

1) What is evaluation? Explain various methods of evaluation briefly. (10)

⇒ Evaluation:

It is defined as the determination of identity, purity and quality of drugs.

• Identity

Exact biological source of drug.

• Purity

Absence of foreign material.

• Quality

~~Give~~ The amount of active ingredient present in drugs.

Methods of Evaluation:

(i) Organoleptic (Morphological) method

(ii) Microscopic method

(iii) Physical method

(iv) Chemical method

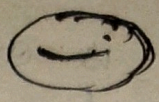
(v) Biological method

(i) Organoleptic method

→ Identification of drug by sense organs.
(color, odour, taste, touch)

→ Drugs are identified by systemic morphological character. (size, shape etc)

(1) Shape -

- Disc (Nuxvomica seed) 
- Wavy (Sarpagandha root) 

(2) Color -

Cinnamona : brown color

(3) Taste -

Sweet : Liquorice, stevia

Pungent : ginger, capsicum

Bitter : Chirata, gentian

(4) Odour -

Aromatic : Clove, Mentha, turmeric
Characteristic

(ii) Microscopic Evaluation

→ It deals with the histological study of drugs.

→ It is used for unorganized drugs because they contain cellular structure. (n)

e.g. Trichomes present in dhatura.

(iii) Physical Evaluation

→ Drugs are evaluated by their physical properties such as moisture content, melting point, boiling point, viscosity, solubility, refractive index, optical rotation etc.

→ Presence of moisture in a crude drug can lead to its deterioration. (ক্ষয়)

→ It can be determined by heating the drug at 150°C in an oven and calculate the loss of weight.

→ Compare melting point and boiling point properties of drug for evaluation.

e.g. Cocoa butter ($30-35^{\circ}\text{C} = \text{M.P}$)

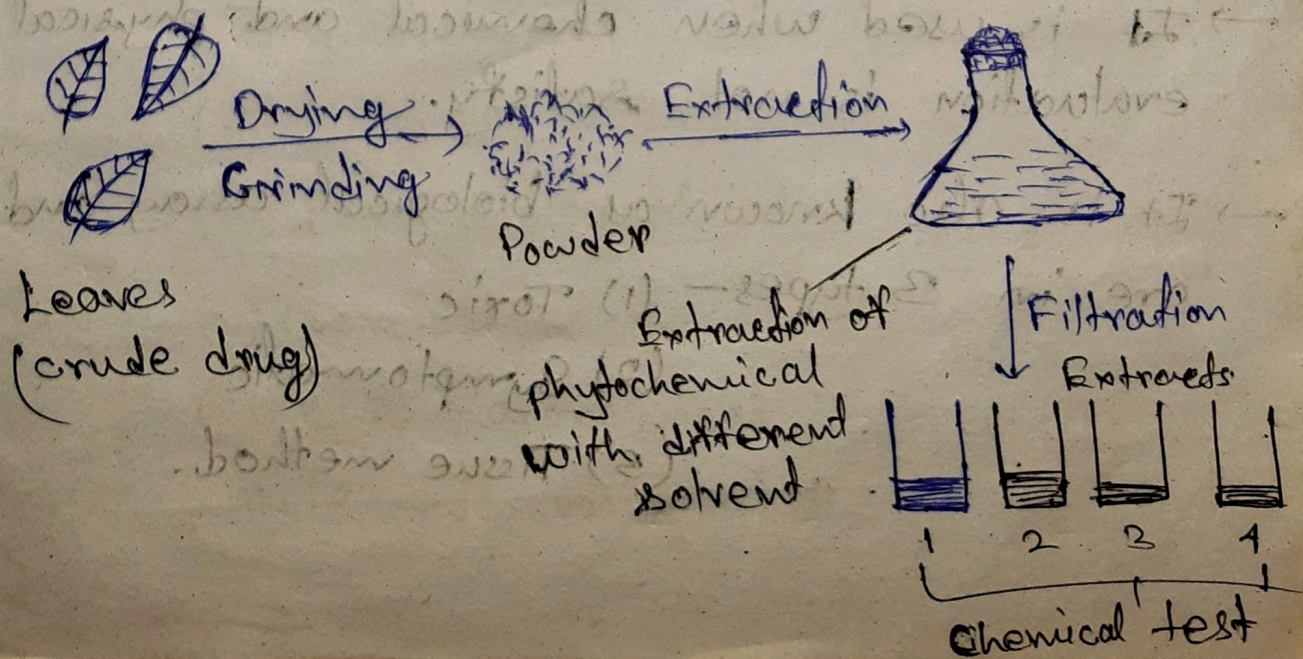
★ Ash constant —

The residue remaining after incineration of a known quantity of crude drug is known as ash content/value of the drug.

e.g. Ashoka-11.00, Ginger-6.00 etc.

(iv) Chemical Evaluation —

The drugs are evaluated with the help of chemical test.



• Methods

- Instrumental (colorimetry, fluorimetry)
- Chemical constants (acid value, iodine value)
- Individual chemical test (used for identify particular drugs)
- Microchemical tests
(carried on slides)
- e.g. Halper's test for cotton seed oil.

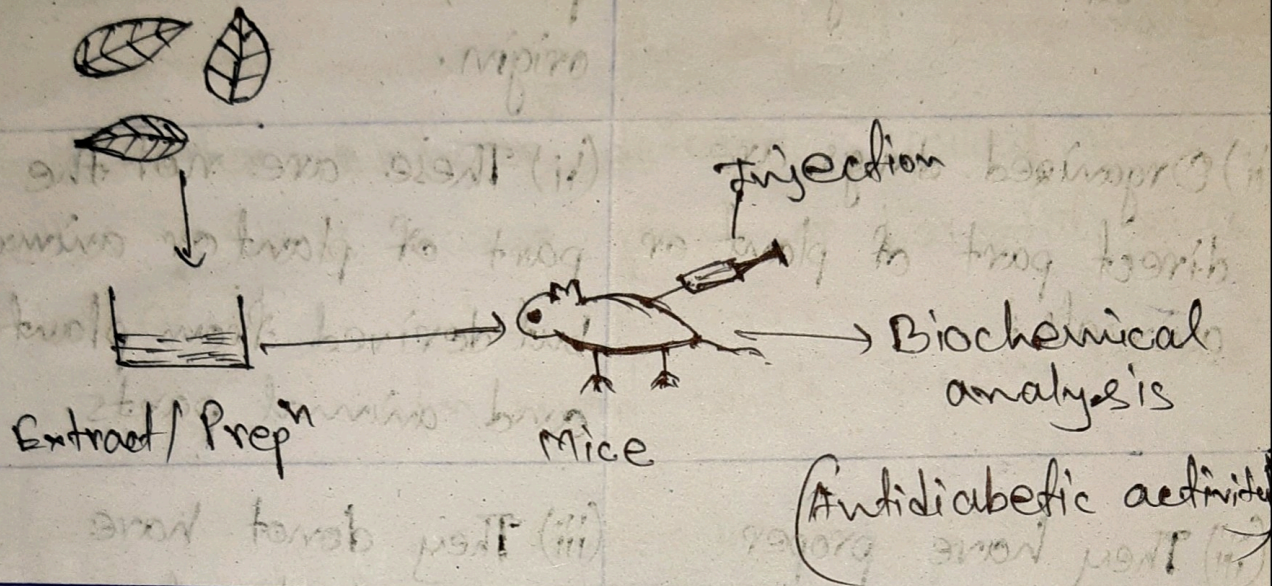
→ Qualitative chemical test include identification test for alkaloids, glycosides, tannins etc.

(V) Biological Evaluation

- It is important but costly evaluation of drugs.
- It is performed on living animals like rat, mice, rabbit, cat etc and isolated organ, tissue.
- It is used when chemical and physical evaluation is not satisfy.
- It is also known as biological assay and are in 3 types—
 - (1) Toxic
 - (2) Symptomatic
 - (3) Tissue method.

• Biological testing of Herbal drugs

Animal method Methodology Assessment of results



Q. What are crude drugs? Organized v/s unorganized drugs. (5)

⇒ Crude drugs

Those drugs which obtained from natural sources like plants, animals, minerals, marines etc.

• Classification

(i) Alphabetical classification

(ii) Taxonomical

(iii) Morphological

(iv) Pharmacological "

(v) Chemical "

(vi) Chemotaxonomical "

(vii) Sero-taxonomical "

Organized Crude Drug

i) These are of plant or animal origin.

(ii) Organized drugs are direct part of plant or animals.

(iii) They have proper cellular structure.
(contain cell)

(iv) These are solid in nature.

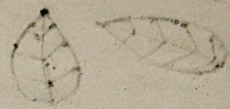
(v) These drugs can be directly used for medicinal purpose.

(vi) Generally identified by morphological character.

(vii) Microscopic character are one of important for identification.

Unorganized Crude Drug

i) These are from plant, animal or mineral origin.



(ii) These are not the part of plant or animal but derived from plant and animal parts.

(iii) They do not have cellular structure
(don't contain cell)

(iv) These are solid, semisolid or liquid in nature.

(v) Essential oil, fixed oil, fat/wax are directly used.

(vi) Generally identified by organoleptic character.

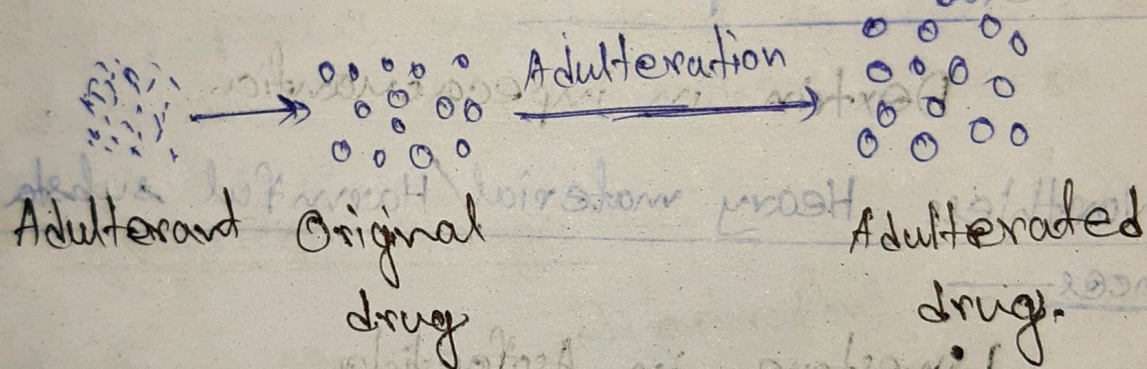
(vii) Microscopic study are not required.

Q. What is adulteration? Discuss the methods of adulteration. (5)

⇒ Adulteration — (Latin word)

Mixing the original drug material with other inferior, defective, spoiled, useless other part of same plant or harmful substances.

→ It is a Latin word which means 'Debase'.



• Types or methods of Adulteration

(i) Direct (intentional) adulteration

(ii) Indirect (unintentional) adulteration.

(i) Direct adulteration →

It is done intentionally which includes practices in which a crude drug is substituted with other products.

(1) With exhausted ~~late~~ material → Exhausted clove (without volatile oil)

(2) Artificially manufactures substances →

Yellow color Paraffin wax for Bees wax.

(3) With Synthetic chemical →
Citral in citrus oil (lemon, orange)

(4) Addition of useless part of same plant →

Stem part in senna leaves.

(5) With superficially similar looking substances

Papaya seeds in black pepper.

(6) Adulteration of powder →

Dextrin in ipecacuanha.

(7) Worthless Heavy material/Harmful substances

Limestone in Asfoetida.

ii) Indirect adulteration →

Those adulteration which sometimes occurs without bad intention of the manufacturers or supplier.

→ It can be happened →

(i) Faulty collection

(ii) Imperfect ~~prep~~ processing

(iii) In correct storage

(i) Faulty collection

Some times adulteration occurs due to carelessness of collectors.

→ In this, some other plants collected due to similarity in appearance, color and lack of knowledge.

(ii) Improper processing

Sometimes neglected drying process may lead to unintentional adulteration or any other process.

(iii) Incorrect storage

Deterioration, leads to the loss of active ingredients and production of non-active toxic metabolites.

• Adulterant

Some material which are cheap and available in large amounts and used to adulterate the original drug.

• Reason for Adulteration

→ Scarcity of the drug.

→ Expensive drug e.g. clove, cinnamon etc.

→ Similarity in morphology.

→ With the interaction of enhancing profits.

Q. Explain Lycopodium spore method in evaluation of crude drugs. (5)

⇒ Lycopodium Spore Method

- It is an important analytical technique for powder drugs.
- When chemical and other method of evaluation fail as an accurate measure of quality.
- In this method, estimation of the % of foreign organic matter in powdered form drug is possible.
- Lycopodium spores are uniform in size (25 μ) and have characterized shape and appearance.
- It has average 94000 spores/mg.
- Lycopodium spores are obtained from Lycopodium clavatum.
- e.g. Powdered clove, ginger etc.

• Procedure

Take powdered material and Lycopodium spores

↓
Dry and remove content

↓
Powdered material + Lycopodium spores
(weighed and mixed)

↓
Mixture is suspended in an appropriate viscous liquid.

↓
Examined under microscope

↓
Counted in 25 fields

↓
Repeated for 2nd similar suspension.

• Formula —

$$\therefore \text{purity of drugs} = \frac{N \times W \times 10000}{S \times M \times P} \times 100$$

Where,

N = No. of sample particles in 25 fields

W = Wt of lycopodium in mg.

S = No. of lycopodium spore in 25 fields.

M = Sample wt.

P = No. of particles present in per mg of drug sample.

2. Explain organoleptic evaluation of crude drugs with examples. (5)

⇒ Organoleptic Evaluation —

- It is defined as the study of drugs using organs of sense.
- It refers to the methods of analysis like colour, odour, taste, size, shape and special features, such as touch, texture etc.
- The initial sight of the plant or extract is so specific that it tends to identify itself.
- If this is not enough, perhaps the plant or extract has a characteristic odour or taste.
- Also with the help of gross morphology, evaluated easily.
- Leaves, flowers, fruits, seeds etc all have different morphological character and sensory characters.

e.g. (i) Shape —

• Disc : Nuxvomica seed 

• Wavy : Sarpagandha root 

(ii) Colour — Cinnamona: Brown colour.

(iii) Taste —

Sweet: Liquorice, stevia

Pungent: Ginger, capsicum

Bitter: Chirata, gerdian

(iv) Odour —

Aromatic characteristic: Mentha,
clove,
turmeric.

Q. Explain the drying methods for crude drugs.

⇒ There are 2 methods of drying of ⁽⁵⁾ crude drugs —

(i) Natural drying

(ii) Artificial drying

(1) Natural drying —

In case of natural drying, it may be either direct sun-drying in the shed.

• For e.g. ^(a) If the natural colour of the drug (clove, senna) and volatile principals of the drug are to be retained, drying in shed is preferred.

(b) If the contents of the drugs are quite stable to the temp and sunlight, the drugs can be dried in sunshine (gumacacia, fruit)

(ii) Artificial drying

→ It involves 3 types —

(a) Tray-dryers

(b) Vacuum dryers

(c) Spray dryers

(a) Tray dryers

~~The drugs which don't contain volatile oils and are stable to heat or enzymes are dried in tray dryers.~~

→ In this process, hot air of the desired temp is circulated through the dryers and facilitates the removal of water content of the drugs.

e.g. cinchona bark, tea leaves and gums are dried by this method.

(b) Vacuum dryers

The drugs which are sensitive to higher temp are dried by this process.

e.g. tannic acid and digitalis leaves.

(c) Spray dryers

Drugs which are highly sensitive to atmospheric conditions and also to the temp. of vacuum drying are dried

by spray drying method.
e.g. papaya latex, pectin, tannins etc.

2. What is evaluation? Explain microscopical and chemical evaluation of crude drugs with examples.

⇒ Evaluation —

It is defined as the determination of identity, purity and quality of drugs.

• Identity —

Identification of biological sources of the drug.

• Purity —

The range of foreign biological material present in a crude drug.

• Quality —

The amount of active ingredient present in drugs.

Microscopic Evaluation —

→ It deals with the histological study of drugs.

→ It is used for organised drugs because these drugs contain cellular structure.

→ It is mostly used for qualitative evaluation of organised crude drugs in entire and powdered forms.

- Every plant possesses a characteristic tissue feature.
- Microscope can be used to confirm the structural details of the drugs from plant origin.
- For the effective results, various stains can be used to distinguish cellular structure.
- Conc HCl give red stain with lignin.
- Mucilage is stained pink with ruthenium red.
- N/50 iodine solⁿ stains starch and hemicellulose blue.

e.g. ~~trichomes~~ trichomes present in Datura.

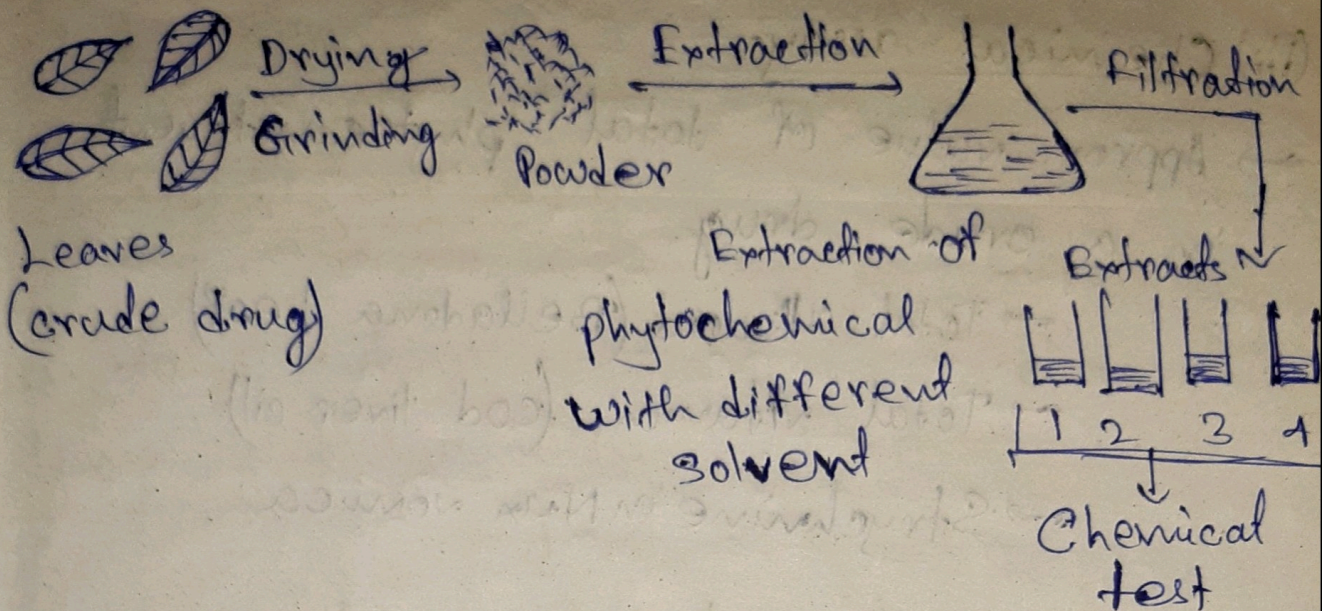
Signified trichomes in nerveonica.

Chemical Evaluation

The drugs are evaluated with the help of chemical test.

→ Chemical test ~~are~~ are in 4 types.

- (i) Qualitative test
- (ii) Quantitative test
- (iii) Chemical assay
- (iv) Instrumental analysts.



(i) Qualitative test —

→ Identification test of various phytoconstituents

- Alkaloid — Mayer's, Wagner's test
- Carbohydrates — Molisch test
- Flavonoid — Shinoda test

- Cardiac glycoside — Batjer, Legal.

~~(i)~~ (ii) Quantitative test —

→ Amount of active constituent in crude drug.

→ Saponification value (lipid)

→ Ester value and Acetyl value (volatile oil)

→ Acid value (Resin Balsam)

~~(iii) Approximate~~

(iii) Chemical assay—

→ Approx value of total phytoconstituent in a crude drug.

→ Total alkaloid (Belladonna leaf)

→ Total vitamin (cod liver oil)

→ Strychnine in *Nux vomica*

(iv) Instrumental Analysis—

→ Analysis of chemical group of phytoconstituents by chromatographic (TLC, HPLC, GC) and spectroscopic method (IR, NMR, MS)

~~•~~ e.g. Halper's test for cotton seed oil.

Q. Write a note on storage of crude drugs.

⇒ Storage is a method of proper ⁽⁵⁾ preservation of crude drug in suitable containers.

→ It is an parameter which is essential in preventing the deterioration of drugs.

* Various factors that should be considered during storage :—

⇒ Contamination—

Crude drugs may get contaminated due to their improper storage.

- The product may contaminate with dust, animal bodies, etc.

ii) Stability of drugs —

Crude drugs may be unstable when exposed to moisture, temp, light, humidity and oxygen.



So, packing of crude drugs are very important.

iii) Container —

Container used for storing crude drugs should be water proof, fire-proof, light proof etc.

iv) Moisture content —

During storage, crude drugs may absorb moisture



which increase its weight



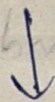
That's result decreasing the potency and quality.

e.g. Digitalis leaves should contain not more than 5% of moisture.

✓ Temperature —

Low temp should be maintained while storing the drugs.

- Optimum or high temp increase the enzymatic reaction



Decreasing the quality of product

Example of storage of drugs —

→ Acacia, in powdered form should be stored in air tight container in cool and dry place.

→ Turpentine oil is stored in light-resistant containers.

Q. Write a note on Ash value and its significance.

(5)

⇒ Ash value —

The residue remaining after incineration of a known quantity of the air dried drug, is known as the ash content of the drug.

• Contents of Ash —

Inorganic salts of carbonates, phosphates, K^+ , Ca and Mg .

e.g. Ashoka — 10.00, Ginger — 6.00 etc.

Significance of Ash value

Ash value is a criteria to judge the identity or purity of crude drug.

→ The determination of ash is useful for detecting low-grade products, exhausted drugs and excess of sandy matter.

→ Types of ash value —

- (i) Total ash
- (ii) Acid-insoluble ash
- (iii) Water-soluble ash
- (iv) Sulphated ash

→ A high ash value indicates —

- Contamination
- Substitution
- Adulteration
- Carelessness
- Preparing crude drug for marketing and manufacturing.

→ Total (ash method) is used to measure total amount of material remaining after incineration.

$$\% \text{ Total ash} = \frac{\text{Wt of ash}}{\text{Wt of sample}} \times 100$$

→ for example, If wt of ash 0.7g
• wt of sample 5g
• Total ash = $0.7/5 \times 100$
= 14% total ash value.

• What is evaluation? Explain physical method of evaluation. (10)

⇒ Physical Evaluation —

→ Drugs are evaluated by their physical properties such as moisture content, melting point, boiling point, viscosity, solubility, refractive index, optical rotation etc.

→ Presence of moisture content in a crude drug can lead to its deterioration.

→ It can be determined by heating the drug at 150°C in an oven and calculate the loss of weight.

→ Compare M.P, B.P. properties of drug for evaluation

e.g. Cocoa butter (M.P $\rightarrow 30-33^{\circ}\text{C}$)

(i) Moisture content : starch - not more than 15%.

(ii) Melting point : Wool fat $30-40^{\circ}\text{C}$

- (ii) Refractive index : clove oil $\rightarrow 1.523 - 1.523$
- (iii) Optical rotation : clove oil $\rightarrow \cancel{(-15.2)} 0 - (-15.2)$
- (iv) Foreign organic matter : Garlic not more than 2%.
- (vi) Volatile oil content : funnel - not less than 1.1%.
- (vii) Solubility : Colophony in light petroleum
- (viii) Swelling index : Ispaghula - not less than 10.
- (ix) Solvent extractive value : water, alcohol and ether soluble
- (x) Ash value : Incineration ginger : not more than 6%.
- (xi) Viscosity : Castor oil - 800 cp at 20°C

Ash value —

The residue remaining after incineration of a known quantity of the air crude drug, is known as ash content of the drug.

• Contents of Ash —

Inorganic salts of carbonates, phosphates, K, Ca, and Mg.

e.g. Ashoka - 11.00, Ginger - 6.00 etc.

Unit-2

Q. Discuss the factors affecting cultivation of medicinal plants. (10)

⇒ The factors which affect the cultivation

- | | |
|-------------------|-------------------------------|
| (i) Altitude | (iv) Rainfall |
| (ii) Light | (vi) Soil and soil fertility |
| (iii) Temperature | (vii) fertilizer |
| (in) Humidity | (viii) Pest and pest control. |

(i) Altitude —

It is a height from sea level.
Important factor for cultivation

e.g. Tea, cinchona need high altitude (1000-2000m)

- Cinnamon, cardamom (500-1000m)

- Senna can be cultivated at sea level

(ii) Light —

It influences photosynthesis, opening and closing of stomata, flowering etc.

(iii) Temperature —

It affects the growth of plants.

e.g. Cinchona → 60-75°C

Coffee → 55-70°C

Tea → 70-90°C

(iv) Humidity —

It affects in cultivation of plants.

e.g. Saffron needs only cold climate and pyrethrum requires dry weather for cultivation.

(v) Rainfall —

Majority of plants need sufficient amount of rainfall for the growth, but some plants required less such as aloe, acacia etc.

(vi) Soil —

It is the most important natural resource as it provides mechanical support, ^{nutrients} water and essential food for the development of plants.

• Soil Fertility —

The capacity of soil to supply plant nutrient and provide suitable medium for plant growth. It affects the cultivation.

(vii) Fertilizers —

These are added to the soil to supply nutrients for the growth of plants.

- Chemical fertilizers: Urea, ammonium sulphate.
- Manures: Cow dung, animal feces.
- Biofertilizers: Rhizobium, Blue green algae etc.

(iii) Pest and Pest control —

→ Pests are undesirable plant and animal species that cause a great damage to the plants.

e.g. insects, microbes etc.

→ It leads to loss of nutrients, water etc and also reduce quality.

→ To get the best quality of plant product it is very necessary to control the pests.

Q. Discuss the role of cytokinin and abscisic acid in plant growth regulation. ⑤

⇒ # Cytokinin:

Cyto → Cell

Kinin → Division

• Def →

→ It is a plant hormone which promote cell division.

→ They contain purine ring in its structure.

• Functions —

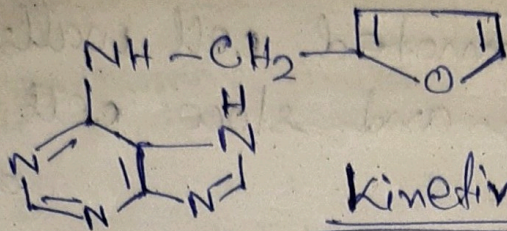
→ Stimulation of cell division

→ Release and induced bud formation

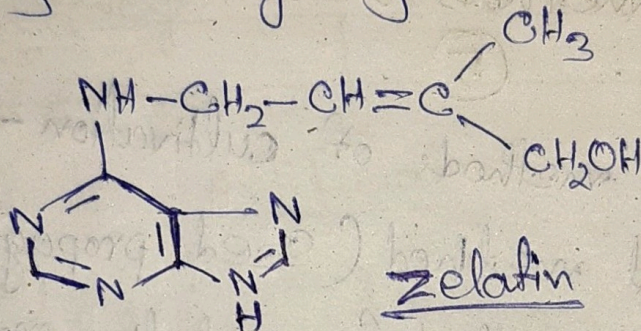
→ Development of embryos during seed development

• Types and examples

→ Synthetic derived - kinetin



→ Naturally occurring cytokinins : Zelenin



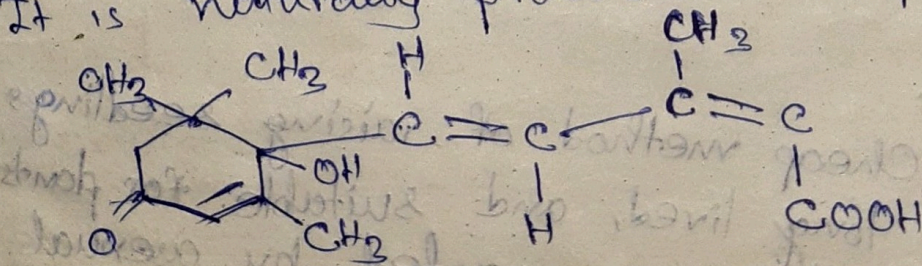
Abscissic acid : (ABA)

→ It is a plant hormone which promotes leaf detachment, induced seed and bud latency and inhibits germination.

→ It is a natural plant growth inhibitor.

→ It also helps to enhance stress conditions like mineral deficiency, injury etc. also called as "stress hormone".

→ It is naturally produced in plant tissue.



• Functions

→ Control of water and ion uptake by roots.

→ Seed and bud latency.

→ Closing of stomatal aperture and abscission of leaves.

→ Inhibit auxin promoted cell walls acidification loosening and slow cell elongation

2. Explain the methods of cultivation with merits and demerits. (5)

⇒ There are 2 methods of cultivation —

(i) Sexual method (Seed propagation)

(ii) Asexual method (Vegetative propagation)

(i) Sexual method —

Seed Propagation

Broad casting

↓
[Scattering of extremely small seeds]

e.g. Linseed, Isabgol

Dibbling

↓
[Sowing of large size seeds into holes method]

e.g. Papaya, castor.

• Merits —

Cheap method of raising seedlings which are long lived, and suitable for plants which cannot be propagated by asexual method.

• Disadvantages —

Time consuming and costly as to grow seedlings first and then actual plant, poor uniformity in yield of seedlings.

(ii) Asexual method —

Vegetative propagation

Natural

- Bulbs (garlic)
- Tubers (aconite)
- Offsets (aloe)
- Corms (saffron)
- Rhizomes (ginger)
- Root (banana)
- Stolons (Licorice)

Artificial

- Cutting (rose)
- Layering (Lemon)
- Grafting (mango)

Tissue culture

- Labs developed culture of banana.

• Merits —

Uniformity in yield and other characters, fast in growth, seedless, nutrient improved our disease resistant varieties can be obtained.

• Demerits —

Poor adaptability to climatic changes and hence short lived.

Q. Write a note on different types of soil and soil fertility. (5)

Soil

⇒ Soil is the top cover of earth and it is most important resource as it supports growth of all plants.

→ It contains minerals, organic matter, water etc.

→ It also contains macro and micro nutrients and help in the growth of the plant.

→ Plant growth depends upon following factors of soil —

- Physical arrangement
- Nature of soil particles
- Organic matter content
- Types of organism present in the soil.

Fertility of soil

It is the capacity of soil to provide nutrients to the plant in adequate amount and in balance proportions.

→ It can be maintained by addition of animal manures, nitrogen, by application of chemical fertilizers.

→ A soil can be fertilize if it has —

- Good variety of minerals and organic matter.

- High percentage of capillary water content
- High nutrient handling capacity
- Good aeration.

Q. Define mutation, and polyploidy. Explain their application in improving the quality and quantity of medicinal plants. (10)

⇒ Mutation —

- It is the permanent alteration in the genetic material of an organism.
- It gives rise to a new genetic changed genotype.
- A cell which shows the effect of mutation is called as 'mutant' and the agent which cause mutation is known as 'mutagens'.

• Types — 3 types —

(i) Spontaneous ~~mutation~~

(ii) Point

(iii) Frameshift

(i) Spontaneous mutation —

It occurs due to some unknown reason from nature.

e.g. in plants, bacteria, virus etc.

(ii) Point mutation —

It also called as base substitution. It is the result of substitution of a single nucleotide in a different nucleotide.

(iii) Frameshift mutation

It results from an addition or loss of one or more nucleotides in a gene and it termed as deletion/insertion mutation.

• Applications —

→ Mutation affect the chemical composition of medicinal plants are imp. to pharmacognosy.

→ Useful for a new chemical variety and resistance to disease.

→ Capsaicin content is Ted in capsicum using ~~ch~~ mutagens.

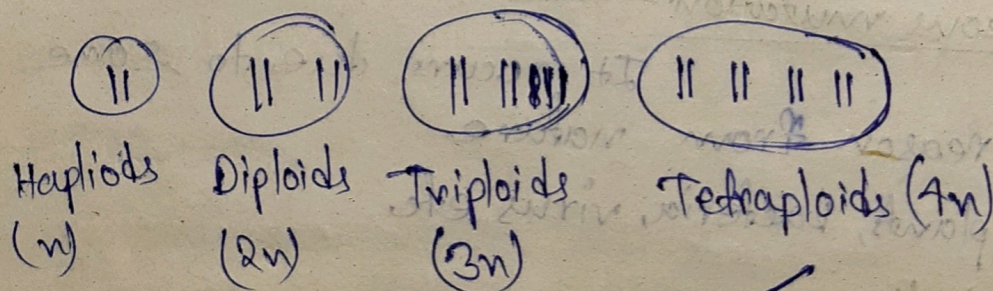
→ Ionization radiation is used to treat the seeds for crop improvement.

Polyploidy —

Poly → Many

Ploidy → Pair of chromosomes.

→ A cell having more than 2 set of chromosomes is known as polyploidy.



↓
Normal
condition

Polyploids

• Classification —

On the basis of their chromosomal composition —

(i) Euploids

(ii) Aneuploids

(i) Euploids —

Eu → Even, Ploids → Genome

→ When a cell has one or more than one complete set of chromosomes.

→ 2 types —

(a) Autopolyploidy (polyploidy b/w same species)

(b) Allopolyploidy (polyploidy b/w different species)

(ii) Aneuploidy —

The abnormal condition where chromosomes complement are not exact multiple and there is addition or loss of 1 or 2 chromosomes.

→ 2 types —

(a) Hypoploidy (no. is less) = $(2n-1)$

(b) Hyperploidy (no. is more) = $(2n+1)$

• Applications —

→ It has greater significant to medicinal plant

→ It may cause formation of new species.

→ Polyploidy plants are healthier, stronger, and larger than their diploid counterparts.

→ Increase morphine conⁿ in opium

→ It also increase in tropane alkaloids in belladonna, cinchona etc.

→ It increase yield of secondary metabolites in plants.

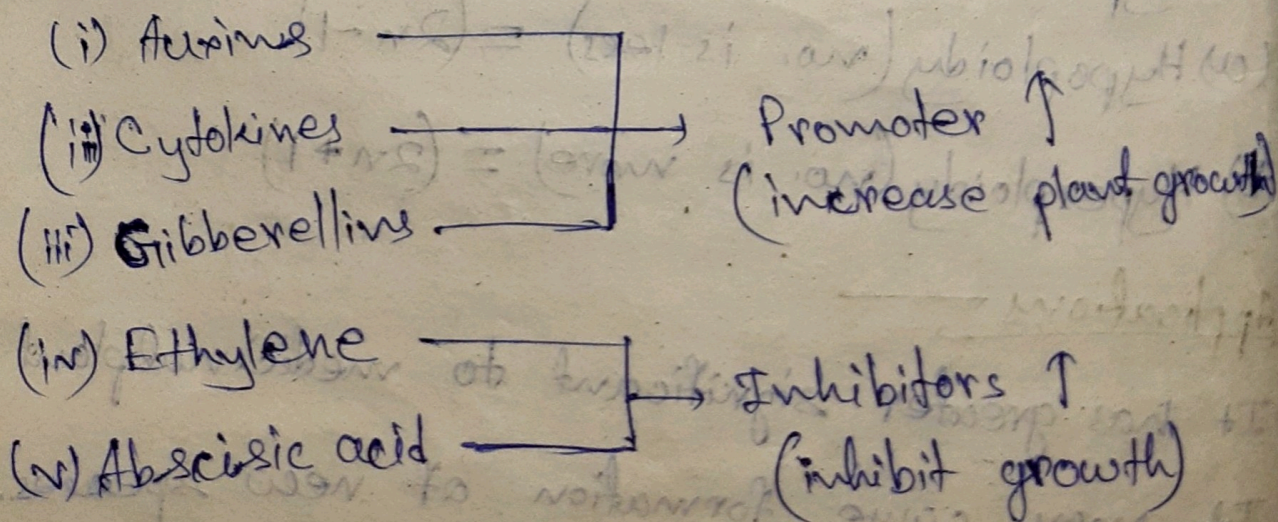
Q. Plant hormones and their applications. (5)

⇒ Also known as plant growth hormone, phytohormones or growth bioregulators.

• Def — These are those chemical substances which are responsible for the growth of plant and also control its physiological process.

• Types —

There are 5 types of hormones —



(i) Applications of Auxins

- Auxin enhanced cell elongation and stem elongation.
- It promote xylem differentiation
- It also promote leaf growth, fruit growth etc.

(ii) Cytokinin

- Stimulation of cell division
- Release and induced bud formation
- Development of embryos during seed development.

(iii) Applications of Gibberellins

- It promote flowering, seed germination and stem elongation
- Able to produce morphological changes in plants.
- It also ↑ in the size of leaves.

(iv) Applications of ethylene

- It promotes fruit ripening and leaf abscission
- At low concⁿ sometimes it promote growth but at higher always inhibit growth
- It can increase cell expansion

(v) Applications of Abscissic acid

- Control of water and ion uptake by roots.
- Seed and bud dormancy.
- Closing of stomatal aperture and abscission of leaves.

Q. Define polyploidy and hybridization. Explain their applications. (10)

⇒ (Polyploidy explained before)

Hybridization

- It is defined as the natural or artificial process that result in a formation of hybrid.
- Hybrid plant result from crossing of 2 species or varieties differing at least in one set of character.

• Types

- Intra-varietal hybridization
- Inter-varietal hybridization
- Inter specific hybridization

• Procedure

Selection of parent plant

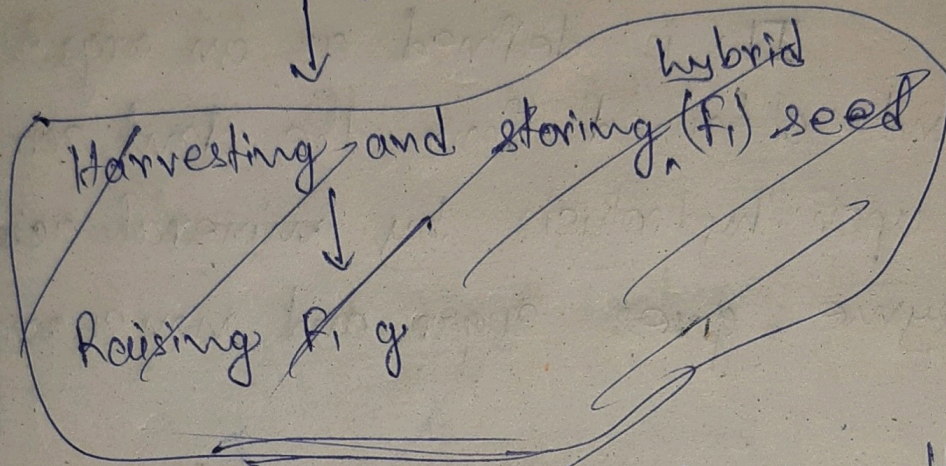
Emulsification

[Removal of stamen from female parent, hand, hot water treatment, alcohol]



↓
Bagging and Tagging (vegetable parchment bag, butter paper, fine cloth)

↓
Crossing (Artificial cross pollen action)



↓
Collect (seeds from mother plants and grow better offsprings)

• Applications

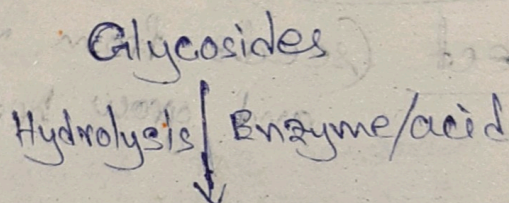
- Improve yield and quality of crop.
- Provide resistance to disease and insect.
- Seedless varieties of crop.
- Improve fruit size and storage capability of plant.

UNIT-4

Q. Define, classify glycosides and write the chemical test for glycosides. (10)

⇒ Def —

It is defined as an organic compound obtained from the plant source which upon hydrolysis by mineral acid or enzyme gives sugar and non sugar moiety.



Sugar + Non-sugar
(glycon) (aglycon)

e.g. Aloe, senna, rhubarb, vanilla, mustard etc.

Classification —

↳ Based on linkage : —

(i) O-glycosides —

Sugar-O-Non sugar

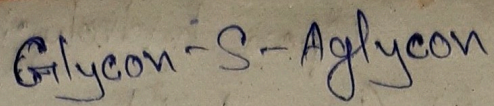
e.g. Rhubarb, senna

(ii) C-glycosides —

Sugar-C-Non sugar

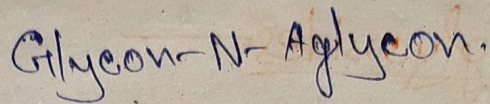
e.g. Aloe, Cascara

(iii) S-glycosides —



e.g. Mustard.

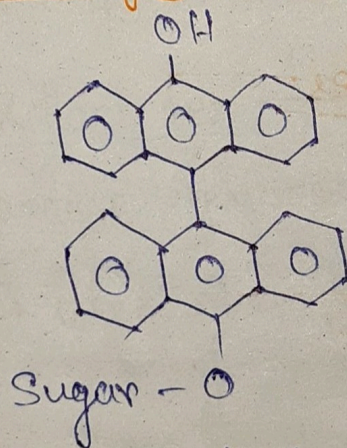
(iv) N-glycosides —



e.g. Nucleosides.

2) Based on chemical nature: —

(i) Anthracene glycosides —

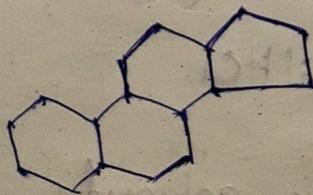


e.g. Aloe, senna, rhubarb.

(ii) Saponin glycosides —

e.g. Liquorice, ginseng

(iii) Steroid/cardiac glycosides —



e.g. Digitalis, squill.

(iv) Cyanogenetic glycosides —

Upon hydrolysis it gives
hydrocyanic acid (very toxic)
e.g. Bitter almond.

(v) Aldehyde glycosides —

e.g. Vanillin

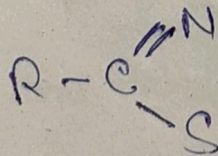
(vi) Phenolic glycosides —

e.g. Bear berry.

(vii) Flavanoid glycosides —

e.g. Citrus.

(viii) Isothiocyanate —



e.g. Black mustard

Chemical test for glycosides —

→ Born Trager's test —

→ Used to identify O-glycosides

Sample + dil HCl

↓

Add an organic solvent

↓

Add NH_3 /alkali.

↓
Aqueous layer shows pink colour because
of the presence anthraquinone

ii) Modified Born Trager's test —

→ Used to identify C-glycosides.

Sample



Treated with $\text{FeCl}_3 + \text{dil HCl}$



Add organic solvent.

iii) Killer Killari test —

→ For cardiac glycosides.

Drug + alcoholic extract



Evaporate to dryness



The above is extracted with chloroform



Few drops of acetic anhydride



Add conc H_2SO_4



Add glacial acetic acid



Add FeCl_3

↓
Add H_2SO_4

↓
Reddish brown colour

↓
Turns to bluish green because of digitonin

(iv) Test for saponin glycosides —

1) Drug in 20 ml water

↓
Shake

↓
foam (stable for 1-2 mins)

2) A drop of blood on slide + drug solⁿ

↓
RBC is ruptured.

Q. Define volatile oils. Classify them with example and give their properties. (5/10)

⇒ volatile oils —

→ Oils which are volatile in ordinary room temperature.

→ Also called as essential oil.

→ It contains N-number of isoprene units

Mol formula = C_5H_8

→ These are the mixture of terpenes and terpenoids.

Classification

• Based on isoprene units:

i) Monoterpene — $(C_5H_8)_2$

ii) Sesquiterpenes — $(C_5H_8)_3$

iii) Diterpenes — $(C_5H_8)_4$

iv) Polyterpenes — $(C_5H_8)_n$

• Based on functional group:

i) Alcohol — Menthol, sandalwood

ii) Aldehyde — Cinnamon, lemon pee, orange pee

eg. citral

iii) Ester — Mustard

iv) Hydrocarbon — Black pepper

v) Oxide — Eucalyptus

vi) Ketone — Spearmint

~~vii) Phenyl ether — Fennel~~

viii) Phenol — Clove

Biological source

Mainly it is present in plants and animals.

Properties —

i) Solubility —

- Insoluble in water
- Soluble in organic solvents, alcohol, and fixed oils

ii) Optical activity —

- Volatile oils are optically active

iii) Oxidation —

- Oxidized by oxidizing agents.

iv) Temperature —

- Evaporating at normal room temperature.

Q. Elaborate on Ayurveda and Unani system of medicine.

(10)

⇒ Ayurveda system of medicine —

Ayur → ~~Science~~ Life Veda → Knowledge

→ 'Science of life' is called as Ayurveda

→ It is contributed by Indians usually Aryans.

→ Scientist : Charaka, Sushruta

• Panchamahabhutas —

whole universe is made up of 5 elements, those are —

(i) Liquid → Water/gel

(ii) Solid → Earth

(iii) Air → Vayu

(iv) Fire → Agni/energy

(v) Space → Akash

• Tridosha —

3 humors are called tridosha.

(i) Vata (gas problem) → Air + Space

(ii) Pitta (high metabolism) → Liquid + Fire

(iii) Kapha (high cough) → Solid + Liquid

• Sapthadhatu —

(i) Rakta → Blood

(ii) Rasha → Lymph

(iii) Medha → Fat

(iv) Majja → Nervous system

(v) Sukra → Reproductive system

(vi) Asthi → Bones

(vii) Manasa → Muscles

Wear and tear (physical activity) of these
saptadhatu —

Excretory material



(i) Mala → feces

(ii) Mutra → urine

(iii) Sweda → sweat

→ If vata, pitta, kapha is balanced, the human body is healthy.

→ for example,

Kapha ↑ (unhealthy condition)



Give a drug to ↓ kapha

Branches in Ayurveda —

(i) Kaya Chikitsa → General medicine

(ii) Shalya Chikitsa → Surgery

(iii) Kumara bhritya → Paediatric

(iv) Agada Chikitsa → Toxicology

(v) Shalyaka Chikitsa → ENT (ear, nose, tongue)

Dosage forms

(i) Churna

(iv) Lehya

(ii) Kalka

(v) Arista

(iii) Gutika

(vi) Asava

Unani System of Medicine

- Originated from Greece. ↖ Other scientist ↗
- Greek Philosopher; Galen, Aristotle, Avicenna
 ↖ Hippocrates ↗
- This system of medicine is introduced in India by Arabians, mainly Muslims.
- This system is mainly used in India and Ayurveda also.

Principles

It involves 2 theory.

Hippocrates theory

For 2m also

According to Hippocrates, the elements, temperaments and humors, if all are in balanced, then the mind and the person is healthy.

→ Four humors involves in this theory

(i) Dhum → Blood (Hot and moist)

(ii) Balgham → Phlegm (Cold and moist)

(iii) Safra → Yellow bile (Hot and dry)

(iv) Soada → Black bile (Cold and dry)

→ This 4 humors are distributed in body balance, Healthy.

2) Pythorian theory —

For 2m also

They tells about proximate qualities are in living body.

→ Any living system will be having four proximate qualities —

(i) Hot → Fire

(ii) Cold → Earth

(iii) Dry → Air

(iv) Moist → water

→ Fire, earth, air and water are represented by elements.

To prevent disease, there are 6 essentials.

(i) Food

(ii) Drink

(iii) Air

(iv) Bodily movements

(v) Sleep and wakefulness.

(vi) Excretion and retention.

Treatment — (Ilijabit / Hajbit)

(i) Ilijabit tadbeer

(iv) Jarahat

(ii) Ilijabit ghiza

(iii) Ilijabit dawa

(i) Ilijabit tadbeer —

Regimental therapy (without drugs)



Exercise, massage, vomiting

(ii) Ilijabit ghiza —

Diet therapy



Quality and quantity of food is monitored.

(iii) Ilijabit dawa —

Pharmacotherapy

(iv) Jarahat —

Surgery

Diagnosis —

It is done by examination of pulse, urine, stools.

Medicines —

• Madar

• Gilo

• Kabab chivini

• Lodh

• Kalth

• Tagar

• Qust

2. Define alkaloids. How are they classified?
Give examples of chemical classification
of alkaloids. (10)

⇒ Alkaloids —

These are the basic organic compounds obtained from plant or animal source and contains one or more N_2 in its heterocyclic ring which has physiological action in lower dose in humans or animals.

e.g. Caffeine, atropine

Function —

- It acts as source of N_2 .
- It may be helpful in growth and development of plants.
- Avoid grazing of animals.
(negotiate)

[Add chemical test also
written in next page]

Classification —

• Chemical Classification : —

<u>Name</u>	<u>Example</u>
(i) Pyrrolidine	→ Hygrine, Cusco hygrine
(ii) Pyridine	→ Arecoline, Ricinine
(iii) Pipyrindine	→ Lobeline, Conine
(iv) Tropane	→ Atropine

<u>Name</u>	<u>Example</u>
(v) Quinoline	Quinine
(vi) Isoquinoline	Morphine
(vii) Aporphine	Boldine
(viii) Nortupinone	Lupinine
(ix) Indole	Reserpine, viscristine, vinblastine
(x) Imidazole	Pilocarpine
(xi) Purine	Caffeine
(xii) Amino alkaloids	Ephedrine.

Q. Citrus bioflavonoids ②

- These are the compounds found in citrus fruits like oranges, grapes.
- They can be taken individually or in a combination.
- It is used to improve blood flow and easy swelling in body.
- They can be taken as a pill or powder.

Q. Gold beater skin test ②

Ox intestine
 ↓
 Soaked in HCl
 ↓
 Rinse with distilled water + Tannin solution
 ↓

↓
Add 1% FeCl_3 solution

↓
Brown/bluish black colour

↓
Indicates tannins as positive

Q. Killer Killani test ←

(2)

Drug + alcoholic extract

↓
Evaporate to dryness

↓
The above is extracted with chloroform

↓
few drops of acetic anhydride

↓
Add conc H_2SO_4

↓
Add glacial acetic acid

↓
Add FeCl_3

↓
Add H_2SO_4

↓
Reddish brown colour

↓
Turns to bluish green because of digitoxin

Q. General test for Alkaloids

(i) Dragendorff's test —

Potassium bismuth iodide

↓
Red brown colour ppt

(ii) Mayer's test —

Potassium mercuric iodide

↓
Cream colour ppt

(iii) Wagner's test —

Iodine in Potassium iodide

↓
Red brown ppt

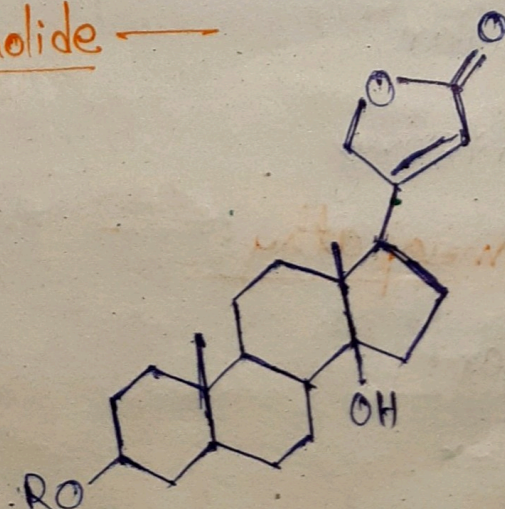
(iv) Hanger's test —

Pilonic acid

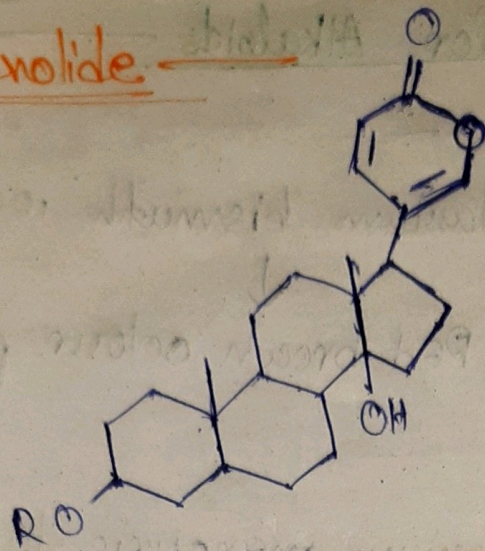
↓
Yellow colour ppt.

Q. Structure of cardenolide and bufadenolide. (2)

⇒ Cardenolide —



Butedexolide



Q. Stage/Wuxing/5 elements of Chinese system of medicine. (2)

- ⇒
- (i) Wood → Liver/Gallbladder
 - (ii) Fire → Heart/Small intestine
 - (iii) Earth → Spleen/Stomach
 - (iv) Metal → Lungs/Large intestine
 - (v) Water → Kidney/Bladder

Q. Write a short note on homeopathy system of medicine. (5)

- ⇒
- 'Homeo' → Similar
 - 'Pathy' → Suffering

Principles of homeopathy

- (i) Law of similarity
- (ii) Law of simplex
- (iii) Law of minimum dose

- (iv) Law of dynamization and potentiaization
- (v) Law of ~~ionization~~ individualization
- (vi) Law of vital energy

(i) Law of similarity

Similar Similibus Curentur

↓ means

Like cure likes

(ii) Law of simplex

- 'Simple' means 'single dose'
- Single dose is used to cure a disease
- More dose can cause disturbance in curing pattern.

(iii) Law of minimum dose

Lesser the dose, more the effect of the drug.

(iv) Law of dynamization and potentiaization

- Dynamization works on dilution.
- This system require more dynamization of the drug

Mother tincture [water/alcohol/
Lactose]

↓ diluted

Centicimal or decimal

Dilutions — $\times 10$

$\times 100$

$\times 1000$

$\times 10,000 \rightarrow$ More potential.

(v) Law of individualization —

When two diseases are similar but the treatment is individual,

(vi) Law of vital energy —

$\rightarrow$ Development of will power from the internal part of the body, which helps to cure.

$\rightarrow$ It is also used as a drug.

Advantages —

$\rightarrow$ Anybody can take homeopathy

$\rightarrow$ Helpful for children

$\rightarrow$ No side effects

$\rightarrow$ Easy to handle

Disadvantage —

$\rightarrow$ Remember to take the dose within time interval.

Q: Shinoda test —

Alcohol solution of flavone + Mg/Zn



Orange/red/violet colour

Q: Borntrager's test — Used to identify

Sample + dil HCl o-glycosides



Add an organic solvent



Add NH_3 /alkali



Aqueous layer shows pink colour because of the presence of anthraquinone

UNIT-5

Q. Write the method of preparation and uses of Papain. (5)

⇒ Biological source

It is the mixture of proteolytic enzymes obtained from the latex of unripe^{pen} fruits of *Carica papaya*,
Family: Caricaceae.

Method of Preparation

The latex is collected by making shallow incision of the unripe^{pen} papaya with 1 incision



The latex freely flow for few seconds and gets coagulated.



These latex are collected on trays



Coagulated lumps are dried in sun or by artificial heat below 55°C



Incisions are made weekly at intervals.



Coagulated lumps are treated with potassium metabisulphide 5mg/kg of latex, as a process

of purification

↓
Then passed through sieves and the latex is dried in vacuum at 55°C or it may also be spray dried to get a fine powder.

↓
Powders are stored in air tight containers at low temperature.

Uses →

- As a digestive enzyme
- Prepⁿ of cheese
- In detergents
- In the clarification of beer
- To clean the contact lenses

Q. Give the biological source, preparation and uses of Gelatin. ⑤

⇒ Gelatin contains n-number of proteins.

Biological source →

It is a protein obtained by skin, bone, connective tissue of domes-tic animals.

e.g. Ovis ariss (sheep)

family → Bovidae

Preparation

Bones are defatted and decalcified with organic solvents and mineral acids



The obtained product is treated with water at 85°C



Collagen dissolves into gelatin



It is further bleached and concentrated under low pressure and allow to set in shallow trays.



It is dried in drying room to eliminate moisture.

Uses

→ Used to manufacture hard and flexible capsule shells.

→ In the prepⁿ of suppositories, passaries and pastes.

→ In the treatment of —

- Brittle finger nails

- Non-mycotic defects of nails

Q. Give the biological source, method of prepⁿ and uses of bees wax. (5)

or,
Discuss beeswax under suitable pharmacognostic schemes. (5)

⇒ BEE SWAX

Biological source —

It is a purified wax obtained from the honey comb of the bees Apis mellifera and other species of Apis.

Family: Apidae

Preparation —

The comb and capping of honeycomb is broken and boiled in soft water



These are then enclosed in a porous bag to keep under water.



The boiling cause destruction of the wax which is collected outside the bag and form a cake after cooling.



The debris on outer surface is removed by scrapping



↓
Beeswax is purified by heating in boiling water.

* This process is repeated several times and finally wax is obtained.

Uses —

- In the preparation of ointments, plasters, polishes.
- To manufacture candles and moulds.
- In dental industries
- In the preparation of cosmetics like lipsticks, face creams.
- It an ingredient for paraffin ointment IP.

Q Give the biological source, chemistry, method of preparation of serratiopeptidase (5)

⇒ Biological source —

It is a proteolytic enzyme obtained from the bacteria belonging to genus *Serratia*, which is present in the gut of silk worm.

Chemistry —

- It is a very effective bacterial enzyme.

→ It has better effects than trypsin and chymotrypsin.

Preparation —

Serratiopeptidase is a proteolytic enzyme



It is present in the silkworm intestine and allows the emerging moth to dissolve its cocoon.



It is produced by purification from culture of Serratia E-15 bacteria.

Uses —

- Used as anti-inflammatory enzymes.
- Acts as fast wound healing agent.
- Used to treat rheumatoid arthritis and osteoarthritis.

Q What are proteolytic enzymes? Discuss the preparation of bromelain. (5)

⇒ Proteolytic enzymes —

Those enzymes that break down proteins.

- These enzymes are made by plants, animals, fungi and bacteria.
- They help in digestion, pain, swelling and healing of skin wounds.

e.g. Bromelain, papain, trypsin, chymotrypsin etc.

Bromelain

Biological source —

It is a mixture of proteolytic enzymes obtained from the stem and ripen fruits of pineapple plant,
(stem)

Ananas comosus

Family — Bromeliaceae

Method of Preparation —

Fruits were cut into small pieces, weighed and macerated (~~for 24 hr~~) and juice was obtained



Juice was pressed and filtered through cheese cloth.



pH of the juice was adjusted to 6



Ammonium sulphate was added until saturation to precipitate the enzyme



Partial purification was done by redissolving crude enzyme in NaCN and repeatedly precipitating it, firstly with 0.6% ammonia

sulphate and then with acetone.

↓
The precipitate is thoroughly washed with acetone and ether and dried in vacuum oven at low temperature.

Uses —

It is used in the treatment of soft tissue inflammation and oedema due to surgery and injury.

✓
Q. Give the biological source, preparation and uses of honey. (5)

⇒ Biological source —

It is a sugar secretion deposited on the honey comb by Apis mellifica

→ Apis dorsata is another species of Apis.

Family → Apidae

Preparation —

Honey comb is smoked to remove honey bee



The nectar of the flower contains —

• 25% sucrose

• 75% water

} watery solution



↓
The worker bee sucks the nectar through a hollow tube, saliva of honey bee having invertase enzyme which converts sucrose into glucose and fructose

↓
The collected nectar is partially utilized by honey bee and rest of it will be stored in the abdomen of honey comb.

↓
The remaining honey is stored in honey comb

↓
Smoke the honey comb

↓
Apply mechanical pressure to remove the honey comb

↓

- Heat the honey at 85°C
- Cool the honey ~~to~~ immediately

} Avoid Fermentation

↓
Strain the honey to remove wax and other impurities (using wet cloth)

↓

↓

The density of the honey is 1.15 and density is reduced by adding some water and it is packed, stored in air tight container.

Uses —

- Used as a very good nutrient —
 - Paediatric
 - Geriatric
- As a protectant
- As a demulcent.
- In burn
- In cosmetics
- In Ayurveda formulation
- In the prepⁿ of syrup
- As sweetening agent

2 Marks

Q

Give the source and uses of bromelain.

⇒ Biological source —

It is a mixture of proteolytic enzymes obtained from the stem and ripen fruits of pineapple plant, Ananas comosus.

Family : Bromeliaceae

Uses —

It is used in the treatment of soft tissue inflammation and oedema due to surgery and injury.

Q. Surgical dressing —

It is a sterile pad applied to a wound to promote healing and protect the wound from further harm.

→ It is designed to make direct contact with the wound, as bandage.

Q. Give the biological source, chemistry of an antileprotic drug.

⇒ Chaulmoogra oil is an antileprotic drug.

Biological source —

It is obtained from the oil of the seeds of Chaulmoogra odorata.

Family → Flacourtiaceae

Chemistry —

Esters of unsaturated fatty acids of —

- Chaulmoogric acid (27%)

- Hydrocarpic acid (48%)

- Glycerides of palmitic acid

Q. Name any four anti-inflammatory agents from marine source.

- ⇒
- (i) Steroids
 - (ii) Alkaloids
 - (iii) Proteins
 - (iv) Fatty acids
 - (v) Polysaccharides
 - (vi) Diterpenes

Q. What are proteins? Give one general test for proteins.

⇒ Proteins —

Protein is a complex with high molecular weight organic compound that consists of amino acids joined by peptide bonds.

General test for proteins —

(i) Biuret test —

Protein + CuSO_4 solution (blue colour)

↓

Formation of a violet coloured complex

Chemical test for acacia, agar, tragacanth

⇒ <u>Tests</u>	<u>Acacia</u>	<u>Tragacanth</u>	<u>Agar</u>
(i) <u>Solubility test</u> — Sample + water and boil	Does not form stiff jelly after cooling	Does not form stiff jelly after cooling.	Forms stiff jelly after cooling
(ii) <u>Ruthenium red</u> <u>test</u> — Sample solution + Ruthenium red	No pink colour	No pink colour	Pink colour
(iii) <u>Iodine test</u> — Sample solution + Iodine solution	No blue/ black colour	Green colour	Crimson to brown colour.
(iv) <u>Lead acetate</u> <u>test</u> — Sample solution + Lead acetate	No ppt	white colour ppt	No reaction -on.
(v) <u>BaCl₂ test</u> — Sample solution + dil HCl + BaCl ₂ reagent	No white ppt	No reaction	white ppt.
(vi) <u>FeCl₃ test</u> —	No bluish black colour	Yellow colour	No reaction

Q. Chinese system of medicine. (2)

- ~~Majorly~~ It was developed b/w 200 BC - 400 AD
- Majorly it depends on deep understanding of nature.
- It consists of 5 basic elements —
 - Earth
 - Fire
 - Water
 - Metal
 - Wood
- 'Yin' and 'Yang' denotes the dark side and light side of the valley.
 - Yin → Front side
 - Yang → Back side
- It is also known as,
 - Yin → Abdomen part
 - Yang → Chest part
- There should be harmony b/w 'Yin' and 'Yang' in healthy person.

Treatment —

Acupuncture