Frequently asked question:

1. What are pigments?

Pigments are chemical compounds that absorb light in the wavelength range of the visible region. Produced color is due to a molecule-specific structure; this structure captures the energy and the excitation of an electron from an external orbital to a higher orbital is produced.

2. why pigments are added in food products?

(1) To replace color lost during food processing,

(2) To provide the original shade color of many fruits, in enhance color already present,

(3) To minimize batches- particularly berries e.g., strawberries, elderberries and to batch variations and

(4) To color foods, otherwise uncolored one are not attracted by buyers

3.how pigments are classified?

Pigments are mainly classified in tothree categories

(i) Natural pigments

(ii) Synthetic or Organic pigments

(iii) Inorganic pigments

4.what are natural pigments? how they classified further?

i. Natural pigments are produced by living organisms such as plants, animals, fungi, and microorganisms.

Moreover, natural pigments further classified by their structural characteristics as fallowing groups:

1. Tetrapyrrole derivatives: chlorophylls, hemes, and bilins

2. isoprenoid derivatives: carotenoids and iridoids

3. *N*-heterocyclic compounds different from tetrapyrroles: purines, pterins, flavins, phenazines, phenoxazines, and betalains

4. Benzopyran derivatives (oxygenated heterocyclic compounds): anthocyanins and flavonoids

5. Quinones: benzoquinone, naphthoquinone, anthraquinone. Melanins.

6. artefacts: melanoidins, caramels

5. give examples for natural pigments available in nature.

Hemoglobin is the blood pigment and also in cytochromes, peroxidases, catalases, and vitamin B12 as a prosthetic group, all of them with a wide distribution.

Plant porphyrins consist of chlorophylls also called as green pigments that are ubiquitous in nature since they are responsible for the photosynthetic process. In spite of their abundance, however, it is primarily plants such as alfalfa, nettle and leaves of carrot which are used as sources of these colorants.

The carotenoids are probably the best known of the food colorants and certainly they are one of the largest groups of pigments produced in nature. carotenoids lipid soluble compounds, responsible of the yellow & red colors of plants & animal products (430 – 480 nm). Most of produced carotenoids in nature is in form of fucoxanthin in various algae, in green leaves: lutein, violaxanthin, neoxanthin; β -carotene; lycopene in tomatoes; capxanthin in red peppers.

6.what are Organic Pigments? explain

these are chemically synthesized, as they are not found in nature. They contain carbon and comes with relatively low levels of toxicity, not providing any major environmental concern.

Raw materials can include coal tar and petroleum distillates that are transformed into insoluble precipitates. They are used as mass colorants and are popular in plastics, synthetic fibers and as surface coatings-paints and Synthetic colors are man-made colors appearance is an important goal in the food industry.

7. name the different types of organic pigments.

Organic pigments are generally categorized into six types:

- Diazo Pigments
- Monoazo Pigments
- Acid and base dye Pigments
- Phthalocyanine Pigments
- Other polycyclic Pigments
- Quinacridone Pigments

8.what is the essential criteria for the characteristic organic pigments.

- Good pictorial strength
- Cost effectiveness
- Consistency and unique shades
- Completely non-toxic
- Organic pigments shows good color strength
- Very good stability to solvents, light, heat, and weathering

• Very bright, pure, rich colors

9.what are Inorganic pigments? give examples

these are created through chemical manufacturing rather than by grinding and washing clays or minerals taken directly from the earth.

 TiO_2 (rutile) and (Anatase), Antimony Oxide, Zinc Oxide, Calcium Carbonate, Fumed Silica. lead oxide, cobalt blue, chromium oxide, cadmium yellow, molybdate orange, and nickel titanate

10. what are the regulation to use the colorants?

Strong regulations regulate the use of colorants and testing of toxicity on animals, usually rodents, have to be done before legalization. Often it is necessary to find a level of Acceptable Daily Intake (ADI) to prevent the consumers of possible negative effects made by the supplements. FDA will be certify before entering into the market by toxicological testing such as subchronic feeding study and acute toxicity studies in at least two animal species, lasting at least 24–30 months will be done before approve the pigments into the market.

11. what are the health benefits of pigments?

Natural and synthetic pigments are used in medicines, foods, clothes, furniture, cosmetics, and in other products. Chlorophylls Contributes to fighting harsh diseases. When chlorophyll is used together with lipids, the pro oxidant activity of these components has to be taken under consideration.

In animals how oxygen and carbon dioxide could be transported without hemoglobin or myoglobin. Under stress conditions plants show the synthesis of flavonoids; the quinones are very important in the conversion of light into chemical energy. The melanins act as a protective screen in humans and other vertebrates, and in some fungi melanins are essential for their vital cycle; a lot of pigments have a well-known pharmacological activity in sickness such as cancer and cardiovascular diseases, and this has stressed pigment importance for human beings.

12. How many basic tastes were there?

There are only five universally recognized basic tastes - sweet, sour, bitter, salty, and umami (means that savory).

13. why flavors are used in food products?

There are two main reasons uses flavors in food products, first, to add an intrinsic flavour - an example being flavoured mineral water with citrus extracts. Second use a flavor if it lost or modified during processing. Example: Fruit flavour in yogurt.

14. write a note on classification of flavors.

There are three principal types of flavorings used in foods,

1. Natural flavoring substances which are extracted from vegetable or animal materials and are not further chemically modified or changed. An example is vanilla extract.

2. Nature-identical flavoring substances those are chemically identical to natural substances, but which are obtained by chemical processes or by chemical modification of other natural substances. An example is vanillin, which is identical to the vanillin in vanilla, but not obtained from vanilla pods.

3. Artificial flavoring substances: Substances obtained by chemical synthesis or chemical modification of natural substances, but which are not present in natural products.

15. what are Flavouring preparation and Process flavourings?

Flavouring preparation is a product from natural origin, but which is not highly purified. For example concentrated apple juice can be defined as a flavouring preparation.

Process flavourings are substances that are formed from natural substances upon processing, mainly heating. A common example is caramel, which is produced by heating sugars.

16. give examples for nature-identical flavoring agents.

Diacetyl Buttery Isoamyl acetate, Banana Benzaldehyde, Bitter almond Cinnamic aldehydes, Cinnamon Ethyl propionate, Grape Fruity Methyl anthranilate, Limonene Orange Ethyl decadienoate, Pear Allyl hexanoate, Pineapple Ethyl maltol, Sugar, Cotton candy Ethylvanillin, Vanilla Methyl salicylate.

17. List out the artificial flavors to enhance sour taste.

Acid Description Acetic acid Gives vinegar its sour taste and distinctive smell.

Ascorbic acid, better known as vitamin C, found in oranges and green peppers and gives a crisp, slightly sour taste.

Citric acid found in citrus fruits and gives them their sour taste.

Fumaric acid not found in fruits, used as a substitute for citric and tartaric acid.

Lactic acid found in various milk or fermented products and give them a rich tartness.

Malic acid found in apples and gives them their sour/tart taste.

Phosphoric acid used in all cola drinks to give an acid taste.

Tartaric acid found in grapes and wines and gives them a tart taste.

18. How to extract coffee and vanilla flavors?

Typical extraction process can be seen in coffee preparation. This process involves hot water separating the flavouring substances and flushing them out of the coffee powder. The filter then separates the soluble coffee components from the powder. The same principle of extraction is applied when deriving vanilla extract from vanilla beans. But here use alcohol or supercritical carbon dioxide (CO2) as solvents.

19. what is Liquid Carbon Dioxide Extraction?

This technique also called as supercritical fluid extraction technique, the raw material is packed into stainless steel extraction columns and then dynamic flow of carbon dioxide in liquid form, at pressures of 40-60 atmospheres in low temperatures between 0-10°C. In this condition, the liquefied CO_2 dissolves the lower molecular weight organic active components of the raw material and leaving behind the higher molecular weight unwanted materials such as heavier fats, waxes, pigments, sugars, starches and tannins. The solution of product in CO_2 emerging from the extraction columns is passed to a sophisticated heat exchanger. This leaves a pure extract of the product which is tapped from the process under pressure, still below ambient temperature.

20. write a note on Counter Current Extraction:

Citrus oils in hydrocarbon solvent are continuously fed into a specially-designed column containing many compartments and this complex mixer, in which a counter-flow of ethanol containing a small amount of water, extracts the flavour and aroma molecules leaving the terpenes to emerge from the opposite end of the column.

21. write a note on Solvent Extraction

Organic solvent extraction is the most common and most economically important technique. In this technique, the raw materials are submerged and agitated in a solvent that can dissolve the desired aromatic compounds. Most commonly used solvents for solvent extraction include hexane and dimethyl ether. During solvent extraction, aromatic compounds as well as other hydrophobic soluble substances such as wax and pigments are also obtained. The extract is then subjected to vacuum processing, which removes the solvent for re-use (or) the solvent is then removed by a lower temperature distillation process and reclaimed for re-use.

22. What is distillation process? How they used in extraction

distillation process The technique is based on the fact that many substances have different boiling points. During distillation, liquid mixtures are separated by heating and the distillation process sees the plant or animal source material being brought to a certain, pre-determined boiling point. The steam is collected by cooling. In flavouring production generally in industries it is used to produce natural citral from lemon grass oil.

23. Explain the different types of distillation.

i. **Vacuum Distillation** is one of the simple techniques for concentration of essential oils before molecular distillation. The raw material or crude oil is heated under vacuum at precisely controlled temperatures, turning the components into vapour, which is then cooled and condensed to a purified liquid product.

ii. **Molecular distillation:** This distillation technique employs the material to heat for the briefest possible time, while at the same time allowing a very high vacuum to be achieved, which lowers the vaporizing temperature, contributing further to the limited exposure to heat. It allows a continuous feed of liquid to enter and pass down the inside of a heated jacket, wiped into a thin film by the centrifugal force of rotating rollers and falling by gravity.

iii. Alcohol Co-Distillation- It involves the addition of pure alcohol to the raw material which are first treated with water, followed by atmospheric pressure or low-vacuum distillation of the alcohol and some water which co-distils the more volatile components to yield a high aroma product. The advantages associated with these type of natural products are clean label, 100% Natural, enhanced functionality, product differentiation and true to nature.

iv. **Steam distillation**. Steam distillation is used as a general term to such products which requires roasting for flavor generation. The method includes, wetting the material with moist gas, steaming at varying pressure & Adding hot water. Generally, used in industries for obtaining coffee flavor.

24. write a note on Flavor:

Flavor is the sensory impression of a food or other substance, and is determined mainly by the chemical senses of taste and smell.

There are two main reasons uses flavors in food products, first, to add an intrinsic flavour - an example being flavoured mineral water with citrus extracts. Second use a flavor if it lost or modified during processing. Example: Fruit flavour in yogurt.

Natural identical flavors:

Nature-identical, which means that they are the chemical equivalent of natural flavors but chemically synthesized rather than being extracted from the source materials

25. what are the types of Flavor extraction?

There are different types of extraction namely Liquid Carbon Dioxide Extraction, Counter Current Extraction, Solvent Extraction. The flavors also extracted from another technique named distillation process.

26. write a note on Pigments and their types

Pigments are used for coloring food, paint, ink, plastic, fabric, cosmetics and other materials. The term "pigment" is used for coloring products such as food products, beverages, textiles, and pharmaceutical products. Pigments produce the colors that we observe at each step of our lives, because pigments are present in each one of the organisms in the world and plants are the principal producers. They are in leaves, fruits, vegetables, and flowers; also, they are present in animal skin, eyes, bacteria and fungi. so the world is colorful.

Natural pigments: these are produced by living organisms such as plants, animals, fungi, and microorganisms. they are contains Tetrapyrrole derivatives, isoprenoid derivatives: carotenoids and iridoids, tetrapyrroles, Benzopyran derivatives, Quinone, artefacts.

Organic pigments / synthetic pigments: these are chemically synthesized, as they are not found in nature. They contain carbon and comes with relatively low levels of toxicity, not providing any major environmental concern.

Inorganic pigments: These are created through chemical manufacturing rather than by grinding and washing clays or minerals taken directly from the earth.

Pigment extraction

Preparing samples from biological tissues is often tedious and time-consuming because the accuracy of the analysis depends on many parameters linked to the preparation of the sample. Examples are sample storage, process, etc. In addition, the complete extraction of pigments often requires several steps, and may use a mixture of several solvents. In rare cases, pigments can be extracted in a one step process.