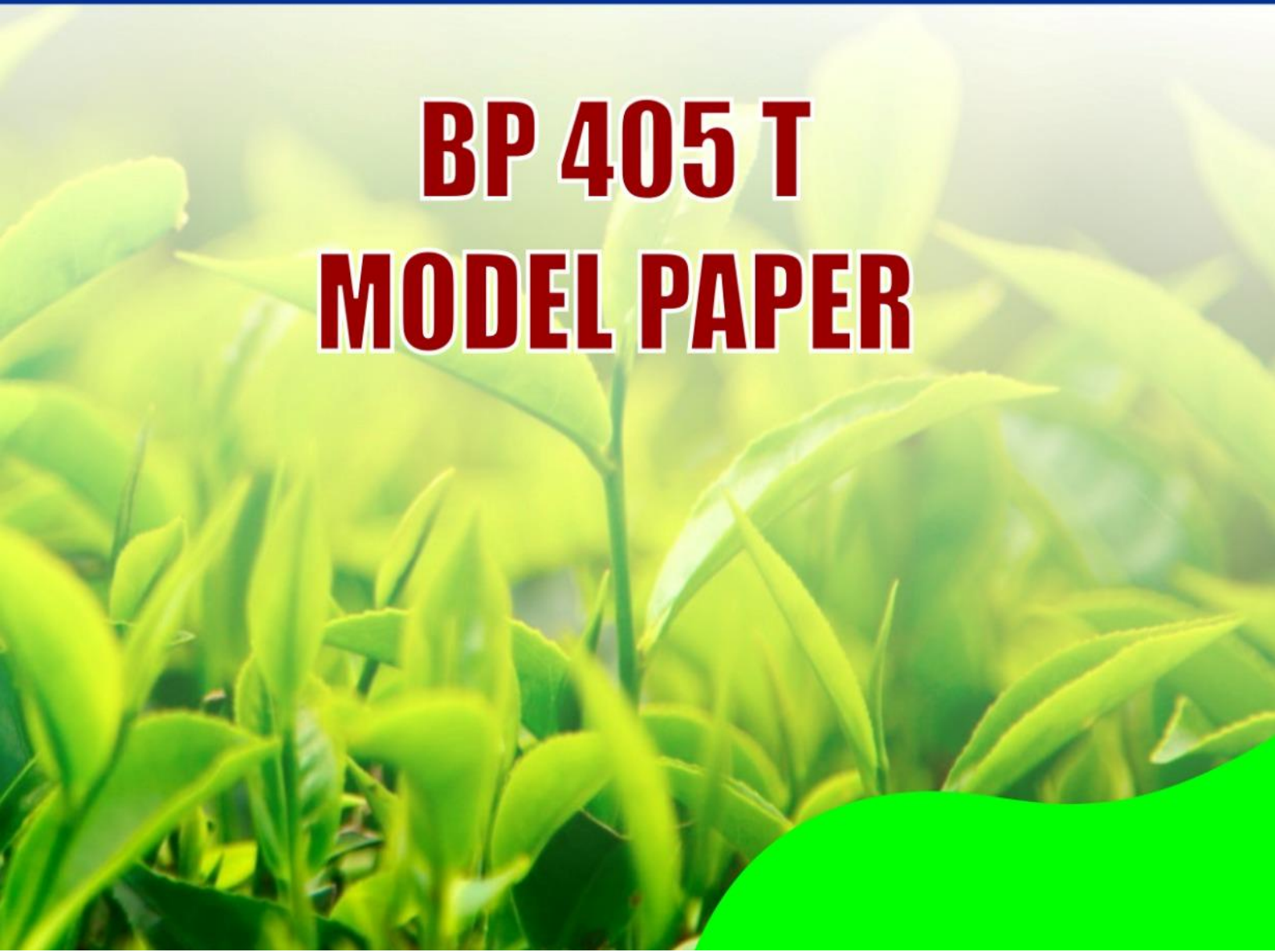
PHARMACY INDIA

B.PHARMA
IVTH SEMESTER

PHARMACOGNOSY AND PHYTOCHEMISTRY - I



BP 405 T
MODEL PAPER

PHARMACOGNOSY-I MODEL PAPER

Ques 1. Describe in detail about organoleptic, microscopic and chemical methods for evaluation of crude drug.

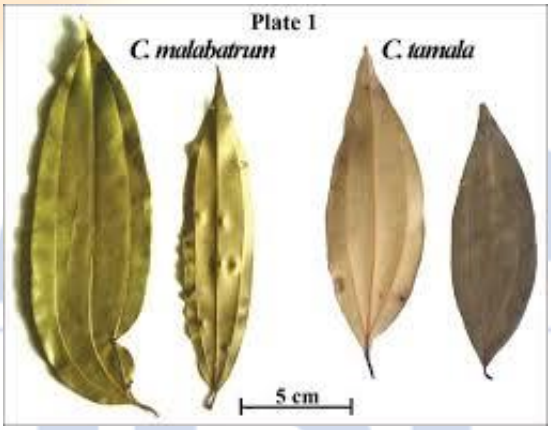
Answer 1.

- Confirmation of identity and determination of quality and purity of crude drugs is called as evaluation of crude drugs.
- Besides confirmation of identity and determination of quality and purity the term drug evaluation also covers detection and determination of the type of adulteration present.

Methods of Evaluation: -

1. **Organoleptic evaluation.**
2. **Microscopic evaluation.**
3. **Chemical evaluation.**

1) Organoleptic evaluation: -

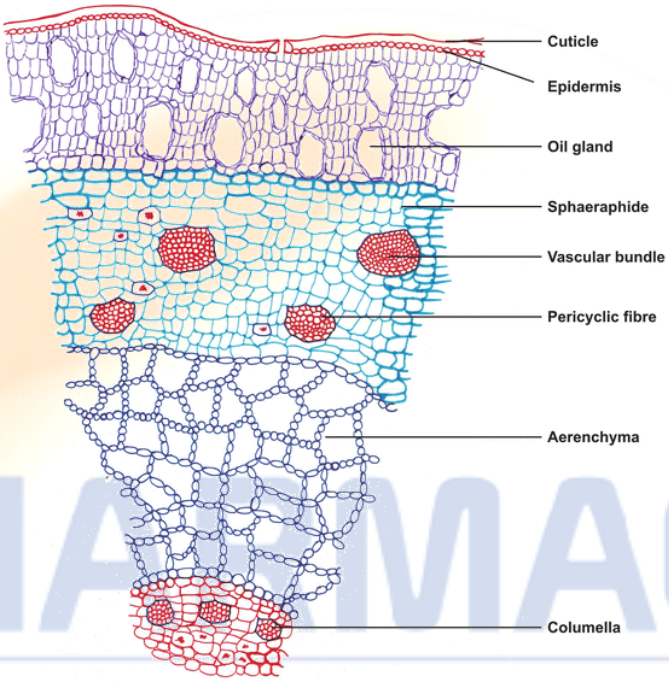


- Examination of the drug by color, odor, shape size, taste, touch, texture, and sound is known as Organoleptic evaluation.
- E.g. taste of fennel is sweet. Taste of clove is pungent. Leaf of datura is hairy.
- While evaluating by this method there are certain restrictions like changes in shape & size of drugs during drying & packing so it is Difficult to the study the drug by organoleptic evaluation.
- e.g. length of the cinnamon quill is 1 meter but mostly it is found in small pieces in the market.
- Digitalis leaves crumple in small pieces during drying and packing.

2) Microscopic Evaluation: -

- Every species has a unique anatomy, the study of which helps us in their identification process.
- Microscopic evaluation is useful for the organized drugs (i.e. drugs having cellular structure).
- T. S. & L.S. of the drugs are observed under the microscope.
- T. S. & L.S. of the drugs are studied under the microscope with the help of the staining agent.

- Special attention is given to the type of tissues, their arrangement, presence or absence of special substances like calcium oxalate crystals, starch grains, size and shape of starch grains, cell contents etc.
- e.g. Nux vomica have lignified trichomes, Fennel contains vascular bundles which are surrounded by reticulated parenchyma and shows the presence of vitae which secrete volatile oil.



T. S. of Clove flower bud

Microchemistry: Sometimes small quantities of chemical reagent are used on sections to highlight specific cells or structures.

- e.g. If we want to observe starch grain then we have to use dilute iodine solution the area of T. S. containing starch grains becomes blue due to iodine.
- To locate strychnine & Brucine in Nux- vomica seeds, we use ammonium vanadate.
- Thus the use of small quantities of drugs & chemical reagents in microscopy is known as microchemistry.
- Following are the examples of microscopic evaluation. (Leaf constants)

A) Stomatal No. : - It is an average no. of stomata present in 1 sq. mm of the epidermis.

- The total no is constant for a given drug. e.g Drug Stomatal no. *Datura stramonium* 87, *D.innoxia* 141.

B) Stomatal Index: - It is the percentage which the number of stomata forms to the total no. of epidermal cells, each stoma being counted as one cell.

- **I = S *100/(E+ S)**
  (where **I** = Stomatal Index. **S** = No of stomata. **E** = No of epidermal cell in the same area.)

- The stomatal index is useful for evaluation of leaf drug however, it is a constant for a given species.

Drug	Stomatal Index
Indian senna	17 - 20
Alexandrian senna	10.8 – 12.6

C)Vein islet no: - Islet is the area surrounded by veins.

- Vein Islet no.: " It is the no. of vein islets per sq.mm of leaf surface.
- It is constant for given species of drug It is used for evaluation of crude drug
- e.g.

Drug	Vein islet no.
Indian senna	19-23
Alexandrian senna	25-30

D) Palisade ratio: - It is the average no of palisade cells beneath one epidermal cell using four continuous epidermal cells for the count.

- It is constant for given leaf and used for evaluation of leaf.
- Eg.

Drug	Palisade ratio
Digitalis purpurea	3.7 – 4.2
Datura stramonium	4 – 7
Atropa belladonna	6 - 10

3) Chemical Method Of Evaluation: -

- This method of evaluation consists of isolation, purification & identification of the active chemical constituent from the crude drug.
- This method consists of following test

1.Acid value

2.Saponification value

3.Iodine value

4.Ester value

5.Acetyl value

6.Determination of methoxy group.

- Chemical evaluation also consists of titration, gravimetric analysis, chromatographic analysis, spectrophotometer analysis, etc.
- Chemical tests are also helpful for the identification of crude drugs. e. g.

1.Van urk's test for Ergot.

2. Halphenes test for Arachis oil.

3. Borntrager tests for Anthraquinone Glycoside.

Ques.2 What are various factors those influence cultivation of medicinal plants? Write in detail about collection and packing of crude drugs.

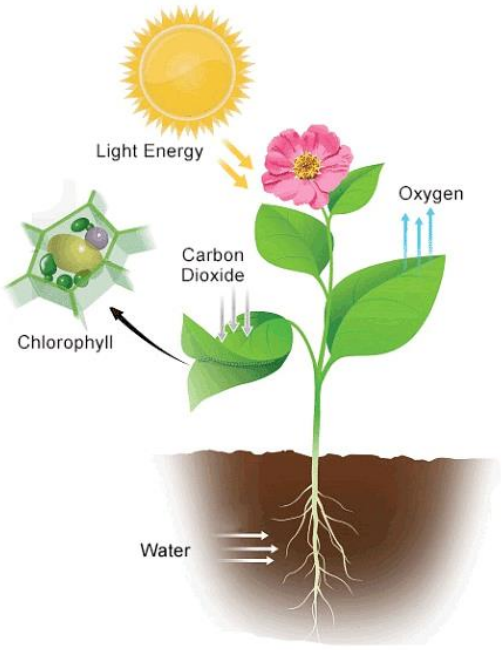
Answer.2 **Factors Influencing the Cultivation of Medicinal Plants**

The following factors are influencing of cultivation:

1. Light
2. Temperature
3. Atmospheric humidity
4. Altitude
5. Rainfall
6. Soil

1. Light:

- Light is the only external source of energy for the continuation of life of the plant.
- It influences photosynthesis, opening and closing of stomata, plant movements, seed germination, flowering and vegetative growth like tuber formation.
- Dry sunny weather increases the proportion of glycosides in digitalis and of alkaloids in belladonna.



2. Temperature:

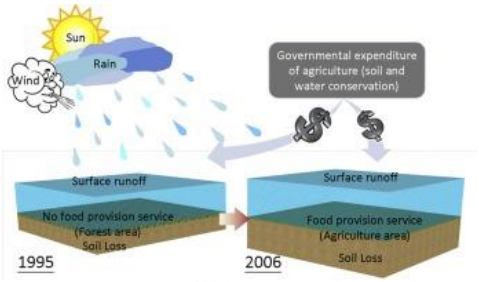
- Temperature is the major factor influencing the cultivation of the medicinal plant.
- The sudden decrease in temperature caused the formation of the ice crystals in intercellular spaces of the plant.
- As a result, water comes out of the cells and ultimately plants die due to drought and desiccation.
- The ice crystals also mechanical injury to the cells temperature stimulates the growth of seedlings. Water absorption decreases at low temperatures.
- The rate of photosynthesis is affected by change in temperature. The rate of respiration increases with increase in temperature.
- Examples; Cinchona- 58-73°F; Tea- 75-90°F and coffee- 55-70°F

3. Atmosphere humidity:

- It is present in the form of water vapours. This is called atmospheric humidity.
- Clouds and fog are the visible forms of humidity.
- The major sources of water vapours in the atmosphere are evaporation of water from earth surface and transpiration from plants the major effect of humidity on plant life and climate.
- Evaporation of water, its condensation and precipitation depends upon relative humidity and humidity affects structure, form and transpiration in plants.

4. Altitude:

- The altitude is the most important factor influencing of cultivation of medicinal plants.
- The increase the altitude, the temperature and atmospheric pressure decreases while the wind velocity, relative humidity and light intensity increases.
- Thus, as the climatic conditions change with height, they also produce change in the vegetation pattern.
- The bitter constituents of Gentiana lutea increase with altitude, whereas the alkaloids of Aconitum nacelles and lobelia inflate and oil content of thyme and peppermint decrease.
- Pyrethrum gives the best yield and Pyrethrum at high altitude.
- Examples:
  - Tea- 9500-1500 meters;
  - Cinnamon- 300-1000 meters
  - Saffron- up to 1250 meters



5. Rainfall:

- The rainfalls are most important factor influencing of cultivation of medicinal plants. The main source of water for the soil is rain water.
- Rainfall and snowfall have a large effect the climate condition.
- The water from rainfall flows into the rivers and lakes percolates into the soil to form ground water and remaining is evaporated. The minerals in the soil get dissolved in water and are then absorbed by plants.
- Water influences morphological and physiology of plant.
- Examples: continuous rain can lead to a loss of water- soluble substance from leaves and root by leaching; this is known to apply to some plants producing glycoside and alkaloids.

6. Soil:

- Soil is defined as surface layer of the earth, formed by weathering of rocks.
- The soil is formed as a result of combined action of climate factors like plants and micro-organisms.
- The soil should contain appropriate amounts of nutrients, organic matter and other elements to ensure optimal medicinal plant growth and quality.
- Optimal soil conditions, including soil type, drainage, moisture retention, fertility and pH, will be dictated by the selected medicinal plant species and/or target medicinal plant part.

Collection and packing of crude drugs involve the careful and systematic gathering, processing, and packaging of plant or animal materials that are used for medicinal purposes. This process is crucial to ensure the quality, potency, and safety of the crude drugs. Here's a detailed overview of the collection and packing procedures:

1. **Collection:**
   - **Identification**: The first step is to correctly identify the plant or animal source of the crude drug. This requires knowledge of botanical or zoological characteristics, such as

appearance, odor, taste, and habitat. Botanists, pharmacists, or experienced collectors often perform this task.

- **Harvesting**: Once identified, the crude drug is harvested at the appropriate time, which can vary depending on the plant part being collected (leaves, flowers, bark, roots, etc.) and the specific requirements of the drug. It is important to ensure that the plant material is collected from sustainable sources and in an ethical manner.
- **Cleaning**: After harvesting, the collected material undergoes cleaning to remove any extraneous matter, such as soil, dirt, leaves, or insects. This is usually done manually or by using mechanical methods like sieving or winnowing.
- **Drying**: Proper drying is crucial to prevent the growth of microorganisms, maintain the chemical integrity of the drug, and extend its shelf life. The collected material is spread out in thin layers or hung in a well-ventilated area, away from direct sunlight. The drying conditions (temperature, humidity, airflow) should be carefully controlled to ensure optimal drying without causing damage or degradation to the drug. In some cases, drying may involve specialized techniques like shade drying, sun drying, or oven drying.
- **Size Reduction**: Once dried, the crude drug may need to be broken down into smaller fragments to facilitate further processing, storage, or extraction. This is typically done by crushing, grinding, or cutting the dried material using appropriate equipment.

2. **Processing**:
   - **Extraction**: Some crude drugs require extraction of their active constituents using solvents. This is done through processes like maceration (soaking the drug in a solvent), percolation (passing the solvent through a powdered drug bed), or decoction (boiling the drug in water). The resulting liquid extract is concentrated, filtered, and sometimes subjected to additional purification steps.
   - **Powdering**: If the crude drug is intended to be used in powdered form, it is pulverized to a fine powder using a suitable grinding apparatus. This ensures uniformity and facilitates the accurate measurement and dosing of the drug.
   - **Other Processing Methods**: Depending on the nature of the crude drug, additional processing methods may be employed, such as fermentation, fermentation with specific microbial cultures, or specific chemical treatments. These processes are carried out to enhance the therapeutic properties, reduce toxicity, or improve stability.

3. **Packaging:**
   - **Containers**: Proper packaging is essential to protect the crude drugs from environmental factors like moisture, light, heat, and contamination. The drug is typically packed in suitable containers made of materials like glass, plastic, or metal, which provide adequate protection against these factors. The containers should be clean, dry, and airtight to prevent degradation or spoilage of the drug.
   - **Labeling:** Each package should be labeled accurately and clearly, providing essential information such as the name of the drug, its botanical or zoological source, batch number, manufacturing date, expiry date, dosage instructions, and any necessary warnings or precautions. Proper labeling ensures traceability, safety, and regulatory compliance.
   - **Storage:** The packaged crude drugs should be stored in a controlled environment with appropriate temperature, humidity, and lighting conditions to maintain their quality and potency. Storage areas should be clean, dry, well-ventilated, and free from pests or other contaminants.

Ques.3 Define crude drugs How can you classify cride drugs, discuss in detail about the therapeutic method of crude drugs classification with its merits und demerits.

Answer 3. **Crude drug** is a plant or animal drug occurring in either the fresh or dried condition and either whole or reduced in particle size by cutting or grinding

Crude drugs are classified in the following different ways -

1. **Alphabetical classification**
2. **Morphological classification**
3. **Taxonomical classification**
4. **Pharmacological classification**
5. **Chemical classification**
6. **Chemo-taxonomical classification**

The therapeutic classification of crude drugs can be done based on various factors, such as their chemical constituents, pharmacological actions, or therapeutic uses. Here is an overview of **Pharmacological Action Classification** methods of classifying crude drugs, along with their merits and demerits:

Pharmacological Action Classification: This classification method categorizes crude drugs based on their observed or reported pharmacological actions. It groups drugs with similar therapeutic effects together, regardless of their chemical composition. Here are the merits and demerits:

Merits:

a. Therapeutic relevance: Pharmacological action classification focuses on the observed therapeutic effects of crude drugs, providing information that is directly relevant to their use in treating specific conditions.
b. Comprehensive approach: This method considers the overall effects of crude drugs, including possible interactions among various compounds within the drug, rather than isolating individual components.
c. Practical application: Pharmacological action classification enables healthcare professionals to select drugs based on their desired therapeutic effects, regardless of their chemical composition.

Demerits:

a. Limited knowledge of mechanisms: Classifying crude drugs based on pharmacological actions may not always provide a complete understanding of the underlying mechanisms of action.
b. Subjectivity and variability: The observed pharmacological actions of crude drugs can vary among individuals and may be subjective, making classification less standardized.
c. Complexity and overlap: Many crude drugs exhibit multiple pharmacological actions, making it challenging to assign them to a single category. Additionally, there can be overlap or similarity between different categories, leading to ambiguity.

Ques 4.Write notes on the followings
i) Nutrients requirement in plant tissue culture technique

ii) Glycosides

iii) Auxins

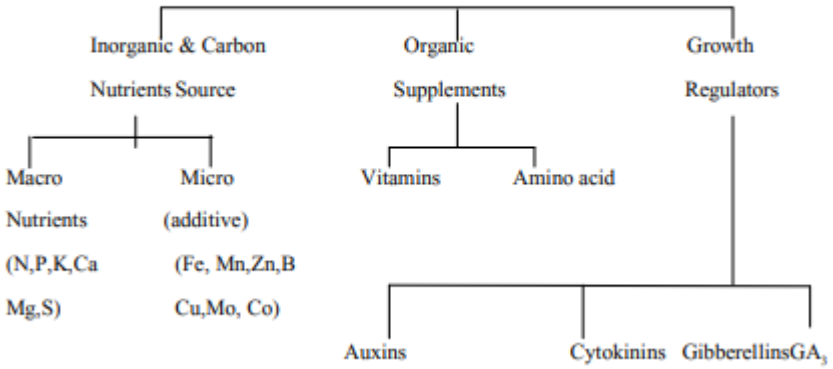
Answer 4.

i) Nutrients requirement in plant tissue culture technique

Tissue culture could be defined as the method of 'in Vitro' culture of plant or animal cells, tissue, or organ on nutrient medium under aseptic conditions usually in a glass container.

The culture media is provided with water, minerals, vitamins, hormones, carbon sources, and certain antibiotics depending upon the plant being cultured.

Main components of Plant tissue Culture medium



Nutritional Requirements of Plant Tissue Culture

The culture media for plant tissue culture consists of various nutritional components to sustain the plant's growth. Different plants do need different media, however, specific media have been devised for specific tissue and organs. Some of the important media are:

- White's Medium
- MS (Murashige and Skoog) Medium
- B5 (Gamborg's) Medium
- LS (Linsmaier and Skoog) Medium

Some of the Organic Nutritional Components are:

- Vitamins like thiamine (B1), Pyridoxin (B6), Nicotinic Acid (B3), etc.
- Antibiotics like Streptomycin, Kanamycin
- Amino Acids like Arginine, Asparagine

Inorganic Nutrients that are added are:

- Some of the micronutrients are Manganese (Mn), Iron (Fe), Molybdenum (Mo), Zinc (Zn), Copper (Cu), Boron (B).
- Six major macronutrients that are included are Nitrogen (N), Sulphur (S), Phosphorus (P), Potassium (K), Magnesium (Mg), Calcium (Ca)

The Components that are used as Carbon and Energy Sources are:

- Lactose
- Maltose
- Galactose
- Raffinose
- Cellobiose

ii) Glycosides

- Glycosides are the compounds of plant and animal origin which on hydrolysis yields a sugar compound (glycone) and a nonsugar compound (aglycone), having marked physiological actions.
- Common sugars found in glycosides are glucose, mannose, rhamnose, & digitoxose.
- The common non- sugar part is alcohol/ phenol/ amine.
- The activity of glycoside is due to non-sugar part (aglycone).
- Glycone part plays role in pharmacokinetic properties of the glycoside like, absorption, metabolism, distribution and excretion..

Physical Properties:

- Glycosides are crystalline colorless solids.
- Non- reducing in nature and are generally laevorotatory.
- They are soluble in alcohol & water.
- Dilute acids and enzymes cause their hydrolysis.

Biological role: -

- They protect the plant from insects & animals.
- They stimulate growth, reproduction & metabolism of the plant.
- Glycosides act as a storage of chemicals for many plants.

Classification: - Glycosides can be classified by two methods

1. **According to the basis of chemical nature of Aglycone.**
2. **According to the chemical linkage between Glycone & Aglycone.**

A) Classification according to the chemical nature of Aglycone: -

S. No.	Class	Examples
1.	Anthraquinone glycosides	Senna, Aloe, Rhubarb, Cascara
2.	Sterol or Cardiac Glycosides	Digitalis, Thevetia, Squill, etc.
3.	Saponin glycosides	Dioscorea, Liquorice, Ginseng, etc
4.	Cyanogenetic and Cyanophoric glycosides	Bitter almond, Wild cherry bark, etc.
5.	Thiocynate and Isothiocynate glycosides	Black mustard

6.	Flavone glycosides	Ginkgo
7.	Aldehyde glycosides	Vanilla
8.	Phenol glycosides	Bearberry
9.	Steroidal glycosides	Solanum
10.	Bitter and Miscellaneous glycosides	Gentian, Picrrohiza, Chirata, etc.

Phenolic Glycosides: -

- According to chemical nature, these glycosides are divided into following types:

Type	Aglycone	Source
Simple Phenolic glycoside	Salicin	Salix species
Anthraquinone glycosides	Barbaloin, aloe- emodin	Aloe, Rhubarb, Senna
Coumarin glycosides	Umbelliferone	Asafoetida, Tobacco
Flavone & flavonoid	Gentisin, Kaempferol	Senna, Gentian, Liquorice
Anthocyanidine	Cyanidin, Malvidin	Rose, Purple grapes.

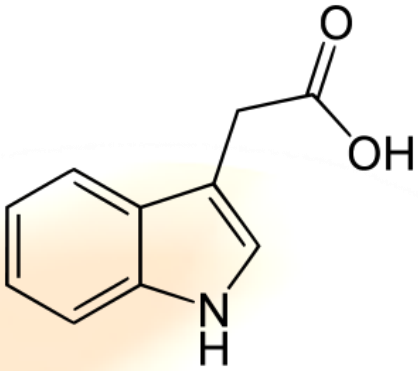
B) Classification according to the chemical linkage between glycone & Aglycone:

1. **O-glycosides:**
   - Sugar molecule is combined with phenol or –OH group of aglycon.
   - **Example:** Amygdaline, Indesine, Arbutin, Salicin, cardiac glycosides, anthraxquinone glycosides like sennosides etc.
2. **N-glycosides:**
   - Sugar molecule is combined with N of the –NH (amino group) of aglycon.
   - **Example:** nucleosides
3. **S-glycosides:**
   - Sugar molecule is combined with the S or SH (thiol group) of aglycon.
   - **Example:** Sinigrin
4. **C-glycosides:**
   - Sugar molecule is directly attached with C—atom of aglycon.
   - **Example:** Anthraquinone glycosides like Aloin, Barbaloin, Cascaroside and Flavan glycosides, etc.

iii) Auxins

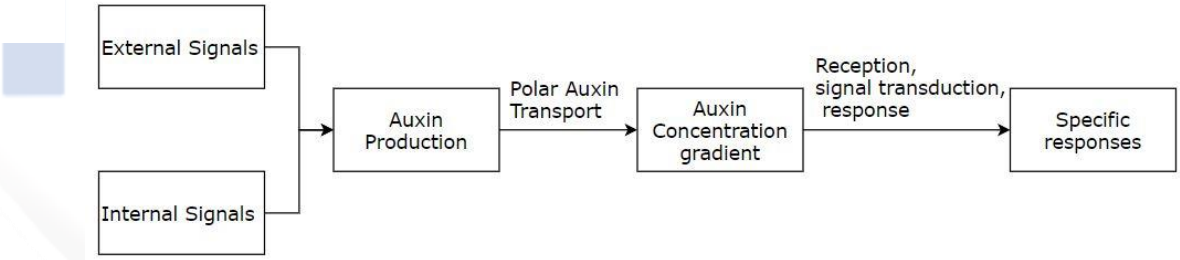
- Auxins are a group of naturally occurring and artificially synthesised plant hormones.
- They play an important role in the regulation of plant growth. Auxins were initially isolated from human urine.
- Auxin means to “enlarge” or “increase”.
- They induce cell division, differentiation and elongation. Charles Darwin detected phototropism movement (bending of plants towards light) in the coleoptile of canary grass. He observed that there was some influencer at the tip of the coleoptile, which was responsible for the bending towards the light.
- Later, Frits Went isolated and named the substance as “Auxin”, which was responsible for phototropic movement in oat coleoptile.
- Kenneth Thimann purified and elucidated the structure of primary auxins, e.g. IAA (Indoleacetic acid).

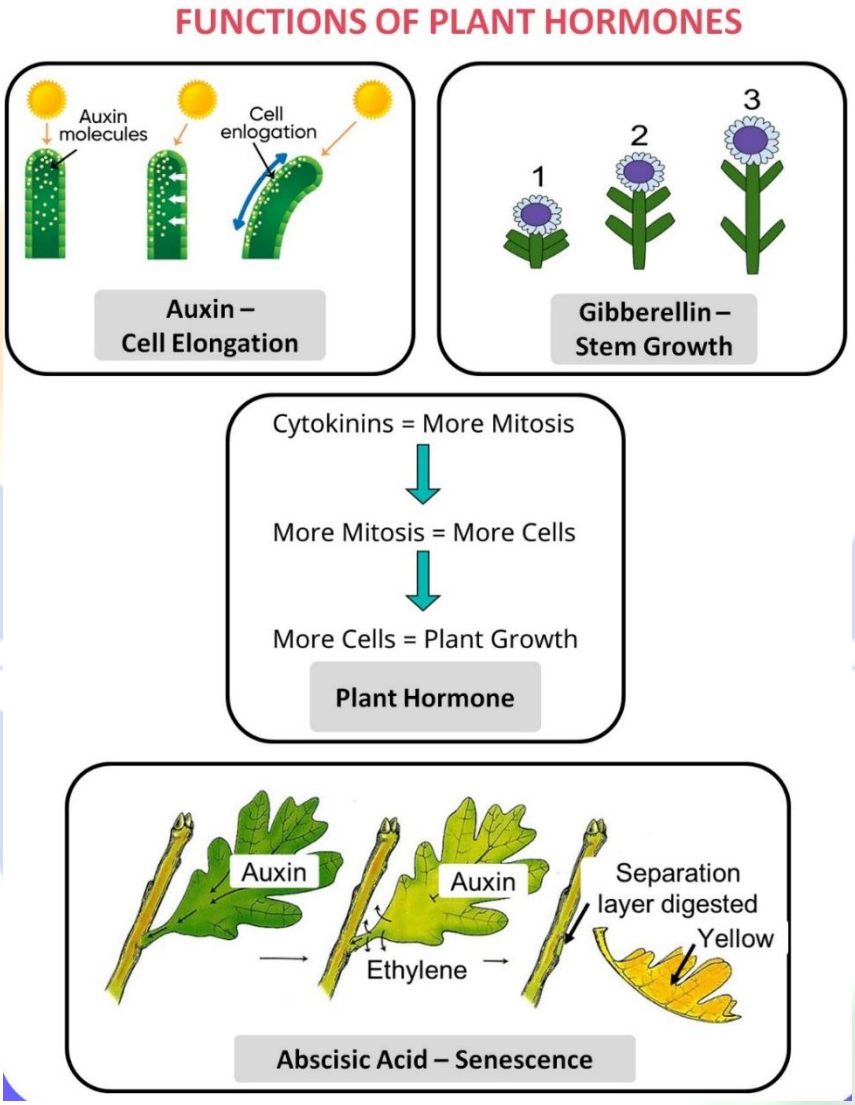
- Naturally Occurring Auxins: Indole-3-acetic acid (IAA), Indole butyric acid (IBA) Artificially synthesized Auxins: 2,4-dichloro phenoxy acetic acid (2,4-D), Naphthalene acetic acid (NAA)



Mechanism of Action of Auxin

- Auxin is mostly produced in the apical meristem of shoots, young leaves and seeds
- Movement of auxin is unidirectional or polar, it moves downwards from its site of production
- Polar transport results in an auxin concentration gradient, which stimulates specific responses
- Auxin specific transport proteins in the plasma membrane control the movement of auxin out of the cell
- Plant hormones act by signal transduction, eliciting more than one cellular responses
- Auxin binds to enzyme-linked receptors, which promotes catalysis of a reaction
- When auxin binds to a receptor, it initiates binding of a repressor protein for certain genes (auxin response gene) to ubiquitin, resulting in degradation of repressor protein and the transcription of auxin response genes progresses leading to cellular growth and development





Auxin Function

1. **Cell Elongation:** Auxin promotes elongation in shoots and coleoptiles. Plasticity of the cell wall is increased by acidification
2. **Cell Division and Differentiation:** Auxin promotes healing. It helps in cell differentiation and regeneration of vascular tissues (phloem, xylem)
3. **Callus Formation and Morphogenesis:** Auxin along with cytokinin induces callus formation in explant and stimulates morphogenesis
4. **Secondary Growth:** Auxin promotes secondary growth and induces cell division in the vascular cambium
5. **Root Initiation on Cuttings:** For asexual propagation, NAA is used to initiate root formation in the stem cuttings
6. **Apical Dominance:** When the growth of apical meristem inhibits the growth of axillary buds, the phenomenon is known as apical dominance. When the shoot tip is

removed, it induces the growth of lateral buds. This is used to promote branching, e.g. in hedge-making and tea plantations

7. **Parthenocarpy:** When auxin is applied to some flowers, it induces parthenocarpy, i.e. ovary enlarges and develops into seedless fruit (unfertilized). Seedless tomatoes are widely produced by this method
8. **Fruit development:** Auxin is produced by seeds and it stimulates fruit development with gibberellins and delays senescence
9. **Flowering:** It delays the senescence of flowers. A high concentration of auxin promotes femaleness in some of the plants. It promotes flowering in litchi and pineapples
10. **Herbicides:** Synthetic auxins, e.g. 2,4-D and 2,4,5-T are widely used to kill weeds. It does not affect grasses (monocotyledons)
11. **Promotes Tropism:** Auxin induces phototropism, gravitropism and thigmotropism, i.e. movement in response to light, gravity and touch, respectively.

Phototropic movement (bending towards light) can be explained by cell elongation due to auxins. Auxin concentration increases towards the shaded side due to auxin migration. It results in more cell elongation at the shaded side than the side exposed to light

Ques 5. Write synonym, biological source, chemical constituents and uses of
i) Tragacanth
ii) Wool fat
iii) Cotion

Answer 5.

i) **Tragacanth**

- **Synonyms** - Gum Tragacanth, Hin.-Anjira.
- **Biological source:**Tragacanth is dried gummy exudation obtained from the stem of Astragalus gummifer Labill.
- **Family**: Leguminosae.
- **Chemical constituents:**

It contains a complex polysaccharide carbohydrate.

a. Water-soluble - Tragacanthin (30-40%)
b. Water insoluble - Bassorin (60-70%)

Tragacanth in turn consists of

(a) tragacanthic acid + (galacturonic acid + xylose + fructose + galactose) and

(b) Arabinogalactan + (arabinose + galactose + galacturonic + Rhamnose in small quantities). It is also contains 3% starch and cellulose.

- **Uses:**

1. It is used as a demulcent (soothing).
2. Suspending agent.
3. Binding agent.
4. Emulsifying agent.
5. Laxative.

6. It is used in adhesive
7. In textile industry.

ii- WOOL FAT

- **Synonyms -** Wool fat; Oesipos; Agnin; Alapurin; Anhydrous lanolin; Adeps lanae; Laniol.
- **Biological Source -** Lanolin is the fat-like purified secretion of the sebaceous glands which is deposited into the wool fibres of sheep, Ovis aries Linn., belonging to family Bovidae.
- **Chemical Constituents**
  - Lanolin is a complex mixture of esters and polyesters of 33 high molecular weight alcohols, and 36 fatty acids.
  - The alcohols are of three types; aliphatic alcohols, steroid alcohols, and triterpenoid alcohols. The acids are also of three types: saturated nonhydroxylated acids, unsaturated nonhydroxylated acids, and hydroxylated acids.
  - Liquid lanolin is rich in low molecular weight, branched aliphatic acids, and alcohols, whereas waxy lanolin is rich in high molecular weight, straight-chain acids, and alcohols.
  - The chief constituents of lanolin are cholesterol, iso-cholesterol, unsaturated monohydric alcohols of the formula $C_{27}H_{45}OH$, both free and combined with lanoceric ($C_{30}H_{60}O_4$), lanopalmitic ($C_{16}H_{22}O_3$), carnaubic, and other fatty acids.
  - Lanolin also contains esters of oleic and myristic acids, aliphatic alcohols, such as cetyl, ceryl and carnaubyl alcohols, lanosterol, and ergosterol.
- **Uses**
  - Lanolin is used as an emollient, as water absorbable ointment base in many skin creams and cosmetic and for hoof dressing.
  - Wool fat is readily absorbed through skin and helps in increasing the absorption of active ingredients incorporated in the ointment.
  - It may act as an allergenic contactant in hypersensitive persons.

iii) COTTON

- **Synonyms:** Raw Cotton Wool, Absorbent Cotton
- **Biological Source:** Cotton consists of the epidermal trichomes of the seeds of Gossypium herbaceum Linn and other species of Gossypium of the family Malvaceae.
- **Constituents:** Raw cotton contains about 90 percent of cellulose and small amounts of wax. fat. remains of protoplasm and ash. Absorbent cotton is almost pure cellulose.
- **Uses:**
  - Cotton is used as the chief material for many surgical dressings.
  - It is also used as a filtering medium and an insulating material.

Ques 6. Discuss about the sources, preparation and therapeutic uses including commercial utility of the following drugs
i) Serratiopeptidase
ii) Sereptokinase
iii) Pepsin

Answer 6.

i) Serratiopeptidase:

- **Sources:** Serratiopeptidase, also known as serrapeptase, is an enzyme derived from the bacteria Serratia E15. It was originally isolated from the gut of the silkworm Bombyx mori but is now produced through microbial fermentation using selected strains of Serratia.
- **Preparation:** Serratiopeptidase is produced by culturing the Serratia bacteria in a suitable medium and then extracting and purifying the enzyme from the resulting fermentation broth. The purified serratiopeptidase is typically available as tablets or capsules for oral administration.
- **Therapeutic Uses:**
  - Serratiopeptidase has anti-inflammatory, analgesic, and fibrinolytic properties.
  - It is commonly used in clinical practice for the treatment of various conditions associated with inflammation and tissue damage.
  - Serratiopeptidase is often prescribed for conditions like swelling, pain, and inflammation following surgical procedures, trauma, or infections.
  - It is also used in conditions such as sinusitis, bronchitis, and arthritis.
- **Commercial Utility:**
  - Serratiopeptidase is commercially available as a prescription medication in many countries.
  - It is marketed under various brand names and is commonly used in combination with other drugs to enhance its therapeutic effects.
  - Serratiopeptidase is also used in some over-the-counter dietary supplements marketed for its potential anti-inflammatory and immune-modulating properties.

ii) Streptokinase:

- **Sources:** Streptokinase is an enzyme produced by certain strains of the bacteria Streptococcus. It is obtained from a culture of beta-hemolytic streptococci, primarily Streptococcus pyogenes.
- **Preparation:**
  - Streptokinase is prepared by growing selected strains of Streptococcus bacteria in a suitable culture medium.
  - The bacteria produce and secrete streptokinase into the medium.
  - The enzyme is then extracted, purified, and formulated for clinical use.
  - Streptokinase is typically administered intravenously.
- **Therapeutic Uses:**
  - Streptokinase is a thrombolytic agent, meaning it helps dissolve blood clots.
  - It is primarily used in the treatment of acute myocardial infarction (heart attack) and certain types of deep vein thrombosis.
  - Streptokinase works by activating the body's natural clot-dissolving system, converting plasminogen to plasmin, which breaks down the fibrin strands in blood clots.
- **Commercial Utility:**
  - Streptokinase has been widely used in the past for the treatment of acute myocardial infarction and pulmonary embolism.
  - Its use has declined over time due to the availability of newer and more specific thrombolytic agents.

iii) Pepsin:

- **Sources:** Pepsin is an enzyme that plays a vital role in the digestion of proteins. It is produced and secreted by the chief cells of the gastric glands in the stomach of mammals, including humans. Pepsin is derived from porcine (pig) or bovine (cow) sources for commercial use.

- **Preparation:** Commercial pepsin is primarily obtained from the stomach lining of pigs or cows. The stomachs are collected from abattoirs, and the pepsin is extracted by a process involving acid precipitation, filtration, and purification. The purified pepsin is usually available in powdered form.
- **Therapeutic Uses:** Pepsin is used in various medical and pharmaceutical applications. It is employed as a digestive aid in individuals with insufficient endogenous pepsin production.

Ques 7. Describe the followings
i) Principle and advantages of ecible vaccines
ii) Plast Terauges
iii) Allergy and plant allergens

Answer 7.

i) Edible vaccines are those which create an immune response in the body against a foreign pathogen that causes disease, have a working mechanism that serves as both a nutritive and a vaccine that we consume in our daily lives.

Principle –

- The concept of edible vaccines lies in converting the edible food into potential vaccines to prevent infectious diseases.
- It involves introduction of selected desired genes into plants and then inducing these altered plants to manufacture the encoded proteins.

Advantages of edible vaccines

- Edible vaccines are produced from inexpensive plants to cultivate, harvest, and process, which is more cost effective than traditional vaccines.
- It does not require specialized storage facilities and is easier to store and transport to remote areas.
- It can be administered orally, eliminating the need for needles and syringes to reduce the risk of infections and injury.
- Further, the edible vaccine is administered with the help of needles, reducing the risk of contamination from the blood-borne pathogen. Also, the potential for simultaneous delivery of multiple vaccines.

iii) Allergy is a medical condition characterized by an abnormal immune response to substances that are typically harmless to most people.
These substances, known as allergens, can trigger an allergic reaction in susceptible individuals.
One category of allergens is plant allergens, which are derived from various plants and can cause allergies in certain individuals. Here's some information about plant allergens and common plant-related allergies:

1. **Pollen Allergies**:
   - Pollen is a common plant allergen that can trigger seasonal allergic rhinitis, also known as hay fever.
   - When people with pollen allergies inhale or come into contact with pollen particles, their immune system reacts by releasing histamine and other chemicals, leading to

symptoms such as sneezing, runny or stuffy nose, itchy and watery eyes, and throat irritation.

- Common plants associated with pollen allergies include grasses, trees (such as oak, birch, cedar, and pine), and weeds (such as ragweed).

2. **Indoor Plant Allergies:**
   - Certain indoor plants can also cause allergies.
   - For example, molds and fungi can grow on the soil or leaves of indoor plants and release spores that can trigger allergic reactions in susceptible individuals.
   - Symptoms may include sneezing, coughing, wheezing, nasal congestion, and skin irritation. Some people may also develop allergic reactions to the sap or latex of specific indoor plants.
3. **Contact Dermatitis:**
   - Some individuals may develop contact dermatitis when they come into direct contact with certain plant allergens.
   - This condition is characterized by skin inflammation, redness, itching, and sometimes blisters. Common plant allergens associated with contact dermatitis include poison ivy, poison oak, and poison sumac.
   - Other plants, such as certain types of flowers, can also cause skin irritation in sensitive individuals.
4. **Food Allergies:**
   - While most food allergies are caused by proteins in specific foods, some individuals may develop allergic reactions to certain plant-based foods.
   - For example, peanuts, tree nuts (such as almonds, walnuts, and cashews), soybeans, wheat, and certain fruits and vegetables (such as apples, bananas, and celery) can cause allergic reactions in susceptible individuals.
   - These reactions can range from mild symptoms like itching and hives to severe reactions like anaphylaxis, which is a potentially life-threatening condition.

Ques 8.

a) Discuss cardioactive and anti-inflammatory drugs, obtained from marine source.

b) Write general identification tests for tannins

Answer 8. (a)

- Cardioactive and anti-inflammatory drugs obtained from marine sources have gained significant attention in recent years due to their potential therapeutic applications.
- Marine organisms, such as algae, sponges, corals, and mollusks, are known to produce a wide variety of bioactive compounds with diverse chemical structures and pharmacological properties.
- Some of these compounds have shown promising effects in treating cardiovascular disorders and inflammation-related conditions.
- Cardioactive drugs obtained from marine sources often target various aspects of cardiovascular health, including hypertension, arrhythmias, and heart failure.

- For instance, certain marine-derived compounds exhibit vasodilatory properties, which can help lower blood pressure and improve blood flow.
- They may act through mechanisms such as modulation of ion channels, regulation of nitric oxide production, or inhibition of angiotensin-converting enzyme (ACE), a key enzyme involved in blood pressure regulation.
- Marine organisms have yielded compounds with potential anti-inflammatory effects. Inflammation is a complex biological response associated with various diseases, including arthritis, inflammatory bowel disease, and cardiovascular disorders.
- Marine-derived anti-inflammatory compounds can inhibit pro-inflammatory cytokines, enzymes, and cell signaling pathways involved in the inflammatory response. By targeting these molecular targets, they may help alleviate inflammation and provide therapeutic benefits.
- It is a synthetic version of a peptide found in the venom of a marine cone snail species. Prialt acts as a potent analgesic by blocking specific calcium channels in neurons, reducing pain signals.

b) There are several general identification tests that can be conducted to detect the presence of tannins in a substance. Here are a few commonly used methods:

1. **Iron(III) Chloride Test**: This test is based on the reaction between tannins and iron(III) chloride. When tannins are present, they form a dark blue or green color complex with iron(III) chloride. To perform this test, add a few drops of iron(III) chloride solution to the substance or extract being tested. If tannins are present, a color change will occur.
2. **Gelatin Test:** Tannins can form complexes with proteins such as gelatin. To conduct this test, prepare a dilute solution of gelatin and add a few drops of the substance being tested. If tannins are present, a precipitate or turbidity will form due to the formation of the tannin-gelatin complex.
3. **Lead Acetate Test**: This test exploits the ability of tannins to form insoluble complexes with lead acetate. Mix a few drops of lead acetate solution with the substance being tested. If tannins are present, a yellow or brown precipitate will form.
4. **Vanillin-HCl Test:** Tannins can react with vanillin in the presence of hydrochloric acid (HCl) to produce a color change. Prepare a solution of vanillin by dissolving it in alcohol and then add a few drops of HCl. Mix this solution with the substance being tested, and if tannins are present, a pink, red, or purple color will develop.
5. **Stiasny's Test:** Stiasny's test involves the reaction of tannins with mercuric chloride. To perform this test, add a few drops of mercuric chloride solution to the substance being tested. If tannins are present, a yellow or white precipitate will form.

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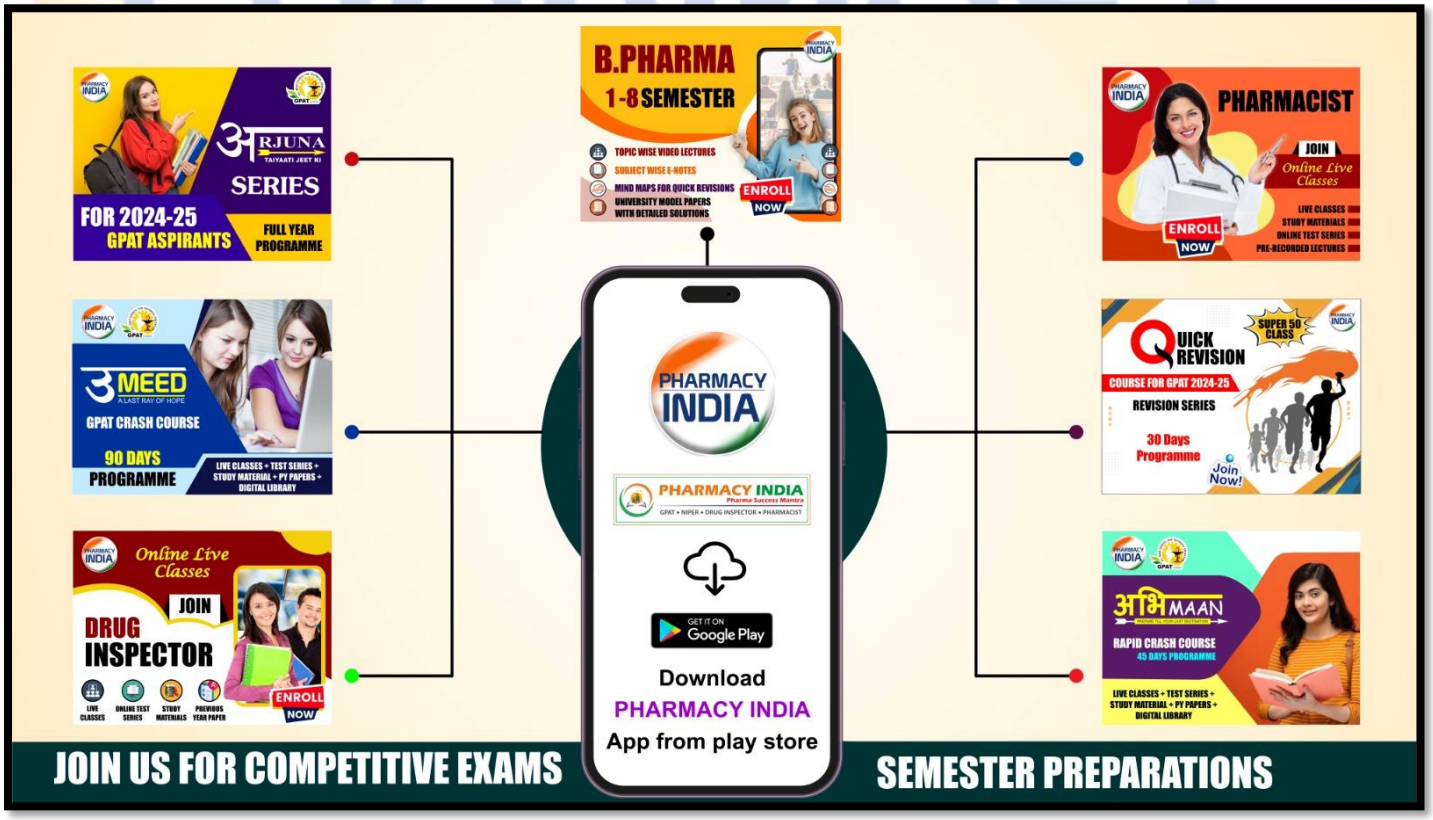

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