III. FAQ:

1. **What are primary metabolites?**

Ans: The food that the organisms eat contains carbon, nitrogen, and minerals get converted into energy. The energy produced ends up in molecules that are common to all cells These molecules that are required for the proper functioning of cells and organisms., e.g., lipids, proteins, nucleic acids, and carbohydrates, are called **primary metabolites** or biomolecules.

2. **Explain secondary metabolites and their role in plants?**

Ans: The primary metabolites are involved in photosynthesis, respiration, protein and lipid metabolism However, most plants also spend carbon and energy to the synthesis of molecules that do not seems to have any role in normal cell function. These molecules are known as **secondary metabolites**.

Role of Secondary Metabolites are:

- Induced plant defenses against insect infestation
- They help to recognize specific components of insect saliva
- Some of these compounds inhibit herbivore digestion
- Herbivore-induced volatiles have complex ecological functions
- They behave as antimicrobial compounds against pathogen attack
- Infection induces additional antipathogendefences
- Phytoalexins often increase after pathogen attack
- Some plants recognize specific pathogen-derived substances
- A single encounter with a pathogen may increase resistance to future attacks

3. **What are terpenes and their usage?**

Ans: The terpenes, or terpenoids, are the largest group of secondary metabolites produced

by plants. Most of the compound in this class are insoluble in water. Terpenes may or may not have well defined functions in the plants in which it is produced. The vast majority of terpenes, are secondary metabolites presumed to be involved in *plant defences*.

4. What are phenolic and their function?

Ans: Most of the plants produce a large variety of secondary compounds that contain a phenol group. These substances are classified as *phenolic compounds, or phenolics*. Plant phenolics are a chemically heterogeneous group of nearly 10,000 individual compounds: Some are soluble only in organic solvents, some are water-soluble. In keeping with their chemical diversity, phenolics play a variety of roles in the plant. Many serve as defenses against herbivores and pathogens. Others function are attracting pollinators and fruit dispersers, in absorbing harmful ultraviolet radiation, or in reducing the growth of nearby competing plants.

5. Write a note on tannins and their importance?

Ans: Tannins are general toxins that can reduce the growth and survival of many herbivores when added to their diets. In addition, tannins act as feeding repellents to a great variety of animals. Mammals such as cattle, deer, and apes characteristically avoid plants or parts of plants with high tannin contents. Unripe fruits, frequently have very high tannin levels, which deter feeding on the fruits until their seeds are mature enough for dispersal. Plant tannins also serve as defences against microorganisms. Today they are commonly used as antioxidants.

6. How colored pigments of plants helps in pollinators and seed dispersers?

Ans: The colored pigments of plants help to attract pollinators and seed dispersers. The coloured pigments are of two types: *carotenoids and flavonoids*. Carotenoids are yellow, orange, and red terpenoid compounds. Carotenoids also serve as accessory pigments in photosynthesis. The flavonoids include a wide range of colored compounds. The most widespread group of pigmented flavonoids is the *anthocyanins. Anthocyanins are* responsible for most of the red, pink, purple, and blue colors seen in flowers and fruits. The other two groups of flavonoids like *flavones and flavonols* are commonly found in flowers. These

flavonoids generally absorb light at shorter wavelengths than do anthocyanins, hence, they are not visible to the human eye. However, insects such as bees, which can see the ultraviolet range of the spectrum respond to flavones and flavonols.

7. **What is defined allelopathy and its significance?**

Ans: From leaves, roots, and decaying litter, plants release a variety of primary and secondary metabolites into the environment. The release of secondary compounds by one plant that have an effect on neighbouring plants is referred to as **allelopathy**. If a plant can reduce the growth of nearby plants by releasing chemicals into the soil, it may increase its access to light, water, and nutrients and thus its evolutionary fitness. Allelopathy is currently of great interest because of its potential agricultural applications. Reductions in crop yields caused by weeds or residues from the previous crop may in some cases be a result of allelopathy. An exciting future prospect is the development of crop plants genetically engineered to be allelopathic to weeds.

8. **Explain Bioavailability of polyphenols?**

Ans: **M**ost polyphenols are present in food in the form of esters,glycosides, or polymers that cannot be absorbed in their nativeform. These substances must be hydrolyzed by intestinal enzymesor by the colonic microflora before they can be absorbed. During the course of absorption, polyphenols are conjugatedin the small intestine and later in the liver. This process mainly includes methylation, sulfation, and glucuronidation. The conjugation mechanisms are highly efficient, and aglyconesare generally either absent in blood or present in low concentrationsafter consumption of nutritional doses. Polyphenols are able to penetrate tissues, particularly those in which they are metabolized. Polyphenols are secreted via the biliary routeinto the duodenum, where they are subjected to the action of bacterial enzymes, especially ß-glucuronidase, in the distal segments of the intestine, after which they may bereabsorbed.

9. **Explains secondary metabolites from microbes?**

Ans: Secondary metabolites are typically organic compounds produced through the modification of primary metabolite synthases. Secondary metabolites do not play a role

in growth, development, and reproduction like primary metabolites do, and are typically formed during the end or near the stationary phase of growth. Many of the identified secondary metabolites have a role in ecological function, including defence mechanisms, by serving as antibiotics and by producing pigments. Examples of secondary metabolites with importance in industrial microbiology include atropine and antibiotics such as erythromycin and bacitracin.

10. Mention the condition for production of secondary metabolites from microbes?

Ans: Secondary metabolites are not produced until the microbe has completed its logarithmic growth phase and entered the stationary phase of the growth cycle. Period of production is called stationary phase also known as idiophase and metabolites as idiolites. In the idiophase, cells do not divide but are metabolically active. Idiolites are organic compounds produced only after considerable number of cells and primary metabolite have accumulated. Rather it can be said that these are produced under sub-optimal concentrations of O2, deviations of pH or when primary nutrient source is depleted. Though idiolites are a characteristic feature of fungal, yeast, actinomycetes and bacteria. In some strains secondary metabolite are produced by further conversion of a primary metabolite.

11. Write a note on the on Exotoxins?

Ans: Exotoxins are produces as secondary metabolites.The toxins are called exotoxins as they are produced and excreted from the cell. The bacterial cells produce these compounds to keep the other contaminants from the environment in which it is growing. Eg. *Corynebacterium diphtheria* which produces DiphtheriaExotoxin which inhibits protein synthesis and causes cell death.

12. Write the functions of secondary metabolites among the microbes?

Ans: **(i) As** competitive weapons used against other bacteria, fungi, amoebae, plants, insects, and large animals;

ii) As metal transporting agents.

iii) As agents of symbiosis between microbes and plants, nematodes, insects, and higher animals.

iv) As sexual hormones;

v) As differentiation effectors.

13. Beneficial effect of plant phenolic's on humans?

Ans: The beneficial effect of plant phenolics are;

- It behaves like an anti-coagulant activity, akin to aspirin
- It has a preventative action against cancer, combating the development of tumours
- It is a powerful anti-oxidant (20 times more than vitamin-E)
- It has anti-inflammatory effects.
- It facilitates the reaction of the immune system.

14. Write a short note on carotenoids and flavonols?

Ans: Carotenoids serve as accessory pigments in photosynthesis. The flavonoids include a wide range of colored compounds. The most widespread group of pigmented flavonoids is the *anthocyanins. Anthocyanins are* responsible for most of the red, pink, purple, and blue colors seen in flowers and fruits. The other two groups of flavonoids like *flavones and flavonols* are commonly found in flowers. These flavonoids generally absorb light at shorter wavelengths than do anthocyanins, hence, they are not visible to the human eye.

15. Function of isoflavonoids?

Ans: *Isoflavonoids*, are found mostly in legumes, have several different biological activities. Some, such as rotenone, can be used effectively as insecticides, pesticides (e.g., as rat poison), and piscicides (fish poisons). Other isoflavones have anti-estrogenic effects; for example, sheep grazing on clover rich in isoflavonoids often suffer from infertility. Isoflavones may also be responsible for the anticancer benefits of foods prepared from soybeans.