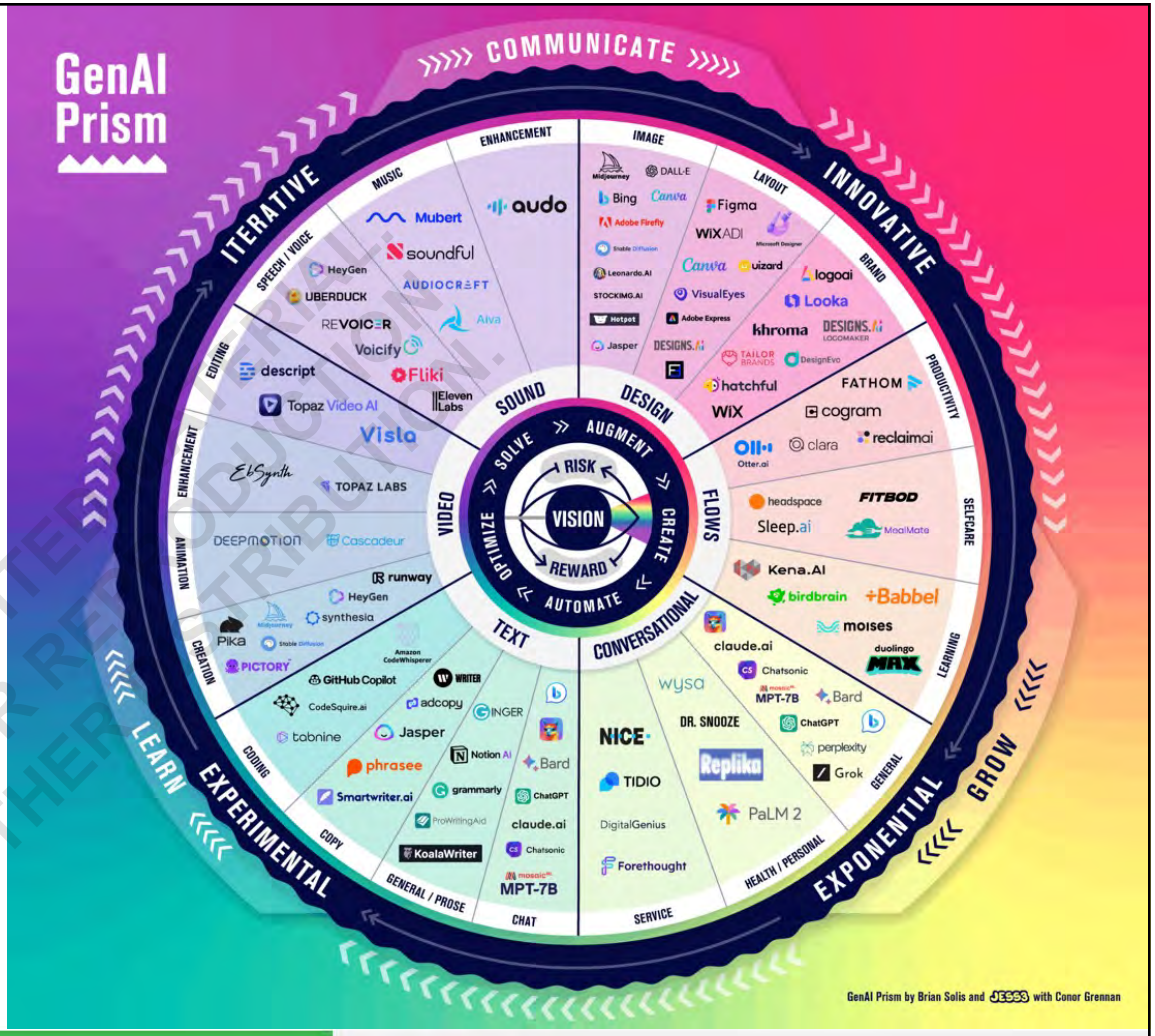


Computer Nerd since 1982

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World of Generative AI Tools

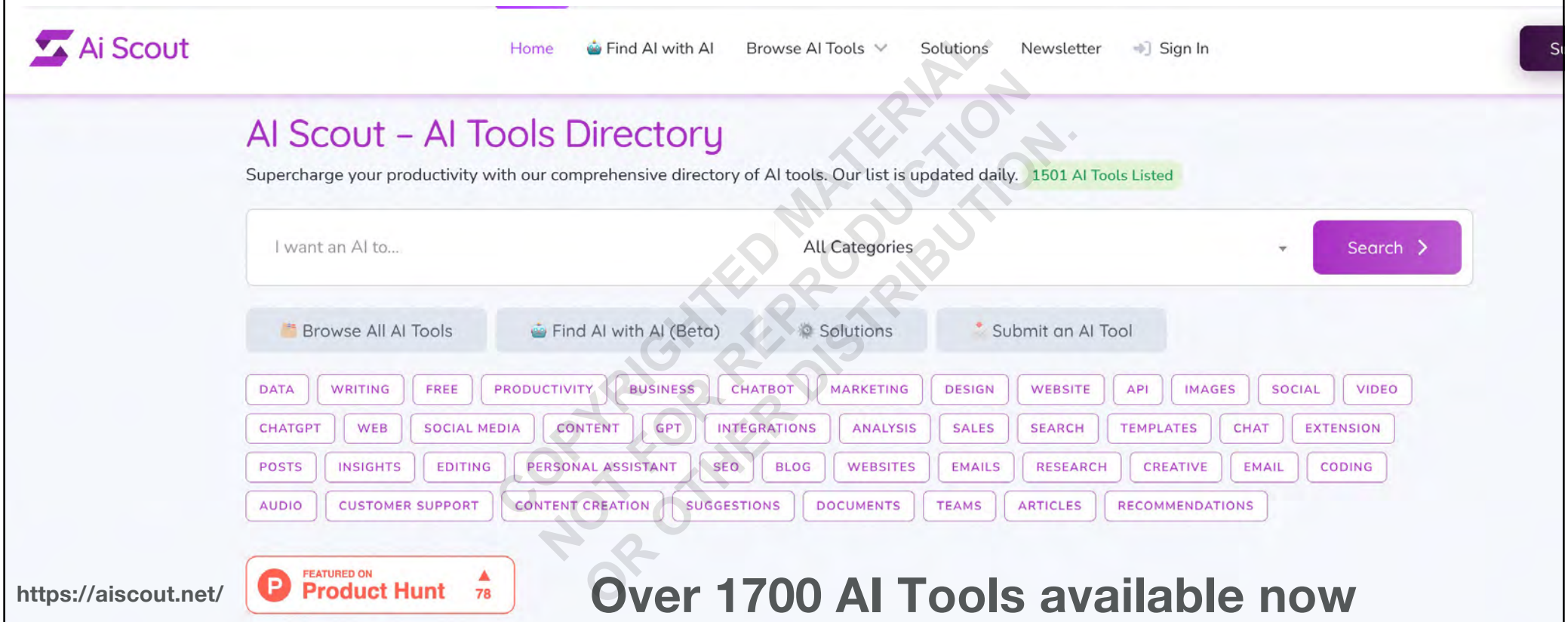
This list is out of date but it changes too quickly!



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AI Tools you can use now!



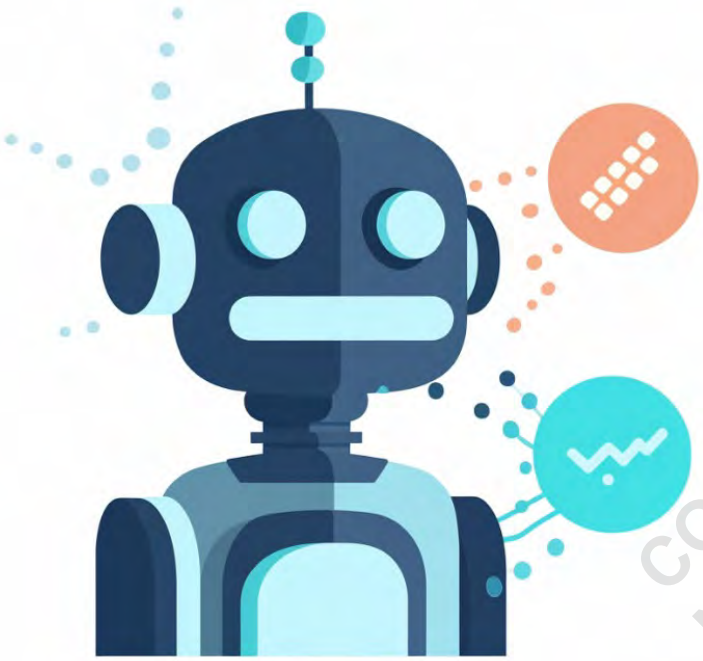
https://aiscout.net/

Over 1700 AI Tools available now

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Useful AI Tools for Cosmetic Chemists



- AI Chatbots
  - Best - ChatGPT, Claude2
  - Gemini, LaMDA
  - CoPilot (Bing chat)
- AI Image generators
  - Midjourney
  - Dall-E

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Common Cosmetic Chemist tasks where AI can help



- Creating starting formulas
- Learning about old/new technologies
- Keeping up with latest research
- Writing reports / articles
- Writing emails
- Analyzing data
- Generating new ideas
- How to do things
- Making presentations

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Want a free list of my favorite AI tools?

Send me an email - let me know you were in this course

perry@chemistscorner.com

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How do cosmetics get created?

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Traditional Way

- Have a great idea!
- Make your product
- Watch the money roll in



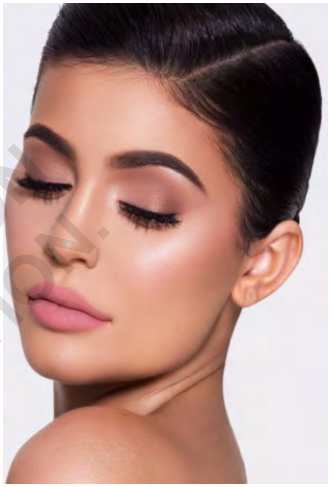


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Another Way it Works

- Create brand / personality
- Make your product
- Watch the money roll in



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Easier to start than ever - And lots of people do

- Online Resources
  - Distribution
  - Product Development
  - Testing
  - Suppliers
  - Marketing
  - Market research



amazon

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Of course, not everyone follows the rules



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Small Businesses & Homemade Cosmetics: Fact Sheet

Share | Tweet | Linkedin | Email | Print

The questions and answers below are based on questions we frequently receive from people who are new to the cosmetics business, and our responses to them. This information is intended to help you get started. We've also included links for learning more on each topic. Before you send a question to FDA, please check here. You may find the answer.

1. Does FDA regulate cosmetics?

2. How do I know if my products are regulated as cosmetics, and not as drugs or some other product category?

3. Do I need to have my cosmetic products or ingredients approved by FDA?

4. What do I need to know about using color additives in cosmetics?

5. Do I need to register my cosmetic firm or product formulations with FDA?

6. Can I manufacture cosmetics in my home or salon?

7. Can I label my cosmetics "natural" or "organic"?



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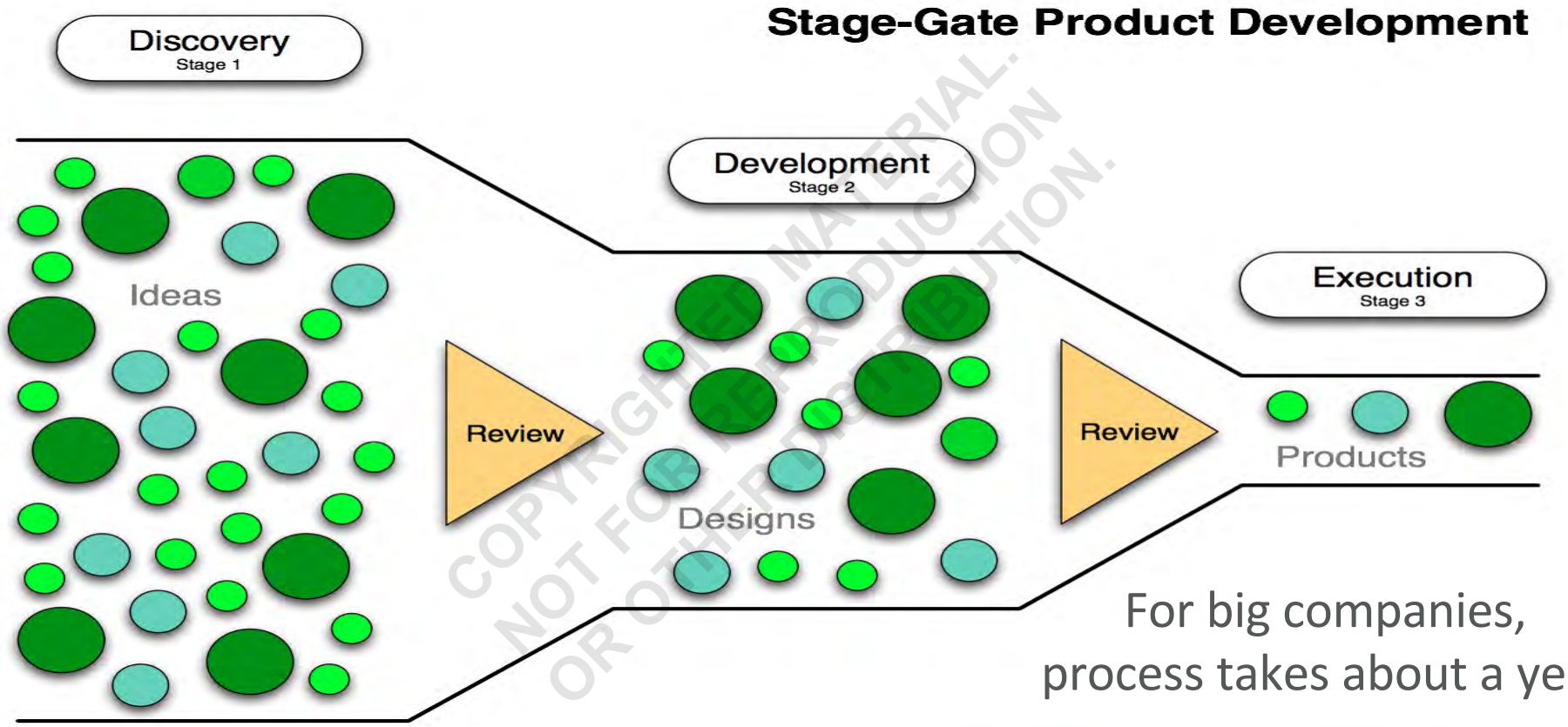
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Cosmetic Product Development Overview

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Product Development Overview



For big companies, process takes about a year

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Stage Gate System

- Process for moving idea to product launch
- Organized by Project Management
- Main Company Groups involved
  - Marketing
  - R&D
  - Manufacturing
- Stages represent activities
- Gates are goals to achieve before proceeding

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Stage 1 Discovery – Main Activities

- Identifying consumers
- Finding consumer needs
- Generating ideas
- Filtering ideas
- Shaping ideas



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Stage 2 Development – Main Activities

- Converting ideas to formulas
- Creating prototypes
- Testing prototypes
- Package development
- Refining marketing message



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Stage 3 Execution – Main Activities

- Finalize choices
- Developing dossier
- Production runs
- Product testing
- Customer Support
- Ongoing marketing & promotion



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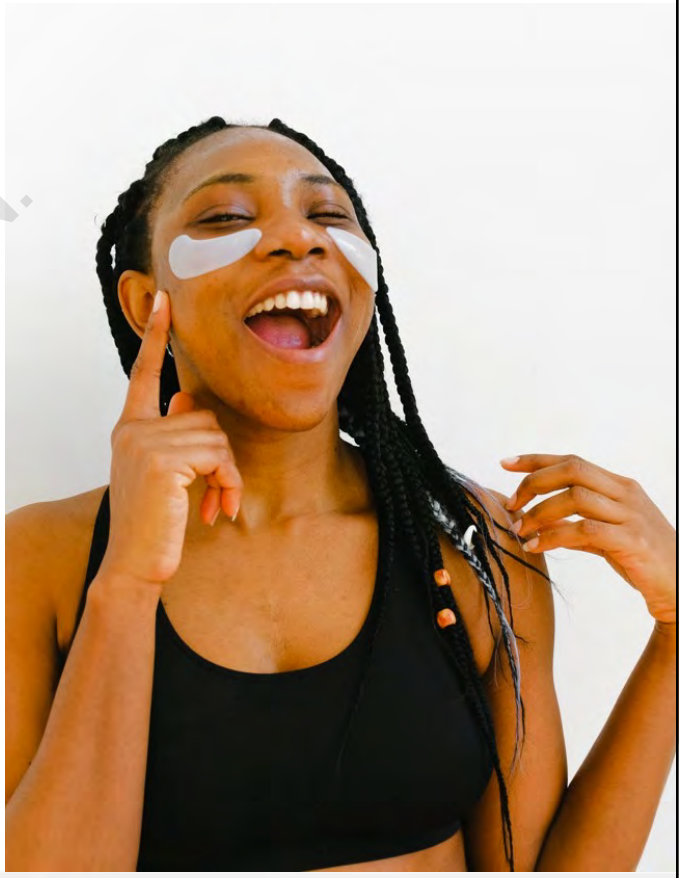


Stage 1
Discovery

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Begin with a Need

- What need does your product satisfy?
- People buy products that solve some problem
- They also buy products because they identify with a brand



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Researching – Key Questions

1. Who is your customer?
2. What problems do they have?
3. How are they solving the problem now?
4. What do they like about current products?
5. What don't they like about current products?



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How are They Solving the Problem?

- Make a list of products
- Make a list of other solutions
- What home remedies are used?
- What products work best?



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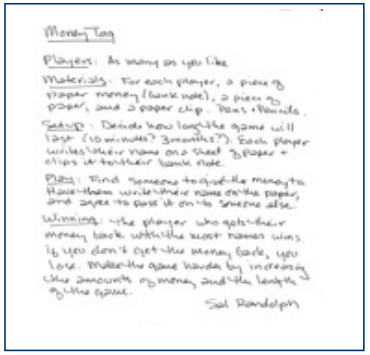
Formal Discovery Process



Product
IDEAS

Marketing
Market Research
R&D

Concept
Creation



Winning
Concepts

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Goal: Come up with Good Ideas

- Generate ideas
- Create a concept
- Test & refine concepts



- End product of this phase:

  Develop product profile sheet

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Reality Check

- Almost no idea is unique
- That's a good thing
- Most successful products are not unique ideas
- The execution of an idea is what's important





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Innovation in Cosmetic Industry

Has everything been done?

Probably

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Products Haven't Changed Much



1950's



1980's



2010's

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Leading Shampoo

Leading Shampoo 2018	**Leading Shampoo 1999**
Water	Water
Sodium Lauryl Sulfate	Ammonium Laureth Sulfate
Sodium Laureth Sulfate	Ammonium Lauryl Sulfate
Cocamidopropyl Betaine	
Glycol Distearate	Glycol Distearate
	Cetyl Alcohol
	Stearyl Alcohol
Cocamide MEA	Cocamide MEA
Dimethicone	Dimethicone
Trisodium Ethylenediamine Disuccinate	
Polyquaternium-7	
Fragrance	Fragrance
Sodium Benzoate	Sodium Benzoate
Citric Acid	Disodium Phosphate
Sodium Citrate	Sodium Phosphate
Tetrasodium EDTA	Disodium EDTA
Sodium Chloride	Sodium Chloride
Sodium Xylenesulfonate	Ammonium Xylenesulfonate
Panthenol	Panthenol
Panthenyl Ethyl Ether	Panthenyl Ethyl Ether
Methylchloroisothiazolinone	Methylchloroisothiazolinone
Methylisothiazolinone	Methylisothiazolinone.

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Leading Shampoo

Leading Shampoo 2018	Leading Shampoo 1999
Water	Water
Sodium Lauryl Sulfate	Ammonium Laureth Sulfate
Sodium Laureth Sulfate	Ammonium Lauryl Sulfate
Cocamidopropyl Betaine	
Glycol Distearate	Glycol Distearate
	Cetyl Alcohol
	Stearyl Alcohol
Cocamide MEA	Cocamide MEA
Dimethicone	Dimethicone
Trisodium Ethylenediamine Disuccinate	
Polyquaternium-7	
Fragrance	Fragrance
Sodium Benzoate	Sodium Benzoate
Citric Acid	Disodium Phosphate
Sodium Citrate	Sodium Phosphate
Tetrasodium EDTA	Disodium EDTA
Sodium Chloride	Sodium Chloride
Sodium Xylenesulfonate	Ammonium Xylenesulfonate
Panthenol	Panthenol
Panthenyl Ethyl Ether	Panthenyl Ethyl Ether
Methylchloroisothiazolinone	Methylchloroisothiazolinone
Methylisothiazolinone	Methylisothiazolinone.

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Leading Shampoo

Leading Shampoo 2018	Leading Shampoo 1999
Water	Water
Sodium Lauryl Sulfate	Ammonium Laureth Sulfate
Sodium Laureth Sulfate	Ammonium Lauryl Sulfate
Cocamidopropyl Betaine	
Glycol Distearate	Glycol Distearate
	Cetyl Alcohol
	Stearyl Alcohol
Cocamide MEA	Cocamide MEA
Dimethicone	Dimethicone
Trisodium Ethylenediamine Disuccinate	
Polyquaternium-7	
Fragrance	Fragrance
Sodium Benzoate	Sodium Benzoate
Citric Acid	Disodium Phosphate
Sodium Citrate	Sodium Phosphate
Tetrasodium EDTA	Disodium EDTA
Sodium Chloride	Sodium Chloride
Sodium Xylenesulfonate	Ammonium Xylenesulfonate
Panthenol	Panthenol
Panthenyl Ethyl Ether	Panthenyl Ethyl Ether
Methylchloroisothiazolinone	Methylchloroisothiazolinone
Methylisothiazolinone	Methylisothiazolinone.

2024 changes

Guar Hydroxypropyltrimonium Chloride
Polyquaternium-6
Histidine

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What has Changed?

- Packaging has changed a little
- Advertising has changed
- Formulas are a little different

Minor differences

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Recent Successes in the Market

- Kylie Cosmetics
- The Ordinary
- Drunk Elephant
- Goop
- Harry's Razors



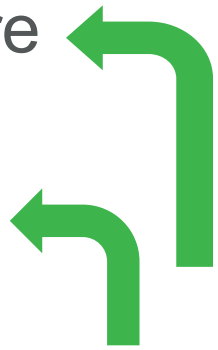
No NEW technology

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How do you Make Products Stand Out?

- Come up with new marketing stories
- Solve big problems in hair and skincare
- Make products providing new benefits



This is what chemists are trying to do

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New Product Ideas



Your own personal idea machine

Simple Prompt for Developing New Product Ideas

- Prompt: "Please give me [NUMBER] unique personal care product ideas"

- Example: Please give me 10 unique personal care product ideas

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Product Ideas



Sure, here are some ideas for unique personal care products:

1. **Temperature-Sensitive Shampoo & Conditioner**: These products change color with the temperature of the water to ensure users always wash and rinse their hair at the optimal temperature for hair health.
2. **Fitness-Motivated Body Wash**: Body wash that only produces lather if the user has been physically active. It can work based on the sweat/pH level of the skin, providing a fun incentive to exercise.
3. **Mood-Enhancing Deodorant**: Deodorant that releases different scents based on the wearer's body temperature, which can correlate with stress or mood levels.
4. **Pollution Neutralizing Facial Cream**: A cream that not only protects skin from the harmful effects of air pollution but also actively neutralizes pollutants.
5. **Eco-Capsule Soaps**: Single-use, water-soluble capsules that contain enough soap for one wash, designed to minimize waste and overuse.
6. **Sleep-Promoting Lotion**: A body lotion infused with essential oils and ingredients known to promote better sleep, such as lavender and chamomile.
7. **Bioluminescent Hair Gel**: Hair gel that glows under UV light, perfect for parties or events.
8. **Customizable Lip Balm Kit**: A kit where users can mix and match flavors and colors to create their own personalized lip balm.
9. **Prebiotic Facial Masks**: These masks would use prebiotics to encourage the growth of beneficial microorganisms on the skin, improving skin health and appearance.
10. **Non-Water Toothpaste**: Toothpaste in a tablet form that doesn't require water. The user simply chews the tablet and brushes. Perfect for travel or water conservation.

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Turn Ideas Into Concepts



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Concept Characteristics

- Varies by company
- Product claims
- Product description
- Tag line
- Illustrations
- Price
- POD – Point of Differentiation

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Example Concept

Introducing a Revolutionary New Hand Soap
that Keeps Your Family Safe

For the first time, Soapster presents Vanilla Brown Sugar liquid hand soap. It wraps you in the soothing, comforting fragrance of Vanilla and Brown Sugar every time you wash your hand. It eliminates the dirt and kills bacteria your family encounters, leaving your hands clean and fresh.

Soapster Vanilla Brown Sugar Liquid Soap available for $3.29

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Consumer Testing

- Focus groups
- One on one
- Group

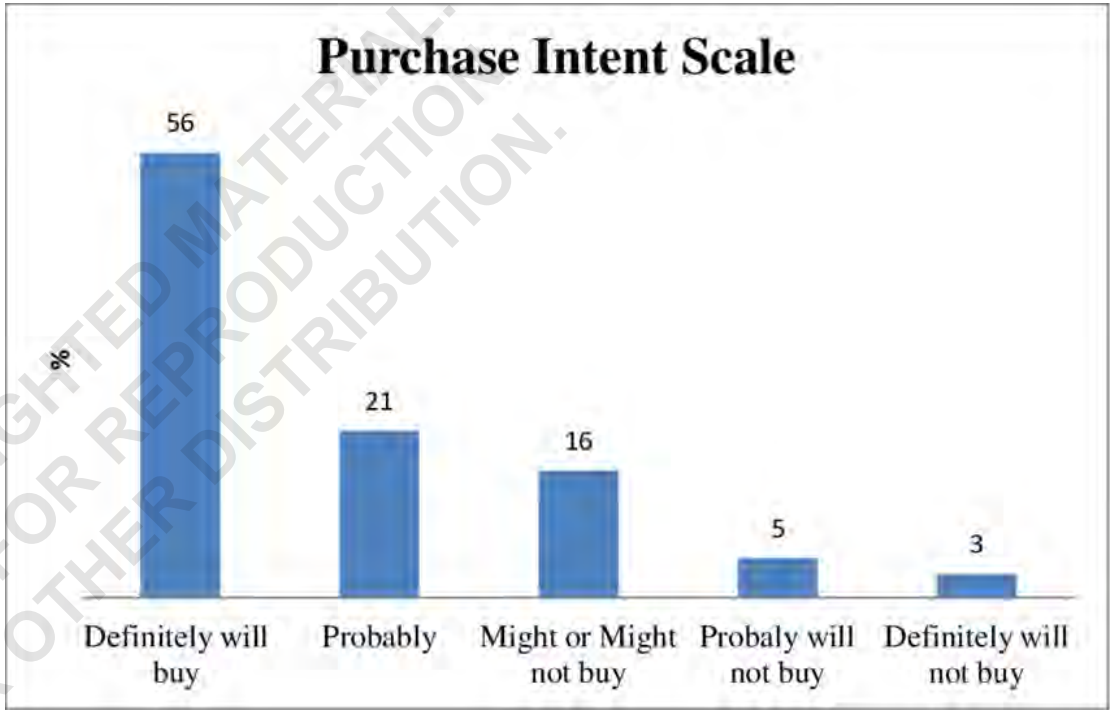


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Consumer Research

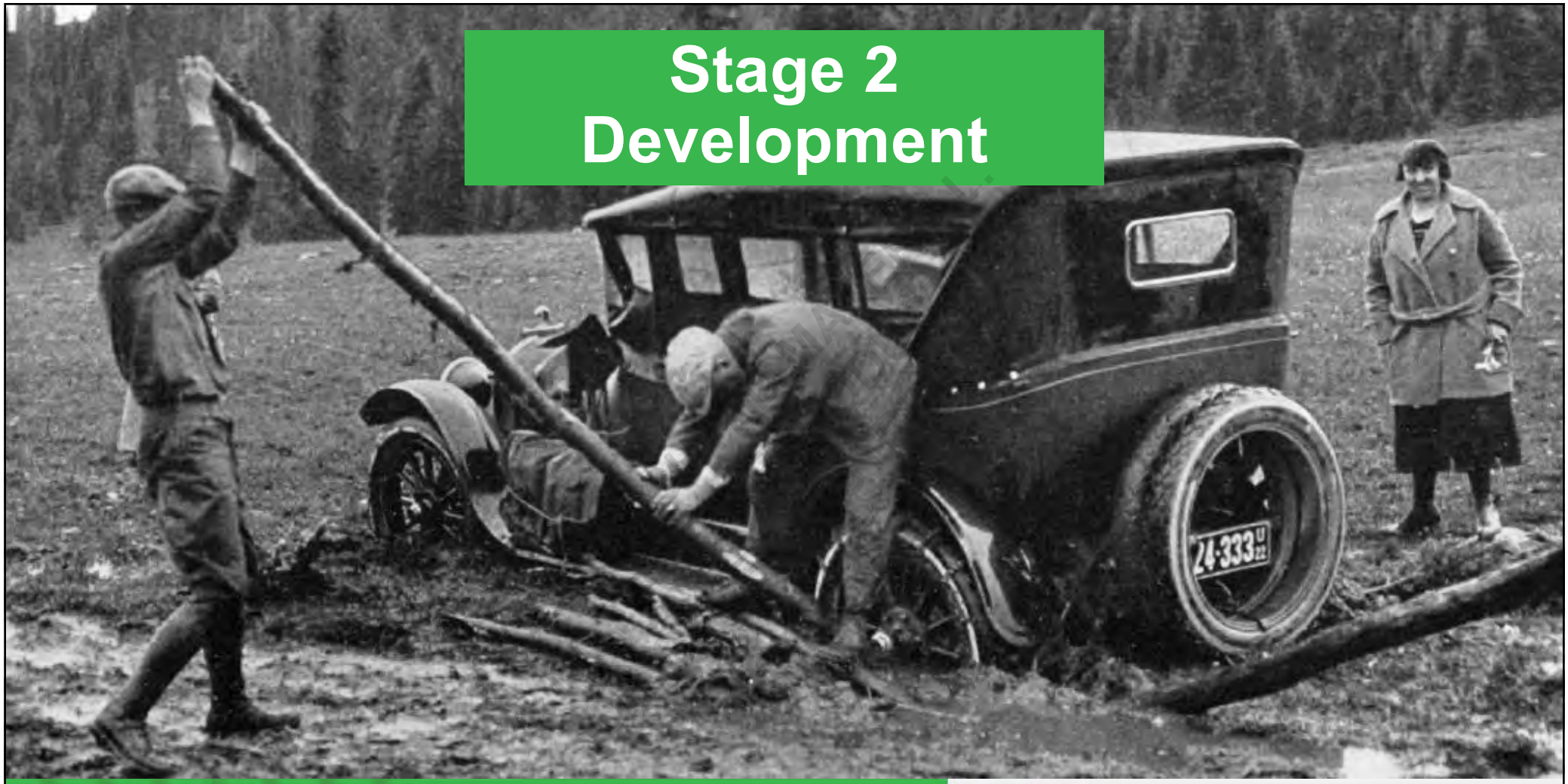
- Purchase intent
- Desire
- Language
- Price
- Product details



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Stage 2 Development



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Stage 2 Development – Main activities

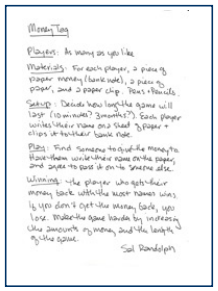
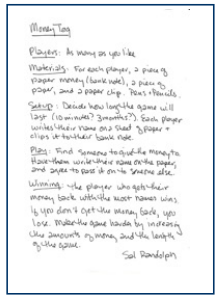
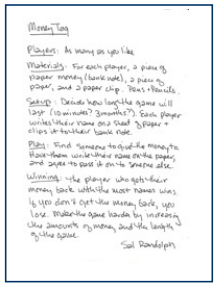
- Converting ideas to formulas
- Creating prototypes
- Testing prototypes
- Package development
- Refining marketing message



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Overview of Prototype Development

Winning Concepts

R&D

Marketing

Prototype Development



Working Product

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Product Information Sheet

- Use to guide formulation efforts
- Outline product benefits
- Define performance characteristics
- Detailed description of physical properties

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Product Profile Elements

- Type of product
- Comparative standards - Benchmarks
- Aesthetics
- Performance targets
- Total Cost
- Claims
- Success criteria
- Packaging



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Break

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Cosmetic Raw Materials



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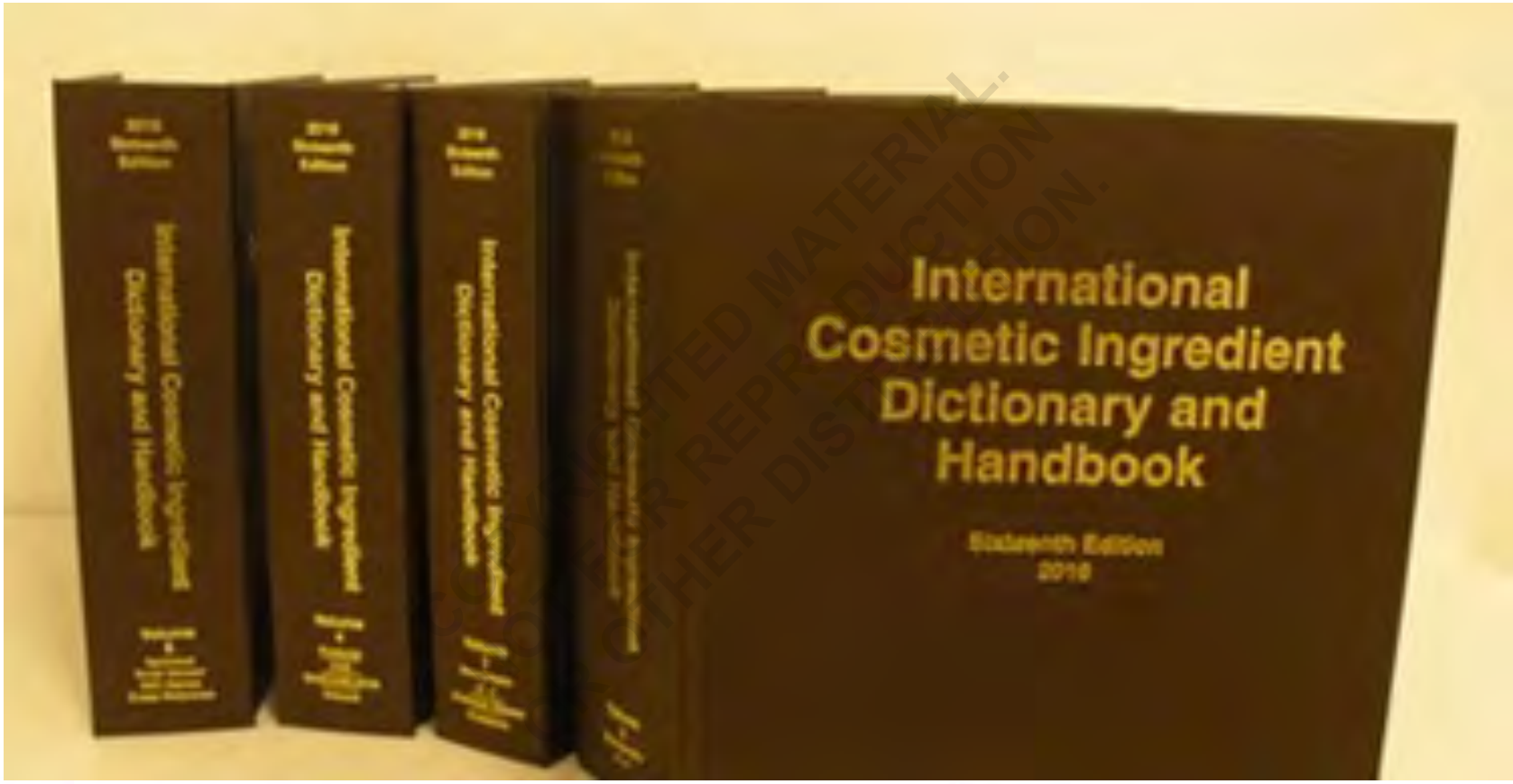
Introduction to Cosmetic Ingredients

- Naming ingredients
- Where do the ingredients come from?
- Overview of cosmetic ingredient types

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Where Do Ingredients Get Their Names?



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INCI Dictionary

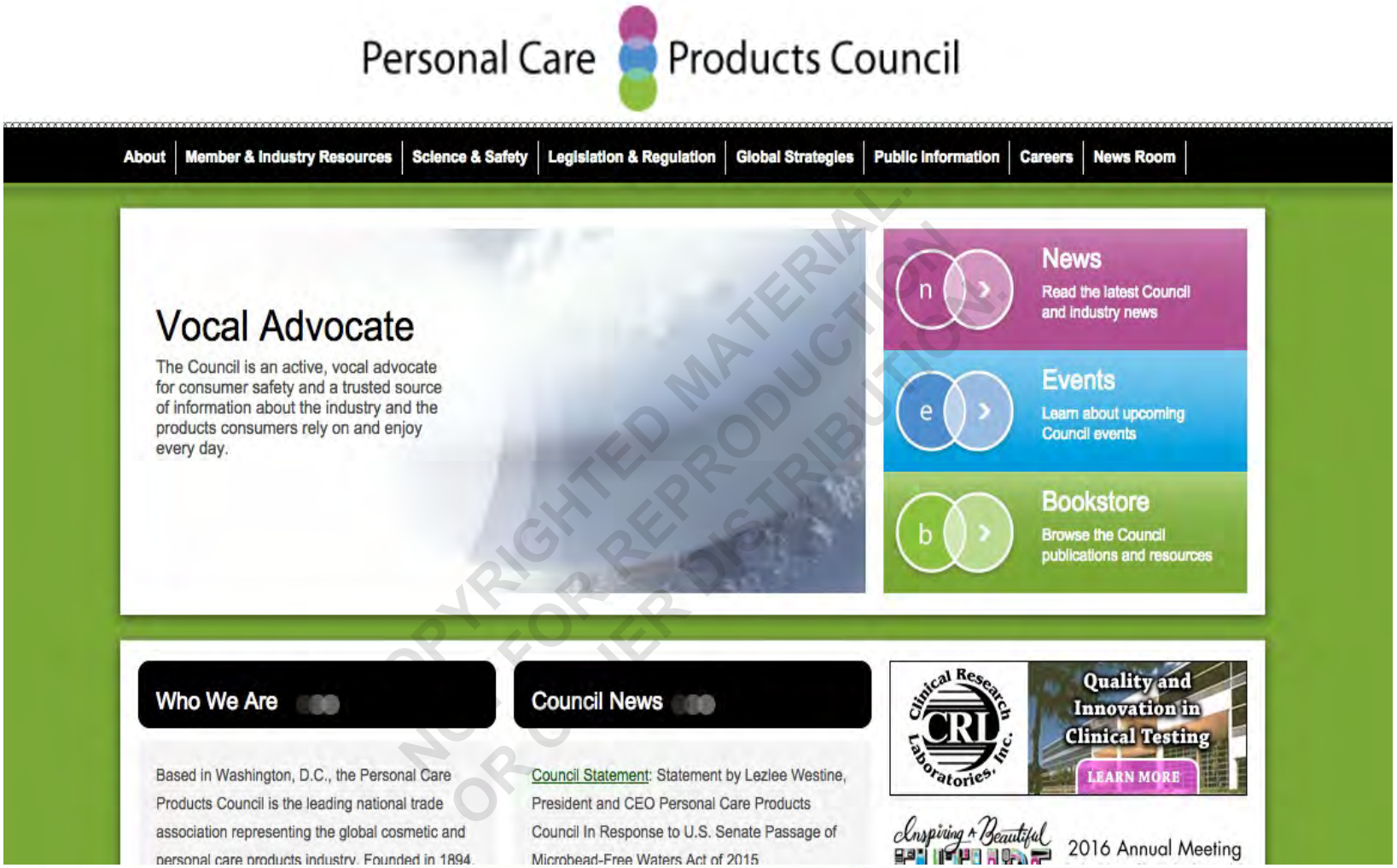
- Names used for ingredient lists
- Over 22,000 ingredient names
- Over 70,000 trade names
- Not a free resource!
- Get this information from supplier
- Created by the PCPC



16th edition

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List of Ingredients on Package



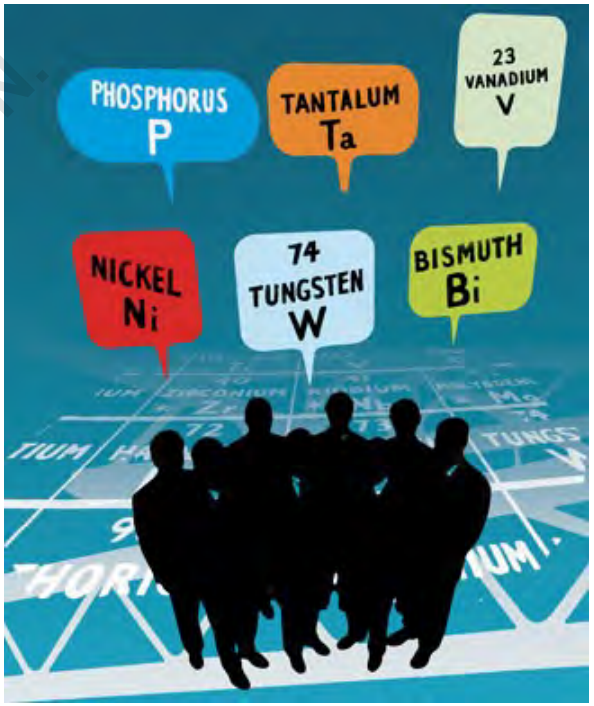
INGREDIENTS: WATER, QUATERNIUM-18, CETYL ALCOHOL, STEARAMIDOPROPYL DIMETHYLAMINE, GELATIN/KERATIN AMINO ACIDS/LYSINE HYDROXYPROPYLTRIMONIUM CHLORIDE (HYDRATEIN), ALOE BARBADENSIS LEAF EXTRACT, ALGAE EXTRACT, SOLUBLE COLLAGEN, CHONDRUS CRISPUS (CARRAGEENAN) EXTRACT, ASCORBIC ACID, NIACINAMIDE, HYDROLYZED WHEAT PROTEIN, HYDROLYZED WHEAT STARCH, HYDROXYETHYLCELLULOSE, STEARYL ALCOHOL, GLYCERYL STEARATE, QUATERNIUM-80, STEARETH-21, DIMETHICONE, DISODIUM DIMETHICONE COPOLYOL SULFOSUCCINATE, OLEAMINE OXIDE, GLYCERIN, CITRIC ACID, PVP, DMDM HYDANTOIN, DISODIUM EDTA, FRAGRANCE.

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Ingredient Names

- Required to list ingredient names on package
- Name requirements started in 1970's
- FDA sets rules for ingredient names



- IUPAC system is used by Chemists
- Long names
- Can get chemical structure from name

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3 Types of Cosmetic Ingredient Names

- INCI names – The “official” names
  - Use for ingredient labels
- Common names – “Unofficial” names
  - Don’t use for ingredient labels
- Trade names – From individual suppliers
  - Don’t use for ingredient labels



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Essential Skill - 01



Learn the ingredient names and what they mean

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INCI Naming System

- Names long enough to distinguish
- Short enough to fit on labels
- Follows a combination of…
  - U.S. Pharmacopoeia (USP)
  - National Formulary (NF)
  - Food Chemicals Codex (FCC)
  - Merck Index



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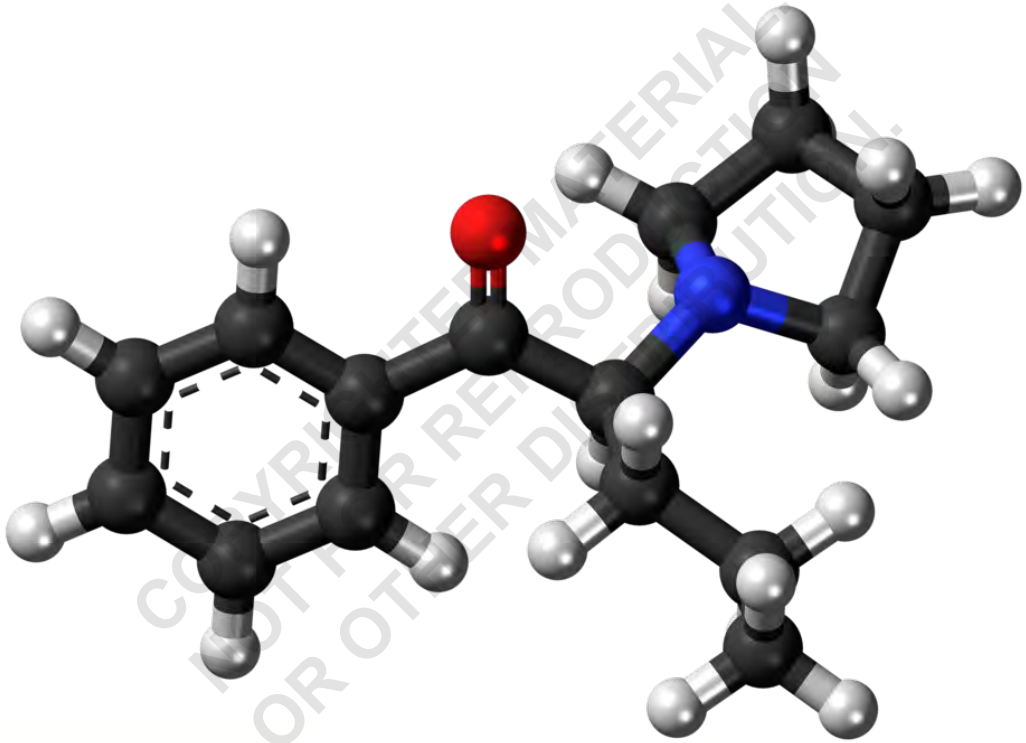
Cosmetic Ingredient Naming Rules

1. Simple names are used when possible
2. Abbreviations are used where applicable
3. Numbers are used sparingly
4. Names from other common systems are retained
5. Each component of a mixture is listed individually
6. System strives to create the short names

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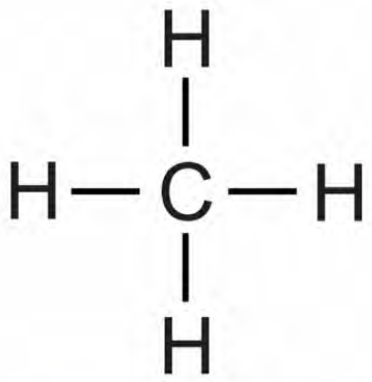
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Hydrocarbons



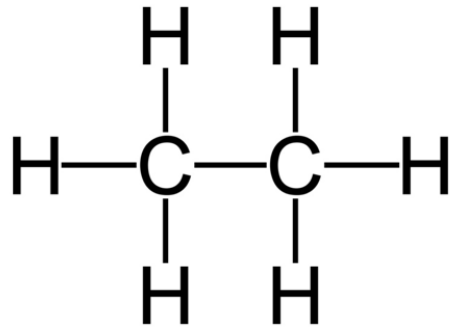
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Naming Simple Hydrocarbons



METHANE

Number of Carbons	Stem name
1	Methyl
2	Ethyl
3	Propyl
4	Butyl
5	Pentyl
6	Hexyl
7	Heptyl
8	Octyl



ETHANE

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Cosmetic Ingredient Hydrocarbons

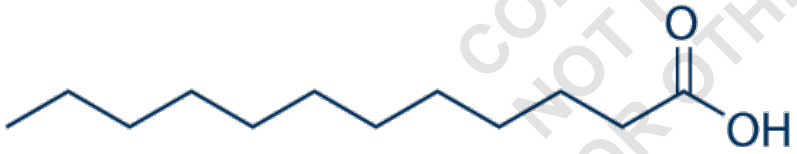
Carbons	(-COOH)	(-OH)
Main Chain	Fatty acids	Fatty alcohols
8	Caprylic	Caprylyl
9	Pelagronic	Nonyl
10	Capric	Decyl
11	Undecanoic	Undecyl
12	Lauric	Lauryl
13	Tridecanoic	Tridecyl
14	Myristic	Myristyl
15	Pentadecanoic	Pentadecyl
16	Palmitic	Cetyl
17	Margaric	Heptadecyl
18	Stearic	Stearyl
20	Arachidic	Arachidyl
22	Behynic	Behenyl

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Ingredient Names

- Hydrocarbon with 12 carbons
- Lauric Acid = 12 C with –COOH group
- Lauryl Alcohol = 12 C with –OH group





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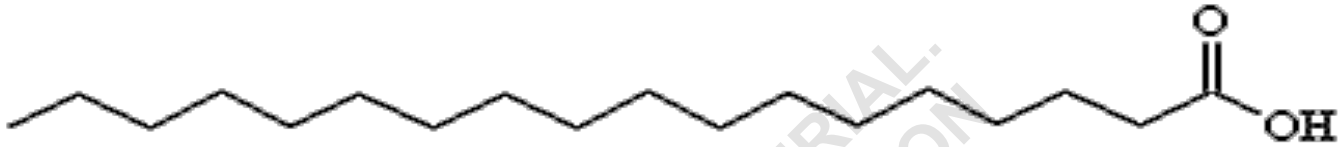
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13	Tridecanoic	Tridecyl
14	Myristic	Myristyl
15	Pentadecanoic	Pentadecyl
16	Palmitic	Cetyl
17	Margaric	Heptadecyl
18	Stearic	Stearyl
20	Arachidic	Arachidyl
22	Behynic	Behenyl

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Naming Acids



Look up the stem name, add the word acid

18 Carbon acid

INCI = Stearic Acid



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Naming Hydrocarbons

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15	Pentadecanoic	Pentadecyl
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17	Margaric	Heptadecyl
18	Stearic	Stearyl
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Esters

Cetyl Alcohol

$CH_3\text{-}(CH_2)\text{-}_{14}\text{-}CH_2\text{ - }OH$

Palmitic Acid

$HOOC\text{ -}(CH_2)\text{-}_{14}\text{-}CH_3$



$$CH_3\text{-}(CH_2)_{14}\text{-}CH_2 - O - C\text{ -}(CH_2)_{14}\text{-}CH_3$$

Cetyl Palmitate

To name: List alcohol then the acid and add the Ending '-ate'

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Naming More Complicated Hydrocarbons

Carbons	(-COOH)	(-OH)
Main Chain	Fatty acids	Fatty alcohols
8	Caprylic	Caprylyl
9	Pelagronic	Nonyl
10	Capric	Decyl
11	Undecanoic	Undecyl
12	Lauric	Lauryl
13	Tridecanoic	Tridecyl
14	Myristic	Myristyl
15	Pentadecanoic	Pentadecyl
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Stem Name Examples

- Sodium Lauryl Sulfate
- Myristyl Myristate
- Caprylic acid
- Behentrimonium Methylsulfate
- Cetyl Alcohol

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Example Names

- Palmitic Acid
- Coconut Oil Aminoethoxyethanol Amides
- Ammonium Palm Kernel Sulfate
- Tallow Dihydroxyethyl Betaine
- Soybean Oil Polyglyceryl-6 Esters
- Sodium Cocoyl Isethionate

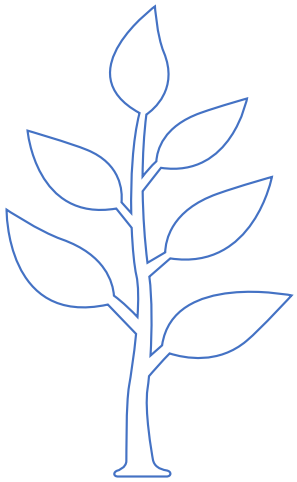


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Fatty Acid Composition of Natural Oils

Acid	C	Coconut	Palm	Soybean	Tallow	Sun Flower
Caproic	6	0.5	-	-	-	-
Caprylic	8	7.0	-	-	-	-
Capric	10	6.0	-	-	-	-
Lauric	12	48.0	-	-	-	-
Myristic	14	19.0	2.0	-	3.5	-
Myristoleic	14	-	-	-	1.0	-
Pentadecanoic	15	-	-	-	0.5	-
Palmitic	16	9.0	42.0	11.0	25.3	6.3
Palmitoleic	16	-	-	-	4.0	-
Margeric	17	-	-	-	2.5	-
Stearic	18	3.0	4.0	4.0	19.4	4.1
Oleic	18	6.0	43.0	21.0	40.8	22.9
Linoleic	18	1.5	9.0	55.5	2.5	66.0
Linolenic	18	-	-	8.5		-
Arachidic	20	-	-	-	-	0.2
Behenic	22					

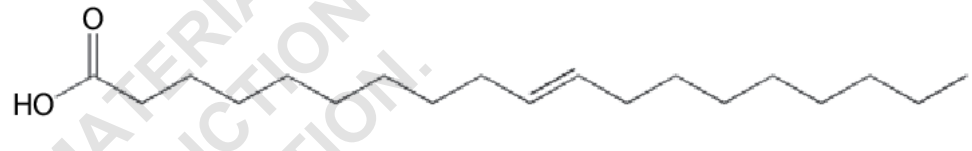
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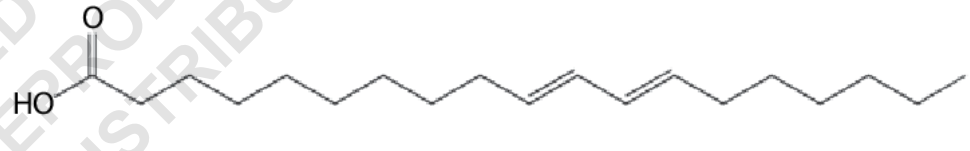
Saturated & Unsaturated

18 Carbon Examples

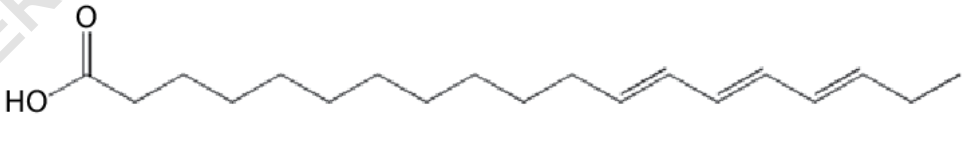
- Stearic - No double bonds
- Oleic - 1 double bond
- Linoleic - 2 double bonds
- Linolenic - 3 double bonds



Oleic acid



Linoleic acid

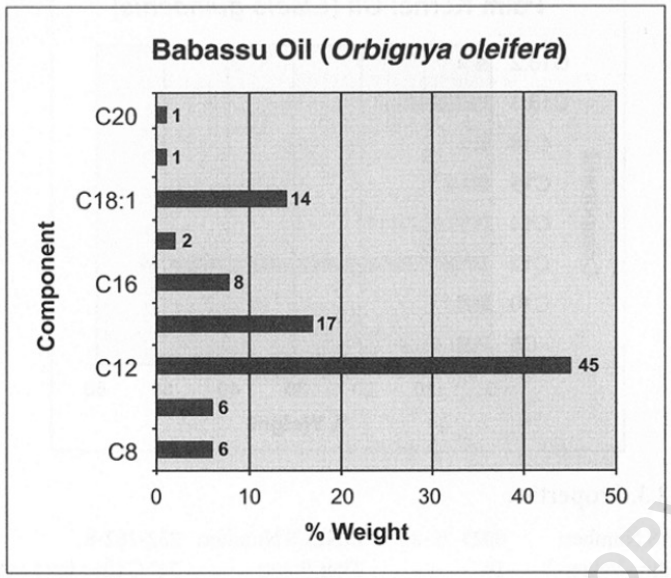


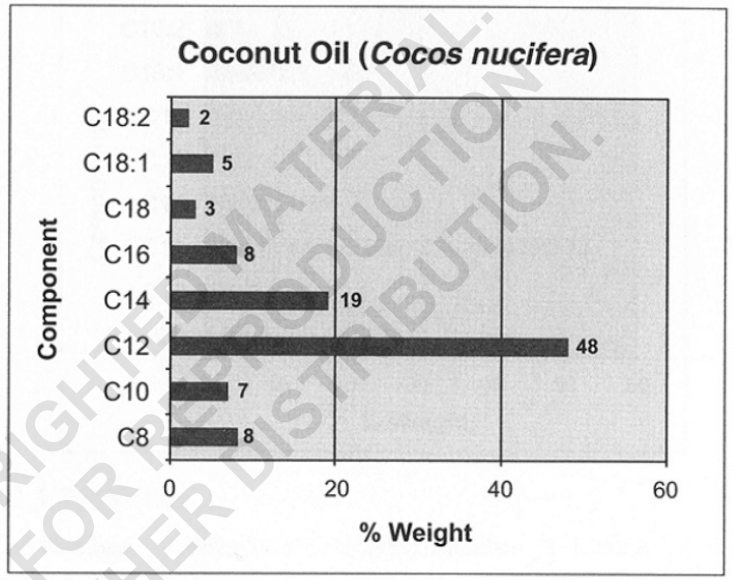
Linolenic acid

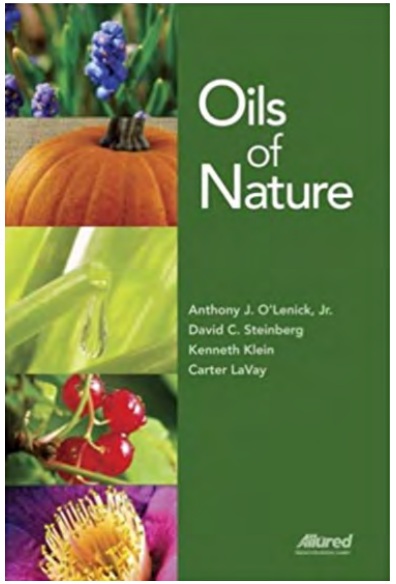
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Composition of Natural Oils - Example







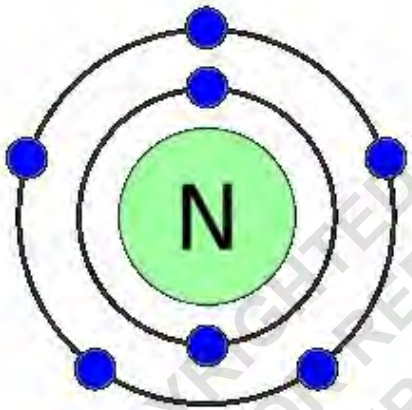
Similar Fatty Acid distribution

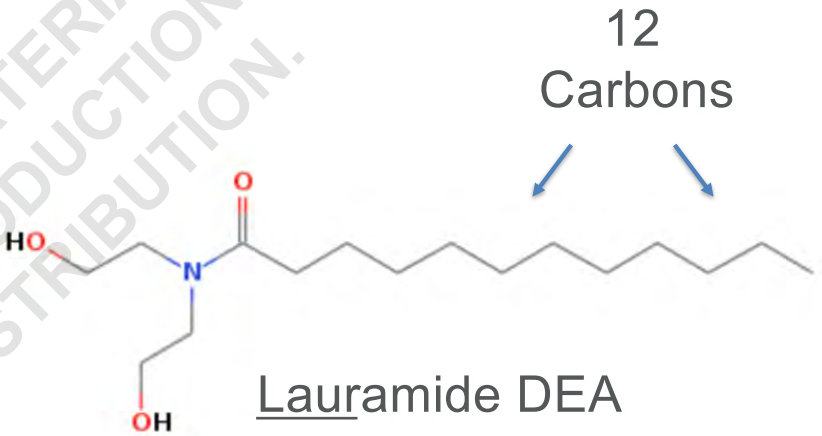
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Nitrogen Containing Ingredients

- Amides
- Amines
- Imines
- Quats
- “-monium”



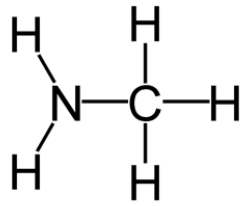


Lauramide DEA

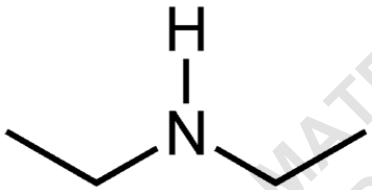
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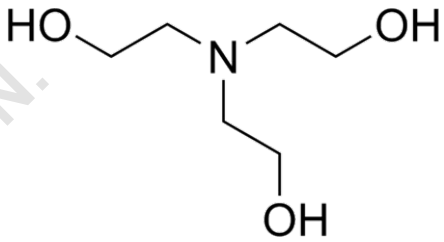
Hydrocarbons with Nitrogen



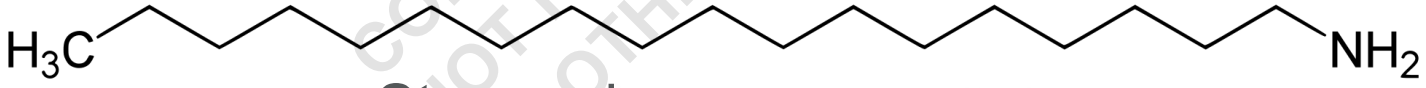
Methylamine



Diethylamine (DEA)



Triethanolamine (TEA)



Stearamine

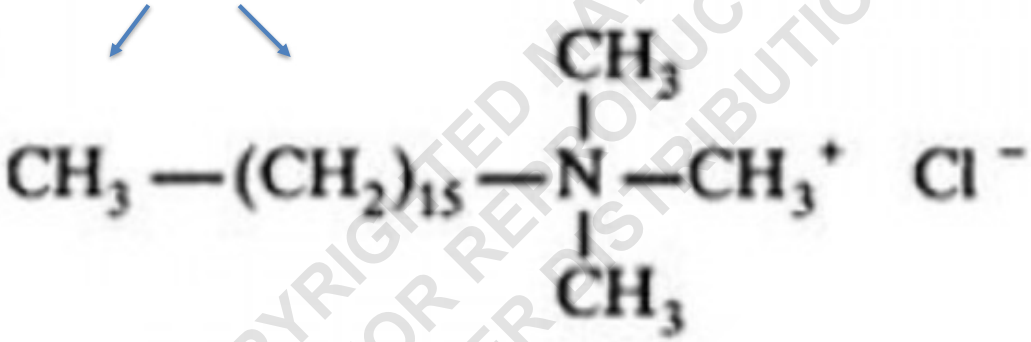
18 Carbons

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Quaternized Salts

16 Carbon chain

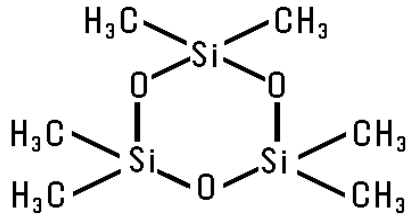


Cetrimonium Chloride

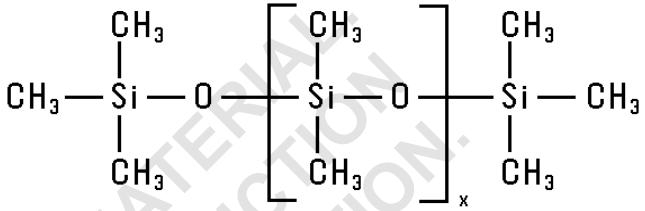
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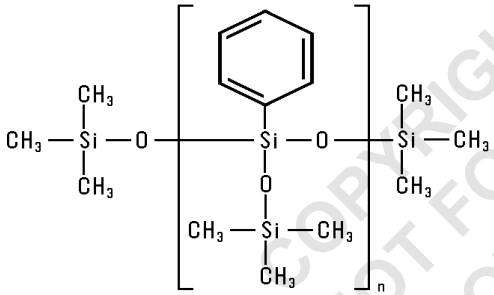
Varieties of Silicones - “-cones”



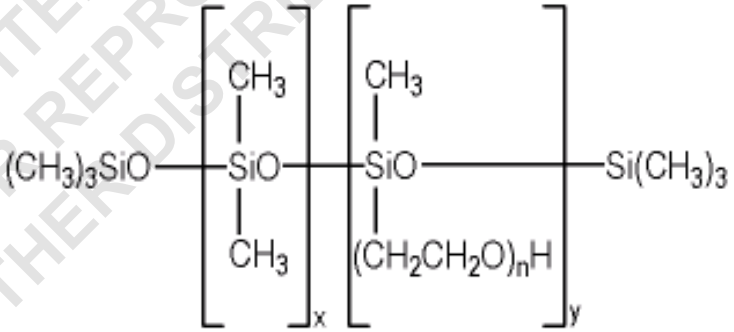
Cyclomethicone
(Hexamethyltrisiloxane)



Dimethicone



Phenyl Trimethicone



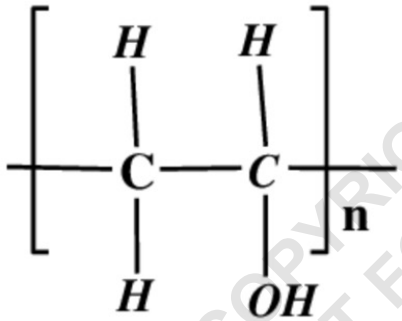
Dimethicone Copolyol

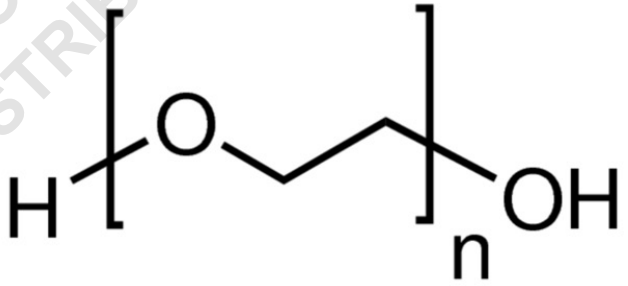
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Polymers

- Long molecules
- Repeating units
- “Poly-”





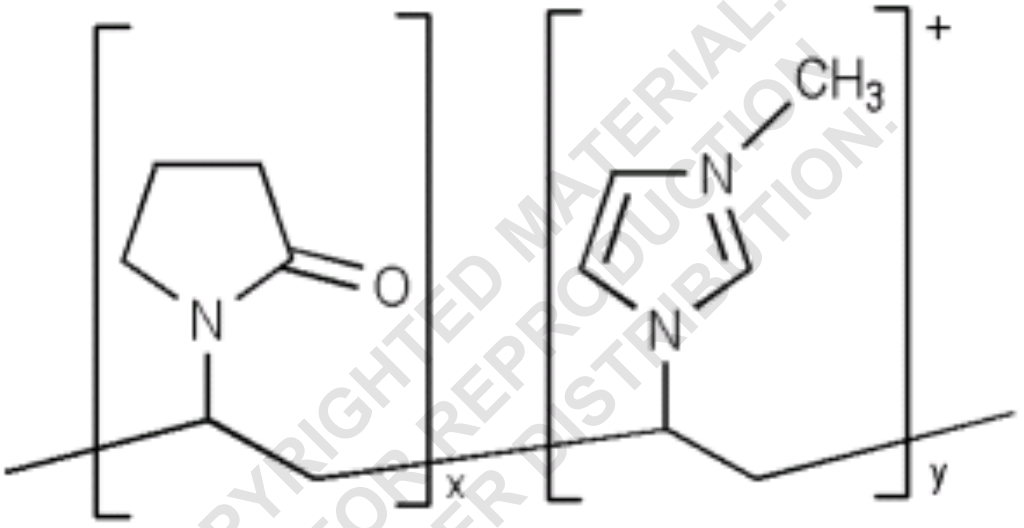
PVA – Polyvinyl Alcohol

PEG – Polyethylene Glycol

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Polyquaternium-44



$yCH_3OSO_3^-$

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Botanical Ingredients

- Extracts
- Juices
- Distillates
- Oils
- Waxes
- Saps
- Tars
- Gums
- Resins



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Natural / Botanical Extracts

- Linnean Classification system
- Use Latin Names
- Sunflower seed Oil
- Foeniculum Vulgare Fruit Extract
- Also include solvent
  -Usually Propylene glycol or glycerin



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Fragrance

- Made up of a blend of ingredients
- Just call it ‘Fragrance’ (or Parfume)
- In EU, must list known *26 allergens
  - Linalool
  - Limonene
  - Benzyl alcohol
  - Benzyl salicylate
  - Cinnamyl alcohol
  - Cinnamal .. etc.



*soon to be 80

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Fragrance Loophole?

- Rules allow fragrance to be listed as Fragrance
- There can be hundreds of components of fragrance
- Called a dubious practice
- In reality…

  It's just practical

- EU requires listing fragrance allergen



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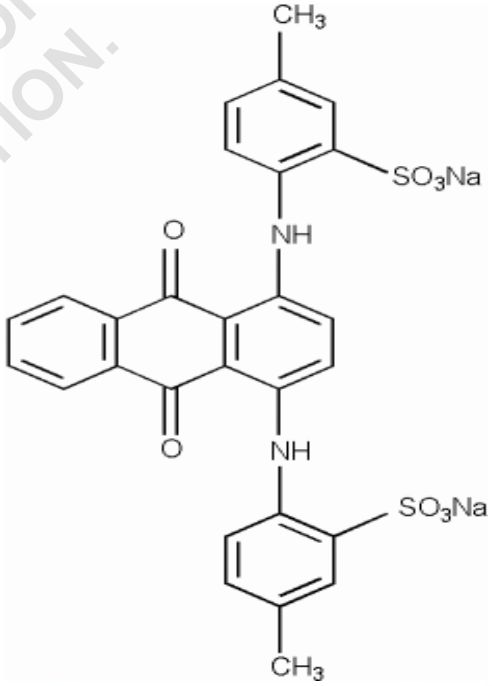
Colorants

6,6'-(1,4-anthraquinonylenediimino) di-m-toluenesulfonic acid disodium salt

D&C Green #5

Is now just…

GREEN 5



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Acronyms

AMP

PVP

MEA

PEG

DEA

https://chemistscorner.com/cosmetic-chemist-jargon-acronyms-of-the-industry/

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Naming Tips Summary

- Learn stem names
- Some names are source derived / blends
- Nitrogen contain – “Amine”, “Amo”, “-monium”
- Quaternium – Has Nitrogen
- Polyquaternium – polymer
  - Number is arbitrary
- Silicones usually have ‘cone’ in the name
- Colors are given numbers
- Fragrance is just Fragrance

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Quiz #2

1. What would you call a molecule with a 14 carbon chain and an -OH group at the end?

A. Cetyl Alcohol
B. Ethanol
C. Myristyl Alcohol
D. Palmitic acid

2. In a polyquaternium compound, what does the number stand for?

A. Number of repeating monomer units
B. Order in which the polymer was registered
C. Molecular weight of the polymer
D. Solubility of the compound

3. What would you call a sulfated surfactant derived from Coconuts?

A. Sodium Lauryl Sulfate
B. Sodium Palmityl Sulfate
C. Sodium Coco Sulfate
D. Sodium Behenyl Sulfate

4. Which of the following likely contains silicon?

A. Dimethicone
B. Phenoxyethanol
C. Cetyl Palmitate
D. Olivyl Siliconate

5. Which of the following contains Nitrogen?

A. Arachidyl Alcohol
B. Cetrimonium Chloride
C. Phenyltrimethicone
D. Potassium Cocoate

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Quiz #2 - Answers

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Categories of Cosmetic Raw Materials



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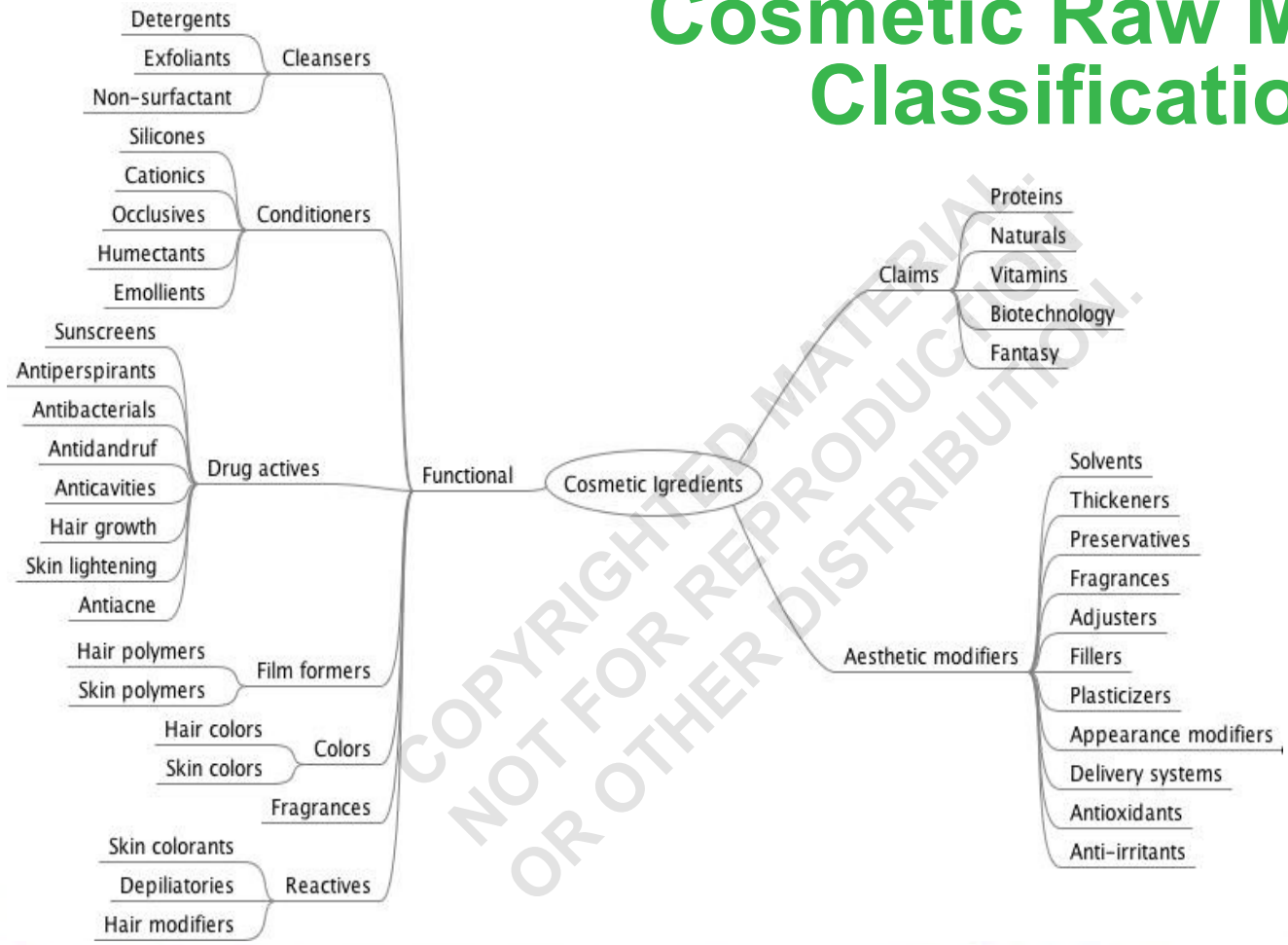
3 Categories of Cosmetic Ingredients

- Functional
- Aesthetic Modifiers
- Claims / Marketing

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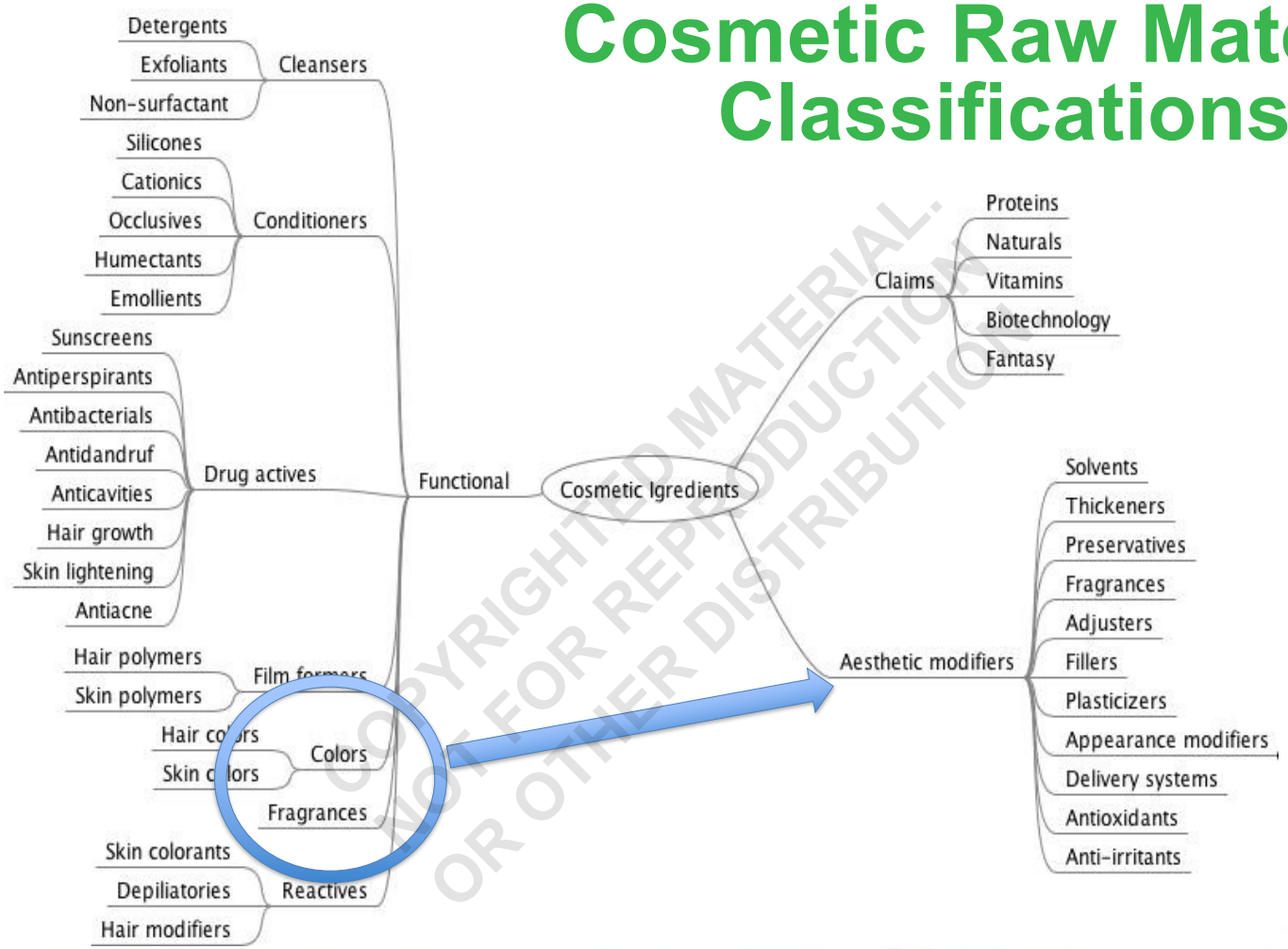
Cosmetic Raw Material Classifications



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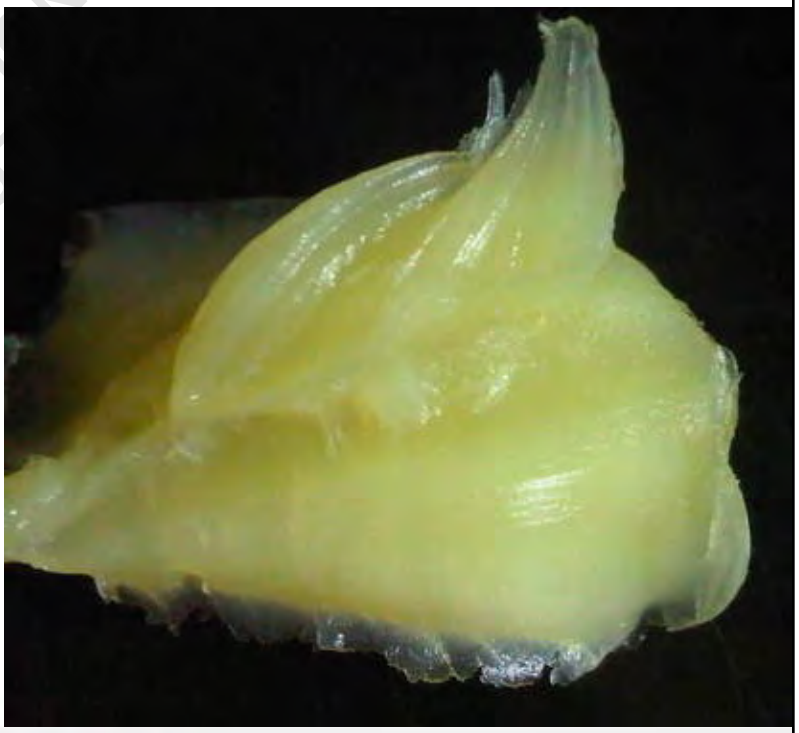


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Functional Ingredients

- Ingredients that provide a consumer benefit
- Make the product work
- Can't make a useful cosmetic without functional ingredient



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Types of Functional Ingredients

- Cleansers
- Conditioners
- Moisturizers
- Colorants
- Fragrances
- Reactive Ingredients
- Film Formers
- *Drug actives



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Must have at least one!

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Only Contain Functional Ingredients



Coconut Oil



Petrolatum

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"Legal" Active Ingredients

- Don't really exist in cosmetics
- Used in Over the counter (OTC) drugs
- Functional ingredients
  - They make the product work

Cosmetics are not allowed to have drug effects
Can't change biochemistry or metabolism

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Cosmetic “Active” Ingredients

- Used as a marketing term
- Consumers believe there is an effect
- Marketers imply an effect

- Active ingredients
  - If they work = drugs (Functional)
  - If they don’t work = Claims ingredients



Drug Facts — Hand Sanitizer 60mL/2 oz

Active Ingredient Ethyl Alcohol 62% — **Purpose** Antiseptic

Uses • For Hand Sanitizing

Warnings

For external use only - hands.
Flammable.

Keep away from heat and flame.

When using this product
Keep out of eyes.
Do not inhale or ingest.
Stop use and ask a doctor
if skin irritation develops.
Keep out of reach of children.

Directions

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Aesthetic Modifiers

- Improve characteristics of the formula
  - Appearance
  - Odor
  - Feel
  - Performance
- Make formulas more appealing to use
- Make formulas last longer



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Various Types of Aesthetic Modifiers

- Solvents
- Thickeners
- Emulsifiers
- Preservatives
- Fragrances
- Adjusters
- Texture modifiers
- Plasticizers
- Extenders
- Appearance Modifiers
- Anti-oxidants
- Anti-irritants
- Delivery systems

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“Claims” Ingredients

- Added to support a marketing story
- Generally have some functionality
- High concentrations are too expensive
- Give a measure of differentiation
- Recognizable by consumers
  - Positive reception
  - Seem like good ingredients

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Marketing Raw Materials

- Vitamins
- Botanical Extracts
- Proteins
- Anti-Aging
- Advanced technology
- Made-up names

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Essential Skill - 02



Learn to analyze
a list of ingredients (LOI)

Figuring out the purpose of
ingredients & possible %

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Essential Skill 2
Analyzing an Ingredient List



- Step 1 - Review the ingredient list
- Step 2 - Identify functional, aesthetic modifiers & claims ingredients

  Look up ingredient if you don't know what it does

- Step 3 - Create a list sorted by ingredient category

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Skill - Ingredient Analysis

Water, Glycerin, Zea Mays (Corn) Starch, Cetearyl Alcohol, Dihydroxyacetone, Mineral Oil, Petrolatum, Ceteareth 20, Ethylhexyl Isononanoate, Steareth 2, Dimethicone, Fragrance, Octyldodecyl Myristate, Stearic Acid, Hydroxyhexyl Acrylate/Sodium Acryloyldimethyl Taurate Copolymer, Isohexadecane, DMDM Hydantoin, Methylparaben, BHT, Ethylparaben, Propylparaben, Polysorbate 60, Citric Acid, Olea Europea (Olive) Fruit Oil, Avena Sativa (Oat) Kernel Extract, Tocopherol, Persea Gratissima (Avocado) Oil, Simmondsia Chinensis (Jojoba) Seed Oil, Calendula Officinalis Flower Extract, Caramel, Erythrulose



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Ingredient Label Analysis Tips

- Main solvent is usually first (aesthetic)
- Functional are generally higher up
- Identifying functional ingredients -

  "If I took this out, could formula still work?"
- Most ingredients are aesthetic modifiers
- Claims ingredients are lower on the list
- Claims ingredients are called out in advertising

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Skill - Ingredient Analysis

Water, Glycerin, Zea Mays (Corn) Starch, Cetearyl Alcohol, Dihydroxyacetone, Mineral Oil, Petrolatum, Ceteareth 20, Ethylhexyl Isononanoate, Steareth 2, Dimethicone, Fragrance, Octyldodecyl Myristate, Stearic Acid, Hydroxyhexyl Acrylate/Sodium Acryloyldimethyl Taurate Copolymer, Isohexadecane, DMDM Hydantoin, Methylparaben, BHT, Ethylparaben, Propylparaben, Polysorbate 60, Citric Acid, Olea Europea (Olive) Fruit Oil, Avena Sativa (Oat) Kernel Extract, Tocopherol, Persea Gratissima (Avocado) Oil, Simmondsia Chinensis (Jojoba) Seed Oil, Calendula Officinalis Flower Extract, Caramel, Erythrulose



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Analyzing an Ingredient List

Functional	Aesthetic Modifiers	Claims
Glycerin	Water	Olea Europea (Olive) Fruit Oil
Dihydroxyacetone	Zea Mays (Corn) Starch	Avena Sativa (Oat) Kernel Extract
Mineral Oil	Cetearyl Alcohol	Tocopherol
Petrolatum	Ceteareth 20	Persea Gratissima (Avocado) Oil
Dimethicone	Ethylhexyl Isononanoate	Simmondsia Chinensis (Jojoba) Seed Oil
Erythrulose	Steareth 2	Calendula Officinalis Flower Extract
	Fragrance	Caramel
	Octyldodecyl Myristate	
	Stearic Acid	
	Hydroxyhexyl Acrylate/Sodium Acryloyldimethyl Taurate Copolymer	
	Isohexadecane	
	DMDM Hydantoin	
	Methylparaben	
	BHT	
	Ethylparaben	
	Propylparaben	
	Polysorbate 60	
	Citric Acid	

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AI Analyzing Ingredient lists?

General Prompt to ask ChatGPT…

"Act as if you are an expert cosmetic chemist. The following is an ingredient list. Please tell me what each ingredient does, the percentages and where you think the 1% line might be [LIST OF INGREDIENTS]"

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AI Analyzing Ingredient lists?

< 3/3

Act as if you are an expert cosmetic chemist. The following is my ingredient list. Please tell me the percentages and where you think the 1% line might be. Aqua/ Water, Glycerin, Caprylic/ Capric Triglyceride, Cetearyl Alcohol, Cetyl Alcohol, Dimethicone, Phenoxyethanol, Polysorbate 20, Ceteareth-20, Behentrimonium Methosulfate, Polyglyceryl-3 Diisostearate, Sodium Lauroyl Lactylate, Ethylhexylglycerin, Potassium Phosphate, Disodium EDTA, Dipotassium Phosphate, Ceramide NP, Ceramide AP, Phytosphingosine, Cholesterol, Xanthan Gum, Carbomer, Sodium Hyaluronate, Tocopherol, Ceramide EOP

Certainly! From the list you've provided, I can deduce the approximate percentage ranges of each ingredient in the formulation, although exact percentages can vary from one formulation to another.

1. **Aqua/Water**: This is usually the main solvent and often constitutes the largest portion of a formulation, especially if it's the first ingredient. It can typically range from 50% to 90% in most creams.
2. **Glycerin**: A common humectant in cosmetic formulations, and it's usually used at 1-10%.
3. **Caprylic/Capric Triglyceride**: An emollient, it's often found at levels of 1-10%.
4. **Cetearyl Alcohol & Cetyl Alcohol**: These fatty alcohols are often used as thickeners and emulsion stabilizers. Generally, they're used in the range of 0.5-5%.
5. **Dimethicone**: A silicone that provides a smooth feel to products, typically used at 1-5%.
6. **Phenoxyethanol**: A common preservative. Its maximum allowable concentration in cosmetics is usually 1%, so this ingredient is a potential marker for the 1% line. However, it's possible that ingredients just after this one could still be around 1%, especially if they're used in combination as preservatives or stabilizers.



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Break

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Functional Cosmetic Ingredients Skin Products

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Objectives

- Introduce you to the functional raw materials used for achieving the benefits you get from skin focused cosmetic products.

- Learn different skin care products
- Problems designed to solve
- Technologies to solve the problems



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Categories of Skin Care Products

Leave on

- Moisturizers
- Anti-aging creams
- Antiperspirants
- Skin lightening
- Sunless tanning
- Sunscreen
- Anti-Acne

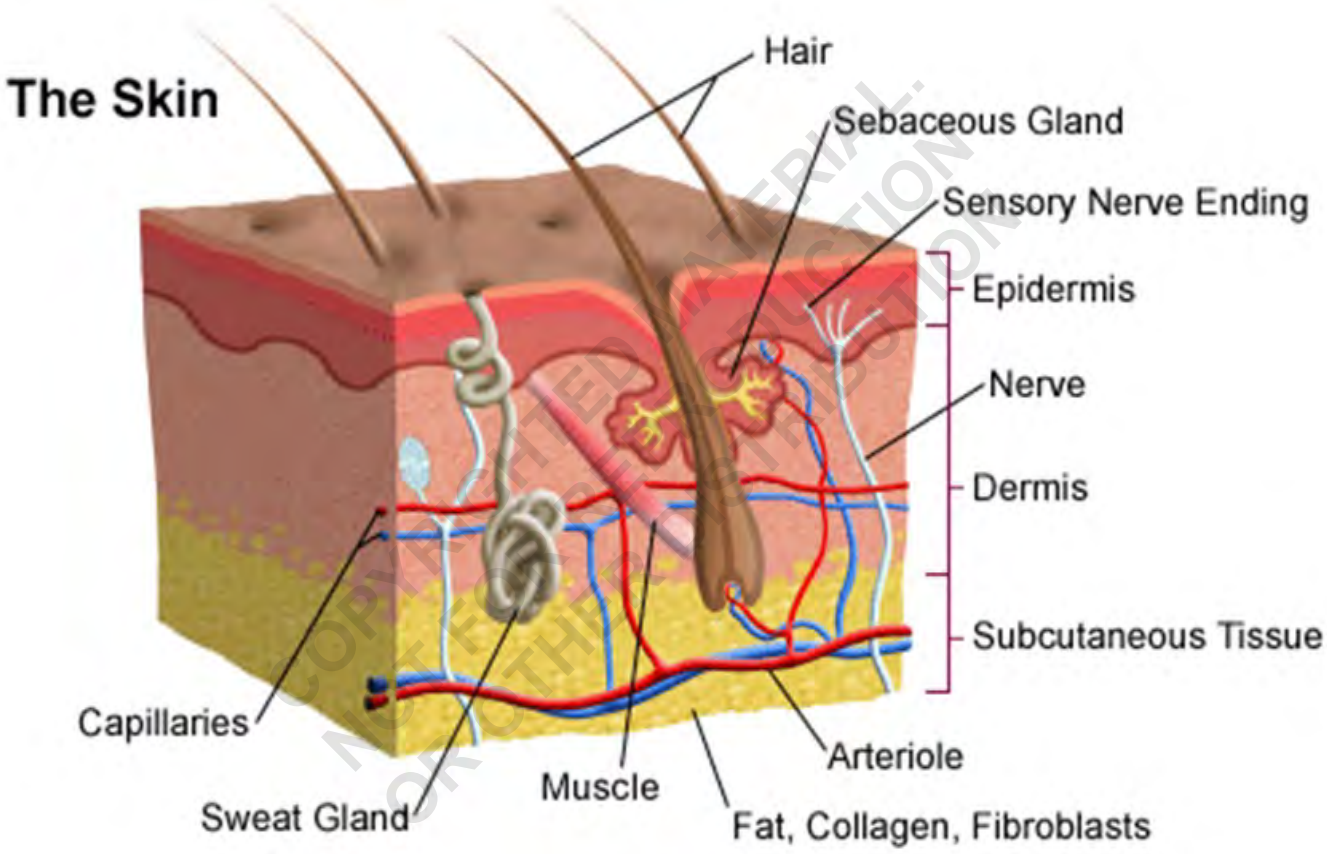
Removal

- Cleansers
- Toners
- Body wash
- Facial wash
- Bubble baths
- Exfoliators

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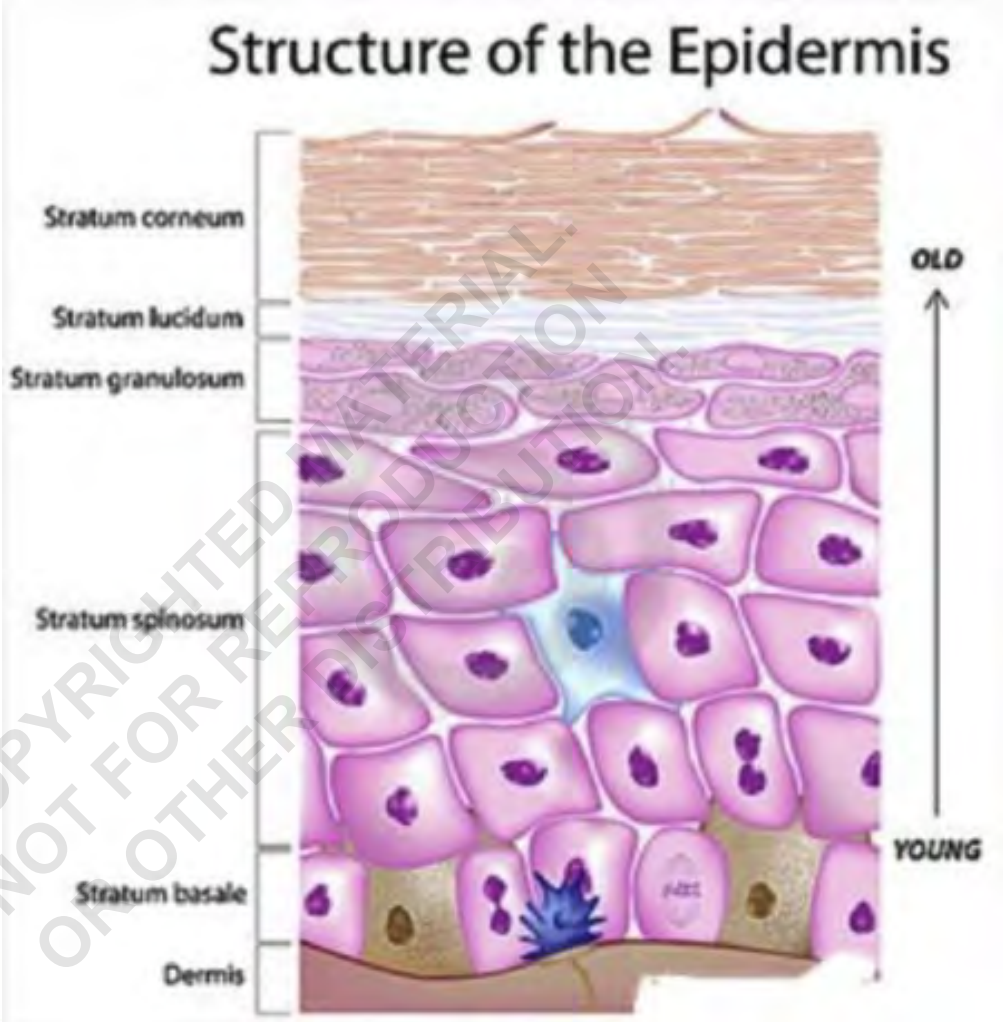
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Skin Biology



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Epidermis



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Skin Moisturizing Products Combat Dry Skin

- Itching
- Redness
- Rough skin / Tightness
- Flaking
- Cracking

- Caused by loss of moisture



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Skin Lotion Technology

- Solution – Put & Keep moisture in skin
  - Relieve dry skin
  - Prevent it from returning

How?

  - Occlusive agents
  - Emollients
  - Humectants

- Technologies are delivered via emulsions

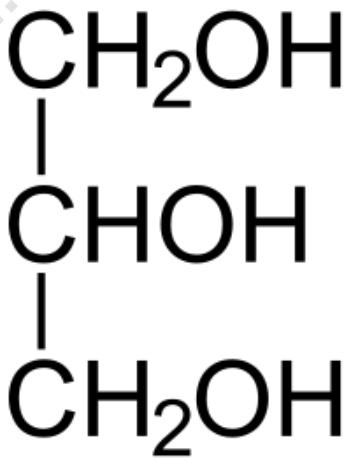


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Humectants

- Ingredients that attract water
  - Hygroscopic
- Structured for Hydrogen bonding
  -OH groups
  -NH groups
- Hygroscopicity
  - Amount of water a material attracts
  - Also called “hydrators” by marketers



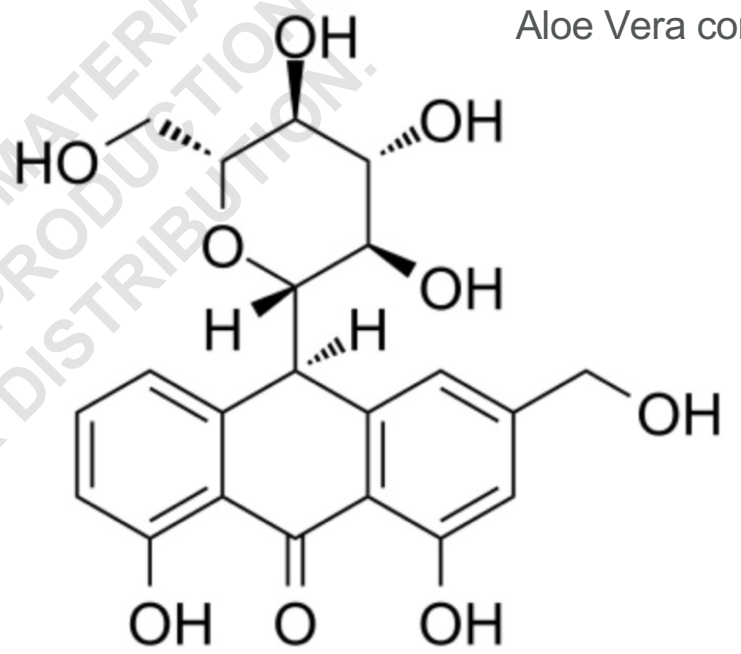
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Humectants

- Glycerin
- Propylene Glycol
- Sorbitol
- Butylene Glycol
- PEG
- Urea
- Sodium PCA
- Hyaluronic Acid
- Biomolecules
- Aloe Vera

Aloe Vera compound

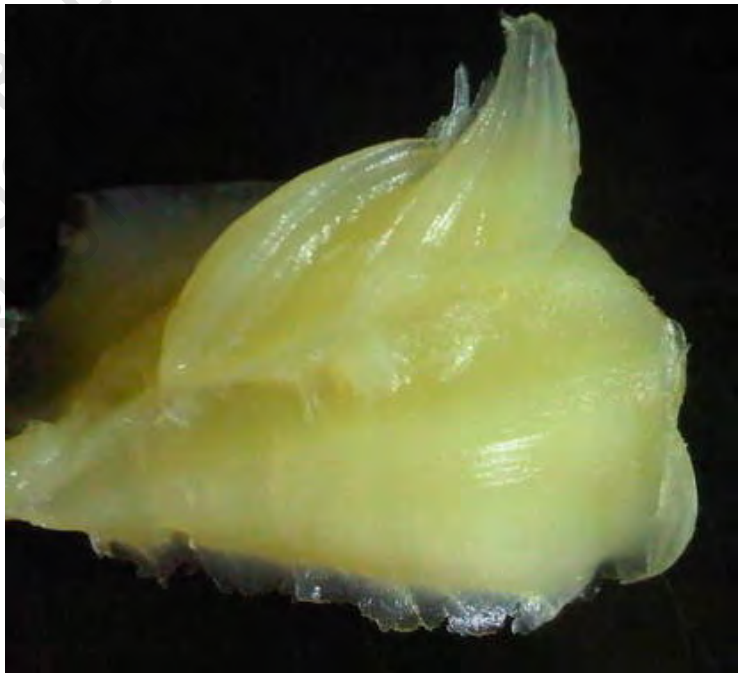


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Occlusive Agents

- Water-insoluble materials
- Create physical barrier on skin
- Types of occlusive agents
  - Hydrocarbon oils - Petrolatum
  - Silicone oils - Dimethicone
  - Vegetable & animal fats
  - Polyhydric alcohols
  - Waxes & butter - Shea Butter
  - Phospholipids
  - Sterols



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Emollients

- Non-polar materials - hydrocarbons
- Naturally occurring / or synthetic
- Light coating on skin
- Different characteristics
  - Melting point
  - Greasy feel
  - Compatibility
  - Penetration
- Depends on chain lengths of material



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Emollients

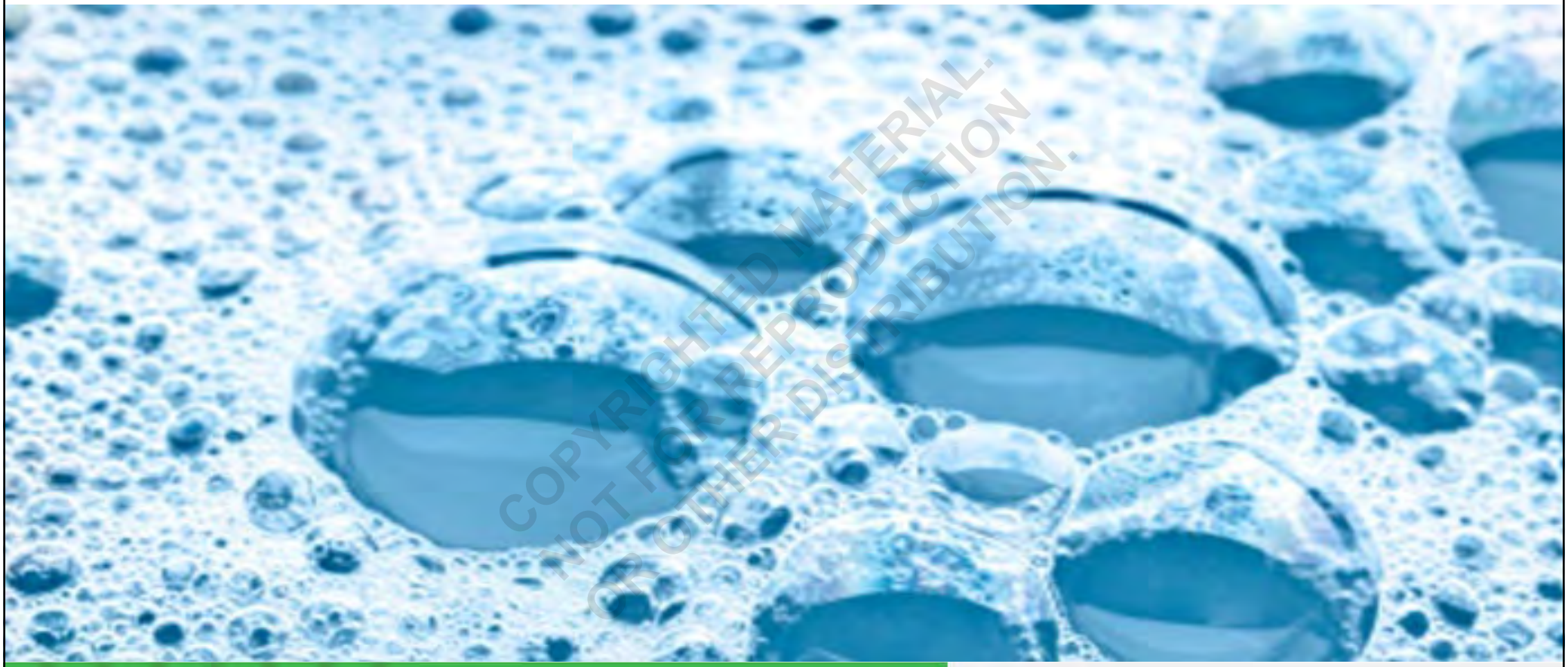
- Lanolin
- Myristyl Myristate
- Cetyl Palmitate
- Coconut Oil
- Almond Oil
- Silicones - phenyltrimethicone



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Cleansers



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Purpose of Cleansers



Remove dirt and oil from a surface

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Consumer Problems

- Skin gets dirty
  - Oils
  - Odors
  - Microbes living on skin – microbiome
- Skin feels unpleasant
- Cleaning skin without drying it out



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Types of Cleanser

- For the Skin
  - Body cleansers
  - Liquid soap
  - Hand sanitizers
  - Facial cleanser
- Performance
  - Clean
  - Moisturize
  - Biodegradable



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Three Cleansing Technologies

1. Water
2. Oils
3. Surfactants



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Water as a Cleanser



Can remove water soluble materials

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Water as a Cleanser



Doesn't work on oily materials

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Oils as a Cleanser



Can remove oily materials

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Cleansing Oil Examples

- Mineral Oil
- Sunflower Seed Oil
- Caprylic/Capric Triglycerides
- Isopropyl Palmitate
- Polyglyceryl-4 Oleate
- PEG-8 Glyceryl Isostearate
- Ethylhexyl Palmitate



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Surfactant Science



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Soap – The First Cleanser

- Accidental discovery
- Saponification
  - Fat + Alkaline
  - Solid soap
- Sodium stearate
- Can cause skin problems

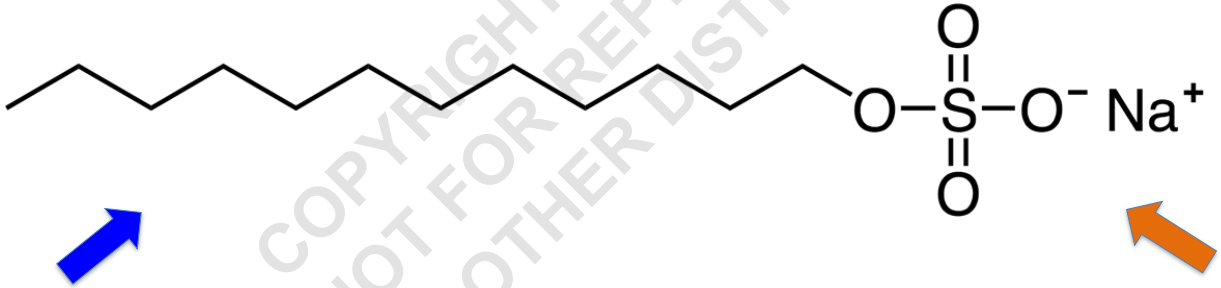


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Surfactants

- Molecules compatible with water & oil
- Surfactant = Surface Active Agent



Compatible With Oil

Compatible With Water

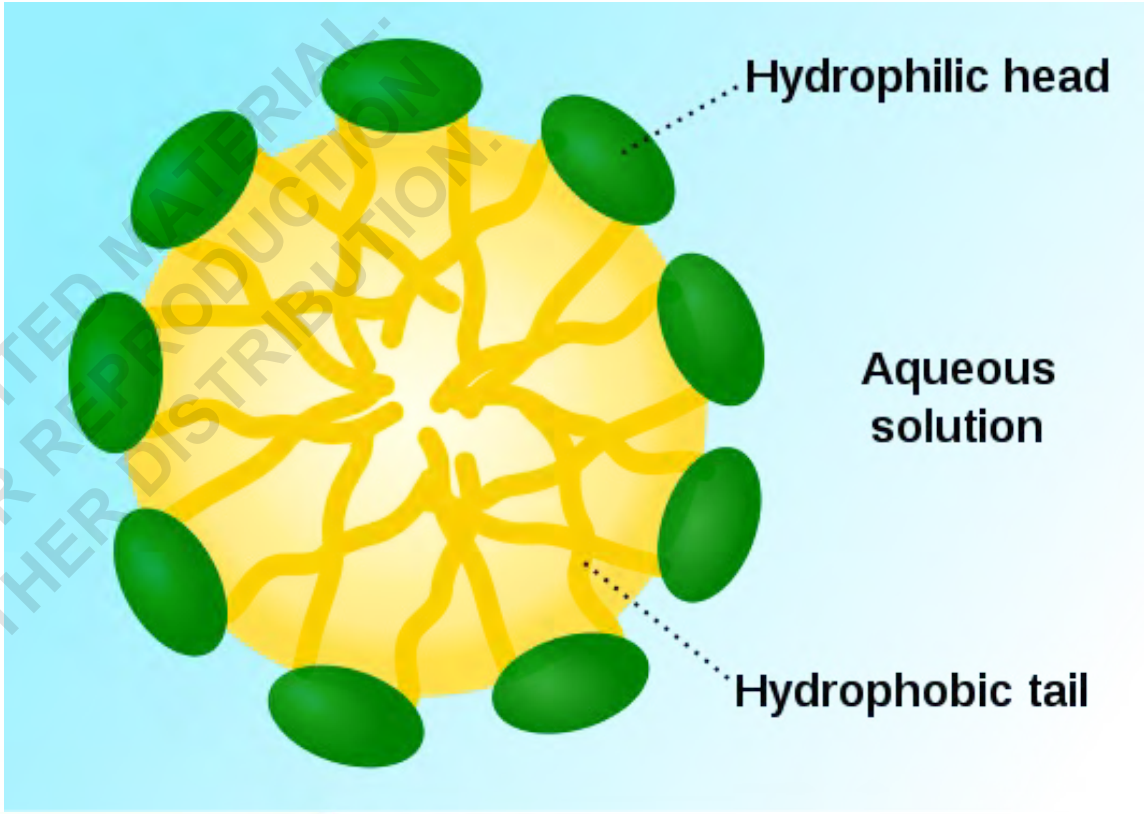
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Surfactant Molecule

Hydrophilic = Lipophobic
Compatible with water

Hydrophobic = Lipophilic
Compatible with oils

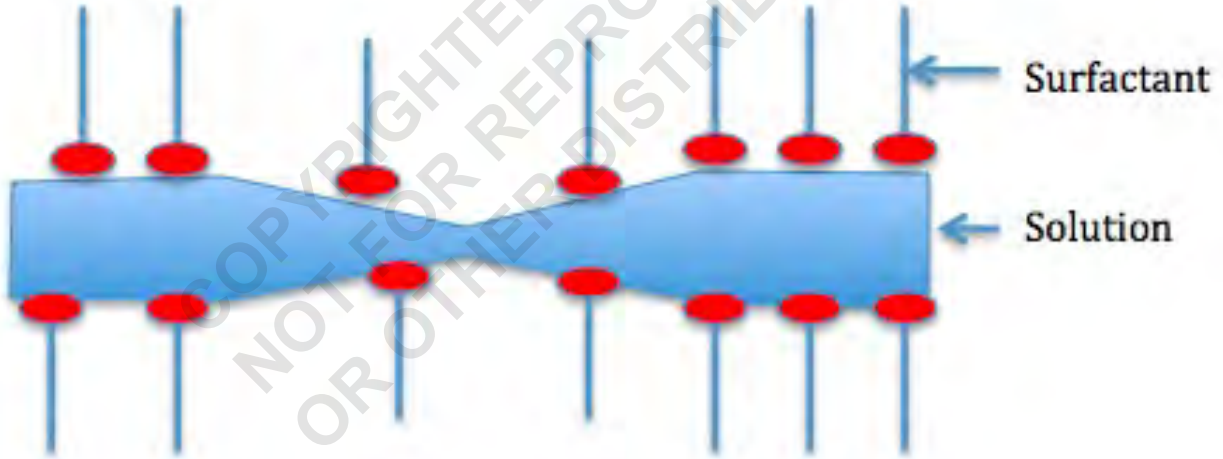


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Surfactant in Solution

- Reduces surface tension
- Helps disperse oil in water (or water in oil)
- Forms micelles to suspend particles

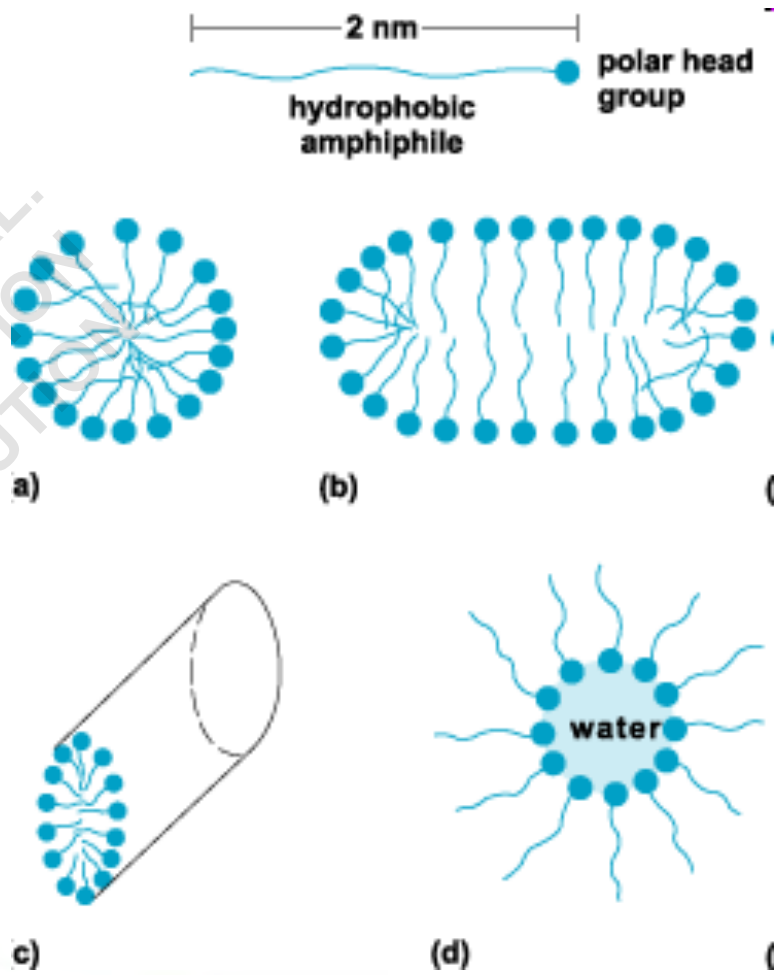


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What happens in Surfactant Solution?

- Typical surfactant mixture
  - Surfactant is mixed with oil
  - Lipophilic tails orient with oil
  - Polar heads orient with water
  - Micelles are created
- Micelle formation
- Critical Micelle Concentration



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Detergency

- How surfactants remove liquids
  - Remove dirt & grease from surfaces
  - Mechanism
    - Surfactant orients along oil/water interface
    - This lifts oil off surface suspending in solution
    - Rinse water removes the oil micelle

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The Shampoo Story



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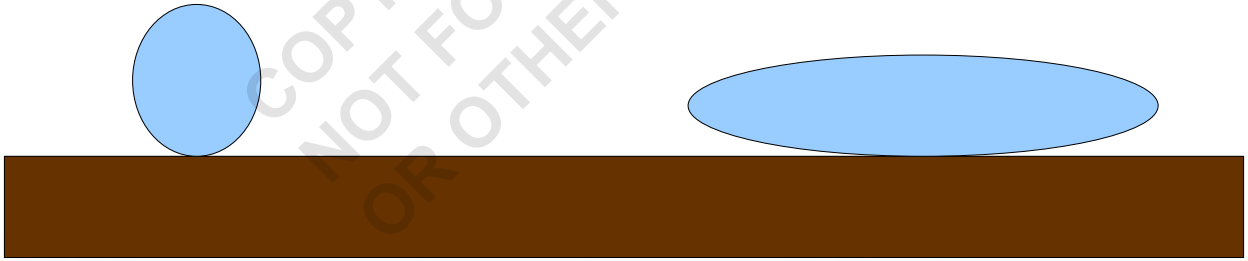
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Wetting

- Breaks down the inherent surface tension of water
- Water with surfactant can spread better on the hair

Without Surfactant

With Surfactant



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Foaming

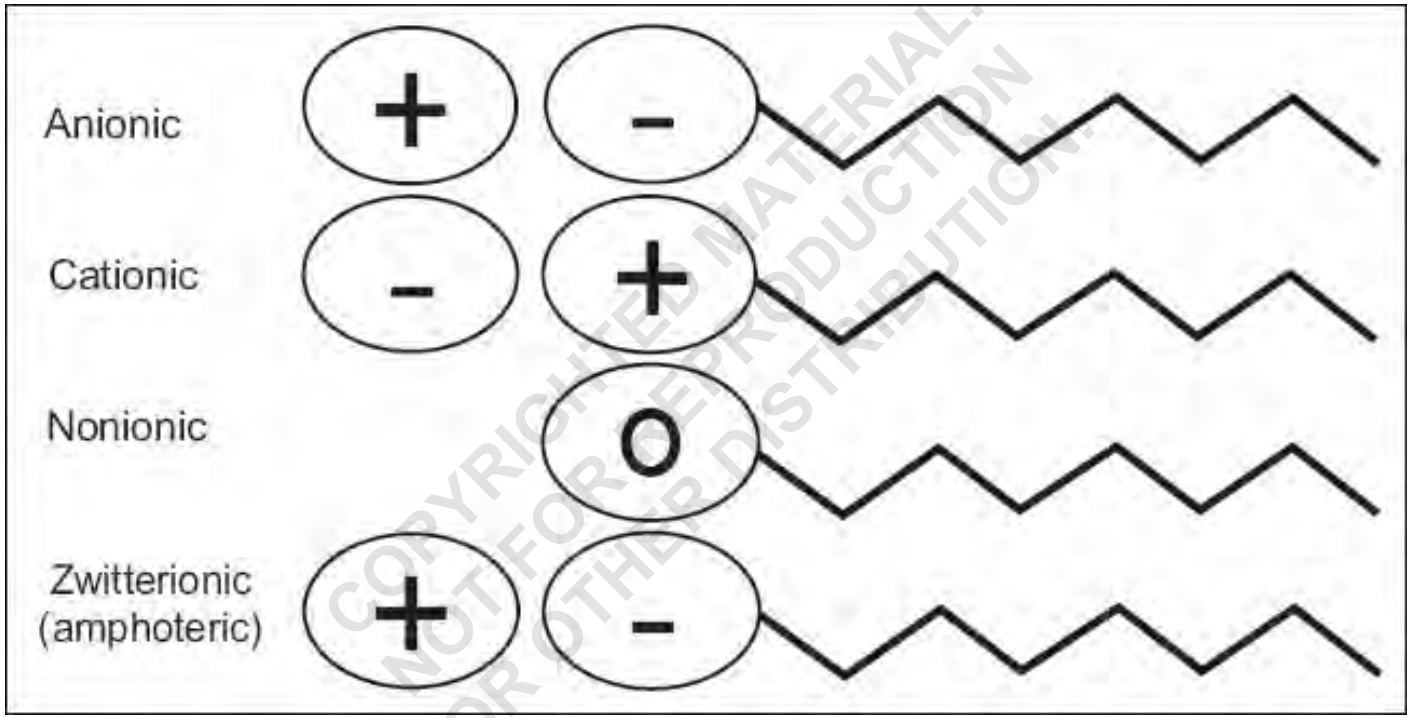
- Air is dispersed in a continuous liquid medium
- Air bubbles are surrounded by thin layers of liquid films
- Foam doesn't contribute much to removal of dirt
- Consumers like foam but it doesn't really mean the product cleans better



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Types of Surfactants



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Anionic Surfactants

- These are the primary shampoo surfactants
- Alkyl Sulfates
  - Examples - SLS
- Alkyl Ether Sulfates
  - Example – ALES
- Alpha – Olefin Sulfonates
  - Example - Sodium C14-16 Olefin Sulfonate

None of these are "natural" although SLS can be derived from coconut oil

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Anionic Surfactants

- Sulfate Alternatives
  - Sulfosuccinates
  - Alkylbenzene Sulfonates
  - Acyl Methyltaurates
  - Acyl Sarcosinates
  - Acyl Isethionates
  - Acyl Polypeptide Condensates
  - Monoglyceride Sulfates
  - Fatty Glyceryl Ether Sulfonates

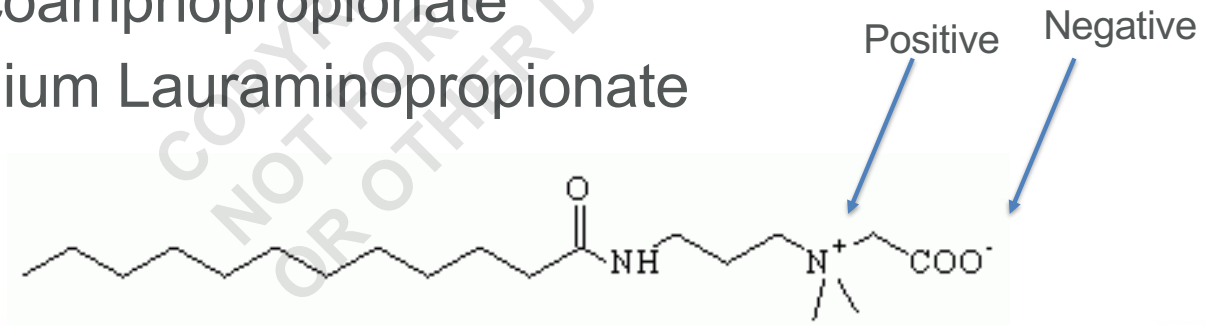
None of these are found in nature but they can be made from natural starting materials

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Amphoteric Surfactants

- Can have a positive or negative charge depending on the pH of the solution
  - Zwitterionic
- Types
  - Cocamidopropyl Betaine
  - Cocoamphopropionate
  - Sodium Lauraminopropionate



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Cleanser Technologies

- Nonionic surfactants
  - Alkyl Glucosides
  - Amine Oxides
  - Peg-80 Sorbitan Laurate

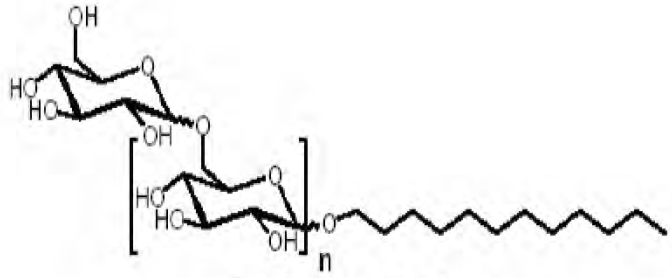


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“Natural” Surfactants

- Alkyl Polyglucoside
  - Natural primary surfactant derived from coconut and sugar
  - Does not build viscosity as well
  - Does not foam as well
  - Higher cost
  - e.g. Lauryl Glucoside



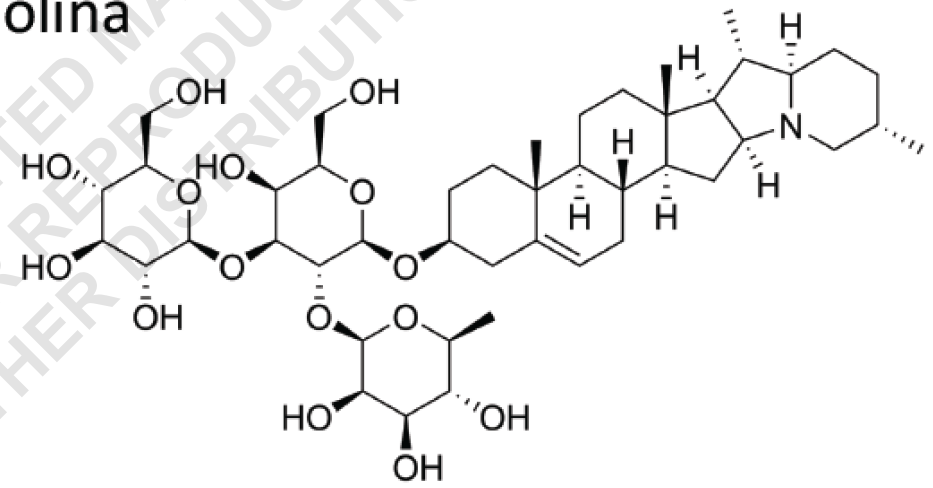
Alkyl polyglycosides

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“Natural” Surfactants

- Saponins – Cleansing Surfactants
- Source: plants – marine derived
  - Quillaja saponaria Molina
- Difficult to purify
- Too expensive
- Not as effective
- ~40% less foam
- Highly colored



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Surfactant Mildness

- Cleans without harming skin
- Non-irritating
- Non-allergenic
- Non-sensitizing
- Choose mild surfactants for cleansers
- Type of surfactants used
  - Anionic
  - Amphoteric
  - Nonionic



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Surfactant Relative Irritation Level

Surfactant	Irritation Potential
– Acyl Phosphates	Low
– Acyl Polypeptides	Low
– Acyl Sarcosinates	Extremely low
– Acyl Taurates	Low
– Alkyl Ether Sulfates	Mildly irritating
– Alkyl Sulfates	Higher
– Isethionates	Low
– Soap	Higher

Irritation depends on the ingredient structure AND the amount plus route of exposure

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Moisturizing Ingredients in Skin Cleansers

- Humectants
- Occlusive agents
- Emollients
- Polymers
  - Polyquaternium 10
  - Guar

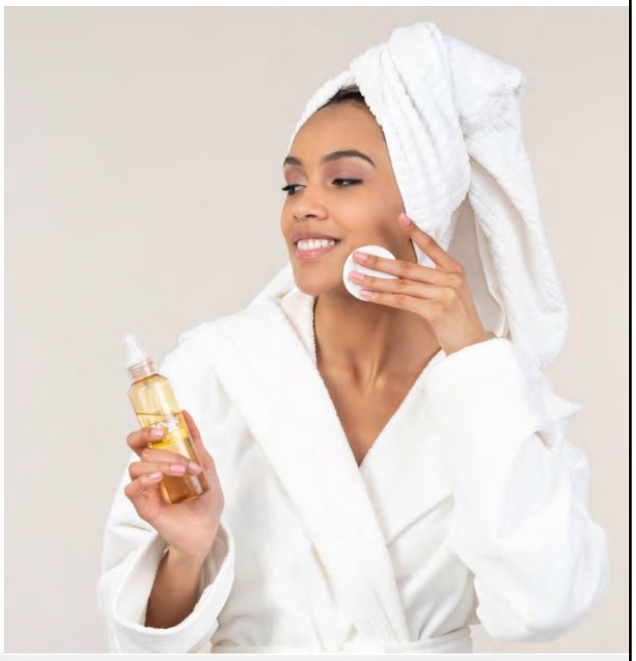


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Exfoliating

- Special type of cleanser
- Process of removing top layer of skin
- Expose “younger” cells below



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Exfoliating – 3 Technologies

- Physical or Manual removal
  - Loofahs, washcloth
  - Walnut shells
  - Microplastics
- Chemical reactive exfoliation
  - Salicylic acid
  - Regulated material
- Enhanced Natural exfoliation / Exuviation
  - AHA's
  - Polyhydric Acids



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Depilatories

- Problem: Hair in unwanted areas
- Solution: Remove hair
- 2 Technologies
  - Physical
  - Reactive

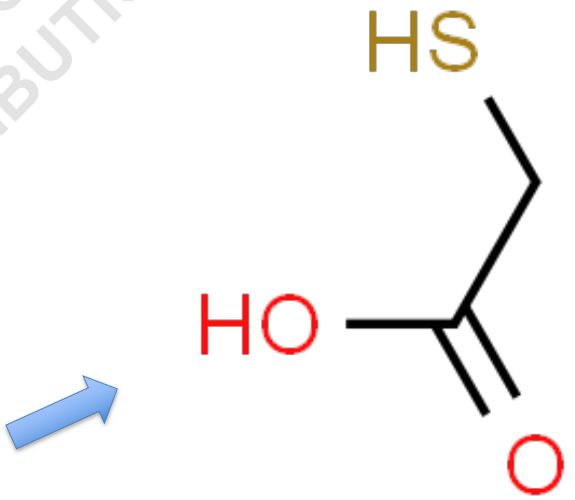


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Depilatories

- Physical
  - Waxes: Beeswax or Paraffin wax
  - Resins: Glyceryl Rosinate
- Reactive
  - Inorganic salts: strontium sulfide
  - Organic compounds: thioglycolic acid
- Salts are used most commonly
  - Calcium Thioglycolate
  - Sodium Thioglycolate
  - Magnesium Thioglycolate



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Anti-aging Products



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What is Aging Skin?

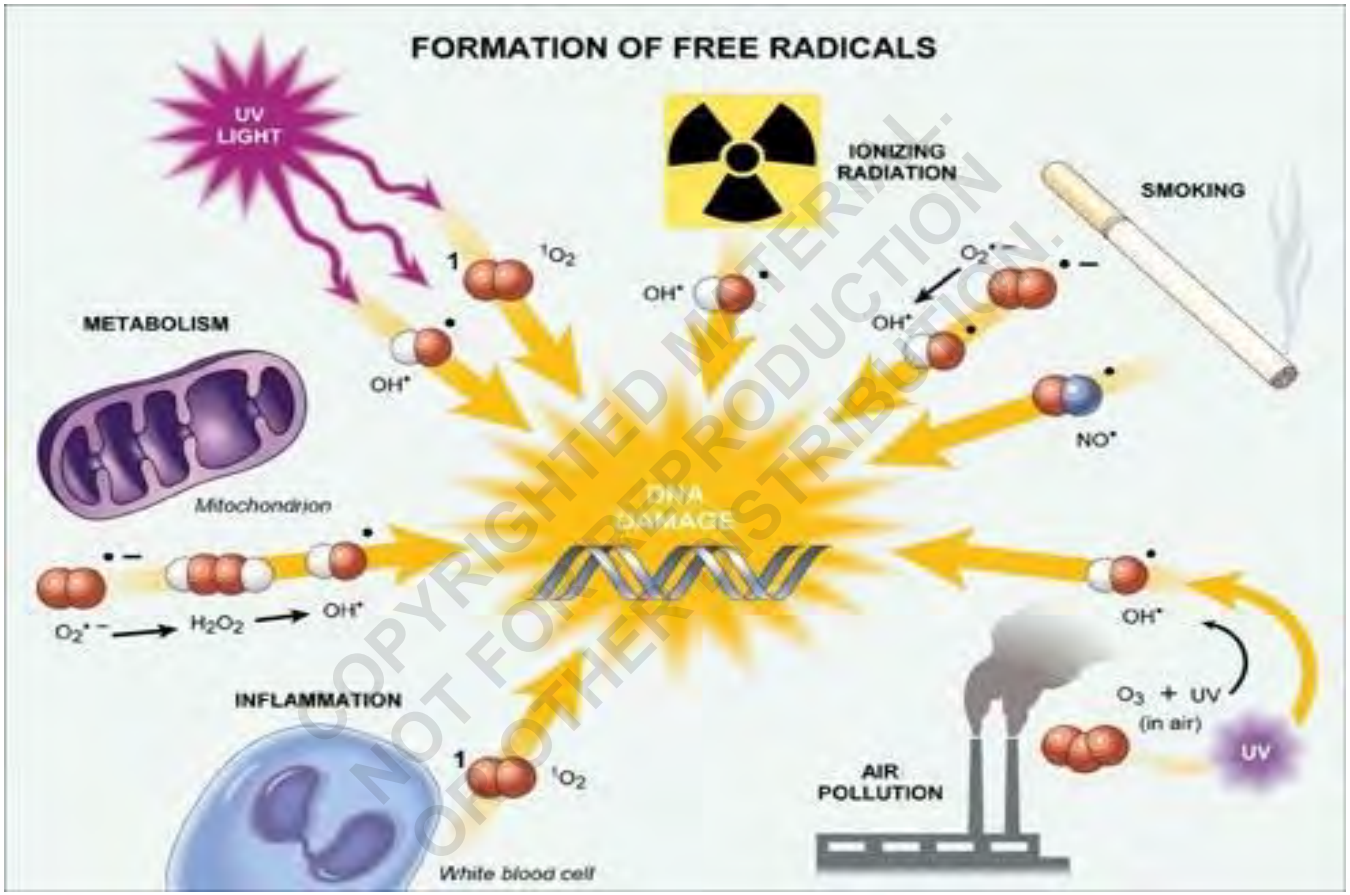
- Problems
  - Wrinkles
  - Thin, sagging skin
  - Dull appearance
  - Age spots
- Decreased biomolecules
  - Collagen
  - Elastin
  - Hyaluronic acid



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Factors that Accelerate Aging



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Anti-aging Treatments

- Exfoliation
- Moisturizers
- Anti-Oxidants
- Sunscreens
- Biochemicals
- Epigenetic effectors



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Anti-aging Ingredients

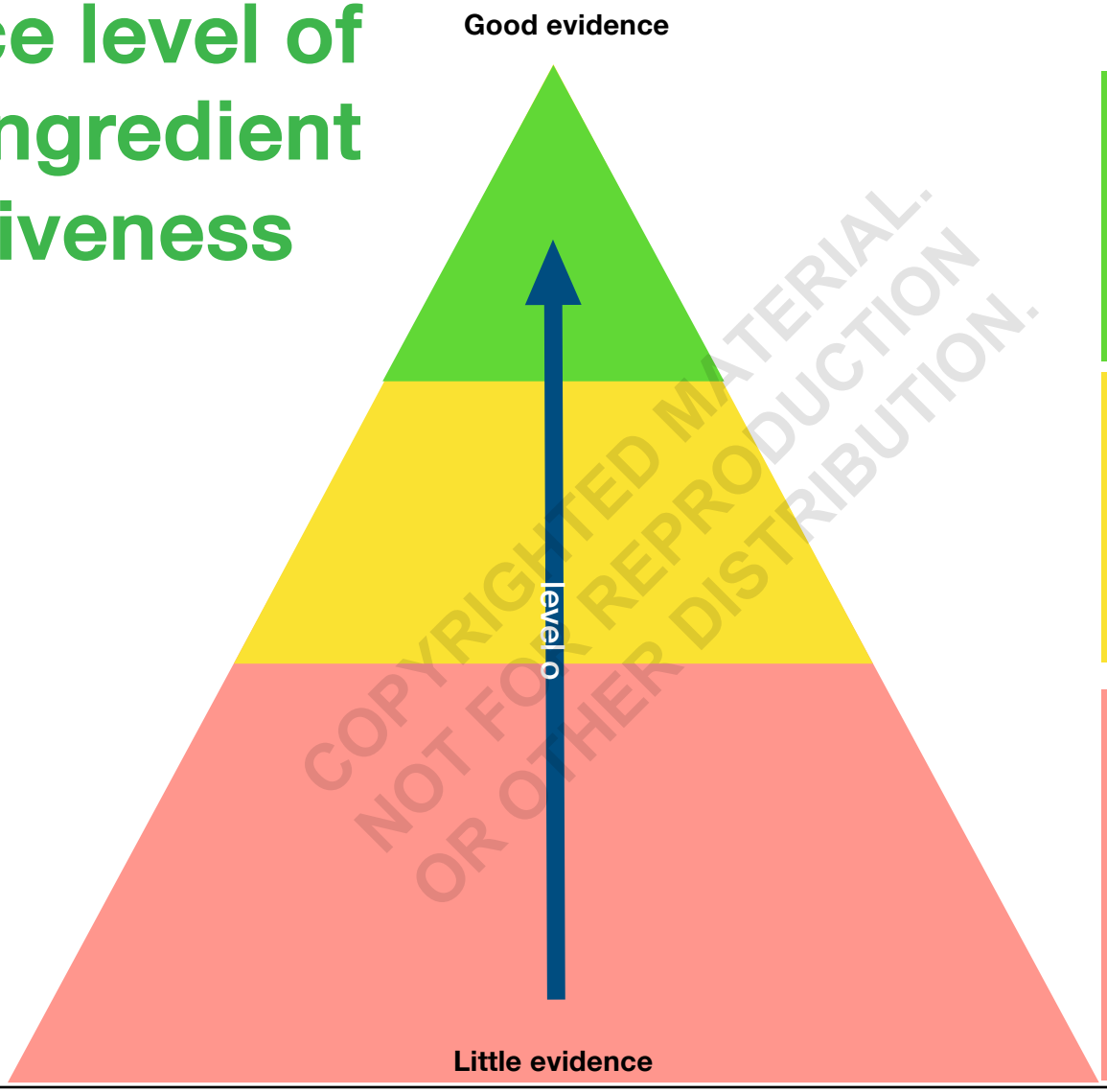
- Niacinamide
- Hyaluronic Acid
- Carotenoids
- Flavonoids
- Polyphenols
- Retinoids
- Alpha Hydroxy Acids
- Peptides
- Kinetin
- Stem Cells
- Vitamins



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Evidence level of Active ingredient Effectiveness



- Drug actives - many
- Retinoids
- Hydroxyacids
- Niacinamide

- Vitamin C
- Vitamin E
- Ceramides
- Ferulic Acid

- Probiotics
- Coenzyme Q10
- Flavonoids
- Peptides
- CBD
- Natural Extracts
- Polyphenols
- Kinetin
- Stem cells
- Curcumin
- Collagen
- Caffeine
- Polyphenols
- Resveratrol

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Quiz #3

1. What do you call a 22 carbon alcohol?

A. Ethanol
B. Cetyl alcohol
C. Palmitic acid
D. Behenyl Alcohol

2. Which surfactant is used most often for cleansing formulas?

A. Anionic
B. Cationic
C. Amphoteric
D. Nonionic

3. Which ingredient has the most convincing supporting evidence of effectiveness?

A. Bakuchiol
B. Retinoic acid
C. Stem cells
D. Flavonoids

4. Which surfactant would be the most mild on its own?

A. Sodium Lauryl Sulfate
B. Soap
C. Sodium Lauroyl Sarcosinate
D. Sodium Laureth Sulfate

5. What do you call the spherical structures that surfactants organize into in a solution?

A. Lamellar
B. Micelles
C. Liposomes
D. Tubules

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Quiz #3 - Answers

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Functional Cosmetic Ingredients Hair Products

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Objectives

- The objective of this section is to introduce you to the specific functional raw materials used in hair care products.

- Review the different types of hair care products
- Problems hair care products solve
- Raw materials that solve those problems

- Know how hair care products are made

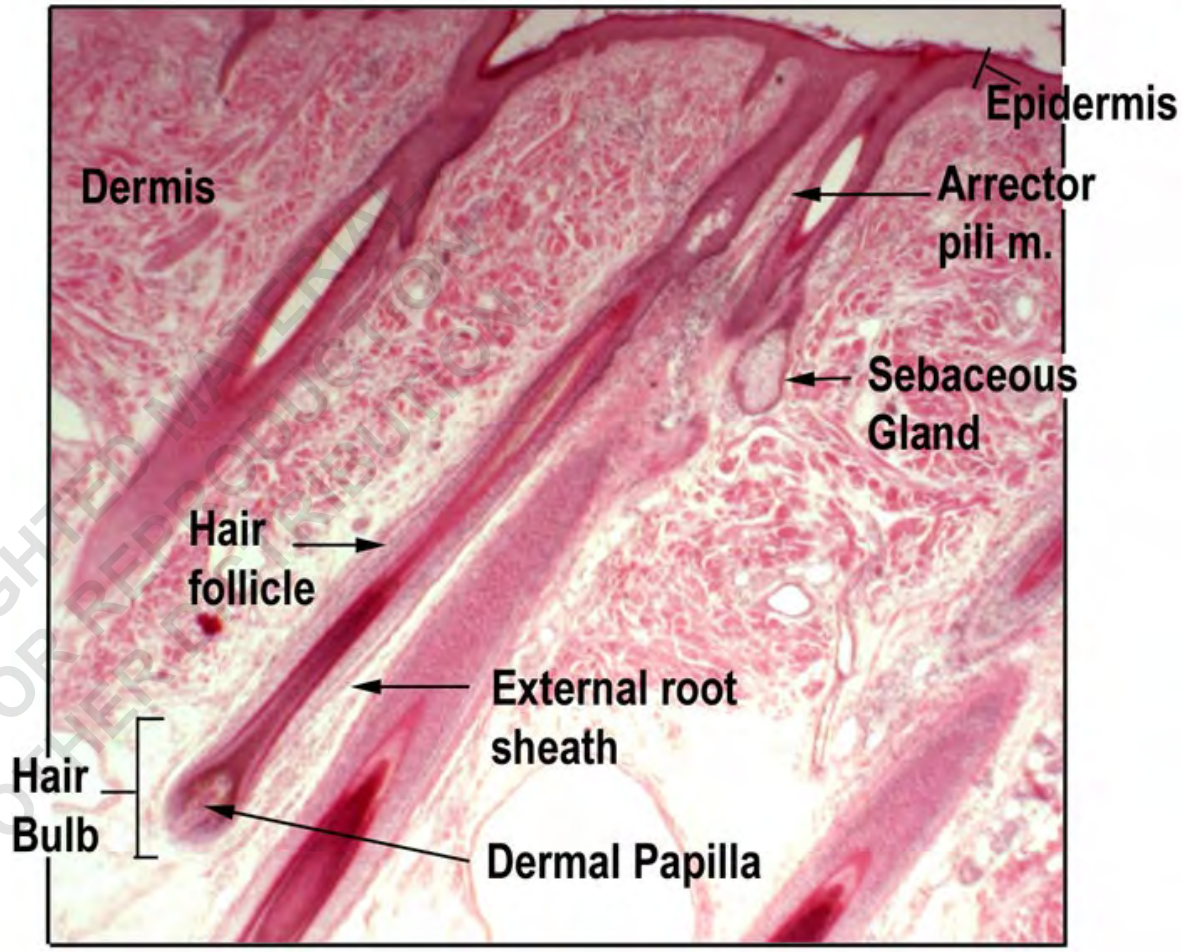


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Hair Biology

- Made up of Protein (keratin)
- Some natural oils (sebum)
- Growth happens in follicle
- Hair outside scalp is dead
- Products target cuticle / cortex

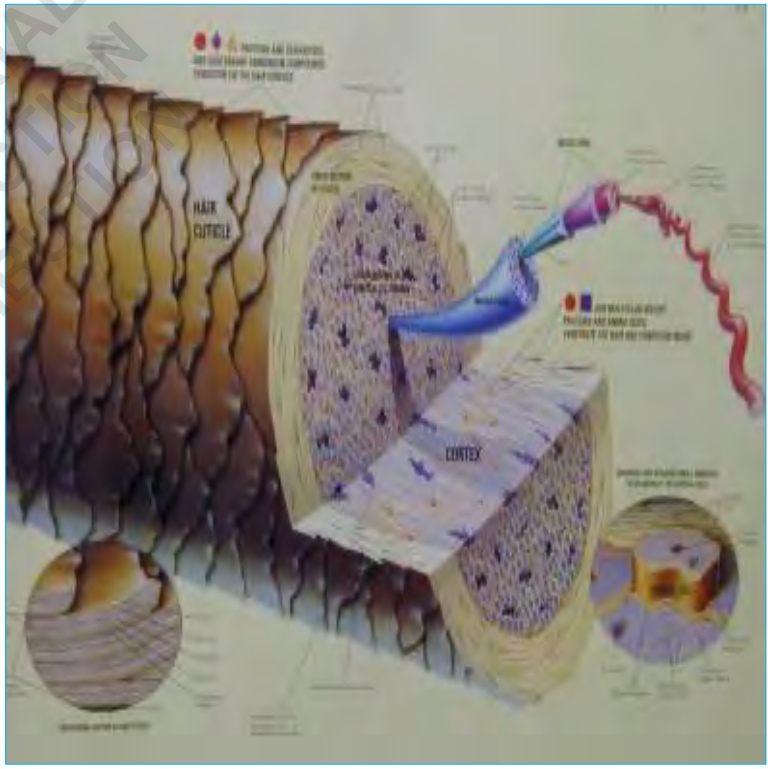


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Hair Biology
3 Main Parts of Structure

- Cuticle
  - Shingle like outer layer
  - Provides protection
- Cortex
  - Inner bundles of protein
  - Provides strength
- Medulla
  - Spongy, hollow zone
  - A mystery!

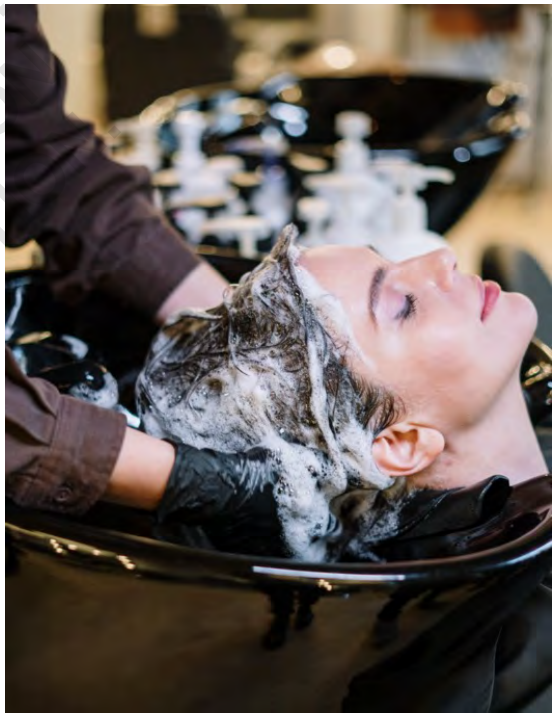


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Hair Product Topics

- Introduction to hair care products
- Shampoos
- Conditioners
- Styling products
- Hair coloring
- Perms and Relaxers



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Categories of Hair Care Products

Rinse off

- Shampoos
  - Antidandruff
  - Hair growth
- Conditioners

Leave-on

- Conditioners
- Styling

Modify

- Relaxers
- Perms
- Hair color

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Shampoo



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Shampoos

- Designed to remove things from hair
- Types of shampoo (marketing)
  - Normal
  - Baby (tear-free)
  - 2 in 1 (conditioning)
  - Extra body - volumizing, thickening, etc
  - Moisturizing - smoothing, shine, restore



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Consumer Problems

- Clean hair / oil removal
- Moisturize
- Easier to comb
- Prevent frizz
- Shine
- Volume
- Medical Problems
  - Anti-dandruff
  - Anti-lice
  - Hair loss



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Addressing the Problems

Problem

- Clean hair / oil removal
- Moisturize
- Easier to comb
- Prevent frizz
- Shine
- Volume
- Medicated
  - Anti-dandruff
  - Anti-lice
  - Hair loss

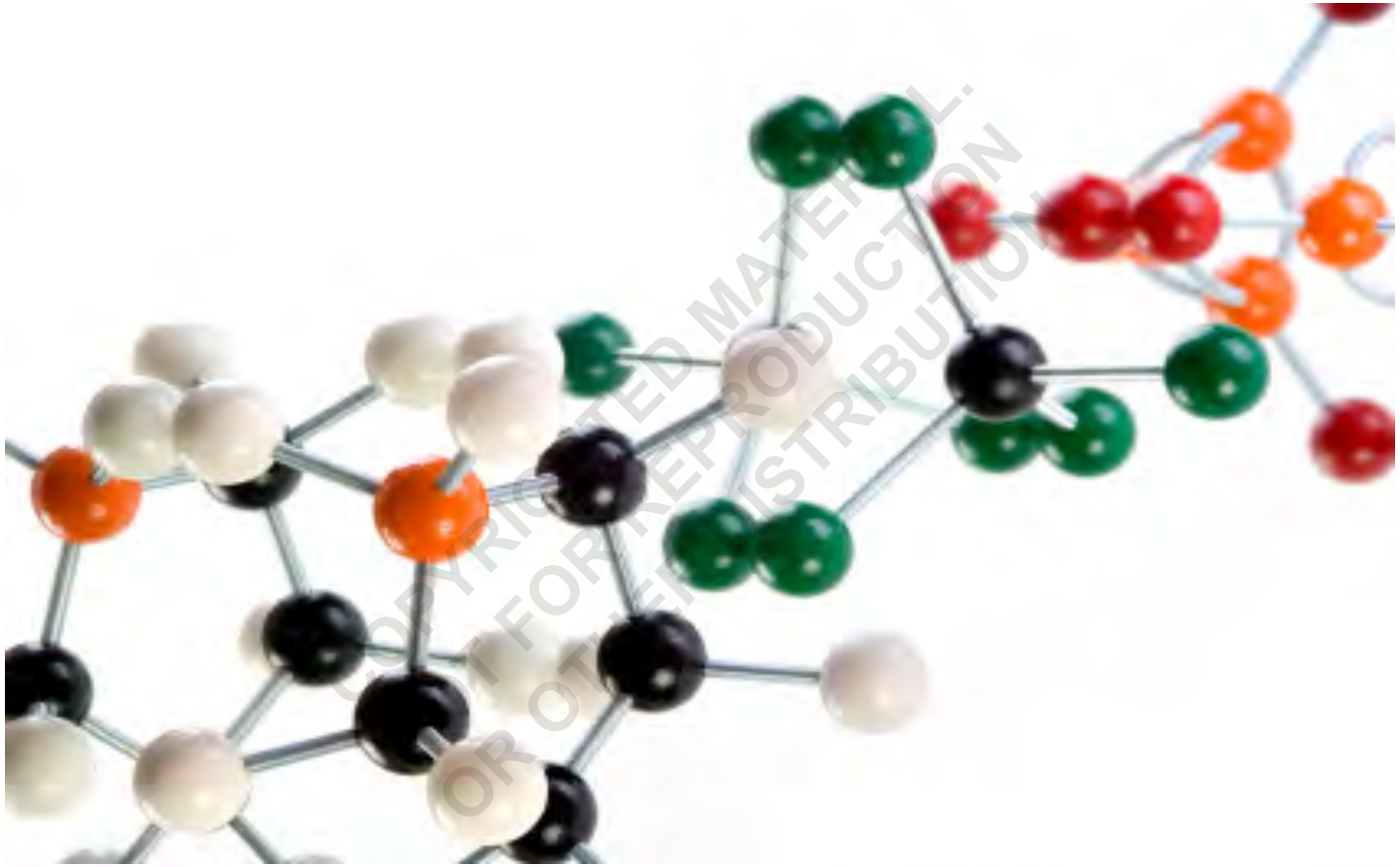
Technology

- Surfactants
- Conditioning agents
  - Anti-dandruff agents
  - Acaracides
  - Minoxidyl

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Shampoo Conditioning Ingredients



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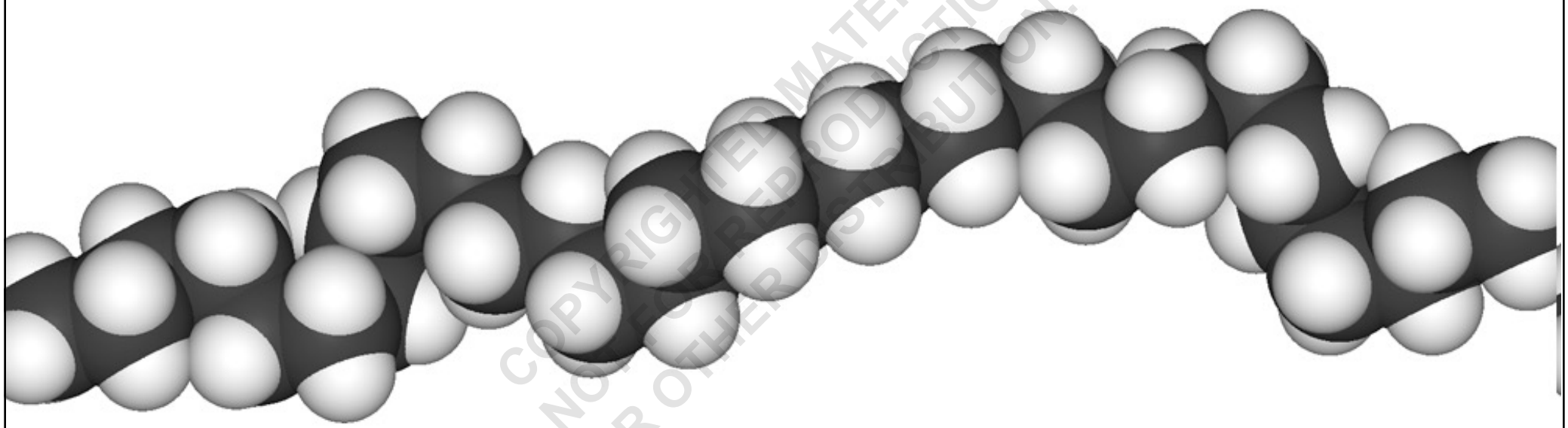
Conditioning Agents in Shampoos

- Defined
  - Ingredients that improve condition of hair
    - Slip
    - Shine
    - Manageability
  - Must be substantive to work
- Most effective in shampoos
  - Cationic polymers
  - Silicones

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Cationic Polymers

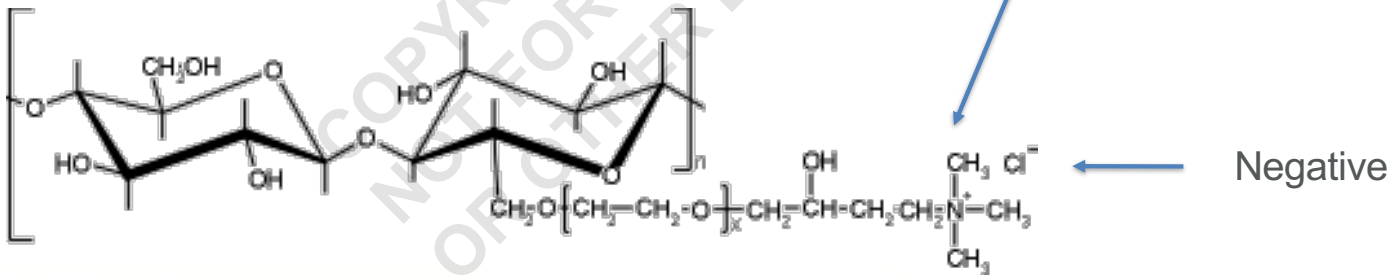


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Cationic Polymers

- Common Examples
  - Polyquaternium 4
  - Polyquaternium 7
  - Polyquaternium 10
  - Guar Hydroxypropyltrimonium Chloride

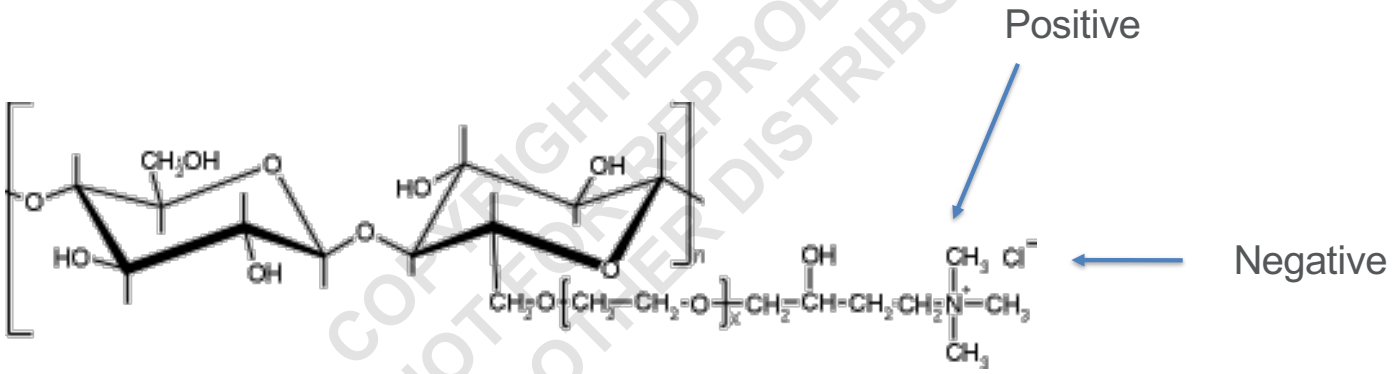


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Cationic Polymers

- Work in 2 ways
  - Electrostatic attraction to damaged sites
  - Water insoluble upon dilution



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Silicones

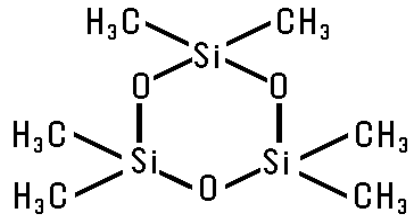
- Hair Benefits
  - Spreadability
  - Feel
  - Slip
  - Shine
  - Protection
  - Easy of combing
  - Detangling



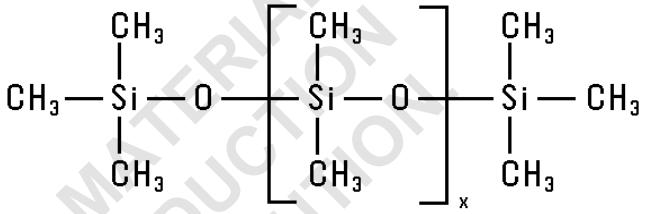
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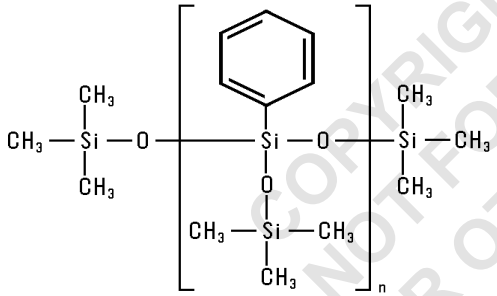
Varieties of Silicones



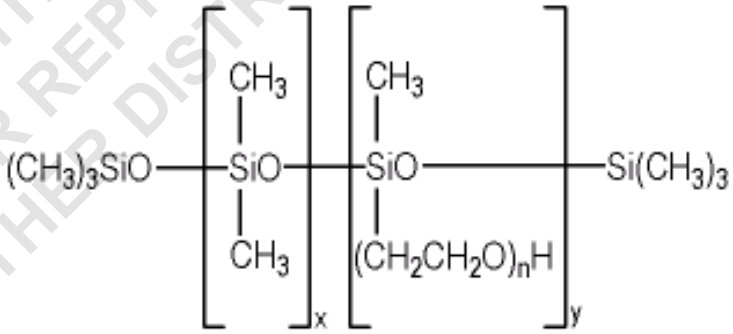
Cyclomethicone
(Hexamethyltrisiloxane)



Dimethicone



Phenyl Trimethicone



Silanol (Dimethicone Copolyol)

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Silicones

- Mechanism of Action
  - Water insoluble
  - Emulsion breaks when diluted
- Benefits
  - Increased shine
  - Increased lubricity
  - Works on undamaged hair
  - Synergistic with cationics
- Drawbacks
  - Build-up
  - Weigh down hair



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Oils are not good materials to use in shampoo formulas



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Conditioners



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Conditioners

- Emulsion-based formulas designed to reduce the forces associated with combing hair
- *Applied after shampooing

*Hot Oil Treatments are an exception

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Conditioner Market

- Types of conditioners (marketing)
- Similar to shampoos
- Rinse-out
  - Volumizing
  - Moisturizing
  - Smoothing / Straightening
  - Color preserving
  - Shine
  - Strengthening



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Conditioner Market

- Intensive (Treatments)
  - Hair Masks
  - Hairdressing
  - Protein packs
  - Hot Oils
  - Capsules
  - Serums
- Leave-In



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Consumer Problems

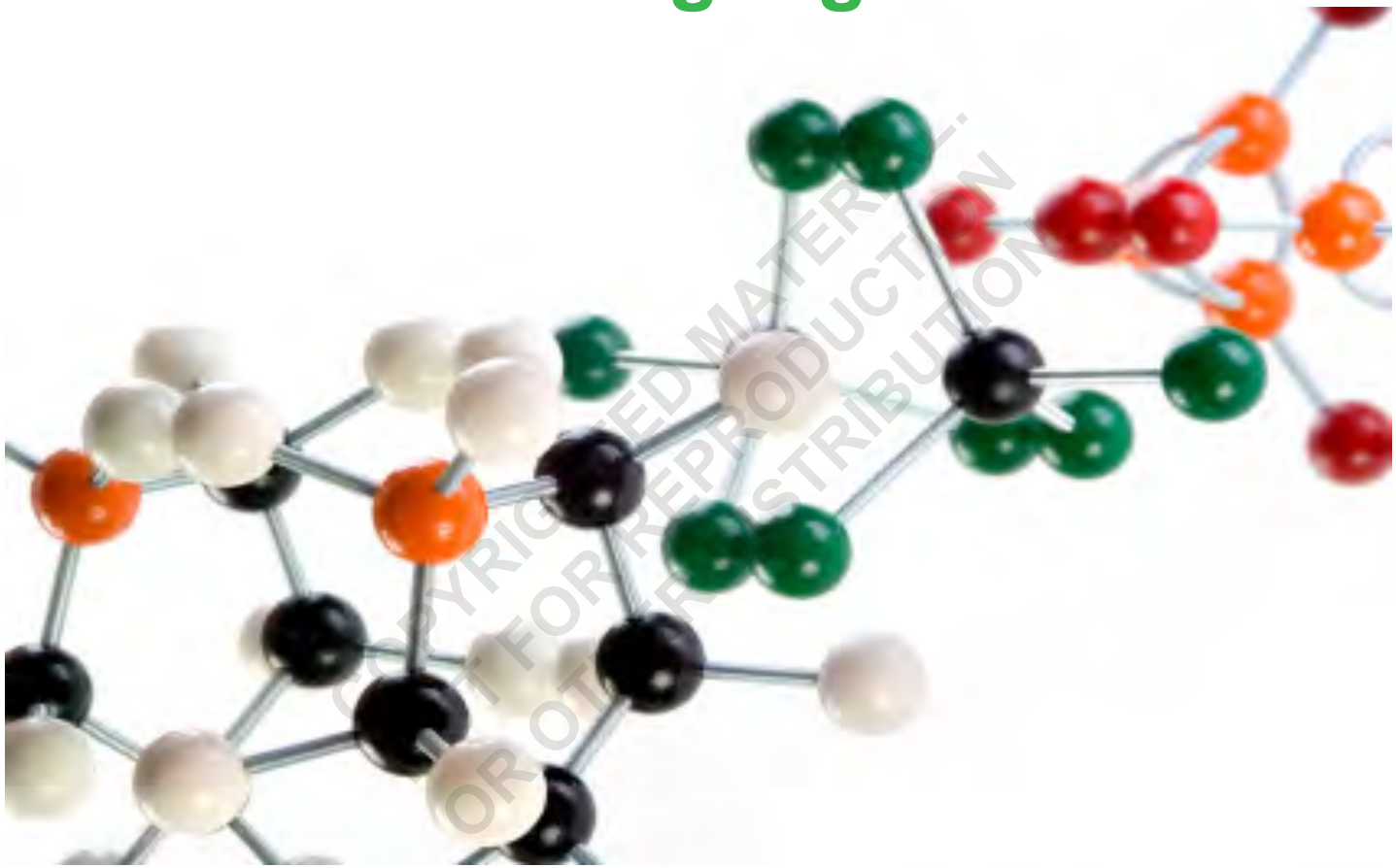
- Hard to comb
- Hair feels dry
- Prevent frizz
- Dull looking
- Too flat
- Hard to shape



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Conditioning Ingredients



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Conditioning Agents

- Defined
  - Ingredients that improve condition of hair
    - Slip
    - Shine
    - Manageability
  - Have an “oily” nature to them
  - Must be substantive to work



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Conditioning Agents MUST be substantive to hair for them to work

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Common Conditioning Agents

- Quats or Cationic Surfactants
- Cationic Polymers
- Silicones
- Humectants
- Emollients
- Proteins

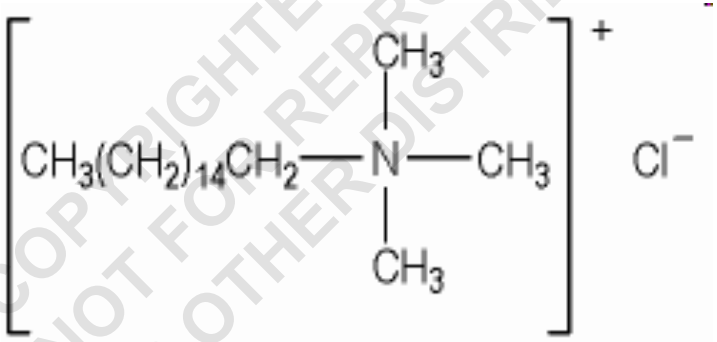


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Quaternized Surfactants

- Cationic Surfactant
  - Hydrophobic tail
  - Hydrophilic head



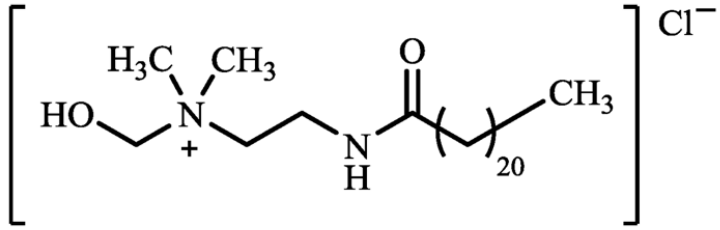
Cetrimonium Chloride

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Quats

- How do they work?
  - Electrostatic Attraction
  - More damage = more substantivity
  - Longer chain length = more conditioning



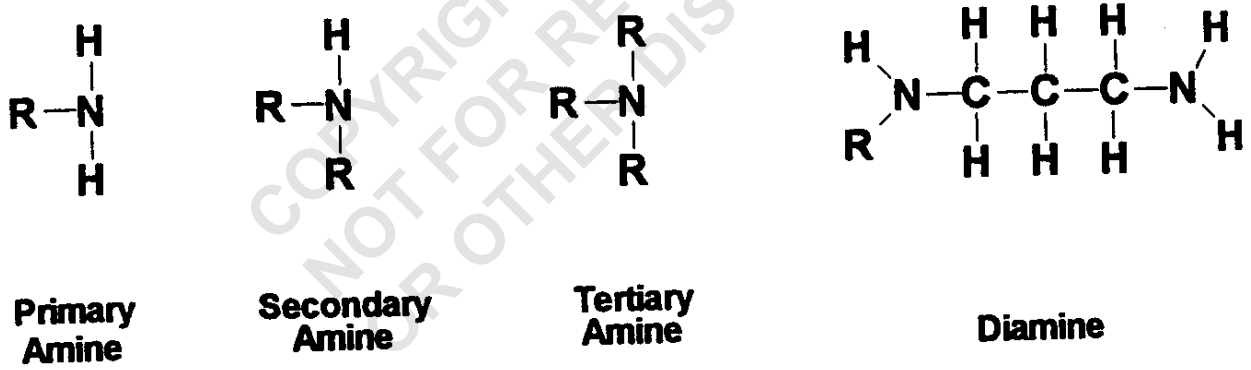
Hydroxyethyl-Behenamidopropyl-Dimonium Chloride (HBD-Cl)

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Quats

- Examples
  - Cetrimonium Chloride
  - Stearalkonium Chloride
  - Dicetyldimonium Chloride
  - Behentrimonium Chloride



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Emollients in Hair Care

- Mimics the effect of silicones
  - Shine
  - Slip
  - Improve flexibility
- Coconut oil penetrates hair
  - Good for hair strengthening
- Most emollients create layer on hair
  - Protection from heat
  - Protection from styling damage

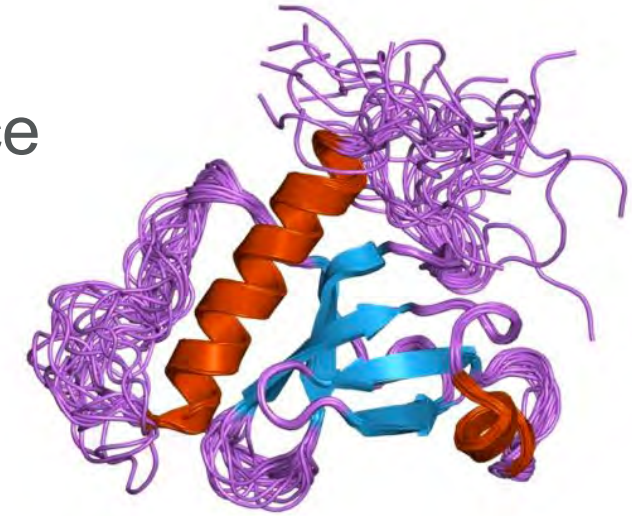


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Proteins for Haircare

- Have a secondary structure
- Hydrolyzed proteins are denatured
- Short chains of amino acids
- Protein source mostly makes no difference
- Easy for formulating
- Humectant / emollient effect
- Film forming effect



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Hair Styling Products

- Formulations designed to help shape and maintain the shape of hair
- Features a styling polymer or ingredient to hold hair



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Consumer Problems

- Hair doesn't look as desired
- Hair doesn't hold shape
- Hair gets damaged



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Styling Product Types

- Types of styling products
  - Gels
  - Waxes
    - Pomades
    - Putties
  - Sprays
    - Mousse
    - Hair spray
  - Creams

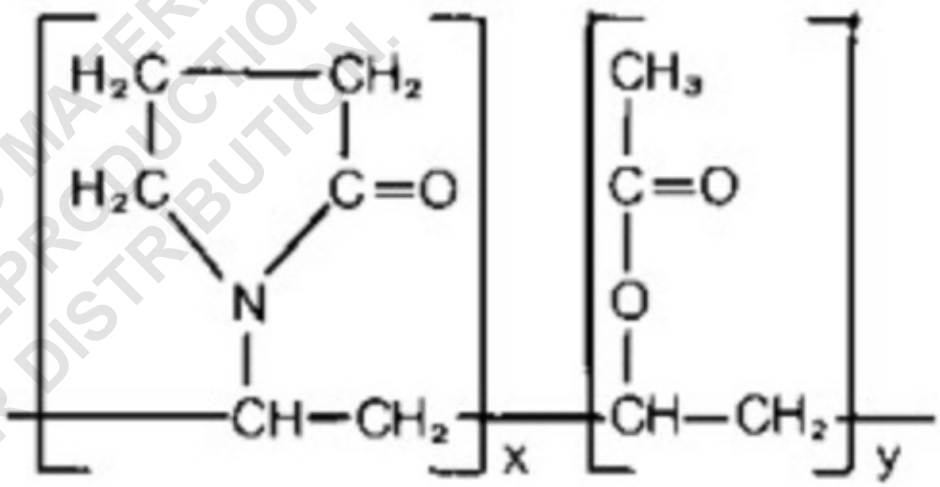


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Styling Polymers

- PVP
  - Readily soluble
  - Easily sprayed
  - Film clarity
- PVP / VA copolymer
  - Reduce water solubility
  - Less sticky
- PVP / DMAPA acrylates copolymer



PVP / VA

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Wax Based Styling

- Where are they used?
  - Pomades
  - Waxes
- Examples
  - Petrolatum
  - Beeswax
- How do they work?
  - Delivered to hair as a thick, sticky film
  - Holds hair in groups “welding” them together
  - Chunks of hair stand up creating a piece-y, texturized look
  - Waxy materials do not dry and remain flexible
  - Allows for remolding of style over time

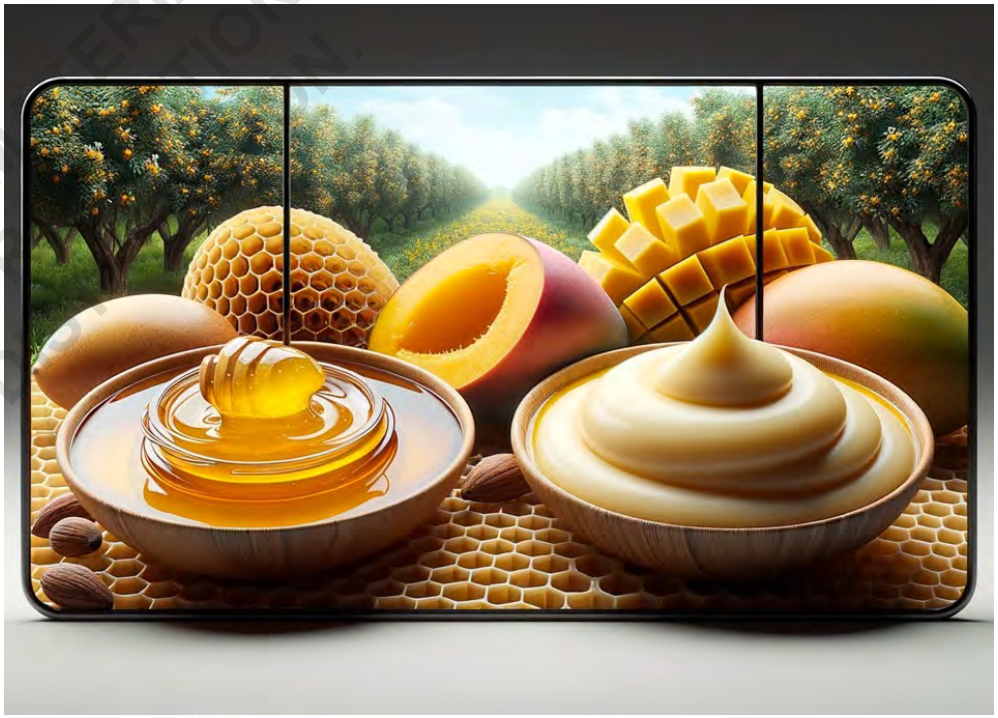


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Natural Styling Ingredients

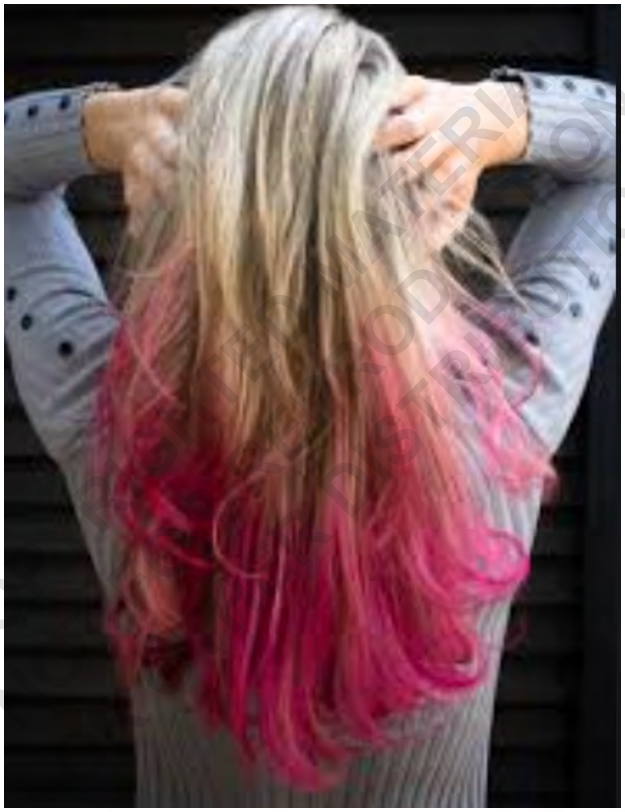
- Limited options
- Maltodextrin/VP Copolymer
- Chitosan
- Acacia Gum
- Oil based stylers / pomades
  - Shea Butter
  - Coconut Oil
  - Beeswax



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Hair Coloring



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Why Does Hair Have Color?

Melanin = pigment that gives hair color



Black to blonde: Two pigments make up ALL hair colors.

Eumelanin, most common, gives shades from brown to black

Pheomelanin gives the yellow-blonde and red colors

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Types of Hair Colors

- Temporary hair color
- Semi-permanent / demi-permanent hair color
- Permanent hair color
- Bleach



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Temporary Hair Color

- Last only a short time
- Washed off with shampoo
- Coat surface
- Acid or Basic dyes
  - Acid Yellow 23
  - Acid Orange 7
  - Acid Blue 9
  - Acid Black 1

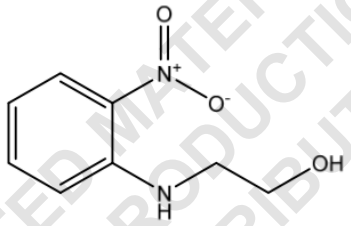
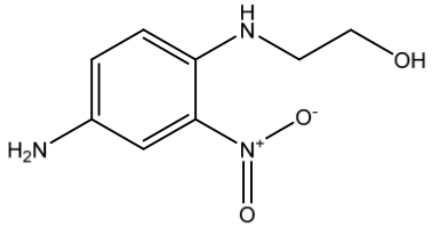


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Semi-Permanent Hair Color

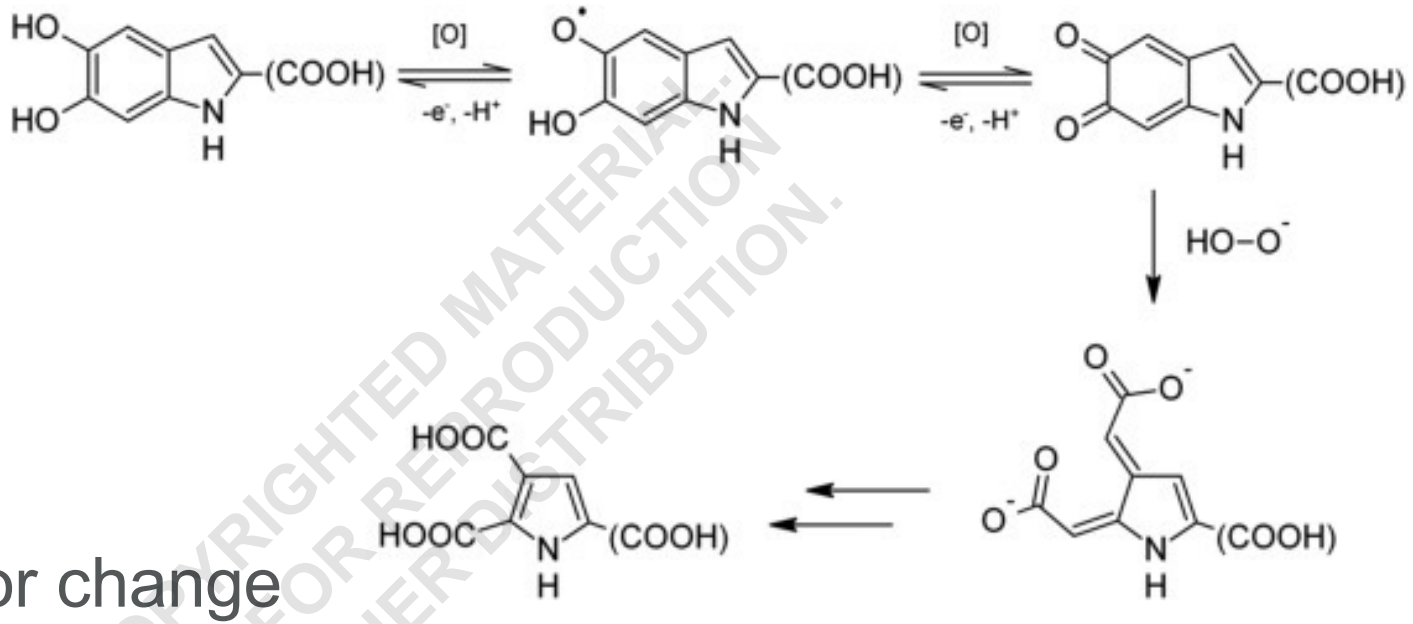
- Last multiple washings
- Types of dyes
  - Nitrophenylenediamines
  - Nitroaminophenols
  - Aminoanthraquinones

INCI: HC Yellow No. 2	INCI: HC Red No. 3
	
CAS No. 4926-55-0 EINECS No. 225-555-8 Empirical Formula: $C_8H_{10}N_2O_3$ Chemical Classification: nitro aniline	CAS No. 2871-01-4 EINECS No. 220-701-7 Empirical Formula: $C_8H_{11}N_3O_3$ Chemical Classification: nitro aniline

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Bleaching



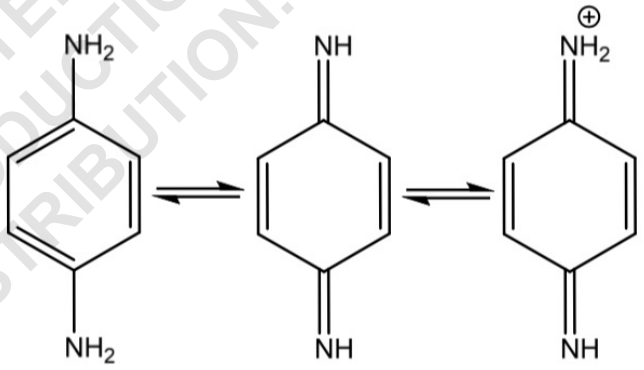
- Permanent color change
- Oxidation reaction with melanin
- Ammonia, Hydrogen Peroxide

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Permanent Hair Color

- Color lasts until it grows out
- Bleach natural color
- Add new color
- Polymerization reaction
- Compounds
  - p-phenylenediamine (PPD)
  - p-aminophenol (PAP)
- Modified with couplers to create various colors



PPD

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Natural Hair Color

- Unreliable but can work
- Juices
  - Carrot
  - Beet
  - Lemon
- Coffee and Tea
- Henna
  - Hard to use
  - Coloring compound Lawsone
  - Heavy metals can be a problem



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Reactive Hair Products

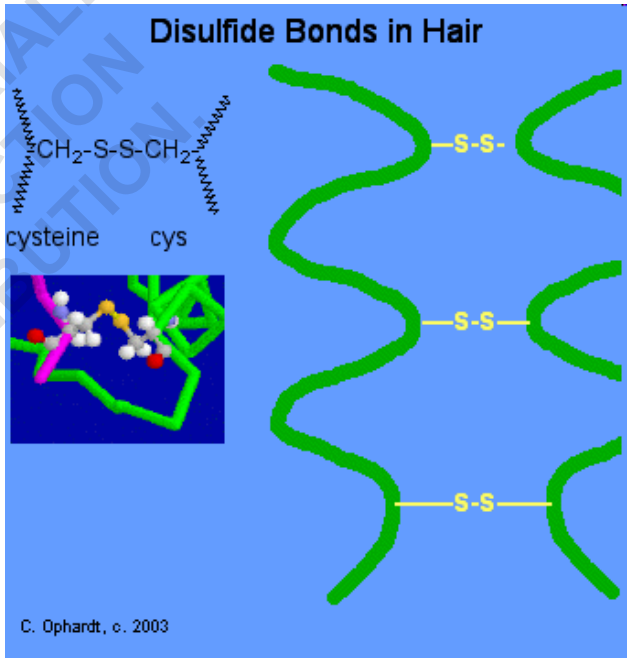


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Hair Style Science

- Disulfide Bonds
- Strong bond between protein chains
- Permanent shape of hair
- Chemical processes to break bonds
  - Thioglycolic Acid
  - Sodium Hydroxide
- Hair relaxers

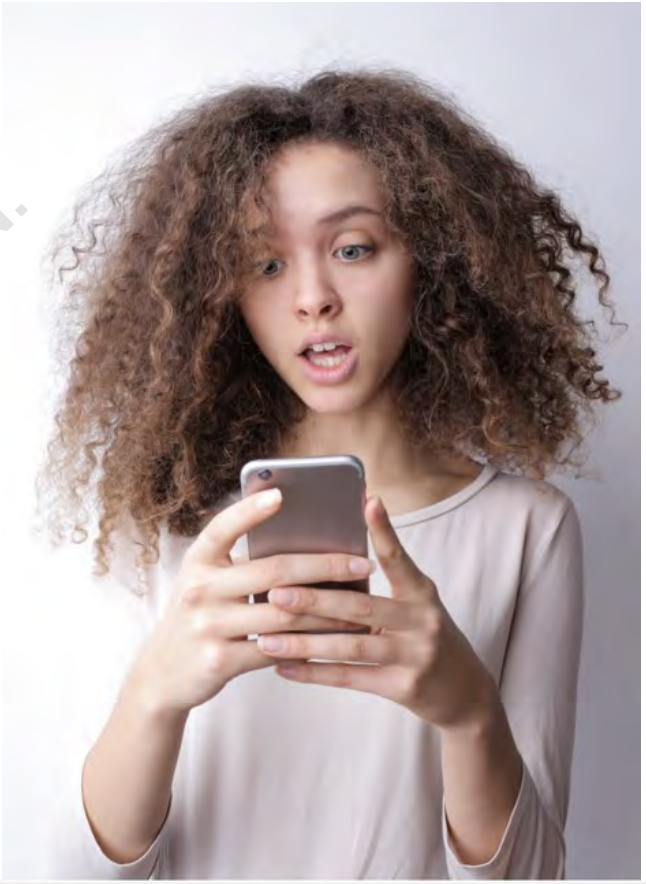


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Types of Relaxers

- Lye relaxers
  - Lye is Sodium Hydroxide
  - Used at 1.8 – 2.8% in formula
  - Depends on strength
- No-Lye relaxers
  - Guanidine hydroxide
  - Lithium hydroxide
  - Potassium hydroxide
- Thioglycolate - Japanese Straightening
- Keratin/Formaldehyde - Brazilian Straightening



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Color Cosmetics Functional Ingredients

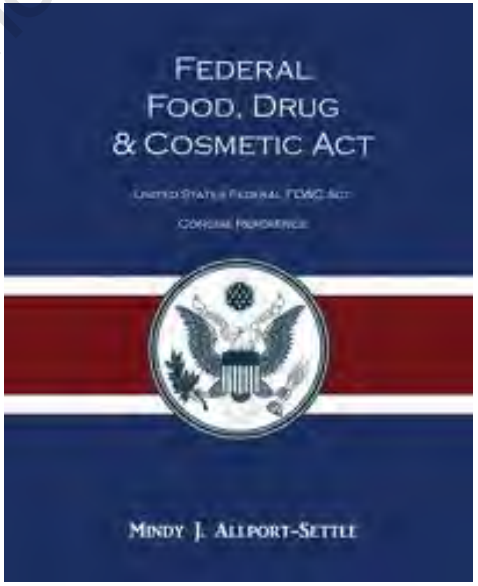


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Cosmetic Colorants

- Most highly regulated ingredients
- First set of rules passed in 1906
- Cosmetics added in 1938
- Creation of the FDA
  - Food, Drug and Cosmetic Act



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Cosmetic Colorants

- Required certification of colorants
- Color additives amendment 1960
  - FDA could set limits on colorants
- In 1959, 116 colorants approved
- In 2007, only 36 colorants approved



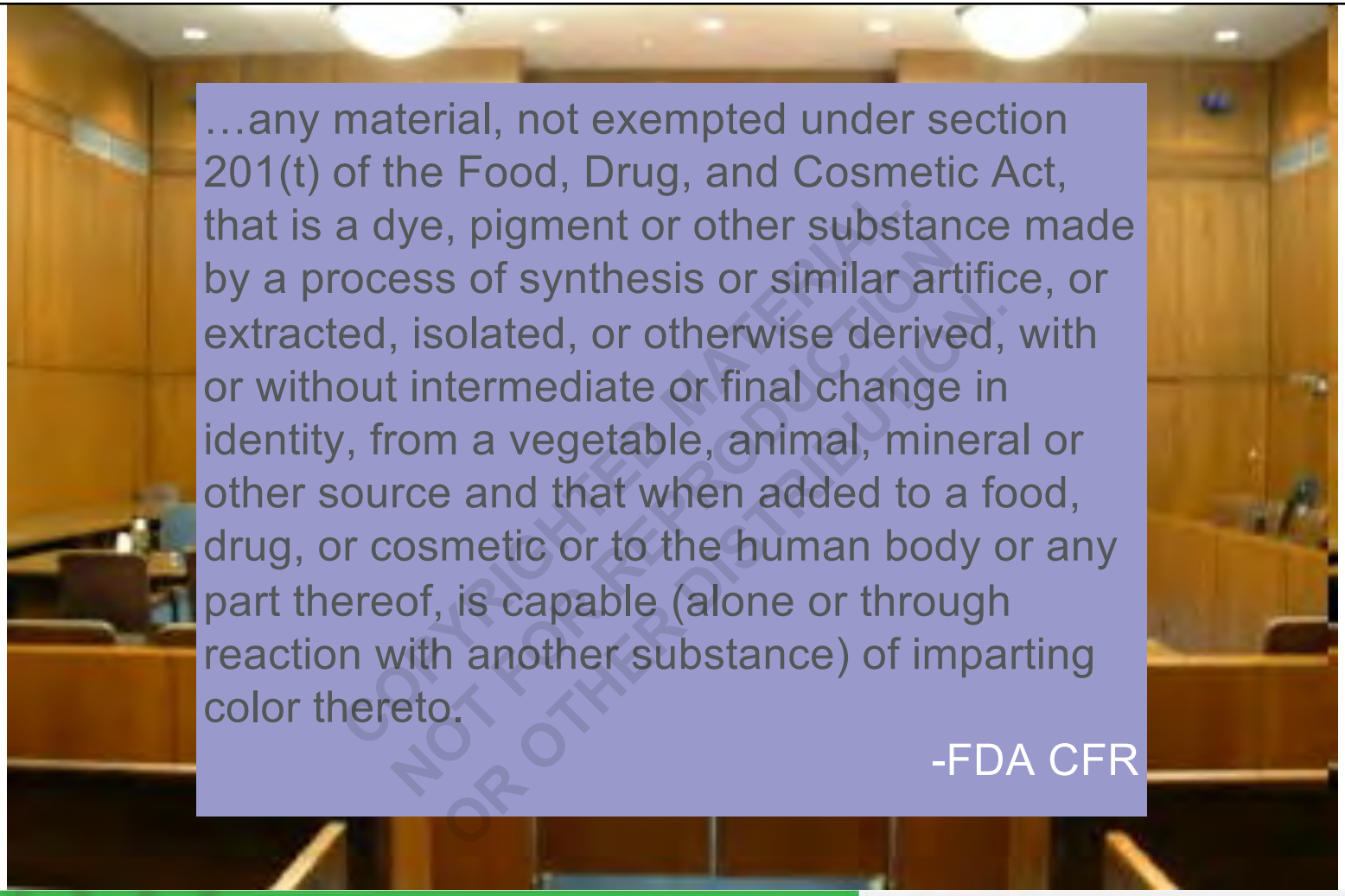
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It is illegal to use colorants that are not on the approved list even if they are a plant extract



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…any material, not exempted under section 201(t) of the Food, Drug, and Cosmetic Act, that is a dye, pigment or other substance made by a process of synthesis or similar artifice, or extracted, isolated, or otherwise derived, with or without intermediate or final change in identity, from a vegetable, animal, mineral or other source and that when added to a food, drug, or cosmetic or to the human body or any part thereof, is capable (alone or through reaction with another substance) of imparting color thereto.

-FDA CFR

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Colorant Cosmetic Ingredients

- Dyes – dissolved in solvent
  - Water soluble
  - Oil soluble
- Impart color on solvent
- Used for coloring formulas



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Pigments

- Pigments – don't dissolve
- Organic
- Inorganic – mineral makeup
- Lake – dye reacted with inorganic metal
- Toners – acid dye reacted with base to form a salt
- Polymer pigments



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Inorganic Pigments

Iron oxides

- 3 main colors
- Red, black, yellow
- Match all skin tones
- Combine with TiO_2

Mixing colors is an art



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Other Inorganic Pigments

Bismuth Oxychloride

- Silvery-grey

Coated Mica

- TiO_2 coated
- Interference film
- Variety of colors

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Inorganic Pigment	Colors	Formula
Chromium Hydroxide	Aqua	$Cr_2O_{3x}H_2O$
Chromium Oxide	Green	Cr_2O_3
Ferric Ammonium	Deep blue	$FeNH_4Fe(CN)_6$
Ferric Ferrocyanide	Deep blue	$Fe[Fe(CN)_6]_3XH_2O$
Iron Oxides	Red Brown Burgundy Black Yellow	Fe_3O_4 Fe_2O_3 Fe_3O_4 FeOOH
Manganese Violet	Violet	$NH_4MnP_2O_7$
Ultramarines	Blue Violet Pink	$Na_x(AlSiO_4)_yS_z$
Titanium Dioxide	White	TiO_2
Zinc Oxide	White	ZnO
Pigment extenders		
Hydrated Alumina	Transparent	$Al_2O_3X\ H_2O$
Barium Sulfate	Translucent	BaSO4

No pre-market certification required

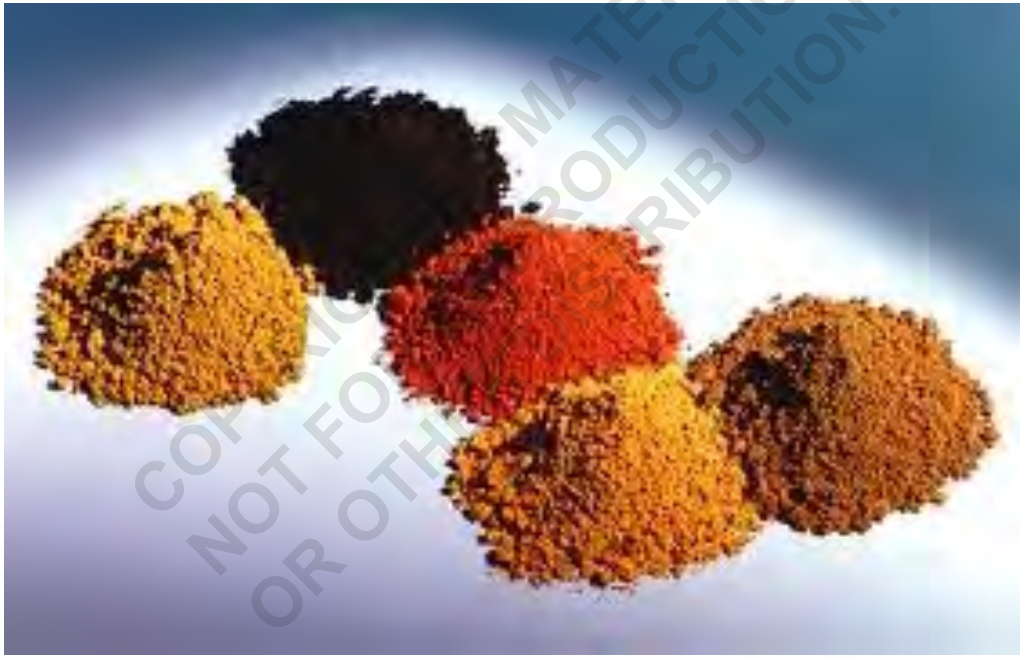


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All minerals used as colorants are synthetically produced

It's illegal to use natural mineral colorants

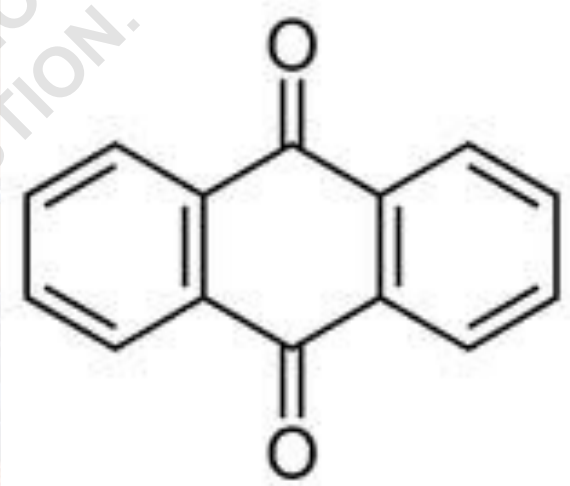


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*Organic pigments

6 classes of organic pigments

- Azo Colorants (N=N)
  - Reds, yellows
- Xanthenes
  - Orange, Red
- Triarylmethane
  - Blue, Green
- Anthraquinone
  - Green
- Quinoline
  - Yellow
- Indigoid
  - Red



Anthraquinone

*Organic as in Organic Chemistry - Not Organic as used in natural marketing

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Organic Pigments

Characteristics

- Transparent
- Bright colors
- Variable stability



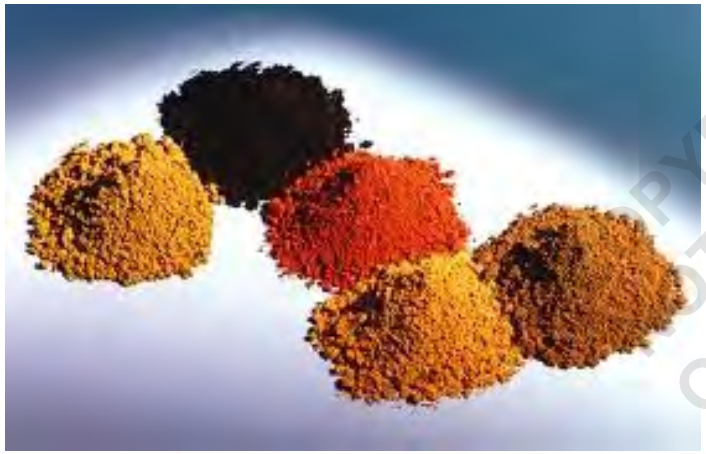
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Pigment Comparison

Compared to organic, inorganic pigments are

- More opaque
- More solvent resistant
- Less bright





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Natural Colorants

- Annatto – yellow/orange
- beta-Carotene - yellow/orange
- Beet Root - red
- Caramel - brown
- Carmine - red
- Chlorphyllin Copper - green
- Guaiazulene - blue
- Henna - brown
- Guanine - purple



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Other allowed Natural Colorants

- Lycopene – reddish / orange
- Capsanthin/Capsorubin – Orange
- Vegetable Carbon – Black
- Curcumin – Yellow
- Canthaxanthin – yellow/red



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Is Carmine Natural Color?







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Fragrances

Making people & products smell better



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What is a Fragrance?

- A fragrance is a blend of aromatic compounds.
- Perfumes
- Colognes
- Body sprays

- Functional ingredient:
- Fragrance or Parfume



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About Fragrance

- Most products include fragrance
- Can cause allergic reactions
- Consumers prefer fragrance
- Volatile compounds
- 75 to 150 ingredients in a single fragrance
- Made by perfumers



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Natural Materials

- From 250 plant species
- Some animal derived but mostly avoided
- 500 different materials
- Isolated from plant
  - Blossoms
  - Buds
  - Fruits
  - Seeds and more
- Higher cost
- Less reliable source



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Natural Materials

- Most expensive materials
- Rose oil
- Jasmine
- Tuberose
- Orris root oil
- Orange flower oil



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Synthetics

- Create compounds that are not found in nature
- Alternate source for difficult to obtain natural source
- Consistent
- More straight forward
- Affordable

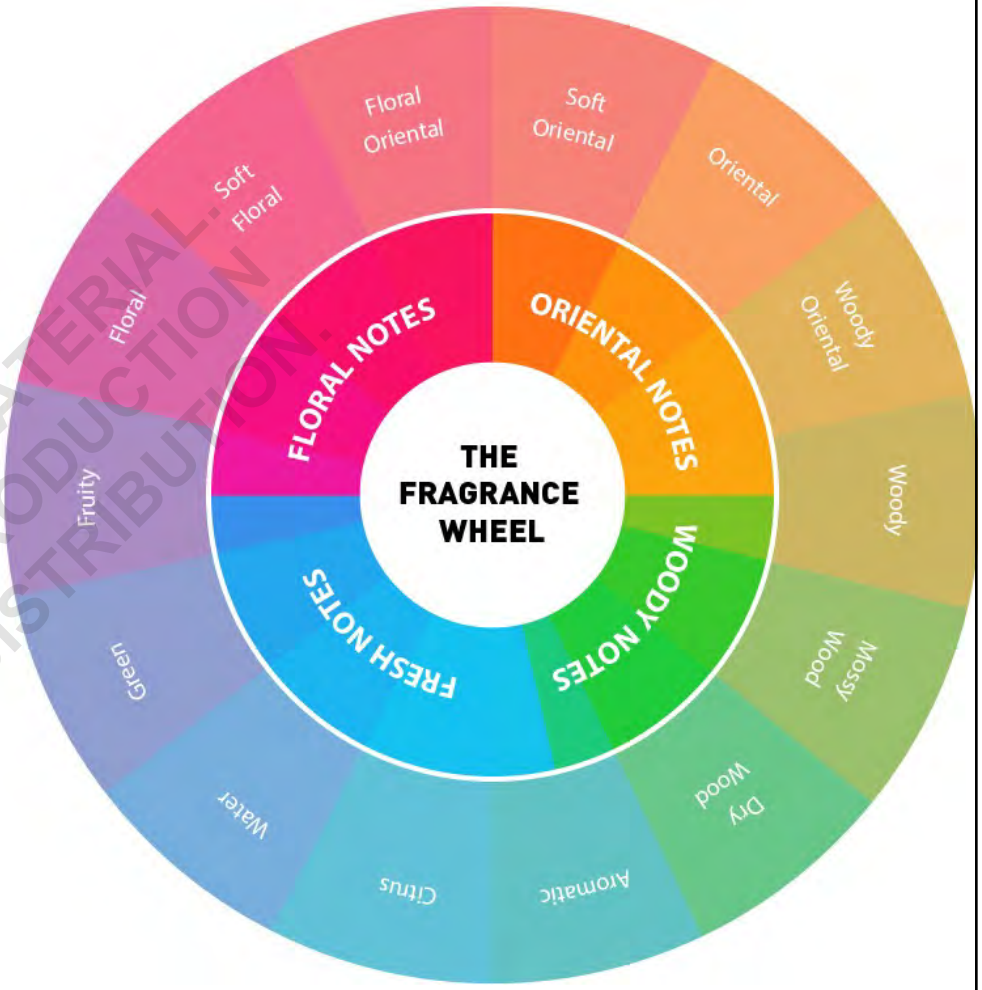


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Fragrance Families

- More appropriate for personal care
  - Fruity
  - Citrus
  - Floral
  - Amber
  - Woody / Green
  - Fougere
  - Gourmand



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Functional Ingredient Summary

- Skin care ingredients
  - Moisturizers
  - Cleansers
- Hair care ingredients
  - Cleansers
  - Conditioners
  - Styling, coloring, straightening
- Color & Fragrance ingredients



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Quiz #4

1. Which ingredient is used for exfoliating?

A. Ceramides
B. Probiotics
C. Alpha Hydroxy Acids
D. Humectants

2. Which emulsion form would theoretically be most effective at improving skin condition?

A. Multiple emulsion
B. Oil in Water emulsion
C. Water in Oil emulsion
D. Polymeric emulsion

3. Which ingredient has the most convincing supporting evidence of effectiveness?

A. Ceramides
B. Peptides
C. Niacinamide
D. Vitamin C

4. Which ingredient makes hair conditioners work?

A. Ethyl Ether
B. Dimethyl Isosorbide
C. Propylene glycol
D. Behentrimonium Chloride

5. What process is responsible for aging skin?

A. Chemical exposure
B. UV exposure
C. Smoking
D. All of the above

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Quiz #4 - Answers

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C. Propylene glycol
D. Behentrimonium Chloride

5. What process is responsible for aging skin?

A. Chemical exposure
B. UV exposure
C. Smoking
D. All of the above

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