Semester-V

17CHU504B CHEMISTRY OF COSMETICS & PERFUMES 3H 3C

Instruction Hours/week: L:3 T:0 P:0 Marks: Internal: 40 External: 60 Total: 100

Course Objectives

This skill enhancement course helps the student to

1. Understand the preparation of hair dyes, hair spray and shampoos.
2. Understand the preparation and uses of lotions, lipsticks and talcum powder.
3. Understand the preparation and uses of creams antiperspirants and artificial flavours.
4. Understand the chemistry of essential oils.

Course Outcome

This skill enhancement course the student knows the method to

1. Prepare hair dyes, hair spray and shampoos.
2. Prepare lotions, lipsticks and talcum powder.
3. Prepare creams antiperspirants and artificial flavours.
4. Understand the chemistry of essential oils.

Unit I

A general study including preparation and uses of the following: Hair dye, hair spray, Shampoo.

Unit II

Preparation and uses of suntan lotions, face powder, lipsticks, talcum powder, nail enamel,

Unit III

Preparation and uses of creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours.

Unit IV

Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, sandalwood oil

Unit V

Essential oils and their importance in cosmetic industries with reference to eucalyptus rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

Suggested Readings:

Text Books:

1. Poucher's, Perfumes, Cosmetics and Soaps 10th Edition 2000, Edited by Hilda Butler Kluwer Academic Publishers, Dordrecht/Boston/London.
2. B.M. Mithal and R.N. Saha, A Handbook of cosmetics, 2006; Published by M.K. Jain for Vallabh Prakashan.

3. Horst Surburg and Johannes Panten, Common Fragrance and Flavour Materials, 2006, Publishers Wiley-VCH Verlag GmbH & KGaA.
4. Stocchi, E. (1990). *Industrial Chemistry*, Vol –I. Ellis Horwood Ltd., UK.
5. Jain, P.C., & Jain, M. (2004). *Engineering Chemistry*. Dhanpat Rai & Sons, New Delhi.

Reference Book:

1. Sharma, B.K. & Gaur, H. (1996). *Industrial Chemistry.* Goel Publishing House, Meerut.

KARPAGAM ACADEMY OF HIGHER EDUCATION

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Coimbatore – **641 021.**

DEPARTMENT OF CHEMISTRY
LECTURE PLAN

STAFF NAME: Dr. S. MANICKASUNDARAM
SUBJECT NAME: CHEMISTRY OF COSMETICS & PERFUMES
SUB.CODE:17CHU504B
SEMESTER: V CLASS: III-B.Sc (CHEMISTRY)

S.No.	Lecture Duration Period	Topics to be Covered	Support Material/Page Nos
		UNIT-I	
1	1	Introduction to Hair dye, Hairspray and Shampoo	T1:271-277
2	1	General study of Hair dye	T1:309 -322
3	1	Preparation and uses of Hair dye	T1: 128-136
4	1	General study of Hair spray	T1: 279-281
5	1	Preparation and uses of Hair spray	T1: 279-281
6	1	General study of Shampoo	T1: 290-296
7	1	Preparation and uses of Shampoo	T1: 302-306
8	1	Revision and Discussion of possible questions	
	Total No of Hours Planned For Unit 1=8		
		UNIT-II	
1	1	Preparation and uses of Suntan lotions	T1: 480-485
2	1	Preparation and uses of Face powder	T1: 180-184
3	1	Preparation and uses of Lipsticks	T1:211-214
4	1	Preparation and uses of Talcum powder	T1:144-148
5	1	Preparation and uses of Nail enamel	T1:330-338
6	1	Revision and Discussion of possible questions	

7	1	Revision and Discussion of possible questions	
	Total No of Hours Planned For Unit II = 7		
		UNIT-III	
1	1	Introduction, Preparation and uses of Creams	T1:444-446
2	1	Preparation and uses of Cold Creams	T1: 445-446
3	1	Preparation and uses of Vanishing Creams	T2:68-69
4	1	Preparation and uses of Shaving Creams	T1:348-351
5	1	Antiperspirants	T1:71-80
6	1	Artificial flavour	T3: 19-24
7		Revision and Discussion of possible questions	
	Total No of Hours Planned For Unit III=7		
		UNIT-IV	
1	1	Introduction to Essential oils	T3:179-181
2	1	Introduction, Essential oils and other importance to cosmetic industries	T3: 179-181
3	1	With reference to Eugenol	T3: 137-138
4	1	With reference to Geraniol	T3: 28-29
5	1	With reference to Sandalwood oil	T3: 230-231
6	1	Revision and Discussion of possible questions	
7	1	Revision and Discussion of possible questions	
	Total No of Hours Planned For Unit IV=7		
		UNIT-V	
1	1	Essential oils and other importance to cosmetic industries	T3: 179-181
2	1	With reference to Eucalyptus oil and rose oil	T3: 205-206, 227-228
3	1	With reference to 2-Phenylethylalcohol	T3: 106-107
4	1	With reference to Jasmone	T3: 91
5	1	With reference to Civetone	T3:185

6	1	With reference to Muscone	T3: 185-186
7	1	Revision and Discussion of possible questions	
	Total No of Hours Planned for Unit V=7		
Total Planned Hours	**36**		

Text Book:

1. Poucher's, Perfumes, Cosmetics and Soaps 10th Edition 2000, Edited by Hilda Butler Kluwer Academic Publishers, Dordrecht/Boston/London.
2. B.M. Mithal and R.N. Saha, A Handbook of cosmetics, 2006,; Published by M.K. jain for Vallabh Prakashan.
3. Horst Surburg and Johannes Panten, Common Fragrance and Flavour Materials, 2006, Publishers Wiley-VCH Verlag GmbH & KGaA.

Unit-I

A general study including preparation and uses of the following: Hair dye, hair spray, Shampoo.

Hair Dye

Hair has no vital function in the human body but provides an outward sign of health and social communication. The history of hair coloring dates from ancient dynasties of Egypt and China where mineral and plant dyes were widely available to cosmeticians. Through the ages, women in particular have dyed their hair to hide grayness and to improve their appearance.

General Features of Hair

In all mammals, hair develops as an epidermal structure from papillae deep in the skin and acquires characteristic patterns on the scalp, eyebrows, eyelashes, and elsewhere on the body. In humans, hair growth is continuous throughout life (declining with advancing age), occurs in cyclic patterns, and is influenced by **androgens** , thyroid hormones, and dietary factors. Human hair is composed largely of keratin and consists of a narrow central medulla surrounded by a thick envelope (cortex) of elongate cells, which contain numerous melanin granules that determine the natural color. The hair is ensheathed in a multilayered cuticle of overlapping cells that become progressively imbricated (having edges overlapping in a regular arrangement) with continued growth. These cuticular cells are rich in cystine (**disulfide bonds**) and become rough or show a weathered appearance through exposure to environmental exposure or poor health.

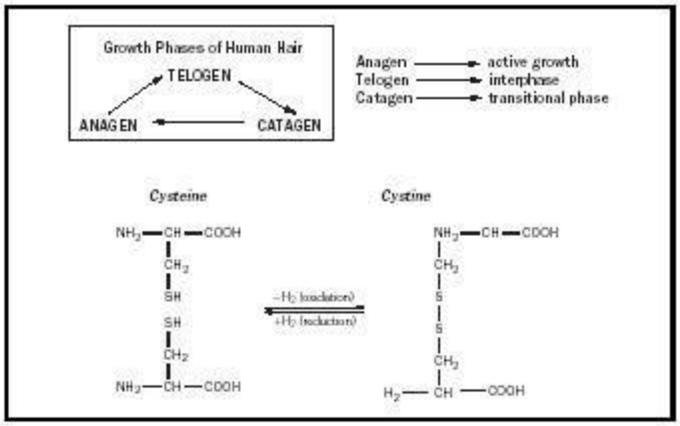


Figure 1.

Chemically, human hair contains approximately 85 percent protein, 7 percent water, 3 percent **lipid** , 4.7 percent protein-bound sulfur (as cystine), and low concentrations of trace minerals (e.g., iron, zinc, copper). The phosphorus content is approximately 80 milligrams per 100 grams (0.003 ounces per 3.5 ounces) of hair. Hair is normally associated with sebum and exocrine secretions from skin glands that confer greasiness but influence its water content and mechanical and physical properties.

Hair follicles are determined prenatally; about 100,000 hairs are found on the scalp region of most adults. Hair density, color, and condition vary according to age, race, and genetic background. Natural hair colors vary from albino or white to blond, red, or intense black and reflect ethnic origin (Caucasoid, Negroid, etc.), age, diet, and health. While hair color is closely related to the density of melanin granules, impairment in a person's health or substances in the diet that influence the availability of trace minerals are potential causes of changes in hair color or condition. The configuration of the hair shaft (i.e., straight, wavy, spiral, or peppercorn) is attributable to the number and distribution of disulfide bonds. Hair straightening requires reduction of these disulfide bonds and fiber cross-linkages.

Hair serves to eliminate toxic materials (e.g., lead) and **metabolites** from the body, and may be used to monitor environmental contamination. For example, copper deficiency is a cause of Menke's "kinky" hair syndrome; protein deficiency leads to hair loss and discoloration. Hair keratin carries a strong negative charge and binds inorganic materials; it becomes prone to discoloration through exposure to environmental chemicals (e.g., cobalt, tar in cigarettes, picric acid, trinitrotoluene, etc.). Prolonged exposure to copper in diet, tap water, or swimming pools is a cause of green hair.

History

Hair dye is one of the oldest known beauty preparations, and was used by ancient cultures in many parts of the world. Records of ancient Egyptians, Greeks, Hebrews, Persians, Chinese, and early Hindu peoples all mention the use of hair colorings. Early hair dyes were made from plants, metallic compounds, or a mixture of the two. Rock alum, quicklime, and wood ash were used for bleaching hair in Roman times, and herbal preparations included mullein, birch bark, saffron, myrrh, and turmeric. Henna was known in many parts of the world; it produces a reddish dye.

Many different plant extracts were used for hair dye in Europe and Asia before the advent of modern dyes. Indigo, known primarily as a fabric dye, could be combined with henna to make light brown to black shades of hair dye. An extract of the flowers of the chamomile plant was long used to lighten hair, and this is still used in many modern hair preparations. The bark, leaves, or nutshells of many trees were used for hair dyes. Wood from the brazilwood tree yielded brown hair dyes, and another hair dye known in antiquity as *fustic* was derived from a tree similar to the mulberry. Other dyes were produced from walnut leaves or nut husks, and from the galls, a species of oak trees. Some of these plant-derived dyes were mixed with metals such as copper and iron, to produce more lasting or richer shades.

The golden red hair captured by many Renaissance painters was artificially produced by some women. The Italian recipe was to comb a solution of rock alum, black sulfur, and honey through the hair and then let the hair dry in sunlight. Other hair dyes, dating from the sixteenth century, were preparations of lead, quicklime, and salt, or silver nitrate in rose water. Another early method of coloring hair was to apply powder. Pure white powder for hair or wigs was the mark of aristocratic dress in Europe during the seventeenth and eighteenth centuries. White powder was made of wheat starch or potato starch, sometimes mixed withplaster of paris, flour, chalk, or burnt alabaster. Similarly colored powders were sometimes used as well. These were made by adding natural pigments such as burnt sienna or umber to white powder to make brown, and India ink was sometimes used to make black powder. In Biblical times, people used powdered gold on their hair. The use of powdered gold and silver returned briefly as a fad in Europe among the wealthy in the mid-nineteenth century. Other hair colorants were blocks similar to crayons made with wax, soap, and pigments. These could be wetted and rubbed on the hair, or applied with a wet brush.

Preparations such as these were the only hair dyes available until the late nineteenth century. Hydrogen peroxide was discovered in 1818, but it was not until 1867 that it was exhibited at the Paris Exposition as an effective hair lightener. A London chemist and a Parisian hairdresser began marketing a 3% hydrogen peroxide formula at the Exposition as *eau de fontaine de jouvence golden* (golden fountain of youth water), and this was the first modern chemical hair colorant. Advances in chemistry led to the production of more hair dyes in the late nineteenth century. The first synthetic organic hair dye developed was pyrogallol, a substance that occurs naturally in walnut shells. Beginning in 1845, pyrogallol was used to dye hair brown, and it was often used in combination with henna. So-called amino dyes were developed and marketed in Europe in the 1880s. The earliest was p-phenylenediamine, patented in Germany by
E. Erdmann in 1888 as a dye for fur, hair, and feathers. To dye hair with p-phenylenediamine and related dyes, a weak solution of the chemical, mixed with caustic soda, sodium carbonate, or ammonia, was applied to the hair. Then hydrogen peroxide was applied, which brought out the color. The amino dyes produced a more natural-looking black than previous dyes, and could make shades of red and brown as well.

A French hairdresser, Gaston Boudou, first marketed a standardized range of hair dyes in 1910. Whereas earlier hair colors had been mixed on the spot by hair dressers, and the colors produced were variable, Boudou's dyes produced a predictable color. Sold in a range of 18 colors, from black to light blond, these became very popular both in Europe and in the United States. The amino dyes, however, caused allergic reactions in a significant portion of users. Researchers in the United States are credited with creating a modified, less toxic amino-based hair dye, for standardizing the method of applying the dye, and for establishing strict specifications for the purity and strength of the raw materials. Further advances in hair dye chemistry were made by the makers of Clairol. Clairol produced the first one-step hair dye in 1950. This eliminated the time-consuming preliminary shampoo and pre-lightening that was the established hair-dying protocol. With intensive marketing of this easy-to-use product, the percentage of women in the United States who dyed their hair grew from approximately 8% to almost 50% by 1973.

Natural Hair Color and Its Control

Melanin granules are secreted by melanocytes in the hair papilla and distributed to keratin in the hair cortex and inner layers of the hair sheath during normal development. Melanogenesis is subject to hormonal control and has been the focus of intensive genetic studies. Two main forms of melanin exist in human skin—eumelanin and phaeomelanin, both of which are derived from **tyrosine** through the action of tyrosinase (a cupro-enzyme) and possibly other key enzymes (with nickel, chromium, iron, and manganese as cofactors). Tyrosine is converted to dihydroxyphenylalanine and, via a series of intermediate steps, to indole-5,6-quinone, which polymerizes to eumelanin. Phaeomelanins are produced by a similar mechanism but with the incorporation of sulfur (as cysteine) by a nonenzymatic step in the **oxidation** process.

Hair color is a balance between these two melanins. Albino or white-haired individuals have latent melanocytes, but possibly show defects in tyrosinasemediated events. Graying of the hair is age-related and possibly results from declining melanocytic function or retarded hair growth resulting from atrophy or degenerative changes in hair papillae. Hair melanin absorbs insufficient ultraviolet (UV) light energy to afford protection for most individuals against sunburn.

Hair Dyes and Cosmetic Coloring

A wide variety of dyes, dressings, and conditioners are available to men and women to enhance the color of hair or to alter its condition, providing the "feel good" factor. Natural hair dyes such as henna and mineral salts are still used, but hair dyeing increasingly involves careful chemical manipulation of the chemistry of hair fibers through bleaching or enhancement of natural colors. Additionally, social and cultural customs have led to the increasing demand for exotic colors (reds, greens, blues, yellows, etc.). Hair coloring is a well-defined science with intense study of the interaction between hair keratin and highly reactive organic dyes, oxidizing agents, and conditioners.

Available hair dyes include:

- Minerals such as lead acetate (<1% aqueous), lead sulfide (kohl); silver nitrate; salts of bismuth, copper, and cobalt (commonly called "gradual" colorants)
- Vegetable materials such as henna (flowers and leaves of *Lawsonia inermis* that contain acidic naphthoquinone, chamomile, and indigo)
- Synthetic dyes including a large number of organic dyes to provide permanent, semipermanent, temporary, or progressive color changes or to enhance natural colors

Types

The four most common classifications are *permanent*, *demi-permanent* (sometimes called *deposit only*), *semi-permanent*, and *temporary*.

Permanent

Permanent hair color generally contains ammonia and must be mixed with a developer or oxidizing agent in order to permanently change hair color. Ammonia is used in permanent hair color to open the cuticle layer so that the developer and colorants together can penetrate into the cortex The developer or oxidizing agent comes in various volumes. The higher the developer volume, the higher the "lift" will be of a person's natural hair pigment. Someone with dark hair wishing to achieve two or three shades lighter may need a higher developer whereas someone with lighter hair wishing to achieve darker hair will not one as high. Timing may vary with permanent hair coloring but is typically 30 minutes or 45 minutes for those wishing to achieve maximum color change.

Demi-permanent

Demi-permanent hair color is hair color that contains an alkaline agent other than ammonia (e.g. ethanolamine, sodium carbonate) and, while always employed with a developer, the concentration of hydrogen peroxide in that developer may be lower than used with a permanent hair color. Since the alkaline agents employed in demi-permanent colors are less effective in removing the natural pigment of hair than ammonia these products provide no lightening of hair's color during dyeing. As the result, they cannot color hair to a lighter shade than it was before dyeing and are less damaging to hair than their permanent counterpart.

Demi-permanents are much more effective at covering gray hair than semi-permanents, but less so than permanents.

Demi-permanents have several advantages as compared with permanent color. Because there is essentially no lifting (i.e., removal) of natural hair color, the final color is less uniform/homogeneous than a permanent and therefore more natural looking; they are gentler on hair and therefore safer, especially for damaged hair; and they wash out over time (typically 20 to 28 shampoos), so root regrowth is less noticeable and if a change of color is desired, it is easier to achieve. Demi-permanent hair colors are not permanent but the darker shades in particular may persist longer than indicated on the packet.

Semi-permanent

Semi-permanent hair coloring involves little or no developer, hydrogen peroxide or ammonia, and is thus less damaging to hair strands. The reduced amount of developer, whether peroxide or ammonia, means that hair previously damaged by applying permanent color or permanent reshaping is less likely to be damaged during the color application process.

Semi-permanent hair color uses compounds of low molecular weight than are found in temporary hair color dyes. These dyes penetrate the hair shaft only partially, because of the reduced amount of developer used. For this reason, the color will survive repeated washing, typically 4–5 shampoos or a few weeks, before undergoing significant fading or washing out entirely.

Semi-permanents may still contain the suspected carcinogen p-phenylenediamine (PPD) or other related colorants. The U.S. Environmental Protection Agency reported that in rats and mice chronically exposed to PPD in their diet, the PPT appears to simply depress body weight of the animals, with no other clinical signs of toxicity observed in several studies.[13]

The final color of each strand of hair will depend on its original color and porosity. Because hair's color and porosity across the head and along the length of a hair strand, there will be subtle variations in shade across the entire head. This gives a more natural-looking result than the solid, all over color of a permanent color. Because gray or white hairs have a different starting color than other hair, they will not appear as the same shade as the rest of the hair when treated with semi-permanent color. If there are only a few grey/white hairs, the effect will usually be enough for them to blend in, but as the gray spreads, there will come a point where it will not be disguised as well. In this case, the move to permanent color can sometimes be delayed by using the semi-permanent as a base and adding highlights.

Semi-permanent color cannot lighten the hair.

Temporary color

Temporary hair color is available in various forms including rinses, shampoos, gels, sprays, and foams. Temporary hair color is typically brighter and more vibrant than semi- permanent and permanent hair color. It is most often used to color hair for special occasions such as costume parties and Halloween.

The pigments in temporary hair color are high molecular weight and cannot penetrate the cuticle layer. The color particles remain adsorbed (closely adherent) to the surface of the hair shaft and are easily removed with a single shampooing. Temporary hair color can persist on hair that is excessively dry or damaged in a way that allows for migration of the pigment to the interior of the hair shaft.

The Manufacturing Process

Raw Materials

Most commercial hair dye formulas are complex, with dozens of ingredients, and the formulas differ considerably from manufacturer to manufacturer. In general, hair dyes include dyes, modifiers, antioxidents, alkalizers, soaps, ammonia, wetting agents, fragrance, and a variety of other chemicals used in small amounts that impart special qualities to hair (such as softening the texture) or give a desired action to the dye (such as making it more or less permanent). The dye chemicals are usually amino compounds, and show up on hair dye ingredient lists with such names as 4-amino-2-hydroxytoluene and m-Aminophenol. Metal oxides, such as titanium dioxide and iron oxide, are often used as pigments as well.

COLORS PRODUCED IN OXIDATIVE DYEING SYSTEMS USING SOME COMMON PRIMARY INTERMEDIATES AND COUPLERS			
	***p* - aminophenol**	***p* - phenylenediamine**	**N,N- *bis* -(2-hydroxyethy)- *p* -phenylenediamine**
m -aminophenol	Warm brown	Red-brown	Medium violet
Resourcinol	Yellow green	Greenish brown	Yellow-gray
2-methylresourcinol	Ash brown	Yellow brown	Gray-violet
m - phenylenediamine	Orange-yellow	Blue	Greenish-blue
5-amino-o-cresol	Orange	Purple-red	Purple
a- *naphthol*	Red-orange	Violet	Blue

Other chemicals used in hair dyes act as modifiers, which stabilize the dye pigments or otherwise act to modify the shade. The modifiers may bring out color tones, such as green or purple, which complement the dye pigment. One commonly used modifier is resorcinol, though there are many others. Antioxidants protect the dye from oxidizing with air. Most commonly used is sodium sulfite. Alkalizers are added to change the pH of the dye formula, because the dyes work best in a highly alkaline composition. Ammonium hydroxide is a common alkalizer. Beyond these basic chemicals, many different chemicals are used to impart special qualities to a manufacturer's formula. They may be shampoos, fragrances, chemicals that make the formula creamy, foamy, or thick, or contribute to the overall action of the formula.

Hair dyes are usually packaged with a developer, which is in a separate bottle. The developer is most often based on hydrogen peroxide, with the addition of small amounts of other chemicals depending on the manufacturer.

Checking ingredients

Before a batch of hair dye is made, the ingredients must be certified. That is, the chemicals must be tested to make sure they are what they are labeled, and that they are the proper potency. Certification may be done by the manufacturer in-house. In many cases, the ingredients arrive from a reputable distributor who has provided a Certificate of Analysis, and this satisfies the manufacturer's requirements.

Weighing

Next a worker weighs out the ingredients for the batch. For some ingredients, only a small amount is necessary in the batch. But if a very large batch is being made, and several ingredients are needed in large amounts, these may be piped in from storage tanks.

Pre-mixing

In some hair dye formulas, the dye chemicals are pre-mixed in hot water. The dye chemicals are dumped in a tank, and water which has been already heated to 158°F (70°C) is pumped in. Other ingredients or solvents may also be added to the pre-mix. The pre-mix is agitated for approximately 20 minutes.

Mixing

The pre-mix is then added to a larger tank, containing the other ingredients of the hair dye. In a small batch, the tanks used may hold about 1,600 lbs (725 kg), and they are portable. A worker wheels the pre-mix tank to the second mix tank and pours the ingredients in. For a very large batch, the tanks may hold 10 times as much as the portable tanks, and in this case they are connected by pipes.

In a formula in which no pre-mixing is required, after checking and weighing, the in gredients go directly to the mixing step. The ingredients are simply mixed in the tank until the proper consistency is reached.

If a heated pre-mix is used, the second mix solution must be allowed to cool. The ingredients that follow the pre-mix may be additional solvents, surfactants, and alkalizers. If the formula includes alcohol, it is no added until the mix reaches 104°F(40°C), so that it does not evaporate. Fragrances too are often added at the end of the mix.

Filling

The finished batch of hair dye is then piped or delivered to a tank in the filling area. A nozzle from this tank lets a measured amount of hair dye into bottles, moving beneath it on a belt. The filled bottles continue on the belt to machines, which affix labels and cap them.

Packaging

From the filling area, the bottles are taken to the packaging line. At the packaging line, the hair dye bottle is put in a box, together with any other elements such as a bottle of developer or special finishing shampoo, instruction sheet, and gloves and cap, or any other tools provided for the consumer. After the package is complete, it is put in a shipping carton. The full cartons are then taken to the warehouse to await distribution.

Quality Control

Government regulations control what ingredients may be used in hair dyes, as many of them are toxic. Industry researchers will have already tested a formula numerous times in the laboratory before it reaches the manufacturing stage, to make sure a formula is non-irritating, works well, performs consistently, etc. As part of the manufacturing process, workers check their chemicals before they go into a batch, to make sure only the correct chemicals at the correct potency are used. After the batch is mixed, samples are taken, and these are subjected to a series of standard tests. Lab technicians make sure that the batch is the required viscosity and pH balance, and they will also test the dye's action on a swatch of hair. If a hair dye formula is being made for the first time, or if a formula has been altered, technicians will also test samples of the dye after the filling stage.

The Future

Hair dye manufacturers are increasing their use of computers to control and automate the manufacturing process. Computers can be used to weigh and measure ingredients, to control reactions, and to regulate equipment such as pumps. The future may see more fully automated manufacturers and increased efficiency.

Avoid These 7 Toxic Chemicals Found in Most Hair Dyes

PPD

PPD is short for para-phenylenediamine. It is used as a dye for dark color shades and is made from coal tar, a petroleum-derived chemical that includes benzene,naphthalene, phenols, aniline, and other chemicals. It is also used as a wood preservative, and contact with skin is best to be avoided. Research states PPD in combination with Hydrogene Peroxide is very toxic and can lead to cancer.

Hydrogene Peroxide

Hydrogene Peroxide is mostly used to stip the natural color away, before applying the hair dye color. It is said to change the hair structure and make it brittle stripping it of its natural luster.

Ammonia

Ammonia is used to open up the hair’s cuticle (the outer layer of the hair) so the dyes can come into the shaft (the inside of the hair). It may produce caustic burns and lung irritation.

DMDM Hydantoin

DMDM Hydantoin is a preservative that slowly releases the toxic formaldehyde chemical, the longer it sits on the shelves. It may cause tissue irritation and affect the immune system. DMDM Hydantoin kills off fungi, yeasts and bacteria and it’s also used in herbicides, floor waxes, polymers, color photography, latex paints, cutting oils, adhesives, copying paper, and inks.

Parabens

The two most common parabens preservatives are Methylparabens and Propylparabens. They are widely used in hair care products and can produce severe allergies and skin irritation.

Lead Acetate

Lead Acetate is used as a color additive for the dark shade hair dyes. It is said to cause anemia and produce neurological problems.

Resorcinol

Resorcinol is a toxic dye that can cause scalp irritation, and is an allergen affecting the endocrine system.

The best way to avoid these harmful chemicals is to buy brands that use 100% natural hair dyes. One needs to read the label carefully though, as some brands may still mix natural dyes with chemical preservatives and other chemical dyes for a faster and longer permanence.

You can also make your own using herbs and other products found at home. But this requires time and you may need to apply it frequently before achieving a darker shade of color.

The third best option is to buy semi-permanent hair dyes, as those only coat the cuticle and will not penetrate the hair shaft.

One good tip I heard of for reversing grey hair is to eat 1 tablespoon of unsulphured blackstrap molasses every day with a glass of water in the mornings. Molasses are full of iron and potassium, which also helps hair growth.

You can also apply it directly to your hair starting from the roots, and leave it on as long as possible. It is quite messy as it will melt with your body heat, so it is recommended to wrap your hair in cling film and put a shower cap on.

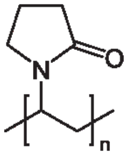
Hair Spray

Hair spray (also hair lacquer or spritz) is a common cosmetic hairstyling product that is sprayed onto hair to protect against humidity and wind. Hair sprays typically consist of several components for the hair as well as a propellant.

Ingredients and operations

Hair sprays consist of the following components:

concentrate, plasticizers, luster agents, and fragrances, as well as propellants.



Concentrate

Hair sprays are a blend of polymers that provide structural support to hair. These frequently include copolymers of polyvinylpyrrolidone (PVP) and polyvinyl acetate (PVAc). Vinyl acetate-crotonic acid copolymers give harder films. In this way hairsprays can be formulated as flexible, medium, and maximum hold.[2] The copolymer mixture is usually adjusted to achieve the desired physical properties (adhesive strength, foaming, etc.),using plasticizers such as aminomethyl propanol, surfactants such as benzalkonium chloride, and other agents like dimethicone.

Propellants

Since the phase-out of CFCs in the 1980s, hydrocarbons are popular propellants. These include propane, butane, isobutane, and related volatile hydrocarbons, as well as mixtures thereof. Such hydrocarbons are poor solvents for the active ingredients such as the polymers. For this reason dimethyl ether is often added as well. It functions both as a propellant and a solvent.[1]

Other components

Plasticizers used in hair spray include esters of citric acid and adipic acid. Silicones and polyglycols are also used. The concentrate comprises only a small volume of a can of hairspray. Most of a canister is filled solvents such as isopropanol (rubbing alcohol) and ethanol

History

Early hair sprays were developed in Europe in the 1920s. In the US, hair sprays were developed around the time of the aerosol can in the 1940s, and the first patents describing copolymers for hair styling were published in the 1940s.

n the US, the first to package it was Chase products (an aerosol manufacturer) in 1948, as the beauty industry saw that the aerosol cans used in World War II for insecticides could be used as a dispenser for hairspray.[5] It thrived and became increasingly popular and mass- produced, as updos and other such hairstyles were created. By 1964, it became the highest selling beauty product on the market.

In 1968 at the feminist Miss America protest, protestors symbolically threw a number of feminine products into a "Freedom Trash Can." These included hairspray,[6] which was among items the protestors called "instruments of female torture"[7] and accouterments of what they perceived to be enforced femininity.

Sales of hairspray declined in the 1970s as hairstyles became predominately worn straight and loose. By the 1980s, hairspray's popularity came back as big hairstyles resurged with the glam metal scene.

Prior to 1979, the most popular propellants in hairsprays were CFCs. Owing to environmental concerns, they were replaced.

Harmful effects

Hairspray is an aerosol product containing many harmful chemical compounds. Because of its aerosol application, hair spray is extremely flammable. In 1993, the FDA released a warning statement to prevent hair spray-related fires. Prior to this statement, many fires caused by the use of this product had been reported.[8] Some volatile organic compounds are found in most hairsprays, which have a range of health and environmental effects. Another dangerous substance found in hairspray is formaldehyde, something used in higher concentrations to preserve tissue samples, specimens, and cadavers. Because it is used to kill mold and bacteria as well, it is in hairspray to ward off potential contaminants. However, formaldehyde can cause many problems such as dermatitis, headaches, and respiratory illness. It is also a suspected carcinogen.

Hair spray is one of the most popular grooming products and is **used by** women and men to hold hairstyles in place. **Hair spray** can be described as fine mists of chemical compounds that are propelled from an aerosol can. They can be applied to either wet or dry hair to help hold it in place in a particular look.

What are the side effects of hair spray?

There are many side effects of these chemicals and we have comprised a list of some of these side effects:

- Hair loss and hair thinning.
- Irritation of the eyes, nose, throat, and skin.
- Dry hair and skin.

- Damage to organs including kidneys and lungs.
- Pneumonia.
- Irritation of the mucous membranes.

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- Damage to organs including kidneys and lungs
- Pneumonia
- Irritation of the mucous membranes
- Accumulation of toxins in organs and tissues, including the brain
- Destroyed hair shafts
- Carcinogenic ingredients
- Skin damage
- Hives and allergic reactions
- Eczema
- Hair breakage
- Asphyxiation
- Blackheads and other skin impurities
- If ingested, depletion of vital nutrients in the body

The shocking truth about these products is that even hair preparation labeled as “natural” contain multitudes of harmful chemicals. There are no labeling laws governing the disclosure of chemicals in cosmetics. And the ingredients that manufacturers do list are often disguised by names that the typical consumer would be hard pressed to identify. Read a complete list of ingredients in these truly natural styling products.

Shampoo

Shampoos are cleaning formulations used for a wide range of applications, including personal care, pet use, and carpets. Most are manufactured in roughly the same manner. They are composed primarily of chemicals called surfactants that have the special ability to surround oily materials on surfaces and allow them to be rinsed away by water. Most commonly, shampoos are used for personal care, especially for washing the hair.

History

Before the advent of shampoos, people typically used soap for personal care. However, soap had the distinct disadvantages of being irritating to the eyes and incompatible with hard water, which made it leave a dull-looking film on the hair. In the early 1930s, the first synthetic detergent shampoo was introduced, although it still had some disadvantages. The 1960s brought the detergent technology we use today.

Over the years, many improvements have been made to shampoo formulations. New detergents are less irritating to the eyes and skin and have improved health and environmental qualities. Also, materials technology has advanced, enabling the incorporation of thousands of beneficial ingredients in shampoos, leaving hair feeling cleaner and better conditioned.

Raw Materials

New shampoos are initially created by cosmetic chemists in the laboratory. These scientists begin by determining what characteristics the shampoo formula will have. They must decide on aesthetic features such as how thick it should be, what color it will be, and what it will smell like. They also consider performance attributes, such as how well it cleans, what the foam looks like, and how irritating it will be. Consumer testing often helps determine what these characteristics should be.

Once the features of the shampoo are identified, a formula is created in the laboratory. These initial batches are made in small beakers using various ingredients. In the personal care industry, nearly all of the ingredients that can be used are classified by the Cosmetic, Toiletry, and Fragrance Association (CTFA) in the governmentally approved collection known as the International Nomenclature of Cosmetic Ingredients (INCI). The more important ingredients in shampoo formulations are water, detergents, foam boosters, thickeners, conditioning agents, preservatives, modifiers, and special additives.

Water

The primary ingredient in all shampoos is water, typically making up about 70-80% of the entire formula. Deionized water, which is specially treated to remove various particles and ions, is used in shampoos. The source of the water can be underground wells, lakes, or rivers.

Detergents

The next most abundant ingredients in shampoos are the primary detergents. These materials, also known as surfactants, are the cleansing ingredients in shampoos. Surfactants are surface active ingredients, meaning they can interact with a surface. The chemical nature of a surfactant allows it to surround and trap oily materials from surfaces. One portion of the molecule is oil compatible (soluble) while the other is water soluble. When a shampoo is applied to hair or textiles, the oil soluble portion aligns with the oily materials while the water soluble portion aligns in the water layer. When a number of surfactant molecules line up like this, they form a structure known as a micelle. This micelle has oil trapped in the middle and can be washed away with water, thus giving the shampoo its cleansing power.

Surfactants are derived from compounds known as fatty acids. Fatty acids are naturally occurring materials which are found in various plant and animal sources. The materials used most often to make the surfactants used in shampoos are extracted from coconut oil, palm kernel oil, and soy bean oil. Some common primary detergents used in shampoos are ammonium lauryl sulfate, sodium lauryl sulfate, and sodium lauryl ether sulfate.

Foam boosters

In addition to cleansing surfactants, other types of surfactants are added to shampoos to improve the foaming characteristics of the formulation. These materials, called alkanolamides, help increase the amount of foam and the size of the bubbles. Like primary detergents, they are also derived from fatty acids and have both water soluble and oil soluble characteristics. Typical materials include lauramide DEA or cocamide DEA.

Thickeners

To some extent, the alkanolamides that make shampoos foam also make the formulations thicker. However, other materials are also used to increase the viscosity. For example, methylcellulose, derived from plant cellulose, is included in shampoos to make them thicker. Sodium chloride (salt) also can be used to increase shampoo thickness.

Conditioning agents

Some materials are also added to shampoos to offset the sometimes harsh effect of surfactants on hair and fabrics. Typical conditioning agents include polymers, silicones, and quaternary agents. Each of these compounds deposit on the surface of the hair and improve its feel, softness, and combability, while reducing static charge. Shampoos that specifically feature conditioning as a benefit are called 2-in-1 shampoos because they clean and condition hair in the same step. Examples of conditioning agents include guar hydroxypropyltrimonium chloride which is a polymer, dimethicone which is a silicone, and quatemium 80, a quatemary agent.

Preservatives

Since shampoos are made from water and organic compounds, contamination from bacteria and other microbes is possible. Preservatives are added to prevent such growth. Two of the most common preservatives used in shampoos are DMDM hydantoin and methylparaben.

Modifiers

Other ingredients are added to shampoo formulas to modify specific characteristics. Opacifiers are added to make the formula opaque and give it a pearly look. Materials known as sequestering agents are added to offset the dulling effects of hard water. Acids or bases such as citric acid or sodium hydroxide are added to adjust the pH of a shampoo so the detergents will provide optimal cleaning.

Special additives

One of the primary factors that influence the purchase of a shampoo is its color and odor. To modify these characteristics, manufacturers add fragrance oils and governmentally approved and certified FD&C dyes. Other special additives can also have a similar effect. Natural materials such as botanical extracts, natural oils, proteins, and vitamins all impart special qualities and help sell shampoos. Additives such as zinc pyrithione are included to address the problem of dandruff. Other additives are dyes which can color the hair.

The Manufacturing Process

After a shampoo formula is developed, it is tested to ensure that its qualities will minimally change over time. This type of testing, called stability testing, is primarily used to detect physical changes in such things as color, odor, and thickness. It can also provide information about other changes, like microbial contamination and performance differences. This testing is done to ensure that the bottle of shampoo that is on the store shelves will perform just like the bottle created in the laboratory.

The manufacturing process can be broken down into two steps. First a large batch of shampoo is made, and then the batch is packaged in individual bottles.

Compounding

Large batches of shampoo are made in a designated area of the manufacturing plant. Here workers, known as compounders, follow the formula instructions to make batches that can be 3,000 gal (11,000 1) or more. Raw materials, which are typically provided in drums as large as 55 gal (200 1) or in 50-lb (23-kg) bags, are delivered to the compounding area via forklift trucks. They are poured into the batch tank and thoroughly mixed.

Depending on the formula, these batches can be heated and cooled as necessary to help the raw materials combine more quickly. Some raw materials such as water or the primary detergents are pumped and metered directly into the batch tank.

These materials are added simply by pressing a button on computerized controls. These controls also regulate the mixing speeds and the heating and cooling rates. Depending on the size and type of shampoo, making a 3,000-gal (11,000-1) batch can take anywhere from one to four hours.

Quality control check

After all the ingredients are added to the batch, a sample is taken to the Quality Control (QC) lab for testing. Physical characteristics are checked to make sure the batch adheres to the specifications outlined in the formula instructions. The QC group runs tests such as pH determination, viscosity checks, and appearance and odor evaluations. They can also check the amount of detergent that is in the formula and whether there is enough preservative. If the batch is found to be "out of spec," adjustments can be made. For instance, acids or bases can be added to adjust the pH, or salt can be added to modify the viscosity. Colors can also be adjusted by adding more dye.

After a batch is approved by QC, it is pumped out of the main batch tank into a holding tank where it can be stored until the filling lines are ready. From the holding tank it gets pumped into the filler, which is made up of a carousel of piston filling heads.

Filling

At the start of the filling line, empty bottles are put in a large bin called a hopper. Here, the bottles are physically manipulated until they are correctly oriented and standing upright. They are then moved along a conveyor belt to the filling carousel, which holds the shampoo.

The filling carousel is made up of a series of piston filling heads that are calibrated to deliver exactly the correct amount of shampoo into the bottles. As the bottles move through this section of the filling line, they are filled with shampoo. From here the bottles move to the capping machine. Much like the bin that holds the empty bottles, the caps are also put in a hopper and then correctly aligned. As the bottles move by the caps are put on and twisted tight.

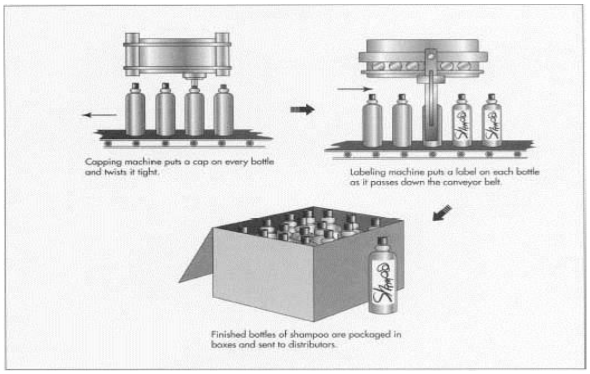
After the caps are put on, the bottles move to the labeling machines (if necessary). Depending on the type of labels, they can either be stuck on using adhesives or heat pressed. Labels are stuck to the bottles as they pass by. From the labeling area, the bottles move to the boxing area, where they are put into boxes, typically a dozen at a time. These boxes are then stacked onto pallets and hauled away in large trucks to distributors. Production lines like this can move at speeds of about 200 bottles a minute or more.

Quality Control

In addition to the initial checks to make sure the product meets specifications, other quality control checks are made. For example, line inspectors watch the bottles at specific points on the filling line to make sure everything looks right. They notice things like fill levels, label placement, and whether the cap is on correctly. The product is also routinely checked to see if there has been any microbial contamination. This is done by taking a bottle off the filling line and sending it to the QC lab. Here, a small amount of the shampoo product is smeared onto a plate and inoculated with bacteria and other organisms to see if they grow. Additionally, the packaging is also checked to see if it meets specifications. Things such as bottle thickness, appearance, and bottle weight are all checked.

The Future

Consumer product corporations will continue to manufacture new types of shampoos. These new formulas will be driven by ever-changing consumer desires and developing chemical technology. Currently, consumers like multi-functional shampoos, such as 2-in-I shampoos, which provide cleansing and



conditioning in one step, or shampoos that aid in styling. New shampoos will likely provide improved conditioning, styling, and coloring while cleaning the hair.

Shampoo technology will also improve as new ingredients are developed by raw material suppliers. Some important advances are being made in the development of compounds such as polymers, silicones, and surfactants. These materials will be less irritating, less expensive, more environmentally friendly, and also provide greater functionality and performance.

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University Under Section 3 of UGC Act 1956)
COIMBATORE-21

DEPARTMENT OF CHEMISTRY
(For the candidates admitted from 2017 & onwards)

17CHU504B Chemistry of Cosmetics and Perfumes

Multiple Choice Questions for Unit I

S. No	Question	Option 1	Option 2	Option 3	Option 4	Answer
	Unit I					
1	Early hair dyes were made from	**Plants**	Animals	Birds	Insects	**Plants**
2	Which is used for bleaching hair in Roman times?	Bleaching powder	**Rock alum**	Wax	Detergents	**Rock alum**
3	For Hair dye preparation Hydrogen peroxide was discovered in the year	1767	1625	**1818**	1951	**1818**
4	The first Synthetic Organic hair dye developed was	Indigo	Congored	Malachite	**Pyrogallol**	**Pyrogallol**
5	Which was known in many parts of the world in hair dye preparation?	**Henna**	Starch	Burnt Sienna	Umber	**Henna**
6	Dyes are usually	**Amino compounds**	Acidic compounds	Neutral compounds	Ionic compounds	**Amino compounds**
7	Which is a Hair dye	4-Nitrotoluene	**4-Amino-2-**	4-Chlorotoluene	Toluene	**4-Amino-2-**

	ingredient?		**hydroxytoluene**			**hydroxytoluene**
8	Which is used as a Pigments?	SiO_2	$TiCl_4$	**TiO_2**	Na_2CO_3	**TiO_2**
9	Which stabilize the dye pigments?	Antioxidants	Fragrance	Soaps	**Modifiers**	**Modifiers**
10	Most commonly used antioxidants in the preparation of dye is	**Na_2SO_3**	H_2O_2	NH_3	TiO_2	**Na_2SO_3**
11	In Hair dye preparation, White powder is	**Wheat starch**	Lead acetate	Na_2SO_3	CaO	**Wheat starch**
12	Which is a common component of Hair spray?	Polyvinylchloride	Polystyrene	**Polyvinylpyrrolidone**	Polyurethane	**Polyvinylpyrrolidone**
13	Which is used as Plasticizers in Hair spray?	Aminotoluene	**Aminomethylpropanol**	Aminomethyltoluene	Aminopropanol	**Aminomethylpropanol**
14	In hair spray Propane is used as a	Plasticizer	**Propellants**	Surfactants	Antioxidants	**Propellants**
15	In hair spray Isobutane is used as a	Plasticizer	**Propellants**	Surfactants	Antioxidants	**Propellants**
16	Which function as both propellant and a solvent?	CFC's	Citric acid	Adipic acid	**Dimethylether**	**Dimethylether**
17	The primary ingredient in	**Water**	Butane	Isobutane	Propane	**Water**

	all shampoos (i.e) 70 – 80% of the entire formula is					
18	Which is used to increase Shampoo thickness?	Sodium sulfite	**Sodium chloride**	Sodium hydroxide	Ammonium hydroxide	**Sodium chloride**
19	Shampoo consists of mainly	One portion	**Two portions**	Three portions	Four Portions	**Two portions**
20	Preservatives are added in shampoo to prevent	**Bacteria growth**	Oxidation	Hydrolysis	Gel formation	**Bacteria growth**
21	Human hair is composed largely of	Acids	**Keratin**	Fats	Esters	**Keratin**
22	Maximum content of human hair is	Lipid	Water	**Protein**	Fats	**Protein**
23	Minimum content of human hair is	**Lipid**	Water	Protein	Fats	**Lipid**
24	The phosphorus content in per 100 gm of hair is approximately	20mg	40mg	60mg	**80mg**	**80mg**
25	Henna produces a	**Reddish dye**	Black dye	Green dye	Yellow dye	**Reddish dye**
26	White powder was made of	Rice starch	**Wheat starch**	Corn starch	Maize starch	**Wheat starch**
27	Hair coloring is a well-defined science with intense study of the interaction between	Hair keratin and shampoos	Hair and hair spray	**Hair keratin and highly reactive organic dyes**	Hair and Bleaching agent	**Hair keratin and highly reactive organic dyes**
28	Hair dyes are classified in how many different ways?	1	2	3	**4**	**4**
29	Which is used in permanaent hair color?	**Ammonia**	Sodium bicarbonate	Sodium carbonate	Ethanol amine	**Ammonia**
30	Which is typically brighter and more vibrant	Semi permanent	**Temporary hair color**	Permanent	Demipermanent	**Temporary hair color**
31	Henna is	2-hydroxy-1,3-	2-hydroxy-1,4-	**2-hydroxy-1,4-**	2-Chloro-1,4-	**2-hydroxy-1,4-**

		naphthaquinone	Benzoquinone	**naphthaquinone**	naphthaquinone	**naphthaquinone**
32	PPD is	***Para*-Phenylene diamine**	Polyphenylenediamine	Polyphosphoric diamide	*Para*-Phenylenediol	***Para*-Phenylene diamine**
33	Which causes tissue irritation and affect the immune system?	Lead acetate	**DMDM Hydantoin**	Parabens	Hydrogen peroxide	**DMDM Hydantoin**
34	Which is a toxic dye?	Chlorophenol	Indigo	Congored	**Resorcinol**	**Resorcinol**
35	Plasticizers used in hair spray is	Esters of Benzoic acid and Salicylic acid	**Esters of citric acid and adipic acid**	Esters of acetic acid and tartaric acid	Esters of acetic acid and formic acid	**Esters of citric acid and adipic acid**
36	In hair spray which functions both as a propellant and a solvent.	**Dimethyl ether**	Diethylether	Diisopropylether	Dimethoxy ethane	**Dimethyl ether**
37	Dangerous substance found in hair spray is	Acetaldehyde	Dimethylether	Diethylether	**Formaldehyde**	**Formaldehyde**
38	Which is a suspected carcinogen in hair spray?	Acetaldehyde	Dimethylether	Diethylether	**Formaldehyde**	**Formaldehyde**
39	The usage of which one damage the organs including kidneys and lungs?	Hair dye	**Hair spray**	Shampoo	Hair colorant	**Hair spray**
40	Henna is a	**Vegetable material**	Animal material	Bird material	Insect material	**Vegetable material**
41	Human hair contains trace concentration of	**Iron**	Protein	Water	Lipid	**Iron**
42	Human hair contains trace concentration of	**Zinc**	Protein	Water	Lipid	**Zinc**
43	Human hair contains trace concentration of	**Copper**	Protein	Water	Lipid	**Copper**
44	Hair density vary according to	Fat content	Lipid content	**Genetic background**	Solvent	**Genetic background**

45	Hair density vary according to	Fat content	Lipid content	**Age**	Solvent	**Age**
46	To which prolonge exposure of hair causes green hair	Protein in diet	**Copper in diet**	Vitamin in diet	Fat in diet	**Copper in diet**
47	To which prolonge exposure of hair causes green hair	Deionised water	Shampoo	**Tap water**	Hairspray	**Tap water**
48	To which prolonge exposure of hair causes green hair	Deionised water	Shampoo	Hairspray	**Swimming pool**	**Swimming pool**
49	Shampoo composed primarily of chemicals called	Opacifiers	**Surfactants**	Additives	Sequestering agents	**Surfactants**
50	Primary detergents also known as	Opacifiers	**Surfactants**	Additives	Sequestering agents	**Surfactants**
51	In where, one portion of the molecule is oil compatible (soluble) while the other is water soluble?	Opacifiers	**Surfactants**	Additives	Sequestering agents	**Surfactants**
52	Surfactants are derived from compounds known as	Ketones	Alcohols	**Fatty acids**	Esters	**Fatty acids**
53	Which is a naturally occurring materials found in various plant and animal sources?	Ketones	Alcohols	**Fatty acids**	Esters	**Fatty acids**
54	Common preservatives used in shampoos are	Benzoic acid	**DMDM hydantoin**	Dimethylether	Diethylether	**DMDM hydantoin**
55	Common preservatives used in shampoos are	Benzoic acid	**Methyl paraben**	Dimethylether	Diethylether	**Methyl paraben**
56	Which makes shampoo	**Opacifiers**	Surfactants	Additives	Sequestering	**Opacifiers**

	opaque?				agents	
57	Which makes shampoo pearly look?	**Opacifiers**	Surfactants	Additives	Sequestering agents	**Opacifiers**
58	Salt is added to the Shampoo to modify	pH	**Viscosity**	Colour	Odour	**Viscosity**
59	Acid or Base is added to the Shampoo to modify	**pH**	Viscosity	Colour	Odour	**pH**
60	Which is added to shampoo to offset the dulling effects of hard water?	Opacifiers	Surfactants	Additives	**Sequestering agents**	**Sequestering agents**

Unit-II

Preparation and uses of suntan lotions, face powder, lipsticks, talcum powder, nail enamel.

Unit-II

Suntan lotion

Definition of 'suntan lotion'

a milky cream that you rub into your skin to protect it from the sun's harmful UV rays.

Suntan lotion can refer to:

1. Indoor tanning lotion, used to *increase* tanning
2. Sunscreen, used to *decrease* tanning and prevent sunburn

Suntan Lotion

Suntan lotion may contain minute SPF (sun protection factor) levels of 4 to 5, but this is not enough to thoroughly protect your skin from the sun. Suntan lotion does not protect the skin at a cellular level, and it is specifically designed to enhance* and encourage melanin production. For individuals with darker pigmentation, a common mistake is to assume that darker pigmentation will not burn. This is not true. While olive and darker toned skin tends to tan more easily, it can still burn with excessive sun exposure. Suntan lotions are designed to encourage a healthy tan while minimally protecting the skin, yet allowing sun rays to penetrate the lotion and create a nice tan. While this all sounds good, it is important to note that spending day after day in the sun with minimal protection will definitely lead to darker skin, it can also lead to sunburn, peeling skin, dry skin, per-cancerous moles, premature wrinkles, and blistering of the skin. If you choose a suntan lotion over sunscreen, opt for an all-natural lotion that contains aloe vera and vitamin E, as these ingredients work to naturally protect the skin and encourage healthy skin cell turnover. Additionally, choose a lotion with the highest SPF possible in the suntan lotion category. The highest levels range between 5 and 7, and still allow for the sun’s rays to penetrate the lotion. If you plan to spend several days in the sun, alternating between suntan lotion and sunscreen is a great idea.

Suntan lotion, also known as **Sunscreen**, as **Sunblock** or **Sun cream**

It is a lotion, spray, gel or other topical product that absorbs or reflects some of the sun's ultraviolet(UV) radiation and thus helps protect against sunburn. Diligent use of sunscreen can also slow or temporarily prevent the development of wrinkles, moles and sagging skin.

Depending on the mode of action, sunscreens can be classified into physical sunscreens (i.e., those that reflect the sunlight) or chemical sunscreens (i.e., those that absorb the UV light).

Medical organizations such as the American Cancer Society recommend the use of sunscreen because it aids in the prevention of squamous cell carcinomas. Many sunscreens do not block UVA radiation, which does not primarily cause sunburn but can increase the rate of melanoma and photodermatitis. The use of broad-spectrum (UVA/UVB) sunscreens can address this concern.

Sunscreens are commonly rated and labeled with a sun protection factor (SPF) that measures the fraction of sunburn-producing UV rays that reach the skin. For example, "SPF 15" means that $^1/_{15}$ of the burning radiation reaches the skin through the recommended thickness of sunscreen. Other rating systems indicate the degree of protection from non-burning UVA radiation. Sunscreens are designed to remain effective at original strength for up to three years, and are generally of doubtful value after that period. Some sunscreens include an expiration date — a date indicating when they are no longer expected to be effective.

Active ingredients

In addition to moisturizers and other inactive ingredients, sunscreens contain one or more of the following active ingredients, which are either chemical or mineral in nature:

1. Organic chemical compounds that absorb ultraviolet light.
2. Inorganic particulates that reflect, scatter, and absorb UV light (such as titanium dioxide, zinc oxide, or a combination of both).
3. Organic particulates that mostly absorb UV light like organic chemical compounds, but contain multiple chromophores that reflect and scatter a fraction of light like inorganic particulates. An example is Tinosorb M. The mode of action is about 90% by absorption and 10% by scattering.

The principal active ingredients in sunscreens are

usually aromatic molecules conjugated with carbonyl groups. This general structure allows the molecule to absorb high-energy ultraviolet rays and release the energy as lower-energy rays, thereby preventing the skin-damaging ultraviolet rays from reaching the skin. So, upon exposure to UV light, most of the ingredients (with the notable exception of avobenzone) do not undergo significant chemical change, allowing these ingredients to retain the UV-absorbing potency without significant photodegradation. A chemical stabilizer is included in some sunscreens containing avobenzone to slow its breakdown; examples include formulations containing Helioplex and AvoTriplex. The stability of avobenzone can also be improved by bemotrizinol, octocrylene and various other photostabilisers. Most organic compounds in sunscreens slowly degrade and become less effective over the course of several years if stored properly, resulting in the expiration dates calculated for the product.

Sunscreening agents are used in some hair care products such as shampoos, conditioners and styling agents to protect against protein degradation and color loss. Currently, benzophenone-4 and ethylhexyl methoxycinnamate are the two sunscreens most commonly used in hair products. The common sunscreens used on skin are rarely used for hair products due to their texture and weight effects.

The following are the FDA allowable active ingredients in sunscreens:

UV-filter	Other names	Maximum concentrat ion	Permitted in these countries	Results of safety testing	UV A	UV B
p-Aminobenzoic acid	PABA	15% (EU: banned from sale to consumers from 8 October 2009)	USA, AUS	Protects against skin tumors in mice.[52][53][54] Shown to increase DNA defects, however, and is now less commonly used.		X
	OD-PABA,	8% (EU, USA, AUS) 10% (JP) (Not currently				

Padimate O	octyldimethyl-PABA, σ-PABA	supported in EU and may be delisted)	EU, USA, AUS, JP			X
Phenylbenzimidazole sulfonic acid	Ensulizole, Eusolex 232, PBSA, Parsol HS	4% (US, AUS) 8% (EU) 3% (JP)	EU, USA, AUS, JP	Genotoxic in bacteria[55]		X
Cinoxate	2-Ethoxyethyl p-methoxycinnamate	3% (US) 6% (AUS)	USA, AUS		X	X
Dioxybenzone	Benzophenone-8	3%	USA, AUS		X	X
Oxybenzone	Benzophenone-3, Eusolex 4360, Escalol 567	6% (US) 10% (AUS, EU) 5% (JP)	EU, USA, AUS, JP	Banned in Hawaii starting in 2021 - harmful to coral[56]	X	X
Homosalate	Homomethyl salicylate, HMS	10% (EU, JP) 15% (US, AUS)	EU, USA, AUS, JP			X
Menthyl anthranilate	Meradimate	5%	USA, AUS		X	

Octocrylene	Eusolex OCR, Parsol 340, 2-Cyano-3,3-diphenyl acrylic acid, 2-ethylhexylester	10%	EU, USA, AUS, JP	Increases ROS[57]	X	X
Octyl methoxycinnamate	Octinoxate, EMC, OMC, Ethylhexyl methoxycinnamate, Escalol 557, 2-Ethylhexyl-paramethoxycinnamate, Parsol MCX	7.5% (US) 10% (EU, AUS) 20% (JP)	EU, USA, AUS, JP	Banned in Hawaii starting in 2021 - harmful to coral[58]		X
Octyl salicylate	Octisalate, 2-Ethylhexyl salicylate, Escalol 587,	5% (EU, USA, AUS) 10% (JP)	EU, USA, AUS, JP			X
Sulisobenzone	2-Hydroxy-4-Methoxybenzophenone-5-sulfonic acid, 3-Benzoyl-4-hydroxy-6-methoxybenzenesulfonic acid, Benzophenone-4, Escalol 577	5% (EU) 10% (US, AUS, JP)	EU, USA, AUS, JP		X	X
Trolamine salicylate	Triethanolamine salicylate	12%	USA, AUS			X

Avobenzone	1-(4-methoxyphenyl)-3-(4-tert-butyl phenyl)propane-1,3-dione, Butyl methoxy dibenzoylmethane, BMDBM, Parsol 1789, Eusolex 9020	3% (US) 5% (EU, AUS) 10% (JP)	EU, USA, AUS, JP		X	
Ecamsule	Mexoryl SX, Terephthalylidene Dicamphor Sulfonic Acid	10%	EU, AUS (US: approved in certain formulations up to 3% via New Drug Application (NDA) Route)	Protects against skin tumors in mice[59][60][61]	X	
Titanium dioxide	CI77891	25% (US) No limit (JP)	EU, USA, AUS, JP		X	X
Zinc oxide		25% (US) No limit (AUS, JP)	EU, USA, AUS, JP	Protects against skin tumors in mice[59]	X	X

Application

The dose used in FDA sunscreen testing is 2 mg/cm^2 of exposed skin. If one assumes an "average" adult build of height 5 ft 4 in (163 cm) and weight 150 lb (68 kg) with a 32-inch (82-cm) waist, that adult wearing a bathing suit covering the groin area should apply approximately 30 g (or 30 ml, approximately 1 oz) evenly to the uncovered body area. This can be more easily thought of as a "golf ball" size amount of product per body, or at least six teaspoonfuls. Larger or smaller individuals should scale these quantities accordingly. Considering only the face, this translates to about 1/4 to 1/3 of a teaspoon for the average adult face.

Some studies have shown that people commonly apply only 1/4 to 1/2 of the amount recommended for achieving the rated sun protection factor (SPF), and in consequence the effective SPF should be downgraded to a square root or 4th root of the advertised value. A later study found a significant exponential relation between SPF and the amount of sunscreen applied, and the results are closer to linearity than expected by theory.

Benefits

Sunscreen use can help prevent melanoma and squamous cell carcinoma, two types of skin cancer. There is little evidence that it is effective in preventing basal cell carcinoma.

A 2013 study concluded that the diligent, everyday application of sunscreen can slow or temporarily prevent the development of wrinkles and sagging skin. The study involved 900 white people in Australia and required some of them to apply a broad-spectrum sunscreen every day for four and a half years. It found that people who did so had noticeably more resilient and smoother skin than those assigned to continue their usual practices.

Minimizing UV damage is especially important for children and fair-skinned individuals and those who have sun sensitivity for medical reasons.

Potential risks

In 2009, the Therapeutic Goods Administration of Australia updated a review of sunscreen safety studies and concluded: "The potential for titanium dioxide

(TiO_2) and zinc oxide (ZnO) nanoparticles in sunscreens to cause adverse effects depend primarily upon the ability of the nanoparticles to reach viable skin cells. To date, the current weight of evidence suggests that TiO_2 and ZnO nanoparticles do not reach viable skin cells." Sunscreen ingredients typically undergo extensive review by government regulators in multiple countries, and ingredients that present significant safety concerns (such as PABA) tend to be withdrawn from the consumer market.

Concerns have also been raised about potential vitamin D deficiency arising from prolonged use of sunscreen. Typical use of sunscreen does not usually result in vitamin D deficiency; however, extensive usage may. Sunscreen prevents ultraviolet light from reaching the skin, and even moderate protection can substantially reduce vitamin D synthesis. However, adequate amounts of vitamin D can be produced with moderate sun exposure to the face, arms and legs, averaging 5–30 minutes twice per week without sunscreen. (The darker the complexion, or the weaker the sunlight, the more minutes of exposure are needed, approximating 25% of the time for minimal sunburn.) Vitamin D overdose is impossible from UV exposure thanks to an equilibrium the skin reaches in which vitamin D degrades as quickly as it is created.

In Conclusion

The environment of today’s world has created a much more dangerous situation when it comes to spending a day at the beach or spending the summer laying out by the pool. While it is still important to get up to 15 minutes a day of fresh air and sun, any extended length of time in the sun without protection can cause irreversible damage. When heading to the beach or pool, make sure to pack a sunscreen with an SPF of at least 15. Apply vitamin E cream and aloe vera to the skin following sun exposure as well, as this will aid in healing the skin at a cellular level. If you are looking to achieve a deep dark tan this summer, your best bet is to go the safe and natural way with an all-natural bronzing cream, as this will give you a lovely tan as well as nourish your delicate skin.

Face powder

Face powder is a cosmetic powder applied to the face to set a foundation after application. It can also be reapplied throughout the day to minimize shininess caused by oily skin. There is translucent sheer powder, and there is pigmented powder. Certain types of pigmented facial powders are meant be worn alone with no base foundation. Powder tones the face and gives an even appearance. Besides toning the face, some powders with sunscreen can also reduce skin damage from sunlight and environmental stress. It comes packaged either as a compact or as loose powder. It can be applied with a sponge, brush, or powder puff. Uniform distribution over the face is achieved more easily when a loose powder is applied.

Because of the wide variation among human skin tones, there is a corresponding variety of colors of face powder. There are also several types of powder. A common powder used in beauty products is talc (or baby powder), which is absorbent and provides toning to the skin.

It can also be applied generously to the higher points of the face to brighten, colour correct and highlight, through a technique termed baking (a.k.a. cooking). This technique also helps to increase the coverage of the make-up whilst helping the makeup stay in place for longer.

Application

Face powder should be carefully chosen to match the skin tone in order to show the best results.

Preparation & Evaluation of Face Powder

Face powder is an **indispensable** article of a lady’s cosmetic range.

A face powder is basically a cosmetic product which has as its prime function the **ability to complement skin color** by imparting a velvet finish to it.

A survey shows that the usage of Male is 11% and Female is 89%.

Ideal Properties

1. Should produce a **smooth finish** to the facial skin
2. **Masking** small visible imperfection of the face & shine due to moisture or grease from perspiration or secretion of sebaceous and sweat glands.
3. Must produce a **lasting effect** , so that frequent application is unnecessary.
4. Shouldmake face **pleasant to look and touch**.
5. Must **adhere** to skin
6. Degree of opacity can vary from **opaque (clown make-up)** to almost **transparent**.

Ideal Characteristics (when applied)

Covering Power, Slip, Adhesiveness, Absorbency, Bloom, Coloring and Perfuming

Ideal Functions

The type and brand of powder will depend on the desired cosmetic effect.
Some face powders are formulated to address different conditions.
Shine control, UV light protection, Improve skin tone, Cover up imperfections and Improve skin condition.

Types of Face powder
Depends on Nature of Skin

Type of Skin	Type of Powder	Characteristics
Dry	**Light**	**Slight** Covering Power Contain **large Quantity** of Talc
Normal or Moderately Oily	**Medium**	**Comparatively higher** covering power **Lesser talc** and balanced by **zinc oxide**
Very Oily	**Heavy**	**High** Covering Power **Lower quantity** of talc and **High quantity** of zinc oxide.

Depends on Texture

Loose

Powder particles are finer and tend to set makeup better than pressed powder. Finely milled texture means the powder is easier to layer.

Loose powder is applied with a brush or a puff. This makes it less portable and more difficult to apply on the go.

Pressed

Pressed powder comes in cake form, providing better and longer lasting coverage.

Pressed powder is applied with a dense puff or makeup sponge, simplifying application whenever needed.

Translucent

Translucent powder is unpigmented, sheer powder used mainly to control oily zones.

Translucent powder **can be pressed or loose powder**.

Tinted

Tinted powder is pigmented and is usually worn without foundation.

Tinted powder **can be pressed or loose powder**.

The ingredients in face powders vary depending on the desired effect on the skin. Here are the most common ingredients used in formulating pressed and loose face powders.

Key Ingredients

Ingredient	Category	Use
Talc	Base/Mineral	Naturally occurring mineral added in safe

		amount.
Mica	Covering Agent	It helps the powder to stay on the skin longer.
Kaolin	Slip/Absorbent	Enhance coverage while reducing the sheen provided by talc.
Magnesium Stearate	Adhesive	Improves the consistency of face powders,

Calcium Carbonate	Absorbent	Absorbs moisture to minimize oiliness and create a matte finish.
Inorganic & Organic Pigments	Colorant	Added to the formula to create the desired tint.
Triclosan	Perfumes	Enhance the intrinsic appeal.

General Preparation

The preparation of powder is simple as it is simply a matter of dry mixing of finely powdered materials.

Add **perfume** with a part of absorbent materials like **calcium carbonate** or with **magnesium carbonate** and keep it aside for some time.

Mix the **color** with part of the talc properly and add the other powders and then the perfume mixture.

Mix and sieve the powder mixture using a silk mesh or an old washed nylon cloth.

Methods of Preparation

World Wide Accepted: ‘3’

Wet method, Dry method and Damp method

Dry Method

Materials and binders are compressed by simple pressure in special presses.

Wet Method

Basic materials , colors and binders are kneaded into a paste with water, pressed into mould and air dried slowly.

Not much used as it can produce cracks.

Damp Method

Base powder, color and perfume are mixed uniformly.

Mixture is then wetted down with liquid binders like aqueous mucilage and blended until the proper plasticity of the mass is attained.

Powder is then screened and compressed by machine and dried at elevated temp.

Widely accepted and commercially used method.

Lipstick

Introduction

Lipstick is a cosmetic product containing pigments , oils , waxes and emollients that apply color , texture and protection to lips.

They are classified under skin colorants which are referred as beauty aids for purpose of alteration of appearance of skin and enhancing the appearance.

As most other types of makeup, lipstick is typically, but not exclusively, worn by women . some lipsticks are also lip balms, to add color and hydration.

These preparation do not damage the skin and are non tacky. They typically involve a color change but also increases shine and smooth out appearance of wrinkles and folds on lips.

They are a solid product housed in a molded packaging.

How Lipsticks work?

Lipsticks are made from hydrophobic materials. When the solid formula is applied to lip surface, friction melts it briefly and allow for transfer. The materials cools and reforms creating a film that sticks to surface due to hydrophobic interactions.

Color is a key ingredient of lipsticks. It gives an impression on lip surface. Silicones and oily materials are also addedto reflect light and provide shine.

Characteristics

Appearance:
It has smooth surface with uniform color.
It is free from defects which includes pinholes and grittiness.
It should have stable shelf life and should not exclude color.
It should be dermatological safe, non toxic and non irritant.
It must consist of stable color easy to apply and stay on for prolong period of time.
Should not be excessive greasy or tacky.
It should not melt at high temperature(45 degree) and should not harden at cold temperature(7-10 degree).
Selection of color and flavor should be complimentary and pleasant.

Composition

Ingredients	**Amount (%)**
STAINING DYES	0.5-3
IL SOLUBLE PIGMENTS	2

INSOLUBLE PIGMENTS	8-10
TITANIUM DIOXIDE	1-4

Wax mixture: gloss and hardness of lipsticks are hardly dependant on characteristics and the quantity of waxes used. So composition of wax is of prime importance. Wax mixture includes White beeswax, Candelilla wax, Carnauba wax, Ozokerite wax, Ceresin wax, Cetyl alcohol and cetostearyl alcohol.

Oils mixture: the oil mixtures are required to blend properly with waxes to provide a suitable film on lips. It also acts as dispersing agent for insoluble pigments. Ideal mixture is one which enables the product to spread easily.
Castor oil, Tetrahydrofurfuryl alcohol and its esters, Fatty acids alkyl amides, Paraffin oil
Isopropyl myristate, isopropyl palmitate and butyl stearate.

Bromo mixture: it is essentially a solution of staining dye stuff in a fatty material to enable the dyestuff to remain either wholly or partially in solution. It is known as bromoacids consists of flourescins, halogenated flouresceins and water insoluble dyes. They are mainly of 2 types:
Red bromo acid: red in color and gives reddish stain.
Orange red bromo acid: orange red in color and gives pink and yellowish pink stain.

Solvents used are Tetrahydrofurfuryl alcohol and esters, Glycerol derivatives, Propylene glycol,triethylene glycol, propylene glycol.

Colors: the color of lipstick is most important commercial and appealing view.the color
is imparted by 2 ways: By staining the skin with a solution of dyestuff which can penetrate the outer layer of lip skin.

By covering lips with colored layer.

Commonly used dyes are:

Staining dyes(soluble dyes)- flourescein, eosin.

Insoluble dyestuff and lake colors-calcium, barium, aluminium and strontium.

Preservatives, Perfumes, Surfactants and other additives:

Preservatives are used for prevention of growth of microbes.

E.g. methyl / propyl paraben.

Perfume is used to mask the odor.

Surfactants are used to promote wetting properties.

Antioxidants are used to prevent rancidification. e.g. BHT,BHA.

Fats:

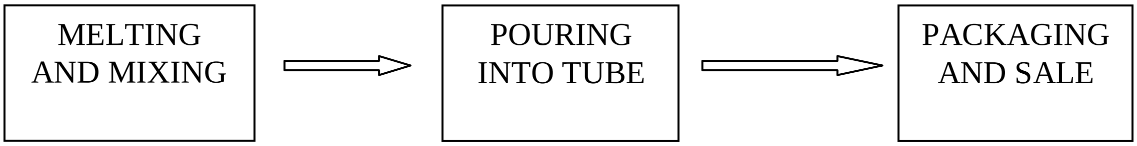
Petroleum jelly, lanolin , paraffin oil and cocoa butter

are used in this category.

Provides emollient and lubricating effects.

MANUFACTURING OF LIPSTICKS

MELTING AND MIXING



First the raw materials like solvents, oils and waxy material are melted in separate stainless steel container.

The solvents and oils are mixed with color pigments.

Then the mixture is passed through roller mill grinding the pigments to avoid grainy feel in lipsticks.

After the pigment mass is grounded and mixed it is added to hot wax until uniform color and consistency is obtained.

Molding

Once the lipstick mass is mixed and free of air, it is ready to be poured in tubes. The melted mass is dispensed into a mold, which consists of bottom portion of metal and a shaping tube. Lipstick is poured upside down so that bottom of tube is at top of mold. Any excess material is scrapped out. The lipstick is cooled and separated from mold and bottom of tube is sealed. The lipstick is passed through flaming test to seal the pinholes and to give finish to the product.

Labelling and Packaging

The lipstick is retracted and tube is capped .The lipstick is ready for labeling and packaging.

Defects

Formulation related problems

1. SWEATING: caused due to high oil content or inferior oil binding.
2. BLEEDING: separation of colored liquids from waxy bases.
3. BLOOMING: due to higher percentage of cetyl alcohol.
4. STREAKING: expected to be caused due to titanium dioxide.

Moulding related problems

1. LADDERING: lipstick does not look smooth or homogenous.
2. DEFORMATION: noticeable in softer formulae.
3. CRATERING: shows up flaming when stick develops dimples.

Evaluation Parameter

Melting point evaluation should be done to know the problems during handling and storage. The melting point should generally be above 50 degree Celsius.

Breaking point of lipsticks should be evaluated for conforming strength of lipsticks.

Force of application to evaluate the value of force to apply to surface.

Stability is an important evaluation parameter .Stability for long time and short time are evaluated.

TITANIUM DIOXIDE	1
FLAVOUR	1.5

Talcum powder

What is Talc Powder?

Talc (derived from the Persian talc via Arabic talq) is a mineral composed of hydrated magnesiumsilicate with the chemical formula $H_2Mg_3(SiO_3)_4$ or $Mg_3Si_4O_{10}(OH)_2$. In loose form, it is the widely used substance known as talcum powder. It occurs as foliated to fibrous masses, its monoclinic crystals being so rare as to be almost unknown. It has a perfect basal cleavage, and the folia are non-elastic, although slightly flexible. It is sectile and very soft, with a hardness of 1 (Talc is the softest of the Mohs' scale of mineral hardness, and can be easily scratched by a fingernail). It has a specific gravity of 2.5–2.8, a clear or dusty luster, and is translucent to opaque. Talc is not soluble in water, but it is slightly soluble in dilute mineral acids. Its colour ranges from white to grey or green and it has a distinctly greasy feel. Its streak is white.

Talc which is grinded to be powder named as **Talc powder** (Talcum powder), Talc powder is a minerals which widely used in all kinds of industry. Talc powder is often used to reduce rub because it is very fine, soft and greasy. Talc powder also is used as the filler of solid medicine. As talc can leave white mark on the rough ground, it is also used as the talc chalk which can write words on cement ground surface.

Talc is a mineral composed of hydrated magnesium silicate.
Its chemical formula is $Mg_3Si_4O_{10}(OH)_2$.
It is very soft and can be cut with a knife.
Talc is insoluble in water, but it is slightly soluble in dilute acids.
Talc is also name as: **Soapstone** (massive gray to bluish or greenish can be carved by hand).
French chalk (soft variety used for making cloth).
Steatite (Used for making electronic tube insulators).
Talc is a common metamorphic mineral in metamorphic belts which contain Ultramafic Rocks, Whiteschist and Blues chist metamorphic Terranes.

Ultramafic Rocks: Silica content (Less than 45%).

Whiteschist: Present in the Himalayas which stretches along Pakistan, Kashmir and Nepal.

Blueschist: Forms by the metamorphism of basalt, corresponding to a depth of 15 to 30 km and 200 to 500° C.

Physical Properties

Color: Light to dark green, brown and white

Crystal Habit: Fibrous Masses

Crystal System: Monoclinic to Triclinic

Cleavage : Basal Cleavage

Specific Gravity: 2.58 to 2.83

Hardness :1

Fracture : Fracture in an uneven pattern

Luster: Wax like or Pearly

Streak: White to Pearl green

Deposits

a) The first type of deposit is derived from Magnesium Carbonates. Found in ancient metamorphosed carbonate sequences. This talc deposit is usually the purest form of talc.

b) The second type of talc deposits are made from Serpentines,which provide 40% of the world's talc production. This type of Talc forming the ore commonly known as "Soapstone."

c) The third type of talc deposit is derived from Alumino-silicate rock. Only about 10% of this type of talc deposit is mined to meet the world's talc supplies.

d) The fourth type of talc is deposited from magnesium sedimentary deposits. This type of deposit is not mined currently and does not bring good economical value.

Formation of Talc

Talc is a metamorphic mineral resulting from the metamorphism of magnesium minerals such as Serpentine, Pyroxene, Olivine, in the presence of Carbon Dioxide and Water. This is known as **Talc Carbonation.**

a) Talc is formed through hydration and carbonation of serpentine.

Serpentine + carbon dioxide → talc + magnesite + water

b) Most talc is formed from the alteration of

Dolomite in the presence of excess dissolved Silica

Dolomite + silica + water → talc + calcite + carbon dioxide

c) Talc can be formed from magnesium chlorite and quartz through the following metamorphic reaction:

chlorite + quartz → kyanite + talc + water

Reserves in Pakistan

a) Talc reserves are estimated 0.6 Million Tons

b) Pakistan has major resources of best quality Talc Deposits in the world.

c) Its mines are situated in green valleys of Khyber Pakhtunkhwa with largest deposits located in: Sherwan (Hazara), Shangla Par (Swat), Kurram Agency, Safed Koh (near Parachinar), Nauseri in Azad Jammu & Kashmir

d) Talc deposits located in Kurram Agency are of good quality matching to International Standards.

Uses of talc (Soap stone):

Paints Industry:

It improves durability, prevents cracking, and enhances smoothness of paints.

Ceramics Industry:

The glazing and bodies of the ceramics rely on talc to give ceramics their gloss, whiteness and shape.

Paper Industry:

It is used as filler and coating for paper products.

Additives in Foods:

Talc coats some foods such as Chewing Gum, Candies, as an anti-sticking agent.

Soap Industry:

Since pre-historic age it is being used as soap that is why Talc is also named as "***Soap Stone***"

Pharmaceutical Industry:

a) Anti- fungal powders include talc to kill bacteria.

b) It is used in many commercial antacids for stomach and indigestion problems.

c) Pills are often coated in talc to help keep moisture out of them.

Health effects:

a) Talc is mostly linked with pulmonary diseases like Lung Cancer and Skin Cancer.

b) Talc Products containing asbestos fibers are fatal to human body.

c) Inhalation of large amounts of talc fine dust may lead to pulmonary edema.

d) May cause irritation to the upper respiratory tract. Tickling cough is a common symptom.

e) May cause redness or irritation of eyes.

Nail enamel

Definition:

"Nail lacquers are viscous preparations intended to decorate nails for fingers and toes".

Ideal Characteristics:

It should have proper viscosity wetting and flow
properties. It should have uniform colour.
It should have good gloss and good adhesive properties.

It should have sufficient flexibility so that it does not crack or become
brittle. It should have sufficient hard surface which is resistant to
impact and scratch.
It should have reasonable drying time (1-2 minutes) without developing bloom.

It should be able to maintain the above mentioned properties for a reasonable time (about 1 week).

A nail enamel composition has a film-forming mixture in a compatible solvent. The film-forming mixture includes nitrocellulose as a major component. The composition further includes a cyanoacrylate mixture comprising cyanoacrylate and a free radical inhibitor, the cyanoacrylate mixture being substantially free of toluene.

Conventional nail enamel products (i.e., nail polish) typically contain nitrocellulose as the main film-forming resin, and may further include additional resins, plasticizers, and other agents. Such products typically also include pigments, and a thixotropic agent for suspending the pigment, as well solvents such as n-butyl acetate, ethyl acetate, and toluene.

To strengthen the enamel, inclusion of an auxiliary resin preferably a film-forming styreneacrylonitrile-acrylicterpolymer is used. However, a film-forming alkyl cyanoacrylate is also listed as an option for strengthening the enamel. Such cyanoacrylate additives typically include toluene, which is a disadvantage due to the offensive odor and also it does not provide a suitable gloss.

Preparation of a Nail enamel

The nail enamel composition comprises the following:

Composition	**Quantity (weight %)**
Ethyl acetate and/or Butyl acetate	45-67
Isopropanol	9-19
Nitrocellulose	9-28
Triphenylphosphate	1-9
Diacetone alcohol	0.01-1
Butylated hydroxyanisole	0.01-0.2
Cyanoacrylate	*

* an operative amount of cyanoacrylate for substantially speeding the drying of the nail enamel composition, not exceeding 1% of the total weight of the nail enamel composition.

The method for forming the nail enamel composition comprises the steps of first mixing the cyanoacrylate with the accelerator mixture, to form the cyanoacrylate mixture. It is critical that the cyanoacrylate first be mixed with the accelerator mixture, as illustrated, to prevent crystallizing of the nail enamel composition butylated hydroxyanisole may be included as a free radical inhibitor.

The accelerator mixture may include 50-70% acetone and 30-50% ethyl acetate.

Separately, the nitrocellulose mixture is formed by mixing a film-forming mixture comprising nitrocellulose as a major component, with a compatible solvent to form the nitrocellu lose mixture. The nitrocellulose mixture is then mixed with the cyanoacrylate mixture to form the nail enamel composition that is substantially free of toluene.

Keeping the cyanoacrylate, mixed with the free radical inhibitor, separate from the film-forming mixture extends the shelf life of the cyanoacrylate, so it is helpful to maintain the cyanoacrylate mixture separately from the film-forming mixture until they are ready to be mixed, packaged, and sold.

Method of applying the nail enamel composition to a nail of a person or animal.

In a first embodiment, a first layer of a nail bonding/preparation solution is applied. The nail bonding/preparation solution may include a primer, a bonding agent, and/or any other form of preparation solution known in the art.

A coat of nail base may then be provided. The nail base provides a protective layer that maximizes color adhesion and eliminates staining. The nail base may comprise, in one embodiment, isopropyl alcohol, ethyl and butyl acetate, polyvinyl butyral, nitrocellulose, trimethyl pentanyl diisobutyrate, tosylamide formaldehyde resin, and benzophenone.

One or more coats of the nail enamel composition are then applied, depending upon how dark the color is desired. Finally, a top coat may be applied. The top coat provides a glossy finish and may also include a wide range of special effects. The top coat may comprise standard ingredients, such as nitrocellulose, ethyl and butyl acetate, cellulose acetate butyrate, n-butyl alcohol, propylacetate, trimethyl pentanyldisobutyrate, phthalic anhydride/trimellitic anhydride/glycols copolymer, acrylates copolymer, acrylates copolymer, bis-phenylpropyl dimethicone, etocrylene, and isopropyl alcohol. These ingredients may be modified or substituted according to the requirements.

Alternatively, the top coat may include various natural extracts, such as chamomilla recutita (matricaria) extract, citrus aurantium dulcis (orange) flower water, hydrolyzed conchiolin protein, lilium candidum bulb extract, retinyl palmitate, simmondsia chinensis (jojoba) seed oil, tocopherol, arachis hypogaea (peanut) oil, benzyl benzoate, butylene glycol, as well as acetyl tributyl citrate, sucrose benzoate, isopropyl alcohol, methylparaben, alpha-isomethylionone, and butylphenyl methylpropional.

Uses

Nails are transparent protective coverings on finger tips and toes of feet. The care of nails is referred to as Manicuring. It is also used for colouring the glass and enamels.

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University Under Section 3 of UGC Act 1956)
COIMBATORE-21

DEPARTMENT OF CHEMISTRY
(For the candidates admitted from 2017 & onwards)

17CHU504B Chemistry of Cosmetics and Perfumes

Multiple Choice Questions for Unit II

S. No	Question	Option 1	Option 2	Option 3	Option 4	Answer
	Unit II					
1	Which is a milky cream that you rub into your skin to protect it from the sun's harmful UV rays?	**Suntan lotion**	Face cream	Vanishing cream	Cold cream	**Suntan lotion**
2	Suntan lotion also known as	Face cream	**Sunscreen**	Vanishing cream	Cold cream	**Sunscreen**
3	Which absorbs or reflects some of the sun's ultraviolet(UV) radiation and thus helps protect against sunburn?	Face cream	Vanishing cream	**Suntan lotion**	Cold cream	**Suntan lotion**
4	Suntan lotion also known as	Face cream	Vanishing cream	**Suncream**	Cold cream	**Suncream**
5	Suntan lotion also known as	Face cream	**Cold cream**	Vanishing cream	**Sunblock**	**Sunblock**
6	If sunscreen reflects the sunlight it is called as	**Physical sunscreens**	Chemical sunscreens	Photolysis	Quantizer	**Physical sunscreens**
7	If sunscreen absorb the	Physical sunscreens	**Chemical**	Photons	Transmitter	**Chemical sunscreens**

	UV light it is called as		**sunscreens**			
8	Sunscreen is classified, based on	Solubility	Refractive index	**Mode of action**	Density	**Mode of action**
9	Depending on the mode of action, Sunscreen is classified into	**Two types**	Three types	Four types	Five types	**Two types**
10	Sunscreen absorb	Water	Air	**UV light**	Nitrogen	**UV light**
11	SPF means	**Sun Protection Factor**	Single Phase Factor	Slightly Polarisable Function	Steady Power Function	**Sun Protection Factor**
12	SPF is used to rate		**Sunscreen**			**Sunscreen**
13	If SPF 15 means, then, How much of the burning radiation reaches the skin through the recommended thickness of sunscreen.	**1/15**	30	15	45	**1/15**
14	If $^{1}/_{15}$ of the burning radiation reaches the skin through the recommended thickness of sunscreen then, What is the value of SPF?	1/15	30	**15**	45	**15**
15	Sunscreens are designed to remain effective at original strength for up to	Two years	**Three years**	Two months	Three months	**Three years**
16	In Sunscreen, Which is responsible for absorption of UV light?	**Organic compound**	Moisture	Minerals	Gemstone	**Organic compound**
17	In Sunscreen, Which is responsible for that to reflect, scatter, and	Organic compound	$CaCl_2$	CaS	**TiO_2**	**TiO_2**

	absorb UV light?					
18	In Sunscreen, Which is responsible for that to reflect, scatter, and absorb UV light?	Organic compound	$CaCl_2$	CaS	**ZnO**	**ZnO**
19	In Sunscreen, Which is responsible for that to reflect, scatter, and absorb UV light?	$CaCl_2+CaS$	$CoO+NiO$	**TiO_2+ZnO**	$CaCO_3+SnCl_2$	**TiO_2+ZnO**
20	The highest level of SPF ranges between	**5 and 7**	1 and 2	3 and 4	8 and 10	**5 and 7**
21	Among the following, which is a cosmetic?	**Face powder**	Bleaching powder	Baking powder	Hydrocarbons	**Face powder**
22	Face powder should be	Crystals	**Smooth**	Nonadhere	Ionic	**Smooth**
23	Which is a main constituent in nail enamel?	Cyanoacrylate	Ethyl acetate	**Nitrocellulose**	Triphenyl phosphate	**Nitrocellulose**
24	To protect from sun harmful UV rays which is used?	Lipstick	Nail enamel	**Suntan lotion**	Talcumpowder	**Suntan lotion**
25	Prolonged use of sunscreen results in deficiency of	Vitamin A	Vitamin B	Vitamin C	**Vitamin D**	**Vitamin D**
26	Natural occurring mineral is	Mica	Kaolin	**Talc**	Triclosan	**Talc**
27	Which contain large quantity of talc?	. **Face powder**	Lipstick	Nailenamel	Suntanlotion	**Face powder**
28	Which enhances smooth application in Face powder?	Calcium carbonate	Calcium hydroxide	Kaolin	**Magnesium stearate**	**Magnesium stearate**

29	In face powder Triclosan is a	**Perfume**	Colourant	Catalyst	Filler	**Perfume**
30	Solvent used in Lipstick is	**Tetrahydrofurfurylalcohol**	Water	Hydrogenperoxide	Cholorobenzene	**Tetrahydrofurfurylalcohol**
31	Antioxidants used in lipstick is	**BHT**	PABA	Propylester	Paraben	**BHT**
32	Chemical formula for talc is	$Mg_2Si_5O_{10}(OH)_2$	$Mg_3Si_4O_{12}$	**$Mg_3Si_4O_{10}(OH)_2$**	$Mg_2Si_4(OH)_{15}$	**$Mg_3Si_4O_{10}(OH)_2$**
33	Specific gravity of talc is	6.78-8.9	10.0	**2.58-2.83**	11-12	**2.58-2.83**
34	Hardness of talc in mho scale is	**1**	2	3	4	**1**
35	Talc is also called as	Soap	Oil	Clay	**Soap stone**	**Soap stone**
36	Lipstick is in	Solid	**Fluid**	Liquid	Aerosol	**Fluid**
37	Which is an indispensable article of a lady’s cosmetic range?	**Face powder**	Toothpowder	Sunscreen	Sunlotion	**Face powder**
38	A survey of face powder usage shows that	Male 30% and Female is 70%	**Male 11% and Female is 89%**	Male 50% and Female is 50%	Male 75% and Female is 25%	**Male 11% and Female is 89%**
39	Face powder should be carefully chosen in order to match the	Climate	Height	**Skin tone**	Weight	**Skin tone**
40	Based on the nature of skin, Face powder is classified into	2 types	**3 types**	4 types	5 types	**3 types**
41	Face powder is classified based on the	**Nature of skin**	Thickness of skin	Dress colour	Climate	**Nature of skin**
42	Medium face powder is for	Very oily skin	**Moderately oily skin**	Low oily skin	Dry skin	**Moderately oily skin**
43	Light face powder is for	Very oily skin	Moderately oily	Low oily skin	**Dry skin**	**Dry skin**

			skin			
44	Heavy face powder is for	**Very oily skin**	Moderately oily skin	Low oily skin	Dry skin	**Very oily skin**
45	Which type of face powder contains large quantity of talc?	**Light**	Medium	Heavy	Viscous	**Light**
46	Talc quantity of Heavy face powder is	High	Normal	Low	**Very low**	**Very low**
47	Zinc oxide quantity of Heavy face powder is	**High**	Normal	Low	Very low	**High**
48	Depends on Texture, Face powder is classified into	2 types	3 types	**4 types**	5 types	**4 types**
49	Which type of face powder contains no zinc oxide?	**Light**	Medium	Heavy	Viscous	**Light**
50	Which face powder has high covering power?	Light	Medium	**Heavy**	Viscous	**Heavy**
51	Which face powder has slight covering power?	**Light**	Medium	Heavy	Viscous	**Light**
52	Which type of face powder is pigmented?	Loose	Pressed	Translucent	**Tinted**	**Tinted**
53	Which is an adhesive in face powder?	Talc	Mica	Kaolin	**Magnesium stearate**	**Magnesium stearate**
54	The gloss and hardness of lipsticks are hardly dependant on characteristics and the quantity of	Dyes	**Waxes**	Soluble Pigments	Insoluble pigments	**Waxes**
55	In Lipstick preparation, Which is of prime importance?	Dye	**Waxe**	Soluble Pigment	Insoluble pigment	**Waxes**
56	Commonly used	Congored	Malachite green	**Flourescein**	Acid red	**Flourescein**

	staining dyes in lip stick is					
57	Insoluble dyestuff and lake colors in lipstick is	**Strontium**	Lead	Cadmium	Nickel	**Strontium**
58	Which preservatives are used for prevention of growth of microbes in lip stick?	Methyl/n-octyl paraben	Isopropyl/Isobutyl paraben	Benzyl/Tolyl paraben	**Methyl /Ethyl paraben**	**Methyl /Ethyl paraben**
59	Which provides lubricating effect in Lipstick?	Surfactants	**Fats**	Antioxidants	Perfumes	**Fats**
60	The accelerator mixture used in nail enamel is	Chlorobenzene and Toluene	Toluene and Xylene	**Acetone and Ethyl acetate**	Chloroform and Diethylether	**Acetone and Ethyl acetate**

Unit-III

Preparation and uses of creams (cold, vanishing and shaving creams), antiperspirants and artificial flavours.

Preparation and Uses of Cold Cream

Introduction

Cold cream leaves behind a cooling effect on skin, thus the name. It is emulsion of water in oil.

Vanishing cream gets the name from the fact that it leaves no trace when rubbed into the skin. It is an emulsion of oil in water.Vanishing creams are more easily washed off and maintained in comparison to cold creams as its harder to wash off an oil phase.

History

Use of cold cream in some forms or the other can be traced as far as 2000 years back. Back then these were used strictly for medicinal purposes only. Formulas for modern cold cream is taken to be created in 1857 in France and then they were used as decoratives.

Cold cream

Type of Emulsion - Water in Oil

Major Ingredients

Beeswax acts as base for the cream.
Borax is used as a preservative.
For 100g of cold cream:
White beeswax-20g
Mineral oil-50g
Water-28.8g
Borax-0.7g
Perfume-0.5g

Special Ingredients

Alpha hydroxy acids (Lactic Acid)

They help removing Fine lines, Irregular pigmentation and Age spots.
Side Effects : Mild irritation and sun sensitivity.

Beta hydroxy acids (salicylic acid)

Remove dead skin cells, improve texture and helps with removing acne.

Hydroquinone

Used in lightening dark spots and age spots hence are also called bleaching or lightening agents.

Kojic acid

It is derived from a fungus and slows the production of melanin (brown pigment). Works similarly to hydroquinone.

Retinol

Helps improve skin texture and tone, Removes fine lines and wrinkles, • It is also one of the best anti ageing mineral.

L-Ascorbic acid

It is one of the forms of vitamin-c . With age and sun exposure collagen synthesis in skin decreases leading to wrinkles. It is the only antioxidant proven to stimulate collagen synthesis minimizing lines, scars and wrinkles.

Hyaluronic acid

Hyaluronic acid is often touted for its ability to “reverse” or stop ageing. It is found naturally in young skin and gets destroyed by age. Products with hyaluronic acid are most often used for wrinkle treatment.

Copper Peptide

Copper peptides promote the synthesis of hyaluronic acid. Studies also show that copper dependent enzymes benefit natural tissue building processes.

Side effects

Indiscriminate use of skin creams may cause some serious problems like Skin harshening and drying, Roughness, Skin cancer, Fairness creams which contain mercury may also cause poisoning.

Directions and General Instructions

Never apply heavy creams on dry skin as they will not let your skin breathe. The fragrances in the creams may irritate you. Cream should be applied evenly to preventing clogging of pores. Different creams be used for different weather. Overuse of these creams will block the skin pores.

Uses

Typically used to cleanse the face off makeup, Heavily moisturises dry skin. Can also be used as a balm for dry cracked lips. It can also be used as a shaving cream alternative for men.

Vanishing Cream

They are oil in water emulsions.

Major Ingredients

Ingredients are Steric Acid, An Alkali (like KOH), A Polyol (like glycerin) and Water in majorcontent.

Composition

Stearic acid-17%
Sodium bicarbonate-0.5%
Potassium bicarbonate-0.5%
Glycerin-6%
Water-71%
Alcohol-4.5%
Perfume-0.5%

Production

The alkali reacts with some of the stearic acid to form a soap which then acts as emulsifier. The polyol (glycerin) prevents loss of moisture. Sodium sterate crystals gives pearly shine .
STEP 1-Melt stearic acid
STEP 2-Mix water, NaOH and glycerin and heat to the same temperature as stearic acid
STEP 3-Mix both the melts together an stir till it becomes creamy.
Uses

Used as adhesive for makeup powders. Reduces loss of moisture from dry skin. Smoothens the skin and keeps it soft. Prevents skin from roughening and chapping.

Shaving Creams

There are three types of shaving creams. One is lather shaving cream other one brushless shaving cream, third one is aerosol shaving cream.

Lather Shaving Cream

It is essentially soap in the form of a cream. That’s why the processing of Shaving Cream at times is combination of Science and art as soap slurry has to be converted into a form that appears to be a Cream.

The raw material used in shaving cream are :
1. Oils andfats
2. Alkalis
3. Glycerin
4. Electrolytes
5. Perfume andadditives

1. Oils andfats

The fat charge consists of mainly stearic acid and coconut oil or coconut oil fatty acids. Total fatty matter varies from 33 to 40%.

2. Alkalis

It is a mixture of potassium and sodium hydroxide either in the form of flakes or solutions.

3. Glycerin or Sorbitol forms an essential part of shaving cream about 20 to 30% of these humactants are added to shaving cream. The addition of this material aids in giving creamy consistency to shavingcream.

4. Electrolytes

Normal electrolytes used are potassium chloride, Boric acid, Sodium Silicate etc., Judicious quantities of these electrolytes are necessary to give right consistency to the product.

5. Perfume and otheradditives

Most shaving cream consist of 0.5 to 1.5% perfumes. Carboxy methyl cellulose and other gums are used for giving consistency. Menthol is usually added to give cool feeling. Super-fatting agents like Lanolin, fatty alcohols are included in some creams. Antiseptic agents are also included.

Manufacture of shaving cream

The manufacture of shaving cream is normally done in a steam jacketed kettle with cooling arrangements. Oil, fatty acid and water is taken together, alkali solution is slowly added. The saponification reaction is allowed to complete. The mixture is stirred under slow speed stirrer. Alkali addition is so controlled that finally product has certain content of free fatty acids. The rest of the items are added one byone.

Batch is cooled and perfumed. The product is left for maturation at room temperature for several days. This maturation changes the consistency and brings in sheen to the product.

The consistency of shaving cream depends on electrolyte concentration ratio of Sodium and Potassium hydroxides and content of soap and glycerin.

Aerosol shaving foams

It is an oil in water emulsion of propellants in aqueous soap solution. The propellant under pressure is liquid and forms as oil phase. As the emulsion is discharged the propellant gets converted in gaseous state and thick lather is generatedinstantly.

It usually consists of sodium, potassium & tri ethanolamine stearate to the extent of 15% ;water to extent of 70 to 75% and propellant at 12.5 to 15% level. There are variety of other additives that are also added to the product.

Brushless shaving creams

These are non-lather shaving creams. They are oil in water emulsions. The product is similar to vanishing cream. Only difference is that it contains more of oils.

The brushless shaving creams are popular because of their convenience and thick film gives adequate lubrication and emolliency to skin. It causes less irritation of skin.

The beard softening property of brushless shaving cream is less. As such normally washing face with water and soap before application of brushless shaving cream is recommended.

Normal brushless shaving cream consists of:

StearicAcid	10 to25%
Lubricants	4 to10%
I. P. M.. MineralOilSoaps	1 to 5%
Thickening agents	0 to1%
Humactent	2 to 10%
Preservatives&Perfumes	q.s.

Processing is carried out like any other cream. Oil phase and water phase are separately weighed and emulsified at higher temperature and then cooled.

Pre shave lotions

The main purpose behind use of preshave (Pre-electric shave) lotion is to stiffen the beard. It consists of high percentage of alcohol which dries quickly and evaporates all the moisture. Some lubricants are incorporated in small proportion. Normal lubricant used is Isopropyl Myristate which has good solubility inalcohol.

Some astringent salts like Aluminium Chlorhydrate and other zinc salts are included to stimulate hair follicle muscle. Suitable antiseptic at low concentration is added.

There are other products like pre electric shave Talc or stick or powder etc.

After shave lotion

After shave lotion consists of sample solution of ethyl alcohol and perfume. Alcohol strength may vary from 40 to 60%.

The main purpose is to act as soothing agent to skin which has been abraded by razor blade. Mild astringency and coolness is achieved by controlling ethyl alcohol concentration and addition of cooling agents like menthol etc.

Perfume addition in after shave lotion is very important as this brings in the feeling of frshness. Since alcohol content is lower, the perfume dispersion in after shave lotion is done with the help of Solubilisers like Tween or ethoxylated castor oiletc.

Small quantity of humectants are also included like sorbitol, glycerol.

Astringents like Zinc Sulphate, Alum etc are also included in certain formulations.

Antiperspirants

Antiperspirant/deodorant (APD) sticks are used to reduce underarm wetness and control body odor. These products are made by blending active ingredients with waxes, oils, and silicones and molding the mixture into stickform.

Body odor is primarily generated in the area under the arms where there is a high concentration of sweat glands. While sweat from these glands is initially odorless, it contains natural oils, called lipids, that provide a growth medium for bacteria living on the skin. These bacteria interact with the lipids, converting them into compounds that have a characteristic sweaty odor. Isovaleric acid, for example, is one chemical compound that gives sweat its smell.

There are two primary types of products used to control body odor. The first, deodorants, reduce body odor by killing the odor-causing bacteria. These products do not affect the amount of perspiration the body produces. Antiperspirants, on the other hand, inhibit the activity of sweatglandssolessmoistureisproduced.Inadditiontoavoidingunpleasantwetness,these products also decrease odor because there is less sweat for the bacteria to act upon. While deodorants are considered to be cosmetic products because they only control odor, antiperspirants are actually drugs because they affect the physiology of the body. Although the exact mechanism of this physiological interaction is not fully understood, theory has it that antiperspirant salts form temporary plugs in some of the sweat gland openings so that moisture is not secreted. While this moisture reduction is not severe enough to interfere with normal body metabolism, it does noticeably lessen underarmwetness.

Raw Materials

Antiperspirants consist of the active drug ingredients that control perspiration; gelling agents that form the stick matrix; and other ingredients, such as fragrance or colorants, that make the product aesthetically pleasing.

Active ingredients

The Food and Drug Administration (FDA) controls the active ingredients used in antiperspirants because they are legally classified as drugs. The FDA publishes an Over the Counter (OTC) Drug monograph that lists which ingredients are approved for use. The ingredients on this list are limited to aluminum chlorohydrate, aluminum chloride, aluminum sulfate, and aluminum zirconium complexes. Of these compounds, the most commonly used is aluminum zirconium tetrachlorohydrex glycine. Most of these materials are supplied as powders, and they are typically used at levels of 8-25% based on the weight of the finished product.

Gelling agents

The bulk of the formulation consists of waxy or fatty materials that are gelled to form a solid stick. Common examples include stearyl alcohol, cetyl alcohol, hydrogenated castor oil, and glycerylstearate. These waxy materials are blended with lubricating oils and emollients such as cyclomethicone, which is a volatile silicone compound. These silicones are liquids at room temperature, but they quickly evaporate and are used because they leave the skin feeling smooth and dry. In addition, talc, starches, or other powders may be added to control stick consistency and to give the product a dry feel and a smoothpayoff.

Other ingredients

Fragrance and colorants may be added to the formula to improve its odor or appearance. Some brands have fragrances that are time released. Other brands may add featured ingredients that contribute little functionality but are designed to increase consumer appeal.

The Manufacturing Process

Batching

In the batching process, ingredients are combined in a jacketed stainless steel kettle. Steam heat is applied to melt the ingredients while the batch is being mixed. During theblending process, the temperature must be carefully controlled to avoid scorching the waxy ingredients. Once all the ingredients have been added to the batch, it is blended until uniform.

Filling

Stick packages are typically hollow tubes with an elevator platform inside that moves up and down to dispense the product. In some packages, this platform can be pushed up by hand, in others it is elevated by turning a screw that causes it to travel up along a central threaded post. These empty containers move along a conveyor belt where the molten product is dispensed through a filling nozzle. The exact process varies depending on whether the package is designed to be filled from the top or bottom. In general, the product is filled slightly above its congealing temperature so that it flows easily. If it is filled too hot, the dispersed solids may settle to the bottom; if it is filled too cold, air bubbles will be trapped in the stick.

Finishing operations

Sticks may then go through subsequent finishing operations to ensure the surface is smooth and that they are free from trapped pockets of air. These operations usually involve heating the tops of the sticks slightly by passing them under an infrared lamp.

A probe is then stuck into the center of the stick to allow air to escape and the surface is heated again to remelt the product, allowing it to flow into the void.

At the next station, the sticks pass through a refrigeration tunnel that rapidly lowers the temperature and forces them to solidify. Depending on the package design, a top or bottom piece is put into place to seal the container.

Finally, the sticks may pass through cleaning stations before they are placed in cartons for shipping.

Quality Control

Safety testing

Safety testing guidelines are recommended by the Cosmetics, Toiletries, and Fragrance Association (CTFA), the primary trade organization for the cosmetic industry. While these guidelines are not absolute rules, they do give manufacturers an indication of the minimal level of testing that should be done to ensure their products are safe. These tests include evaluation of the irritation potential (for skin and eyes), contact sensitization (where contact with the product can result in a chemical delayed reaction), photodermatitis (where light interacts with the product to cause a reaction), as well as toxicity (both ingested andinhaled.)

Efficacy testing

According to the OTC monograph, antiperspirants must reduce the amount of perspiration by at least 20% and a variety of test methods are used to ensure formulations meet this requirement. One method, known as the visualization technique, shows the action of the sweat glands via a color change. This is done by first painting the skin with a mixture of iodine castor oil and alcohol. After drying, the skin is then whitened with a layer of powdered starch. When sweat droplets are exuded, they appear as very dark spots against the white background. Another method involves painting a silicone polymer painted onto the skin to form a film. The subject is made to sweat by exposure to elevated temperature or by physical exertion and the film is peeled off and examined for tiny holes formed by the sweat drops. A relative measure of the amount of sweat produced by the body can be obtained by counting the number of holes in the film. Sweat production can also be measured using infrared gas sensors that detect moisture loss. In this process, a constant stream of gas is passed over the subject's armpits and is subsequently analyzed for moisture content. Gravimetric techniques are also used to measure the amount of sweat collected on cotton balls.

By products/Waste

During the filling process, overfilling or spillage may occur, resulting in scrap product. This can usually be returned to the batch tank and remelted. Depending on the quantity of material involved and the degree of reheating, the batch may have to be assayed to ensure it still meets quality specifications. Additional solvent or fragrance may be added to replace that which was driven off during the reheating operation. The product can then be filled into the packages. Any waste material that is contaminated or otherwise unsuited for refilling must be disposed of in accordance with local regulations.

Artificial flavours

Synthesis of Ester is an artificial flavour

Introduction

Many esters have the characteristic property of a pleasant odor. As such, they are used as artificial flavors and perfumes Have you ever tasted peppermint gum or banana-flavored ice cream? These flavors are most likely due to an organic compound known as an ester. Not all esters have odors, some are odorless too. An example of an odorless ester would be vegetable oil.

The process of dehydration synthesis using an alcohol with an acid forms esters. Their names are formed from the very alcohol and acid used in their making. For example, when making the ester methyl salicylate (oil of wintergreen), the alcohol and acid used would be methanol and salicylic acid, respectively. This ester has an agreeable “peppermint” odor. Another example would be the ester butyl formate, which is produced when reacting butyl alcohol with formicacid.

When an organic acid (RCOOH) reacts with an alcohol (R`OH), water is removed and an ester is formed. This process is an example of dehydration synthesis.

$$\mathrm{RCOOH} \quad + \quad \mathrm{R`OH} \rightarrow \quad \mathrm{H_2O} \quad + \quad \mathrm{RCOOR`}$$

For example.

C_6H_5OCOOH+	CH_3OH →	H_2O +	$C_6H_5OCOOCH_3$
salicylicacid	methanol	water	methylsalicylate

The acid catalyst increases the rate at which equilibrium is reached but does not affect the position of the equilibrium.

In order to shift the equilibrium to the right and prepare the ester in reasonable yield two measures can be taken: 1) use a large excess of the alcohol, or 2) remove either the water or ester as it is formed. The most common method of the two, especially when the alcohol is inexpensive as is the case for methanol and ethanol, is to use an excess of the alcohol. This procedure is call Fischer Esterification.

Some artificial flavors are formed by the mixing of esters in an attempt to duplicate the flavor or odor of a natural substance. For example, the odor of raspberries is due to a mixture of isobutyl formate and isobutyl acetate. In this experiment you will make three different esters having characteristic odors of banana, peppermint, and fruit essences. The produce formed will be quite crude; however, you will be able to detect the three different odors, as well as experience the basic method of producingesters.

DISCUSSION:

Volatile esters usually have pleasant, fruity odors. The characteristic fragrance and flavor of fruits and flowers are due, in most cases, to mixtures of esters. The mixture of esters responsible for a natural flavor is usually complex and difficult to duplicate. However, if the flavor is attributed to a major component then a synthetic ester of the same structure can be substituted for the natural flavor at a fraction of the cost. For this reason, esters are used in the food, flavor, and fragrance industries. A formula for artificial pineapple flavor is given below. The composition of the mixture is very important to duplicating the flavor; and it should also be pointed out that our perceptions of an ester's smell may depend on its dilution.

ARTIFICIAL PINEAPPLE FLAVOR

Pure Compounds %		**Essential Oils %**	
allylcaproate	5	oil ofsweetbirch	1

isoamyl acetate	3	oil of spruce	2
isoamyl isovalerate	3	balsam Peru	4
ethyl acetate	15	volatile mustard oil	1
ethyl crotonate	5	oil cognac	5
ethyl butyrate	22	concentrated orange oil	4
terpinyl propionate	3	distilled oil of lime	2
caproic acid	8		
butyric acid	12		
acetic acid	5		
	81%		**19%**

The structures and approximate smell of a few esters follow:

Name	Flavor	Structure
Isoamyl acetate	Banana	$CH_3COOCH_2CH_2CH(CH_3)_2$
Methyl butyrate	Apple	$CH_3CH_2CH_2\ COOCH_3$
n-Propyl acetate	Pear	$CH_3COOCH_2CH_2CH_3$
Isobutyl propionate	Rum	$CH_3CH_2COOCH_2CH(CH_3)_2$
Ethyl butyrate	Pine apple	$CH_3CH_2CH_2COOCH_2CH_3$
Octyl acetate	Orange	$CH_3COOCH_2(CH_2)_6CH_3$

SAMPLEPROCEDURES:

Isoamyl acetate(banana)

$$CH_3COOH \quad + HOCH_2CH_2CH(CH_3)_2 \quad \overset{H^+}{\longleftrightarrow} \quad CH_3COOCH_2CH_2CH(CH_3)_2$$

(i) Mix 6 mL of isoamyl alcohol and 10 mL of glacial acetic acid in a 100 mL round bottom flask. Carefully add 1 mL of concentrated sulfuric acid whileswirling.

(ii) Add either boiling chips or a stirring bar and assemble the apparatus for reflux. Gently reflux with stirring for 30minutes.

(iii) Allow the flask to then cool at room temperature for about five minutes and then cool in an icebath.

(iv) Pour the mixture into a separatory funnel and add 10 mL of cold water (made from ice and distilled water chilled in an ice bath). Shake the layers and allow them to separate. Remove and discard the lower, aqueous layer but keep the top organiclayer.

(v) Add another 10 mL portion of cold water to the organic oil, shake the layers and separate them again. Discard the aqueous layer but keep the top organiclayer.

(vi) Wash the organic layer with 10 mLs of saturated sodium bicarbonate ($NaHCO_3$), separate, and then wash once with it with 10 mLs of saturated sodium chloride solution($NaCl$).

(vii) Transfer the organic layer to a 125 mL Erlenmeyer flask and dry it for five minutes over magnesium sulfate ($MgSO_4$). Filter the driedsolution.

(viii) Determine the weight of your crude product. If so instructed purify the banana oil by simple distillation.

(ix) Calculate the yield, the % yield, and put the sample in a labeled vial to turnin.

KARPAGAM ACADEMY OF HIGHER EDUCATION
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COIMBATORE-21

DEPARTMENT OF CHEMISTRY
(For the candidates admitted from 2017 & onwards)

17CHU504B Chemistry of Cosmetics and Perfumes

Multiple Choice Questions for Unit III

S. No	Question	Option 1	Option 2	Option 3	Option 4	Answer
	Unit III					
1	Vanishing cream is a	**Oil in Water emulsion**	Water in Oil emulsion	Jelly	Volatile liquid	**Oil in Water emulsion**
2	Which one leaves a protective invisible film of stearic acid on the skin?	Antiperspirants	**Vanishing cream**	Artificial flavor	Lipstick	**Vanishing cream**
3	Which ester is present in banana?	**Isoamyl acetate**	Propylbenzoate	Benzylacetate	Phenylbenzoate	**Isoamyl acetate**
4	Which one is a natural flavouring substance?	Ethylacetate	Isoamylacetate	**Vanilla**	Benbalzdehyde	**Vanilla**
5	Cold cream is an	Oil in Water emulsion	**Water in Oil emulsion**	Jelly	Volatile liquid	**Water in Oil emulsion**
6	Which is present in orange as a flavouring agent?	Methyl anthranilate	**Limonene**	Methylsalicyalte	Ethylpropionate	**Limonene**
7	In the preparation of creams, which is used as a preservative?	**Borax**	Kaolin	Triclosan	CaO	**Borax**
8	Which is the main ingredient in Antiperspirants?	Magnesium stearate	**Aluminium chlorohydrate**	Kaolin	Limonene	**Aluminium chlorohydrate**
9	What is the role of Antiperspirants?	**Stop sweating**	Stop nausea	Stop sneezing	Stop coughing	**Stop sweating**

10	Methyl anthranilate is present in	Orange	**Grapes**	Apple	Pineapple	**Grapes**
11	Malic acid is present in	Orange	Grapes	**Apple**	Pineapple	**Apple**
12	On the skin vanishing cream leaves a invisible film of	**Stearic acid**	Oleic acid	Linoleic acid	Zincoxide	**Stearic acid**
13	Artificial flavor is an synthesis of	**Ester**	Acid	Amines	Amides	**Ester**
14	Antiperspirants is used to stop	Cough	**Sweat**	Dizziness	Vomiting	**Sweat**
15	Allylhexanoate is present in	Banana	Orange	**Pineapple**	Grapes	**Pineapple**
16	Which one leaves a protective invisible film of stearic acid on the skin?	Antiperspirants	**Vanishing cream**	Artificial flavor	Lipstick	**Vanishing cream**
17	Cold cream leaves a	**Cooling effect**	Hot effect	Normal effect	Wrinkle effect	**Cooling effect**
18	Which acts as a base for Cold cream?	Borax	**Bees wax**	Perfume	Mineral	**Bees wax**
19	Which acts as a preservative for Cold cream?	**Borax**	Bees wax	Perfume	Mineral	**Borax**
20	In cold cream, Which removes fine lines?	**Lactic acid**	Borax	Salicylic acid	Kojic caid	**Lactic acid**
21	In cold cream, Which removes age spots?	**Lactic acid**	Borax	Salicylic acid	Kojic caid	**Lactic acid**
22	Which is derived from fungus?	Lactic acid	Borax	Salicylic acid	**Kojic caid**	**Kojic caid**
23	Which removes wrinkles in cold cream?	Borax	**Retinol**	Perfumes	Minerals	**Retinol**
24	Which removes dead skin cell in cold cream?	Lactic acid	Borax	**Salicylic acid**	Kojic caid	**Salicylic acid**
25	Which is the major content in vanishing cream?	Sodiumbicarbonate	Alcohol	**Water**	Glycerin	**Water**
26	Which one leaves no trace when rubbed into the skin?	Cold cream	**Vanishing cream**	Shaving cream	Shave lotion	**Vanishing cream**
27	Which one can be easily washed off?	Cold cream	**Vanishing cream**	Shaving cream	Shave lotion	**Vanishing cream**
28	Use of cold cream is as far as from	100 years back	500 years back	1000 years back	**2000 years back**	**2000 years back**
29	Long back, cold cream were strictly used for	Cosmetics	**Medicine**	Perfumes	Preservative	**Medicine**
30	In France, cold cream were used as	Perfumes	Cosmetics	**Decoratives**	Preservative	**Decoratives**
31	Which is the only antioxidant proven to stimulate collagen synthesis minimizing lines, scars and wrinkles in cold cream?	Lactic acid	Kojic acid	Salicylic acid	**L-Ascorbic acid**	**L-Ascorbic acid**

32	Copper peptides promote the synthesis of	Lactic acid	**Hyaluronic acid**	Salicylic acid	Kojic acid	**Hyaluronic acid**
33	Fairness creams leads to poisoning, if it contains	Silver	Lead	**Mercury**	Aluminium	**Mercury**
34	Cold cream can also be used as	**Shaving cream**	Vanishing cream	Nail polish	Lipstick	**Shaving cream**
35	Perfumes present in shaving cream is	**0.5-1.5%**	9.5-11.5%	20.5-22.5%	24.5-26.5%	**0.5-1.5%**
36	Which is responsible for cool feeling in Shaving cream?	Perfumes	Fatty acids	**Menthol**	Alkali	**Menthol**
37	How many types of shaving cream is there?	2	**3**	4	1	**3**
38	Which is an essential part of shaving cream?	Water	Perfumes	**Glycerin**	Oils	**Glycerin**
39	Which is an essential part of shaving cream?	Water	Perfumes	**Sorbitol**	Oils	**Sorbitol**
40	Which is necessary to give right consistency to the shaving cream?	**Electrolytes**	Water	Oils	Perfumes	**Electrolytes**
41	The normal electrolyte used in shaving cream is	**KCl**	Na_2CO_3	$NaHCO_3$	$HgCl_2$	**KCl**
42	The normal electrolyte used in shaving cream is	**H_3BO_3**	Na_2CO_3	$NaHCO_3$	$HgCl_2$	**H_3BO_3**
43	Normal lubricant used in pre shave lotion is	Grease	**Isopropyl Myristate**	Coconut oil	Vaseline	**Isopropyl Myristate**
44	To stimulate hair follicle muscle in pre shave lotion, which is added?	Calcium sulphate	Magnesium sulphate	**Aluminium Chlorhydrate**	Calcium phosphate	**Aluminium Chlorhydrate**
45	Antiperspirant are used to reduce	Irritation	**Underarm wetness**	Hyperactivity	Pain	**Underarm wetness**
46	Antiperspirants inhibit the activity of	Pituitary gland	Thyroid gland	**Sweat glands**	Parathyroid	**Sweat glands**
47	Antiperspirants is available in the form of	**Deodorant stick**	Spray	Solution	Crystals	**Deodorant stick**
48	Antiperspirants are actually	Solvents	Confectionary	**Drugs**	Perfumes	**Drugs**
49	Antiperspirants in the form of deodorants are only	**Cosmetics**	Lubricants	Acidic	Basic	**Cosmetics**
50	Antiperspirants in the form of deodorants control only	Colour	**Odour**	Appearance	Viscosity	**Odour**
51	CTFA means	**Cosmetics, Toiletries, and**	Cosmetics, Toiletries, and	Critical Theory of Fragrance	Chemical Theory of	**Cosmetics, Toiletries,**

		Fragrance Association	Fragrance Activeness	Analysis	Fragrance Alternatives	**and Fragrance Association**
52	The most commonly used antiperspirants is	Ceric ammonium nitrate	**Aluminum zirconium tetrachlorohydrex glycine**	Calcium titanate	Nickel dimethylglyoxime	**Aluminum zirconium tetrachlorohydrex glycine**
53	Which controls the active ingredients used in antiperspirants?	CTFA	FIDA	**FDA**	WHO	**FDA**
54	APD means	**Antiperspirant deodorant**	Active pharamceutical drug	Active potential drug	Analaysis of pharmaceutical drug	**Antiperspirant deodorant**
55	Artificial flavor is an synthesis of	Acid	**Ester**	Flavones	Alkaloids	**Ester**
56	Many esters have the characteristic property of	Pungent odour	Irritating odour	**Pleasant odour**	Odourless	**Pleasant odour**
57	Which is called oil of winter green?	**Methyl salicylate**	Ethyl salicylate	Ethyl benzoate	Methyl benzoate	**Methyl salicylate**
58	The ester methyl salicylate has the odour of	Phenol	**Peppermint**	Amine	Hydrocarbon	**Peppermint**
59	Ester is formed by the reaction of	Acid and PCl_5	Acid and Amine	Amine and Aldehyde	**Acid and Alcohol**	**Acid and Alcohol**
60	The characteristic fragrance and flavor of fruits and flowers are due to	**Mixture of Esters**	Mixture of Acid and Amine	Mixture of Alcohols	Mixture of Amine and Ketone	**Mixture of Esters**

Unit-IV

Essential oils and their importance in cosmetic industries with reference to Eugenol, Geraniol, Sandalwood oil

Essential Oils

Production

Essential oils are obtained from plant materials by distillation with water or steam. After condensation of the vapor phase, the oil separates from the aqueous phase and is removed. The yield of essential oil, based on the starting plant material, generally ranges from a few tenths of 1% to a few percent.

Essential oils consist of volatile, lipophilic substances that are mainly hydrocarbons or monofunctional compounds derived from the metabolism of mono- and sesquiterpenes, phenylpropanoids, amino acids (lower mass aliphatic compounds), and fatty acids (long-chain aliphatic compounds). Unlike fatty oils, essential oils do not leave a grease stain when dabbed on filter paper.

Essential oils are to be distinguished from the so-called distillates which are ethanol-containing products obtained from plant materials by distillation with ethanol or with ethanol-water mixtures. Essence oils are defined as essential oils that separate from the aqueous phase in the distillation receiver during the distillative concentration of fruit juices (usually citrus juices).

Citrus peel oils are a special type of essential oil. They are isolated by pressing the peel to release the volatile substances stored in the pericarp in small oil glands. The resulting products are termed essential oils because they consist largely of highly volatile terpene hydrocarbons. However, they also contain small amounts of nonvolatile compounds, such as dyes, waxes, and furocoumarines.

Uses.

Most essential oils are used directly as starting materials in the production of flavor and fragrance compositions. However, some essential oils are fractionated or concentrated by distillation, partitioning, or adsorption. Substances that are important for the desired characteristic odor and taste are thus concentrated, and other components, which possess either an unpleasant or very faint odor or are unsuitable for the application in question, are removed.

Individual compounds can be isolated from essential oils containing one or only a few major components by distillation or crystallization. Examples are eugenol from clove oil, menthol from cornmint oil, citronellal from Eucalyptus citriodora oil, and citral from Litsea cubeba oil. These compounds are used as such or serve as starting materials for the synthesis of derivatives, which are also used as flavor and fragrance substances. However, the importance of some of these oils has decreased substantially because of the development of selective synthetic processes for their components.

Although essential oils or their fractions are mixtures of many substances, these oils are occasionally converted as a whole into derivatives. Examples of such derivatives are vetiveryl acetate from vetiver oil, guaiyl acetate from guaiac wood oil, and acetyl cedrene from cedarwood terpenes. These products are also employed as fragrance substances.

Selected Essential Oils in Cosmetic Products

Immortelle Essential Oil, Lavender Essential Oil, German Chamomile Oil, Neroli Essential Oil, Peppermint Essential Oil, Rosemary Essential Oil, Rose Oil and Tea Tree Oil.

Individual Fragrances

Anethole, Bisabolol, Carvone, Citral, Eugenol, Farnesol, Geraniol, Limonene, Linalool and Menthol,

Eugenol

Eugenol (Figure 1g) is a pale yellow to colourless aromatic oily liquid. It is a cinnamate derivative of the shikamate pathway. It belongs to the chemical group of phenylpropanoides. Eugenol is the main component in clove essential oil (70–85%) and in allspice oil (60–90%). It can also be found in the essential oil of Ceylon cinnamon (10%) as well as in nutmeg, basil and pepper but in lower concentrations. As isoeugenol, eugenol is used for the production of synthetic vanillin. Eugenol is used in perfumes and also as a flavouring agent and in dentistry, due to its antiseptic and anaesthetic properties. It can be mixed with zinc oxide and then used for temporary fillings.

A study was conducted to investigate antifungal activity of eugenol and essential oils containing eugenol (pimento oil, bay oil, clove oil and cinnamon oil) against 38 clinical isolated strains of Candida albicans. The results led to the conclusion that antifungal effects of the investigated oils were strongly related with their concentration of eugenol.

Eugenol is hepatotoxic and can cause serious health issues when used in high concentrations. As a component in personal care and dentistry products, it can cause allergic reactions such as contact dermatitis and contact stomatitis. One case report described a 34-year-old woman who was diagnosed with occupational asthma and dermatitis due to eugenol in a cleaning product. She used a mop spray which contained chemical substances including eugenol. After one month of using this spray, the woman developed maculopapular erythema on parts of her body which were exposed to the spray.

Maculopapular erythema was also followed with other symptoms such as cough and dyspnoea. After an antihistaminic treatment, the symptoms were reduced and after her holiday, all symptoms had vanished. A specific bronchial test was performed in a challenge chamber with two minutes inhalation of eugenol at the corresponding dilution. The patient showed positive spirometric reactions to eugenol and it was later considered as the main allergen. Another case report noted a 53-year-old female patient who suffered painful oral mucosal lesions after she had received a new dental bridge. The patient was skin patched with the standard series recommended by the German Contact Allergy Group. The patient had no positive reaction to any of the tested substances at either 48 or 72 h after testing. Since it is often used in combination with zinc oxide in dentistry, eugenol as a single substance was tested and the reaction was positive to eugenol after 72 h, a fact that revealed that eugenol caused delayed-type sensitization.

Isoeugenol 2-methoxy-4-(1-propenyl)phenol-$C_{10}H_{12}O_2$

Isoeugenol occurs in many essential oils, mostly with eugenol, but not as the main component. Commercial isoeugenol is a mixture of cis and transisomers, in which the trans isomer dominates because it is thermodynamically more stable. Isoeugenol is a yellowish, viscous liquid with a fine clove odor, that of the crystalline trans isomer being the more delicate.

Isoeugenol can be hydrogenated catalytically to form dihydroeugenol. Vanillin was formerly prepared by oxidation of isoeugenol. Additional fragrance materials are prepared by esterification or etherification of the hydroxy group.

Production.

The starting material for the synthesis of isoeugenol is eugenol. The sodium or potassium salt of eugenol is isomerized to isoeugenol by heating. Isomerization can also be carried out catalytically in the presence of ruthenium or rhodium compounds.

Uses.

Isoeugenol is used in perfumery in a large number of blossom compositions, mostly for clove and carnation types, but also in oriental perfumes. Small amounts are employed in aromas and in reconstituted essential oils.

Geraniol

Geraniol (Figure 1i) is a monoterpenoid alcohol. It is a colourless to pale-yellow oily liquid that has a sweet rose, floral odour. It occurs naturally in rose oil, citronella oil and palmarosa oil but it can also be found in other essential oils like lemon, geranium, bergamot and lavender oil in lower concentrations. Due to its pleasant rose odour it is commonly used in perfumes, body lotions, creams, after shave lotions and hygiene products. Geraniol is also widely used as a flavouring agent to induce the flavour of fruits such as pineapple, raspberry, peach, grapefruit, plum, red apple, lime,watermelon, orange and lemon. As a flavouring agent it can be found in candies, ice creams and baked food products to improve the smell of the foods. Geraniol has antiseptic, antibacterial and anti-inflammatory properties.

As one of the 26 fragrances identified as a potential causes of allergy contact dermatitis by the EU Scientific Committee for Consumer Safety geraniol must be labelled on personal care products (Table 1).

Geranial and neral, two sensitizing compounds, are formed from geraniol by autoxidation and skin metabolism and they are considered as a possible cause of allergy reactions on the skin. Hagvall and co-workers tested the hypothesis that oxidized geraniol caused more cases of contact allergy dermatitis than pure geraniol. From January 2006 to August 2010, 2227 patients were patch tested with Swedish base line series. 14 out of 2227 patients were patch positive to one or more of the tested substances. From these 14 patients three were patch positive to geraniol, 11 reacted to oxidized geraniol, 11 to geranial, five to neral and seven to citral. In a follow-up study, they investigated the relationship between cross reactivity of citral and geraniol and allergic reaction to oxidized geraniol.

The patients were tested for pure geraniol, citral mixture (66% geranial and 34% neral), geranial and neral. Patch test results showed that 19 of 655 tested persons reacted positive to one or more tested compounds. Out of these 19 patients, 13 reacted positive to geranial.

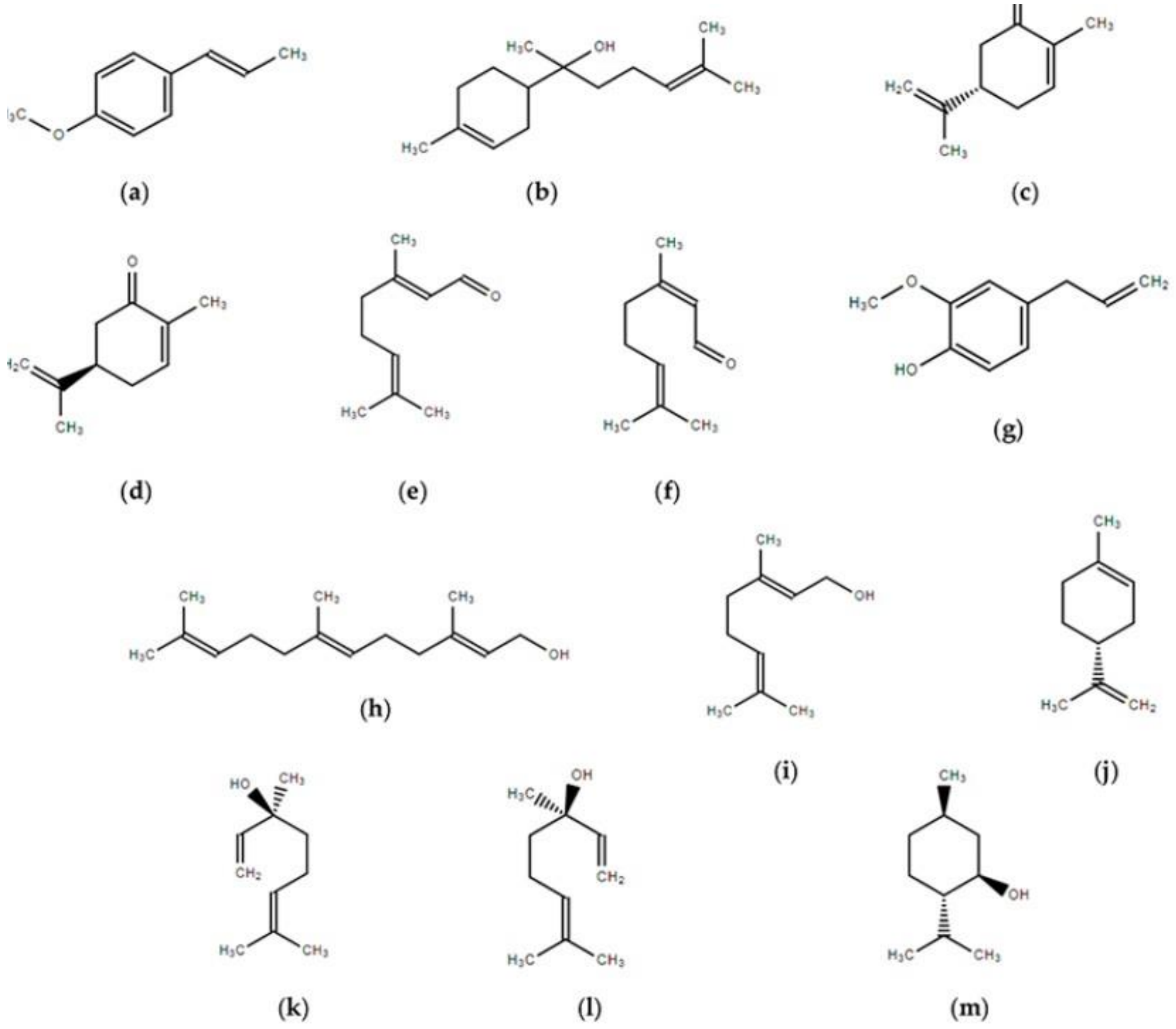


Figure 1. Chemical structures of most common fragrances. (**a**) trans Anethole; (**b**) _-Bisabolol; (**c**) S-(+)-Carvone (caraway); (**d**) R-(-)-Carvone (spearmint); (**e**) Geranial (citral A); (**f**) Neral (citral B);(**g**) Eugenol; (**h**) Farnesol; (**i**) Geraniol; (**j**) D-Limonene; (**k**) S-(+)-Linalool; (**l**) R-(-)-Linalool;(**m**) (-)-Menthol.

Conclusions

Essential oils and their fragrance compounds are a very important part of perfume and cosmetic industry as they can serve as natural or natural-like chemical preservatives and, at the same time, offer various benefits for skin and body. Additionally, these chemicals increase the value of cosmetic products due to their pleasant odour. The cosmetic and perfume industry therefore are unimaginable without these precious substances. However, it should be taken into account that essential oils and their components could cause allergic reactions and symptoms. These reactions can be gleaned in the scientific literature. According to de Groot and Schmidt, 79 different essential oils have caused contact allergy or allergic contact dermatitis until 2015.

Most of the reports described only single cases of allergy contact dermatitis caused by essential oils and many of the studies were performed on persons whose allergic potential was above average as well as on patients suffering from dermatitis or other dermal diseases. For these individuals, the application of cosmetic care products or perfumes containing potential allergens might be a risk. Therefore, the labelling of potential allergens is mandatory to enable persons with skin problems to avoid products containing critical substances. The demands for appropriate storage and handling of products containing fragrance compounds are also very important during all stages (industry, trade and consumer).

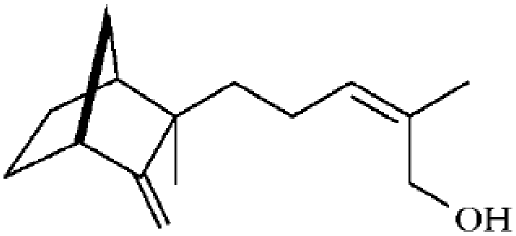
If the number of allergic reactions to essential oils and their compounds is compared to how widely these substances are applied, we can conclude that the use of essential oils in perfumes and cosmetic products could be considered as safe for the majority of the population.

SANDAL WOOD OIL

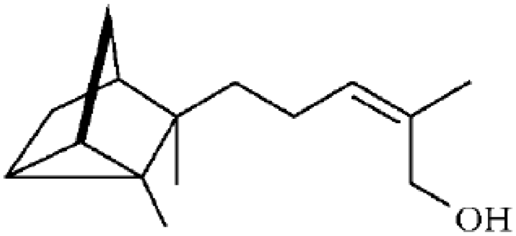
Sandalwood oil, East Indian is obtained by steam distillation of the heartwood of Santalum album L. (Santalaceae). It is a slightly viscous, almost colorless to yellow liquid with a characteristic, sweet, woody, long-lasting odor.

d_{20}^{20} 0.968 – 0.983; n^{20}_{D} 1.5030 – 1.5090; α^{20}_{D} –21° to – 12°; solubility: 1 vol in not more than 5 vol of 70% ethanol at 20 °C; ester number: max. 10; free alcohol content (calculated as santalol): min. 90%.

East Indian sandalwood oil consists almost exclusively of closely related sesquiterpenoids; by far the main constituents are the alcohols α-santalol, 41 –55%, and β-santalol, 16– 24 %. Mainly responsible for the odor is β-santalol.



(–)-*β*-Santalol



(+)-*α*-Santalol

The trees cultivated for oil production must be at least 30 years old to make oil production profitable. The oil yield, calculated on the amount of wood used for steam distillation, is 4 – 6.5%. The oil was formerly produced in India and Indonesia in annual quantities of ca. 100 t. In the last few years the production in Indonesia has decreased significantly. Alternatively, Australian sandalwood oil has been introduced onto the market. This oil type is obtained from Santalum spicatum (R.Br.) A.DC. It also contains santalols as main constituents but differs somewhat in the remaining composition. Today, it already makes up a considerable part of the sandalwood oil market. East Indian sandalwood oils are used extensively in perfumery as very valuable, stable fixatives.

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University Under Section 3 of UGC Act 1956)
COIMBATORE-21

DEPARTMENT OF CHEMISTRY
(For the candidates admitted from 2016 & onwards)

17CHU504B Chemistry of Cosmetics and Perfumes

Multiple Choice Questions for Unit IV

S. No	Question	Option 1	Option 2	Option 3	Option 4	Answer
	Unit IV					
1	Essential oil is	**Hydrophobic liquid**	Hydrophilic liquid	Ester of fatty acid	Hydrated esters	**Hydrophobic liquid**
2	Essential oil is a aroma compounds obtained from	**Plants**	Animals	Bees	Wax	**Plants**
3	Which is used for Aroma therapy?	Glycerin	**Essential oil**	Fats	Wax	**Essential oil**
4	The nature of Eugenol is	Acidic	Basic	**Phenolic**	Aldehydic	**Phenolic**
5	Eugenol is	4-Methoxy-2-(prop-1-en-1-yl)phenol	3-Methoxy-4-(prop-2-en-1-yl)phenol	**2-Methoxy-4-(prop-2-en-1-yl)phenol**	3-Methoxy-phenol	**2-Methoxy-4-(prop-2-en-1-yl)phenol**
6	Essential oil is also called as	**Ethereal oil**	Nonvolatile oil	Wintergreen oil	Fattyesters	**Ethereal oil**
7	Eugenol can combine with	CaO	**ZnO**	MgO	BaO	**ZnO**
8	Overdosage of Eugenol may cause damage to	Skin	Tongue	**Liver**	Lungs	**Liver**
9	The odour of Eugenol is	Jasmine like	**Clove like**	Rose like	Unpleasant	**Clove like**
10	Which is used as folk medicine throughout history?	Vegetable oils	Nonedible oil	Fats	**Essential oil**	**Essential oil**

11	Eugenol is restricted in use in	**Perfumery**	Medicine	Ointment	Dentistry	**Perfumery**
12	Sandalwood oil contains more than 90% of	Terpenoids	**Sesquiterpenic alcohols**	Steroids	Alkaloids	**Sesquiterpenic alcohols**
13	Geraniol is a	**Monoterpenoid and Alcohol**	Terpenoids	Alcohol	Phenol	**Monoterpenoid and Alcohol**
14	Essential oil is also called as	Edible oil	Wax	**Volatile oil**	Nonvolatile oil	**Volatile oil**
15	Eugenol is	Aliphatic	**Aromatic**	Alicyclic	Allylic	**Aromatic**
16	Geraniol is	**Aliphatic**	Aromatic	Alicyclic	Allylic	**Aliphatic**
17	Generally the yield of essential oil from any plant would be	**Few percent**	Low percent	Moderate percent	High percent	**Few percent**
18	Essential oil consists of mainly	Alkaloids	**Hydrocarbons**	Steroids	Phenols	**Hydrocarbons**
19	Essential oil consists of	Alkaloids	Steroids	**Mono- and Sesquiterpenes**	Phenols	**Mono- and Sesquiterpenes**
20	Eugenol is obtained from	**Clove oil**	Cornmint oil	Citrus peel oils	Litsea cubeba oil	**Clove oil**
21	Menthol is obtained from	Clove oil	**Cornmint oil**	Citrus peel oils	Litsea cubeba oil	**Cornmint oil**
22	Citronellal is obtained from	Clove oil	Citrus peel oils	**Eucalyptus citriodora oil**	Litsea cubeba oil	**Eucalyptus citriodora oil**
23	Citral is obtained from	Clove oil	Citrus peel oils	Eucalyptus citriodora oil	**Litsea cubeba oil**	**Litsea cubeba oil**
24	Essential oil is used as	**Flavour**	Solvents	Lubricants	Cleaning agent	**Flavour**
25	Essential oil is used as	Solvents	**Fragrance**	Lubricants	Cleaning agent	**Fragrance**
26	Eugenol is a	Solid	**Liquid**	Gas	Aerosol	**Liquid**
27	Colour of Eugenol is	**Pale yellow to Colourless**	Red to Orange	Red to Pink	Violet to Blue	**Pale yellow to Colourless**
28	Eugenol is the main component in	Immortelle oil	Lavender oil	**Clove oil**	German Chamomile Oil	**Clove oil**
29	Eugenol is the main component in	Immortelle oil	Lavender oil	**Allspice oil**	German Chamomile Oil	**Allspice oil**
30	In Pepper concentration of	**Low**	Medium	High	Absent	**Low**

	Eugenol is					
31	Concentration of Eugenol in Ceylon cinnamon is	80%	60%	30%	**10%**	**10%**
32	Eugenol is used for the production of	Resin	**Vanillin**	Polymer	Rubber	**Vanillin**
33	Isoeugenol is used for the production of	Resin	**Vanillin**	Polymer	Rubber	**Vanillin**
34	Eugenol is used in	Engineering field	Mechanical field	**Dentistry**	Welding	**Dentistry**
35	Eugenol has	Catalytic property	**Antiseptic property**	Solvent property	Ion-exchange property	**Antiseptic property**
36	Eugenol has	Catalytic property	**Anaesthetic property**	Solvent property	Ion-exchange property	**Anaesthetic property**
37	For temporary fillings, Eugenol can be mixed with	Copper oxide	Cobalt oxide	**Zinc oxide**	Barium oxide	**Zinc oxide**
38	Eugenol has	Antiviral effect	Antiinflammatory effect	**Antifungal effect**	Antioxidant effect	**Antifungal effect**
39	When Eugenol is used in high concentration it is	Antiviral	**Hepatotoxic**	Antiinflammatory	Antioxidant	**Hepatotoxic**
40	When Eugenol is used in high concentration it can cause	Nothing	Irritation	**Serious health issue**	Mild health effect	**Serious health issue**
41	A 34-year-old woman who was diagnosed with occupational asthma and dermatitis due to	Citral	**Eugenol**	Menthol	Carvone	**Eugenol**
42	Isoeugenol occurs in many essential oils, mostly with	Citral	Menthol	**Eugenol**	Carvone	**Eugenol**
43	Isoeugenol is a mixture of	**Cis- and Trans isomers**	Optical isomers	Enatiomers	Diastereomers	**Cis- and Trans isomer**
44	Which isomer of Isoeugenol is more stable?	Cis-	**Trans-**	Enantiomer	Metamer	**Trans-**
45	Isoeugenol is a	**Yellow viscous liquid**	Red viscous liquid	Green viscous liquid	Brown viscous liquid	**Yellow viscous liquid**

46	Isoeugenol can be hydrogenated catalytically to form	Hydroeugenol	**Dihydroeugenol**	Trihydroeugenol	Tetrahydroeugenol	**Dihydroeugenol**
47	Isoeugenol has	Jasmine odour	**Fine Clove odour**	Rose like odour	Unpleasant odour	**Fine Clove odour**
48	Trans isoeugenol is	**Crystalline**	Liquid	Viscous liquid	Gas	**Crystalline**
49	Vanillin is prepared from isoeugenol upon	**Oxidation**	Hydrogenation	Dehydration	Hydration	**Oxidation**
50	Dihydroeugenol is formed from Eugenol upon	Oxidation	**Hydrogenation**	Dehydration	Hydration	**Hydrogenation**
51	Additional fragrance materials are prepared from isoeugenol by	Hydrolysis	Oxidation	**Esterification**	Reduction	**Esterification**
52	The starting material for the synthesis of isoeugenol is	Menthol	Carvone	Citral	**Eugenol**	**Eugenol**
53	The conversion of eugenol to isoeugenol is carried out by	Photolysis	**Heating**	Cooling	Crystallization	**Heating**
54	Isoeugenol obtained from eugenol by the process of	Crystallization	Distillation	**Isomerisation**	Tautomerisation	**Isomerisation**
55	Geraniol is a	**Monoterpenoid alcohol**	Sesquiterpenoid alcohol	Diterpenoid alcohol	Triterpenoid alcohol	**Monoterpenoid alcohol**
56	The odor of Geraniol is	Jasmine odour	Lily odour	Unpleasant odour	**Sweet rose**	**Sweet rose**
57	Additional fragrance materials are prepared from isoeugenol by	Hydrolysis	Oxidation	**Etherification**	Reduction	**Etherification**
58	Geraniol has	Antiviral effect	**Antiinflammatory effect**	Antifungal effect	Antioxidant effect	**Antiinflammatory effect**
59	East Indian sandalwood oil consists almost exclusively of closely related	Monoterpenoids	**Sesquiterpenoids**	Diterpenoids	Triterpenoids	**Sesquiterpenoids**
60	Mainly responsible for the odor of Sandalwood oil is	α-Santalol	**β-Santalol**	γ-santalol	δ-santalol	**β-Santalol**

Unit-V

Essential oils and their importance in cosmetic industries with reference to eucalyptusoil, rose oil, 2-phenyl ethyl alcohol, Jasmone, Civetone, Muscone.

Essential Oils

Production

Essential oils are obtained from plant materials by distillation with water or steam. After condensation of the vapor phase, the oil separates from the aqueous phase and is removed. The yield of essential oil, based on the starting plant material, generally ranges from a few tenths of 1% to a few percent.

Essential oils consist of volatile, lipophilic substances that are mainly hydrocarbons or monofunctional compounds derived from the metabolism of mono- and sesquiterpenes, phenylpropanoids, amino acids (lower mass aliphatic compounds), and fatty acids (long-chain aliphatic compounds). Unlike fatty oils, essential oils do not leave a grease stain when dabbed on filter paper.

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Selected Essential Oils in Cosmetic Products

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Individual Fragrances
Anethole, Bisabolol, Carvone, Citral, Eugenol, Farnesol, Geraniol, Limonene, Linalool and Menthol,

EUCALYPTUS OILS

Eucalyptus oils are produced from plants belonging to the genus Eucalyptus (Myrtaceae), which includes ca. 500 species in Australia, the country of origin, alone. Correct botanical classification was possible only by determining the chemical compositions of the essential oils obtained from the leaves. At present, few of these oils are commercially important.

1. Cineole-rich Eucalyptus oils

(a) Australian eucalyptus oil is obtained by steam distillation of the foliage of certain Eucalyptus species indigenous to Australia, mainly from Eucalyptus fruticetorum F. Muell. ex Miqu. (E. polybractea R. T. Bak.) d_{20}^{20} 0.918 –0.928; n_D^{20} 1.458 – 1.465; α_D^{20} –2° to +2°; solubility: 1 vol in 3 vol of 70% ethanol at 20° C; 1,8-cineole content: 80 – 85% .

The minor components of this oil differ from those of E. globulus oil. Despite its high cineole content, annual production of Australian eucalyptus oil is only 50 t–100 t.

(b) Eucalyptus globulus oil is produced by steam distillation of the leaves of Eucalyptus globulus Labill. It is an almost colorless to pale yellow liquid with a fresh odor, characteristic of cineole. The crude oil contains more than 60% 1,8-cineole and between 10 and 22% a-pinene [493– 499]. Rectified qualities have a cineole content of more than 70% or more than 80 %. The respective specifications of these three types are as follows: d_{20}^{20} 0.905 – 0.925/0.904 – 0.920/0.906 – 0.920; n_D^{20} 1.457 – 1.475/1.460 – 1.468/1.458 –1.465; α_D^{20} +2° to +8°/0° to +10°/+2° to +10°; solubility: 1 vol in max. 7/10/5 vol 70% ethanol. 1.8-cineole content 60/70/80% minimum.

The oil is produced mainly in Spain and Portugal, where the wood is used in the cellulose industry, and in China. Worldwide production is ca. 2000 t/yr. Eucalyptus oils with high cineole content are used for cineole production. The oils and cineole itself are used primarily in pharmaceutical preparations. Fairly large quantities are also used in perfumery, e.g., to imitate the odor of cineole-containing essential oils and flavoring of food (sweets) and oral care products

2. **Eucalyptus citriodora oil** is obtained by steam distillation of leaves and terminal branches of Eucalyptus citriodora Hook. It is an almost colorless, pale yellow, or greenish-yellow liquid with a citronellal-like odor. d_{20}^{20} 0.860 – 0.870; n_D^{20} 1.4500 –1.4560; α_D^{20} –1° to +3°; content of carbonyl compounds calculated as citronellal: min. 70 %; content of citronellal by GC: min. 75%.

In addition to the main component, citronellal, the oil contains citronellol and isopulegol (5 – 10% each) .Young E. citriodora trees that are grown exclusively for essential oil production are cut back to a height of 1 – 1.50m and develop into shrubs. The leaves can be harvested throughout the year; more than 200 kg of oil can be obtained per hectare. The major producer is Brazil with over 200 t/yr. Eucalyptus citriodora oil is a starting material for the manufacture of citronellal and products derived from it. It is also used in perfumery for the same purposes as citronellal.

3. Eucalyptus dives oil is obtained by steam distillation of fresh leaves of Eucalyptus dives Schauer piperitone-type, grown in Australia and South Africa. In addition to (–)-piperitone the oil contains 15 – 25% a-phellandrene. The oil was previously used as a starting material in the manufacture of (–)-menthol, but has lost much of its significance. Annual worldwide production has dropped to 50 t.

ROSE OIL

Rose oil and rose absolute are used mainly in fine fragrances. Rose oil is also used in small amounts for flavoring purposes.

1. Rose oil is obtained by steam distillation of blossoms of Rosa x damascene Mill, which is mainly cultivated in Turkey, Iran, Morocco, and Bulgaria (Kazanlik rose). Since a reasonable amount of rose oil is still dissolved in the aqueous phase after steam distillation, the distillation water (rose water) is redistilled or extracted.

Rose oil is a yellow partly crystallized liquid with the characteristic odor of rose blossoms and distinct tea and honey notes.

d_{20}^{20}0.848 – 0.880; n^{20}_{D} 1.4520 – 1.4700; α^{20}_{D} –5° to – 1.8°; fp +16– 23.5 °C; ester value: 7– 24; content by GC (Bulgaria/Turkey/Morocco): citronellol: 20 – 34/34 –49/30– 47 %; geraniol 15– 22/8 –20/6 – 23 %; nerol 5 – 12/3 – 11/3 – 11%; phenylethyl alcohol 53.5/53/53%.

The major constituents of rose oil are (–)-citronellol, geraniol, and nerol. In contrast to the absolute, the oil contains only a minor amount of phenethylalcohol, which is most soluble in water.

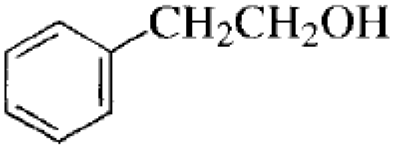
In addition to the major components mentioned above, rose oil also contains a number of components which, although present in low concentrations, contribute to the characteristic fragrance.

Since ca. 3 t of blossoms are required to prepare ca. 1 kg of oil, rose oil is one of the most expensive essential oils. Production is just a few tens of tons per year.

2. Rose absolute is prepared from the concrete extracted from Rosa x damascene in the countries mentioned above, as well as from Rosa x centifolia L. types in Morocco and the south of France (rose de mai).

The absolute is a reddish liquid with a typical rose odor. The phenethyl alcohol content of its volatile fraction is 60– 75 %.

2-Phenyl ethyl alcohol



$C_8H_{10}O$ MW: 122.17, bp. 219.8° C, $d^{20}4$ 1.0202, n^{20}_{D} 1.5325,

It is the main component of rose oils obtained from rose blossoms. It occurs in smaller quantities in neroli oil, ylang-ylang oil, carnation oil, and geranium oils. Since the alcohol is rather soluble in water, losses occur when essential oils are produced by steam distillation.

Properties.

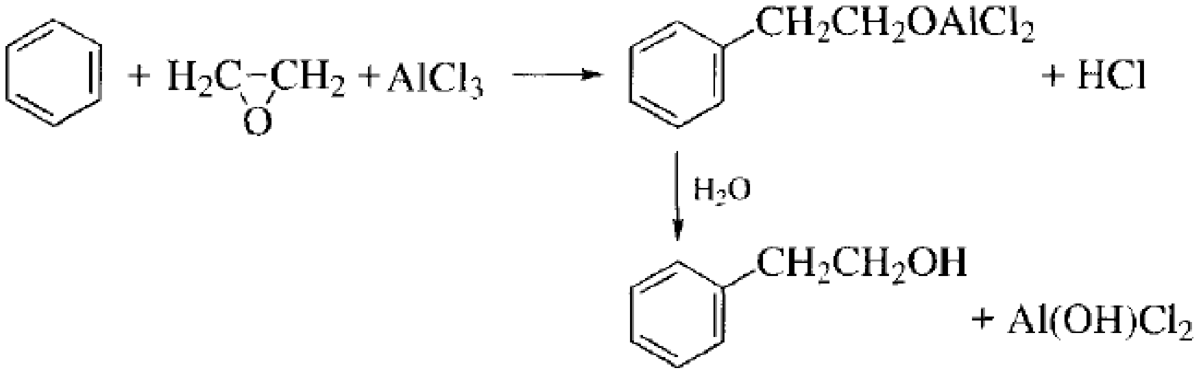
Phenethyl alcohol is a colorless liquid with a mild rose odor. It can be dehydrogenated catalytically to phenylacetaldehyde and oxidized to phenylacetic acid (e.g., with chromic acid). Its lower molecular mass fatty acid esters, as well as some alkyl ethers, are valuable fragrance and flavor substances.

Production.

Many synthetic methods are known for preparing phenethyl alcohol, the following are currently of industrial importance:

1. Friedel – Crafts Reaction of Benzene and Ethylene Oxide

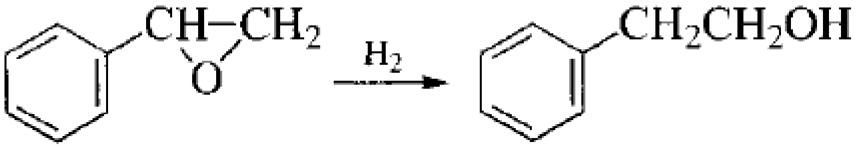
In the presence of molar quantities of aluminum chloride, ethylene oxide reacts with benzene to give an addition product, which is hydrolyzed to phenethyl alcohol:



Formation of byproducts, such as 1,2-diphenylethane, is largely avoided by using an excess of benzene and low temperature. Special purification procedures are required to obtain a pure product that is free of chlorine and suitable for use in perfumery.

2. Hydrogenation of Styrene Oxide

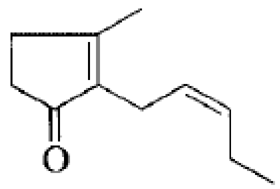
Excellent yields of phenethyl alcohol are obtained when styrene oxide is hydrogenated at low temperature, using Raney nickel as a catalyst and a small amount of sodium hydroxide.



Uses

Phenethyl alcohol is used frequently and in large amounts as a fragrance material. It is a popular component in rose-type compositions, but it is also used inother blossom notes. It is stable to alkali and, therefore, ideally suited for use in soap perfumes.

***cis*-Jasmone,** 3-methyl-2-(2-cis-penten-1-yl)-2-cyclopenten-1-one
$C_{11}H_{16}O$, MW: 164.25, bp78 – 79° C, d^{20} 0.9423, n^{20}_{D} 1.4989.

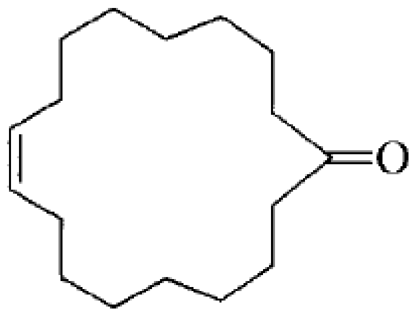


It occurs in jasmineabsolute and contributes to its typical jasmine odor. It is a pale yellow, viscous liquid with a strong jasmine odor. Various stereospecific syntheses for *cis*-jasmone have been reported.

A patented method involves alkylation of 3-methyl-2-cyclopen-ten-1-one with *cis*-2-pentenyl chloride in an alkaline medium in the presence of a phase-transfer catalyst (e.g., tricaprylmethylammonium chloride).

cis-Jasmone is used in perfumery in fine jasmine bases and floral compositions.

Civetone, 9-Cycloheptadecen-1-one

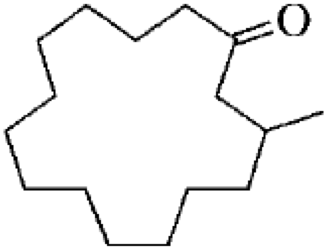


$C_{17}H_{30}O$, MW: 250.43, bp 103° C, d^{20}_{20} 0.923– 0.940, n^{20}_{D} 1.485– 1.492,

It is a colorless liquid with warm sensual animal and musky odor and extreme tenacity. It is the main odoriferous constituent of civet. Civetone was formerly prepared by multi-step syntheses. Recently, newer processes using dimethyl (*Z*)-9-oc-tadecendioate as starting material have been described. This is cyclized by a Dieck-mann condensation either in liquid or in gaseous phase. (*Z*)-9-Octade-cendioic acid is available by microbial oxidation of oleic acid with Candida tropi-caulis.

It is used in fine fragrance compositions for, for example, toiletries and body care products.

Muscone, 3-Methylcyclopentadecanone



$C_{16}H_{30}O$, MW 238.42, d^{20}_{20} 0.918 – 0.925, n^{20}_{D} 1.477 –1.482.

It is an odoriferous constituent of natural musk. It is a colorless liquid with very soft, sweet, musky odor and a perfumery, animal tonality. Numerous syntheses have been developed for its preparation.

Because of its excellent stability it can be used in a wide range of products to give elegant, warm, animal notes. It is important for the reconstitution of natural musk.

KARPAGAM ACADEMY OF HIGHER EDUCATION
(Deemed to be University Under Section 3 of UGC Act 1956)
COIMBATORE-21

DEPARTMENT OF CHEMISTRY
(For the candidates admitted from 2017 & onwards)

17CHU504B Chemistry of Cosmetics and Perfumes

Multiple Choice Questions for Unit V

S. No	Question	Option 1	Option 2	Option 3	Option 4	Answer
	Unit V					
1	Civetone is a	**Ketone**	Aldehyde	Alcohol	Phenol	**Ketone**
2	Jasmone is a volatile portion of oil from	Lily	**Jasmine**	Lotus	Rose	**Jasmine**
3	Which cosmetics is used in eye area makeup?	**2-Phenylethyl alcohol**	Jasmone	Civetone	Muscone	**2-Phenylethyl alcohol**
4	Jasmone is	Aromatic	**Aliphatic**	Macrocyclic	Polycyclic	**Aliphatic**
5	Which is used in the synthesis of rose oil?	**2-Phenylethylalcohol**	Essential oil	Eucalyptus oil	Sandalwood oil	**2-Phenylethylalcohol**
6	Muscone is a	**Ketone**	Alcohol	Alkaloid	Terpenoid	**Ketone**
7	The molecular formula for Jasmone is	$C_{11}H_{18}O$	$C_{12}H_{16}O$	$C_{11}H_{16}O_2$	**$C_{11}H_{16}O$**	**$C_{11}H_{16}O$**
8	Which is used as a preservative?	Civetone	**2-Phenylethylalcohol**	Muscone	Jasmone	**2-Phenylethylalcohol**
9	The odour of 2-Phenylethanol is	**Faint rosy flower**	Jasmine	Camphor	Unpleasant	**Faint rosy flower**
10	The molecular formula for Muscone is	$C_{16}H_{32}O$	$C_{16}H_{36}O$	**$C_{16}H_{30}O$**	$C_{15}H_{30}O$	**$C_{16}H_{30}O$**
11	Essential oil is	Hydrophilic	**Hydrophobic**	Nonvolatile oil	Heavy oil	**Hydrophobic**

12	Eucalyptus oils are produced from plants belonging to the genus	Euphractus	**Eucalyptus**	Erythrocebus	Equus	**Eucalyptus**
13	Eucalyptus belong to the family of	Malvaceae	Fabaceae	**Myrtaceae**	Asteraceae	**Myrtaceae**
14	The country of origin for Eucalyptus oil is	**Australia**	India	Newzealand	Bangladesh	**Australia**
15	The Botanical name of Eucalyptus oil is	Euphractus globulus	**Eucalyptus globulus**	Erythrocebus globulus	Equus globulus	**Eucalyptus globulus**
16	Eucalyptus oil is extracted from the plant by	Fractional distillation	Reduced pressure distillation	**Steam distillation**	Zone distillation	**Steam distillation**
17	Eucalyptus globulus oil is obtained from the plant	Bark	Stem	**Leaves**	Roots	**Leaves**
18	Australian eucalyptus oil is rich in	1,2-cineole content	1,8-Napthaquinone	1,8-Quinine	**1,8-cineole content**	**1,8-cineole content**
19	Eucalyptus globulus oil is obtained from the plant	Euphractus globulus Labill	**Eucalyptus globulus Labill**	Erythrocebus globulus Labill	Equus globulus Labill	**Eucalyptus globulus Labill**
20	In Cineole-rich Eucalyptus oils, Cineole content is	96-99%	**80-85%**	65-75%	55-60%	**80-85%**
21	Annual production of Australian eucalyptus oil is only	**50 t–100 t**	2 t–4 t	6 t–10 t	15 t-20 t	**50 t–100 t**
22	Annual production of Australian eucalyptus oil is low due to high	Quinone content	**Cineole content**	Quinine content	Water content	**Cineole content**
23	Eucalyptus oil is soluble in	Water	HCl	**Ethanol**	H_2SO_4	**Ethanol**
24	Density of Cineole-rich Eucalyptus oil is	1.12-1.16	**0.918 –0.928**	0.62-0.68	0.32-0.36	**0.918 –0.928**
25	Colour of Eucalyptus globulus oil is	**Colourless to Pale yellow**	Red to Greenish yellow	Green to Violet	Colourless to Orange	**Colourless to Pale yellow**
26	The crude Eucalyptus globulus oil contains more than 60% of	1,2-Cineole	**1,8-Cineole**	1,8-Quinine	1,8-Napthaquinone	**1,8-Cineole**
27	The crude Eucalyptus globulus oil	**α-pinene**	β-pinene	γ-pinene	δ-pinene	**α-pinene**

	contains 10-22 % of					
28	Eucalyptus globulus oil is produced mainly in	India, Pakisthan and Srilanka	India, Pakisthan and Bangladesh	**Spain, Portugal and China**	Russia, Japan and korea	**Spain, Portugal and China**
29	The world wide production of Eucalyptus globulus oil is	100 t/yr	500 t/yr	1000 t/yr	**2000 t/yr**	**2000 t/yr**
30	Eucalyptus oil is used for the production of	**Cineole**	Quinine	Phenol	Tetrazine	**Cineole**
31	The colour of Eucalyptus citriodora oil is	**Colourless**	Red	Pink	Orange	**Colourless**
32	The odour of Eucalyptus citriodora oil is like	Naptha	**Citronellal**	Camphor	Quinone	**Citronellal**
33	The yield of Eucalyptus citriodora oil per hectare is more than	**200Kg**	500Kg	1000Kg	2000Kg	**200Kg**
34	The Major producer of Eucalyptus citriodora oil is	Indonesia	Bangladesh	**Brazil**	Taiwan	**Brazil**
35	Eucalyptus citriodora oil produced by Brazil is	10 t/yr	50 t/yr	100 t/yr	**200 t/yr**	**200 t/yr**
36	Eucalyptus citriodora oil is a starting material for the manufacture of	Quinol	**Citronellal**	Quinones	Quinines	**Citronellal**
37	Rose oil is obtained by	**Steam distillation**	Reduced pressure distillation	Fractional distillation	Zone distillation	**Steam distillation**
38	Rose oil is obtained from the blossoms of	Rosa Alba L	**Rosa damascene Mill**	Rosa GallicaL	Rosa CentifoliaL	**Rosa damascene Mill**
39	Rosa damascene Mill is cultivated in	**Turkey**	Japan	Taiwan	Bangladesh	**Turkey**
40	The Odour of Rose oil is	Jasmine	**Rose**	Lily	Lotus	**Rose**
41	Colour of Rose oil is	Green	Violet	Purple	**Partly Yellow**	**Partly Yellow**
42	The major constituents of rose oil are	**(–)-Citronellol, Geraniol, and Nerol**	Quinol and Thymol	Quinine and Thymine	Quinone and Quinine	**(–)-Citronellol, Geraniol, and Nerol**
43	The minor constituents of rose oil is	Quinone	**2-Phenylethylalcohol**	Thymine	Thymol	**2-Phenylethylalcohol**
44	Rose oil used mainly as	**Fine fragrance**	Solvent	Lubricant	Antioxidant	**Fine fragrance**

45	Density of Rose oil is	0.234-0.314	0.413-0.456	**0.848 – 0.880**	1.221-1.342	**0.848 – 0.880**
46	The specific rotation of Rose oil is α^{20}_{D}	–25º to – 18º	**–5º to – 1.8º**	**–45º to – 38º**	**+5º to +8º**	**–5º to – 1.8º**
47	The colour of Rose absolute is	**Reddish**	Yellow	Orange	Magenta	**Reddish**
48	The odour of Rose absolute is	Typical Jasmine	**Typical rose**	Typical lemon	Typical orange	**Typical rose**
49	In Rose absolute the phenylethyl alcohol content is	10-24%	45-50%	**60-75%**	86-90%	**60-75%**
50	The molecular formula for 2-Phenylethylalacohol is	**$C_8H_{10}O$**	$C_8H_{12}O$	$C_6H_{10}O$	$C_6H_{12}O$	**$C_8H_{10}O$**
51	The boiling point of 2-Phenylethyl alcohol is	101.6ºC	151.8ºC	**219.8º C**	301.4ºC	**219.8º C**
52	2-Phenylethyl alcohol is a	**Colourless liquid**	Red liquid	Rose liquid	Black liquid	**Colourless liquid**
53	The odour of 2-Phenylethyl alcohol is	Lemon	**Mild Rose**	Mild Jasmine	Mild Lily	**Mild rose**
54	2-Phenylethyl alcohol is soluble in	HCl	H_2SO_4	**Water**	HNO_3	**Water**
55	2-Phenylethyl alcohol is the main component of	**Rose oil**	Eucalyptus oil	Sandalwood oil	Carvone oil	**Rose oil**
56	The IUPAC name of *cis*-Jasmone, is	1-methyl-2-(2-*cis*-penten-1-yl)-2-cyclopenten-1-one	**3-methyl-2-(2-*cis*-penten-1-yl)-2-cyclopenten-1-one**	3-methyl-2- (2-*cis*-penten-1-yl)- 1-cyclopenten- 2-one	2-methyl-3-(2-*cis*-penten-1-yl)-2-cyclopenten-1-one	**3-methyl-2-(2-*cis*-penten-1-yl)-2-cyclopenten-1-one**
57	The boiling point of *cis* Jasmone is	46-48ºC	65-68ºC	**78-79ºC**	102-104ºC	**78-79ºC**
58	The odour of *cis* Jasmone is	**Jasmine**	Rose	Lily	Lotus	**Jasmine**
59	The molecular formula for Civetone is	$C_{15}H_{30}O$	**$C_{17}H_{30}O$**	$C_{17}H_{34}O$	$C_{17}H_{32}O$	**$C_{17}H_{30}O$**
60	Muscone is a	**Colour less liquid**	Red liquid	White solid	Pale yellow solid	**Colour less liquid**