

PHARMACOGNOSY & PHYTOCHEMISTRY-II

(BP-504T)

B. PHARM Vth SEM.

UNIT-II

Shailish Pathak

* ALKALOIDS:-

The term alkaloid derived from the word alkali-like, originally the term was used to describe any nitrogen containing base.

- The term alkaloid was coined by Meissner, a German Pharmacist in 1819.
- An Alkaloid is a nitrogenous organic molecule that has a pharmacological effect on human and animal.
- They occur naturally in seed bearing plant and are found in berries, bark, fruit, root & leaves.
- Alkaloids are found as secondary metabolites in plants (eg. Vines & Shutter), animal (shellfish) and fungi and can be extracted from their sources by treatment with acid.
- There are main three types of alkaloid.
 1. True alkaloid
 2. Proto alkaloid
 3. Pseudo alkaloid

① True alkaloid:- True alkaloid derived from amino acid and they share a heterocyclic ring with nitrogen.

- These alkaloids are highly reactive substances with biological activity even in low doses. All true alkaloid have a bitter taste and appear as a white solid, with the exception of nicotine which has a brown liquid.
- True alkaloid form water soluble salts.
eg. cocaine, quinine, dopamine & morphine.

(2) Protoalkaloids:- Proto alkaloids are compounds in which the N-atom derived from an amino acid is not a part of the heterocyclic. Such kinds of alkaloid include compounds derived from L-tyrosine, L-tryptophan, ex- Hordenine, mescaline & yohimbine.

(3) Pseudoalkaloids:-

Pseudoalkaloids are compounds the basic carbon skeletons of which are not derived from amino acid. In reality, pseudoalkaloids are connected with amino acid pathway.

- They are derived from precursor of amino acid. Ex- ephedrine, solanidine, caffeine and theobromine.

⇒ Atypical alkaloids also known as non heterocyclic alkaloids and contain nitrogen in aliphatic chain.

⇒ Typical alkaloids are also known as heterocyclic alkaloids and contain nitrogen in heterocyclic ring system.

Chemical classification

(1) True alkaloids (Heterocyclic alkaloid):-

a) Pyrrrole and Pyrrolidine:-

Ex- Cocaine

Hydrazine

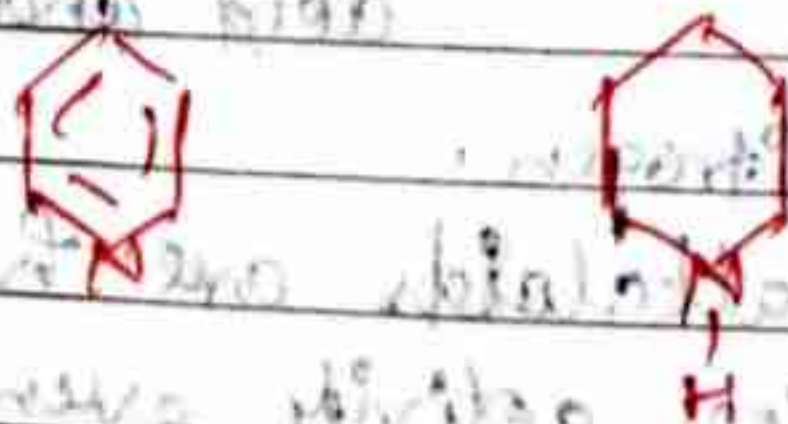


b) Pyridine & Piperidine:-

Ex- Atropine

lobeline

Anabasine



c) Pyrrolizidine:-

Ex Echimidin

lymphitane



d) Tropane (piperidine, N-methyl pyrrolidine) -

Ex Atropine, hyoscyne
- cocaine, hyoscyamine
- metelolidine



e) Quinoline alkaloid -

Ex Quinine, Quinidine
Cinchonine, cinchonidine



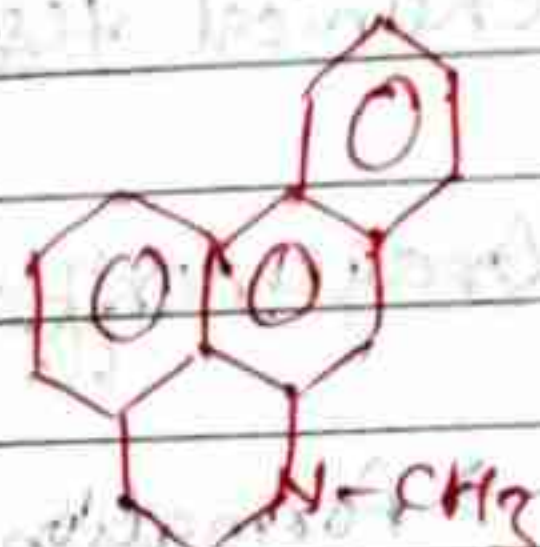
f) Isoquinoline alkaloid.

Ex Morphine, codeine
d-tubocurarine, emetine
ephedrine, papaverine, narcotine



g) Aporphine (isoquinoline naphthalene)

Ex Boldine



h) Indole alkaloid

Ex Ergotamine, Ergometrine
reserpine, vinorelbine
strychnine, physostigmine



i) Imidazole

Ex Pilocarpine, Pilocpine
Isopilocarpine



j) Nucleoside

Ex Cytidine, Guanine
Adenosine, Uracil



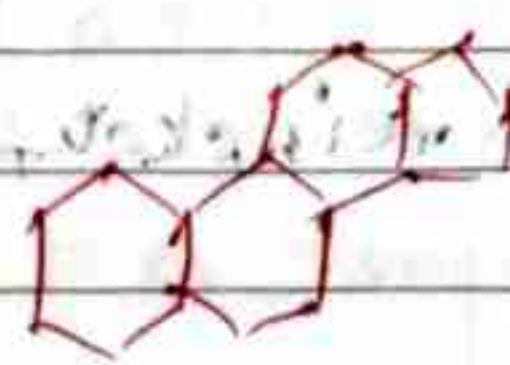
k) Purine (pyrimidine/imidazole)

Ex caffeine, theobromine
theophylline



l) Steroid

Ex Solanidine
conessine



2) Pseudoalkaloids -

Diterpene -

Ex Aconitine

Aconitine

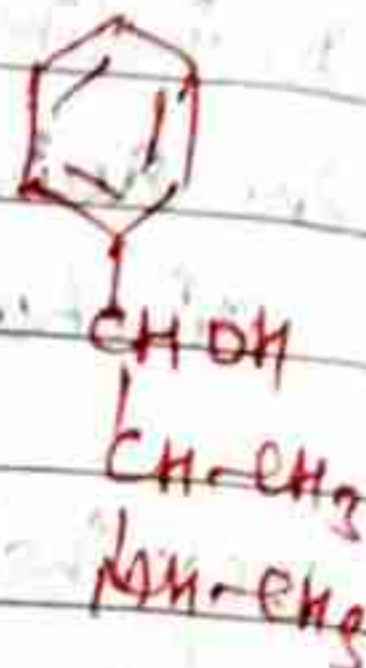
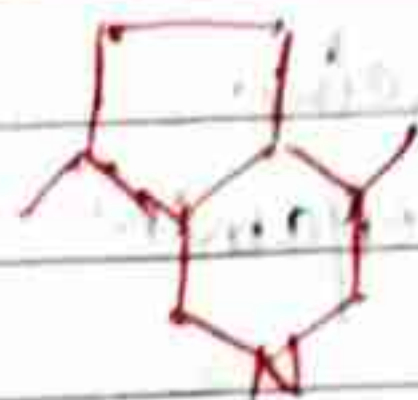
Hypoaconitine

3) Protoalkaloid (Amino alkaloid) -

alkylamine -

Ex. Ephedrine, Pseudoephedrine,

colchicine, nescienine



* Chemical test :-

① Dragendorff's test :- Drug solution + Dragendorff's reagent (potassium bismuth iodide)

→ formation of orange red colour.

② Mayer's test :- Drug solution + few drops of Mayer's reagent (potassium mercuric iodide) →

formation of creamy white precipitate

③ Hager's test :- Drug solution + few drops of Hager's reagent (saturated aqueous solution of

picric acid) → formation of crystalline yellow precipitate

④ Wagner's test :- Drug solⁿ + few drops of tannic acid solⁿ / Wagner's reagent (dilute cocaine solⁿ)

→ formation of reddish brown ppt

⑤ Tannic acid test :- Drug solⁿ + few drop of tannic acid solⁿ → formation of buff coloured ppt (light brown)

⑥ Ammonia Reineckate test :- Drug solⁿ + slightly acidified (HCl) saturated solⁿ of ammonia Reineckate → formation of pink flocculent colloidal precipitate come out of suspension to sediment under form of flock



<u>Name of drug</u>	<u>Biological source</u>	<u>Active constituent</u>	<u>Uses</u>
Rauwolfia (Sarpagandha)	- Root & rhizomes of - Rauwolfia serpentina - Apocynaceae	- reserpine - rescinnamine	- hypotensive - tranquilliser
Vinca (Catharanthus)	- Entire plant of - Catharanthus roseus - Apocynaceae	- Vinorelbine - Vinblastine	- Anticancer
Opium	- Dried latex from capsule of - Papaver somniferum - Papaveraceae	- morphine - codeine - narcotine - Papaverine	- narcotic analgesic - In Diarrhoea
Belladonna	- Dried leaves & flowering - top of Atropa belladonna - Solanaceae	- Atropine - L-hyoscyamine	- Anticholinergic - Antispasmodic

* Role of alkaloids in plants:-

The alkaloids are poisonous in nature but when used in small quantities, exert useful physiological effects on animals and human beings and hence they have secured significant place in medicine.

- They are the reserve substances with an ability to supply nitrogen.
- They might be the defensive mechanisms for plants growing in dry regions to protect from grazing animals, herbivores and insect.
- They might have a possible role as growth regulatory factors in the plants.
- It is also possible that they are end products of detoxification mechanism in plants and by this way check formation of substances which may prove to be harmful to the plants.

Shashank Pathak

VINCA:-

* Synonym Catharanthus, periwinkle

* Biological source:- It is the dried whole plant of Catharanthus roseus, belonging to family Apocynaceae. It is also known as Vinca rosea.

* Geographical source:- The plant is a native of Madagascar and is found in many tropical & subtropical countries especially India, USA, Australia, South Africa & Caribbean Islands as an

* Macroscopic character:- Ornamental plant

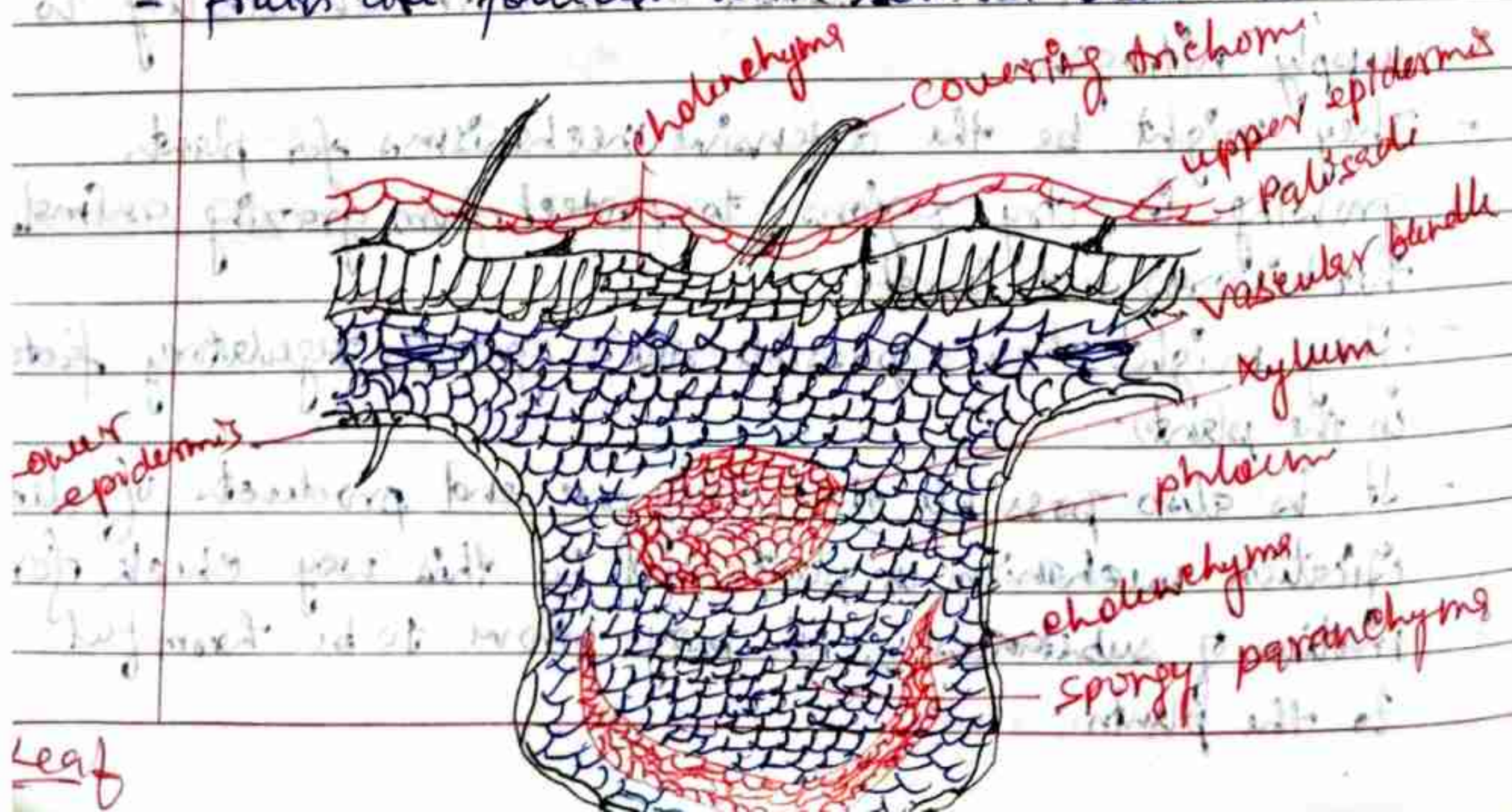
- leaf colour - green
- root - pale gray
- flower - violet, pink, white
- odour - characteristic
- taste - Bitter

- Vinca is an erect, pubescent herb, with branched tap root.

- Leaves are simple, petiolate, ovate or oblong, reticulate, with acute apex and glossy appearance.

- flowers are bracteate, pedicellate, complete, hermaphrodite

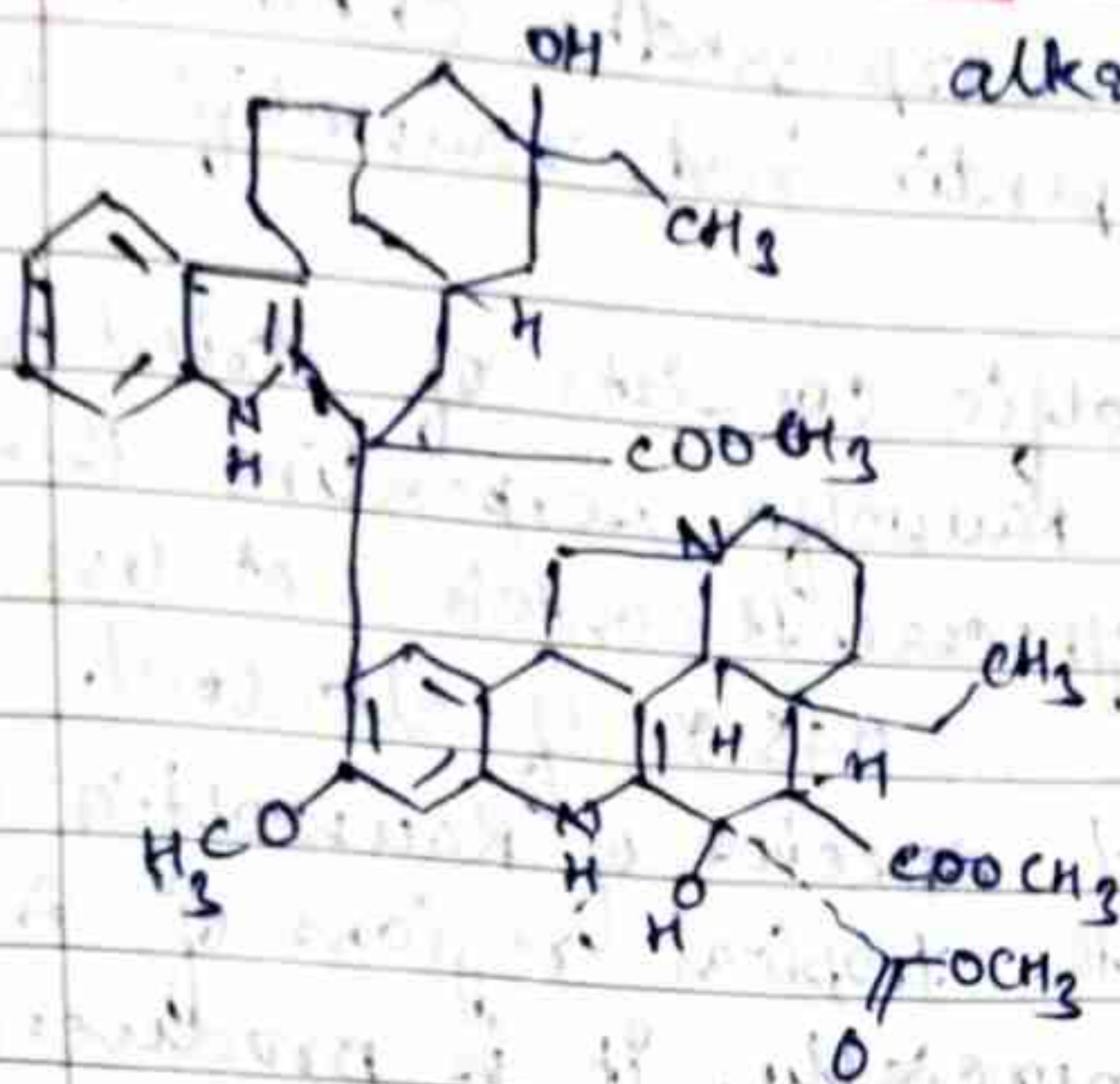
- fruits are follicles with several black seeds



Leaf



* Chemical constituents :- A large number of indole alkaloids are present in vines.



→ Vinblastine

- Vineristine

→ other alkaloid present in Vines - Ajmalicine

- Lochnerine

- Serpentine

* Uses :- Vinblastine is an antitumour alkaloid used in the treatment of Hodgkin's disease.

- Vineristine is a cytotoxic compound and used to treat leukaemia in children.
- Vines is used in herbal practice for its astringent and tonic properties in menorrhagia and in haemorrhage.
- In case of scurvy and for relaxed sore throat and inflamed tonsil, it may also be used as a gargle.
- For bleeding piles, it may be applied externally as well as taken internally.
- It is also used in treatment of bleeding diabetes.
- The flowers of periwinkle are gently purgative but lose their effect on drying.

RAUWOLFIA :-

* Synonyms - Sarpagandha, Chhotachand, serpentine root, rauwolfia root.

* Biological source :-

Rauwolfia consists of dried roots of the plant known as Rauwolfia serpentina Benth belonging to family - Apocynaceae. It contains not less than

* Geographical source

0.15% of alkaloid.

Several species of Rauwolfia are found distributed in the tropical regions of Asia, America & Africa. Commercially, it is produced in India, Sri Lanka, Myanmar, Thailand and America. In India, it is cultivated in UP, Bihar, Orissa, Gujarat, Maharashtra, Karnataka, Tamil Nadu, West Bengal.

* Macroscopic character :-

colour - Root bark is greyish yellow to brown & wood / pale yellow.

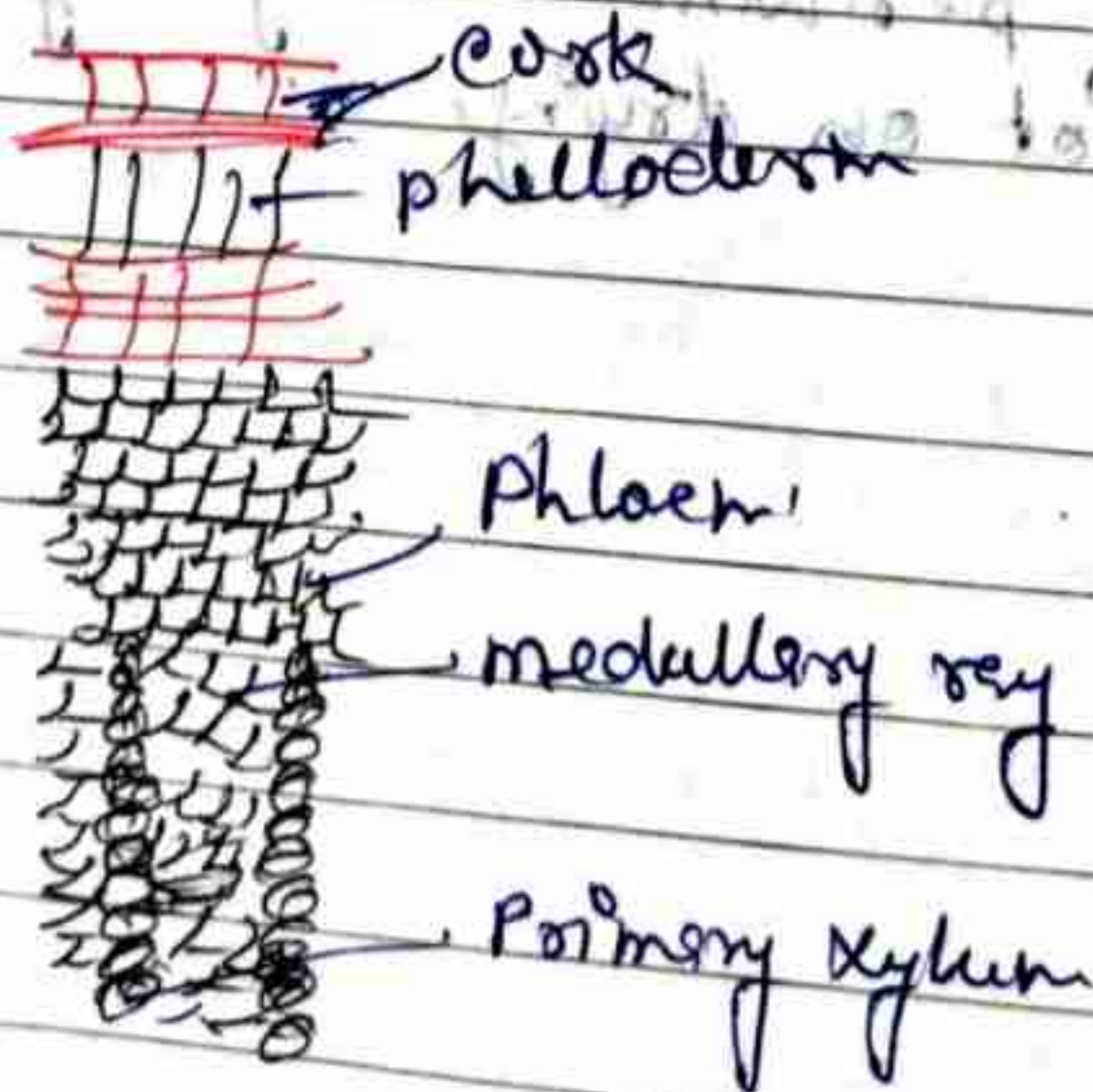
odour - Odourless

Taste - Bitter

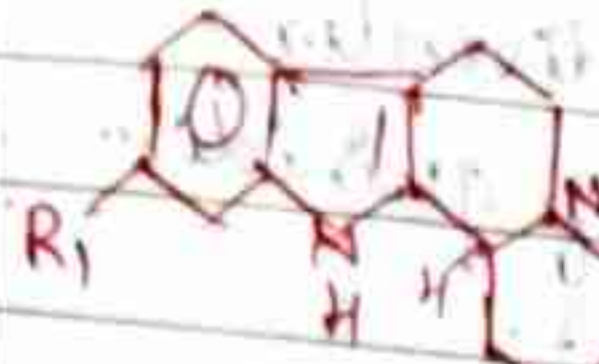
Size - About 10 to 18 cm long and from 1 to 3 cm

shape - Roots are sub-cylindrical in diameter

* Microscopic character :-

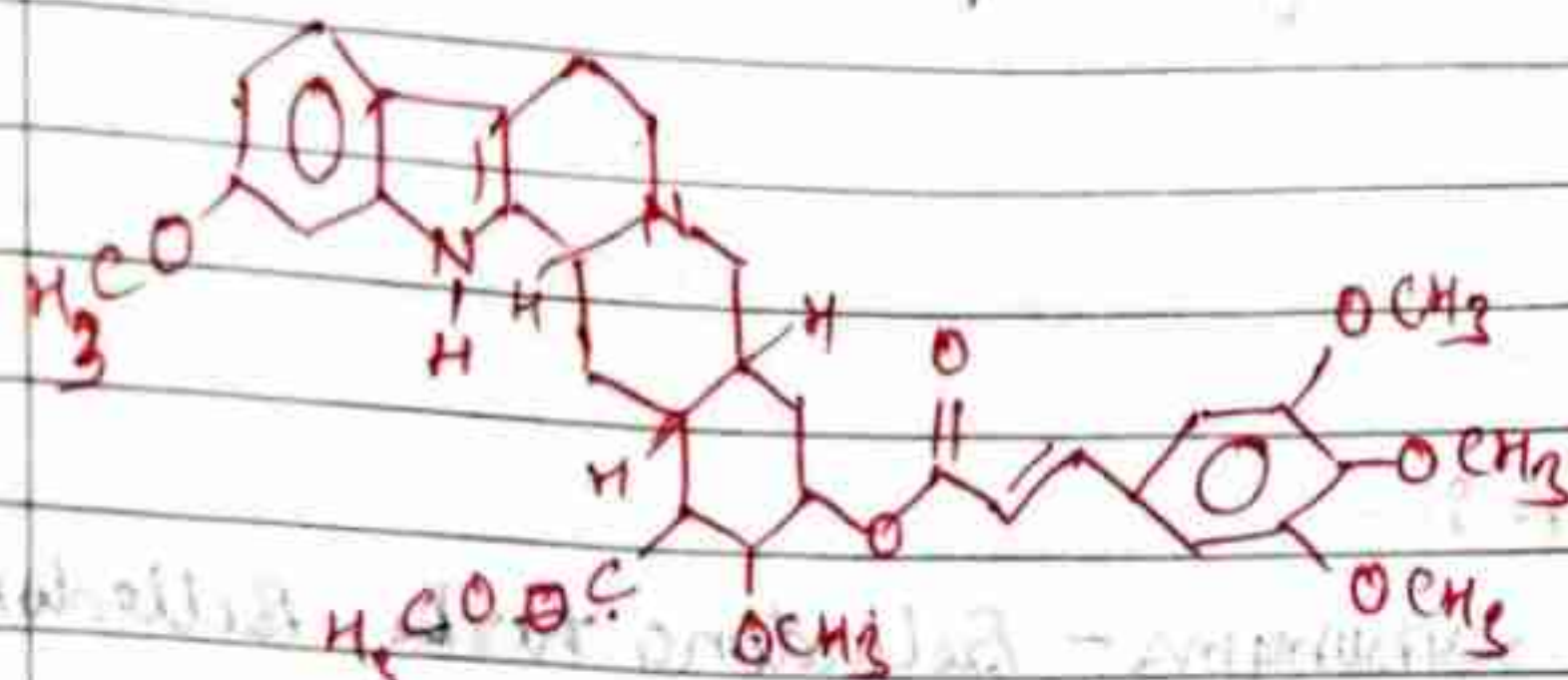
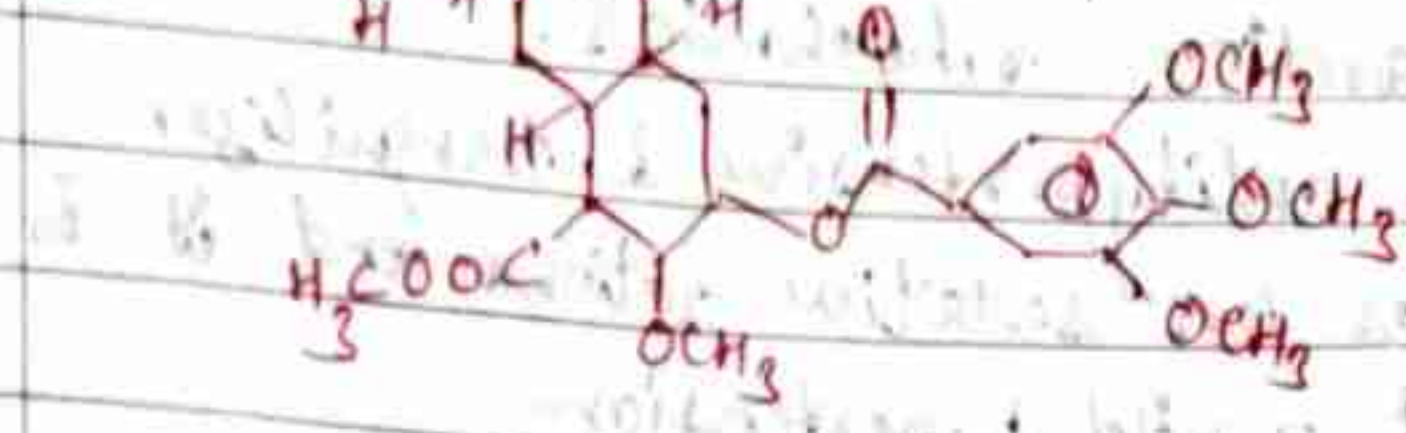


* Chemical Constituents:-

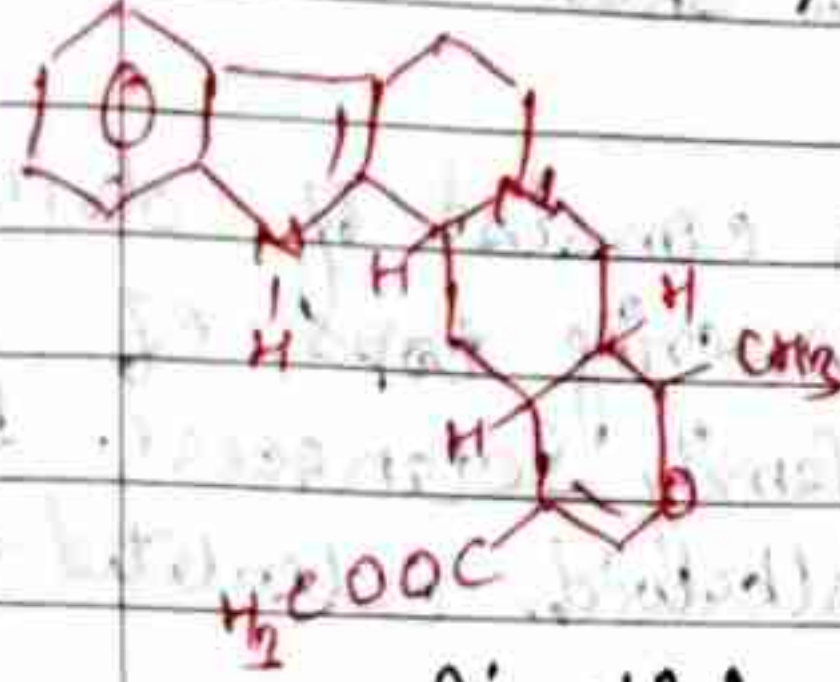


$R_1 = OCH_3$ - Reserpine

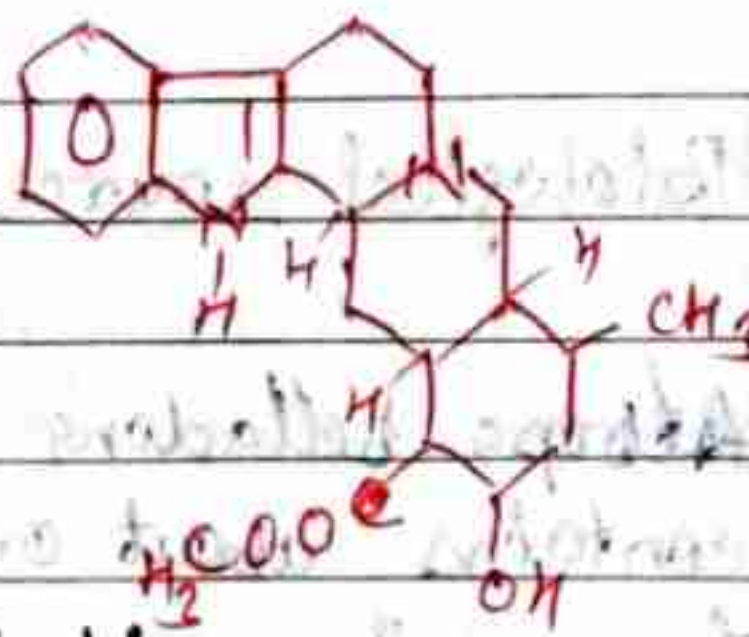
$R_1 = H$ - Deserpidine



Rescinnamine



Ajmalicine



Jolimbine

→ Ajmalin

→ Syrosingopine

* Chemical Test:-

① A red colouration along with the medullary rays is observed when the freshly fractured surface is treated with conc. nitric acid

② Reserpine shows violet red colour when treated with solution of vanillin acetic acid

* Application:-

- Rauwolfia is used as hypnotic, sedative and antihypertensive

- It is specific for insanity, reduces blood pressure and cures pain due to affections of the bowels.

- It is given in labours to increase uterine contraction and in certain neuropsychiatric disorder.
- Atrialine is similar properties of quinidine for treatment of cardiac arrhythmias.
- Reserpine is an antihypertensive & tranquilizer.
- Sympathomine has less sedative actions and it is used for the treatment of mild hypertension.

Shanley

BELLADONNA:-

* Synonyms - Belladonna herba, Belladonna leaf, deadly night shade leaves

* Biological source:- Belladonna consist of dried leaves and flowering tops of

~~Atropa~~ belladonna belonging to family Solanaceae. It contains about 0.35% of total alkaloids calculated as hyoscyamine.

* Geographical sources:- A belladonna cultivated in USA, UK, Canada, Germany and India.

In India, it is found in western Himalayas from Sindh to Kashmir & Himachal Pradesh.

* Macroscopic Characters

* Colour - Leaves - Green to brownish green.

flowers - Purple to yellowish brown.

fruits - Green brown.

* Odour - Slight and characteristic.

* Taste - Bitter and astringent.

* Size - leaves - 5-25 cm long and 2.5 to 12 cm wide.

flowers - corolla 2.5 cm long & 1.5 cm wide.

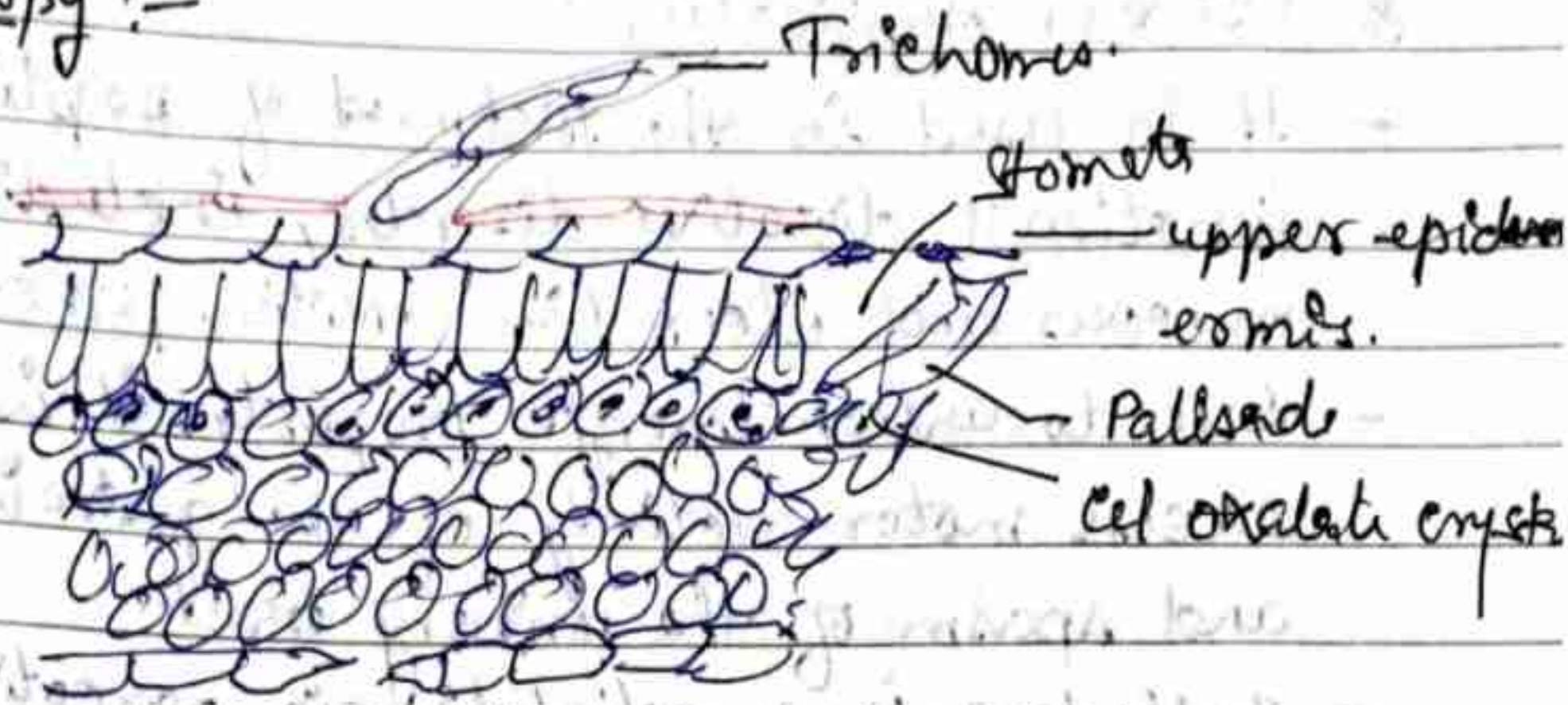
fruits - About 1.0 cm in diameter.

Shape- Leaves - Oval, entire margin, petiole brittle and transversely broken

Flowers - Campanulate, 5, small reflexed lobes of

Fruits - Berries, Subglobular in shape corolla.
with numerous flat seeds

* Microscopy :-

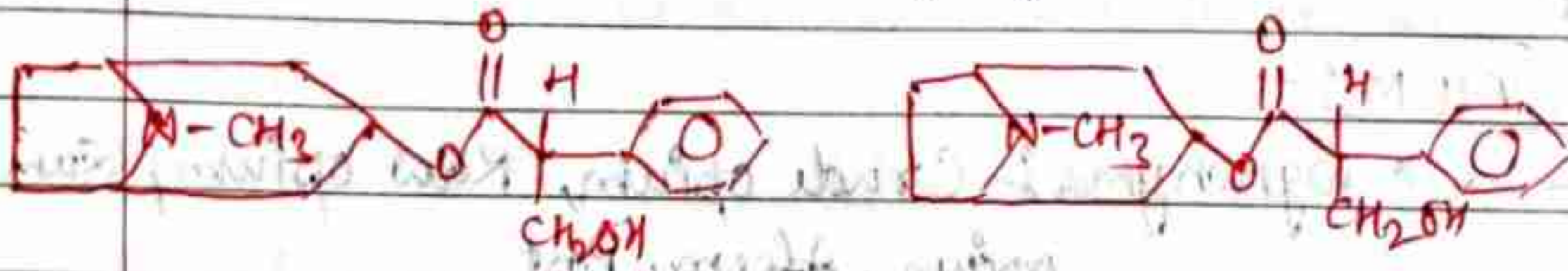


Belledone leaf

* Chemical constituent :-

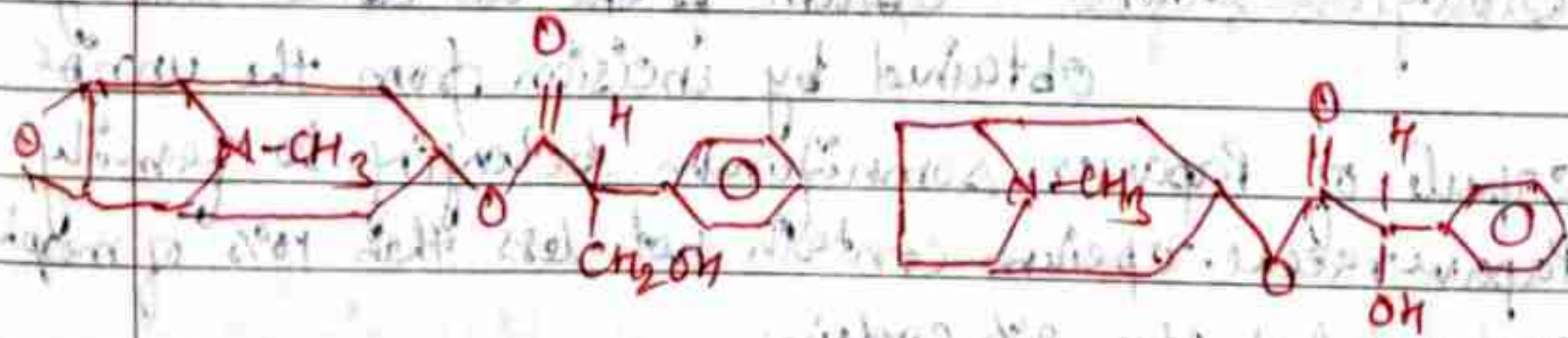
The total alkaloid content of drug is 0.4 to 1% and varies in different parts of plant, roots (0.6%), stems (0.05%), leaves (0.4%), unripe & ripe berries (0.19 - 0.24%) and seeds (0.33%).

- The main alkaloids are 1- hyoscyamine and its racemic mixture



Atropine (Tropine (+))

Hyoscyamine (Tropine (-))



Hyoscin

Homotropine

- Belladonna
- Scopolamine

* Standard :-

1. Total ash - 14%
2. Acid Insoluble ash - 3%
3. Foreign organic matter - not more than 3%

* Uses or Application :-

- It is used in the treatment of peptic ulcer, diarrhoea, functional digestive disorders, including spastic, mucous and ulcerative colitis, pancreatitis.
- Due to anticholinergic property it is used to control excess motor activity of the gastrointestinal tract and spasm of the urinary tract.
- Belladonna is an anticholinergic, narcotic, sedative, diuretic mydriatic properties.
- It relieves spasm of gut or respiratory tract.
- Consumption of belladonna checks excessive perspiration of patient suffering from tuberculosis.

* Opium :-

* Synonyms :- Crude opium, Raw opium, Gum opium, Afeem, Post.

* Biological source :- Opium is the air dried milky latex obtained by incision from the unripe capsule of *Papaver somniferum*. belonging to family *Papaveraceae*. opium contain not less than 10% of morphine and not less than 2% codeine.

* Geographical source :-

India, Pakistan, Afghanistan, China, Turkey, Russia, Iran etc.



* Macroscopic Character:-

Odour - Strong characteristic

Taste - Bitter

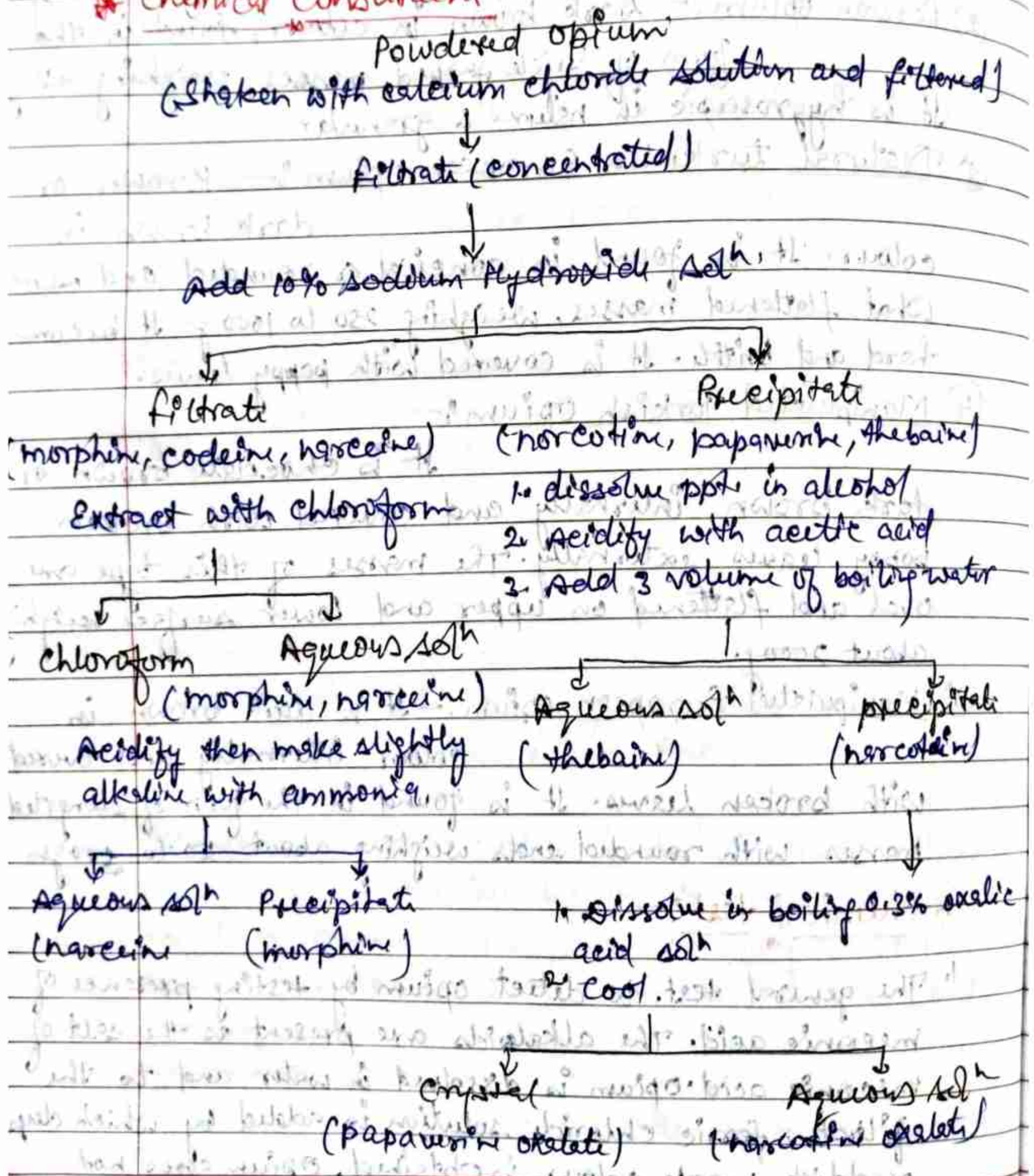
- ① Indian Opium:- Dark brown in colour. It is found in the form of cubical pieces weighing about 900 gm for marketing purposes. It is enclosed in tissue paper and is brittle and plastic in nature. The powdered form is available in the pack of 5 to 10 kg.
- ② Persian Opium:- Dark brown in colour, found in the form of brick shaped masses, weighing 450g. It is hygroscopic in nature & granular.
- ③ Natural Turkish or European Opium:- Brown or dark brown in colour. It is found in conical or rounded and somewhat flattened masses, weighing 250 to 1000g. It becomes hard and brittle. It is covered with poppy leaves.
- ④ Manipulated Turkish Opium:- It is chocolate brown or dark brown internally and covered with broken poppy leaves externally. The masses of this type are oval and flattened on upper and lower surface weighing about 2000g.
- ⑤ Manipulated European Opium:- It is dark brown in colour internally and covered with broken leaves. It is found in the form of elongated masses with rounded ends weighing about 150 to 500g.

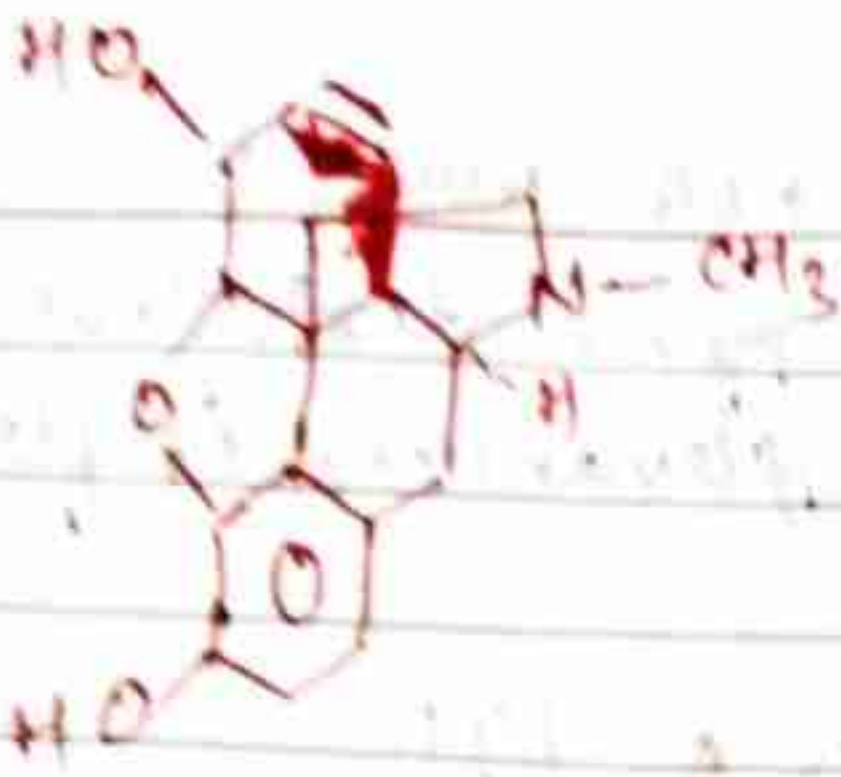
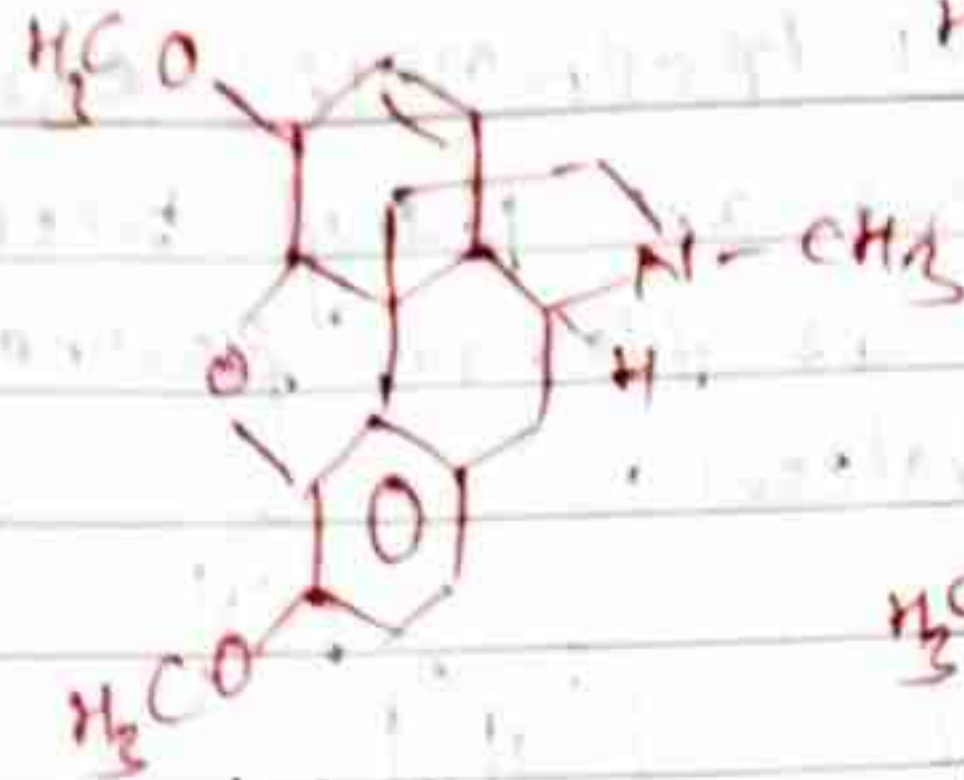
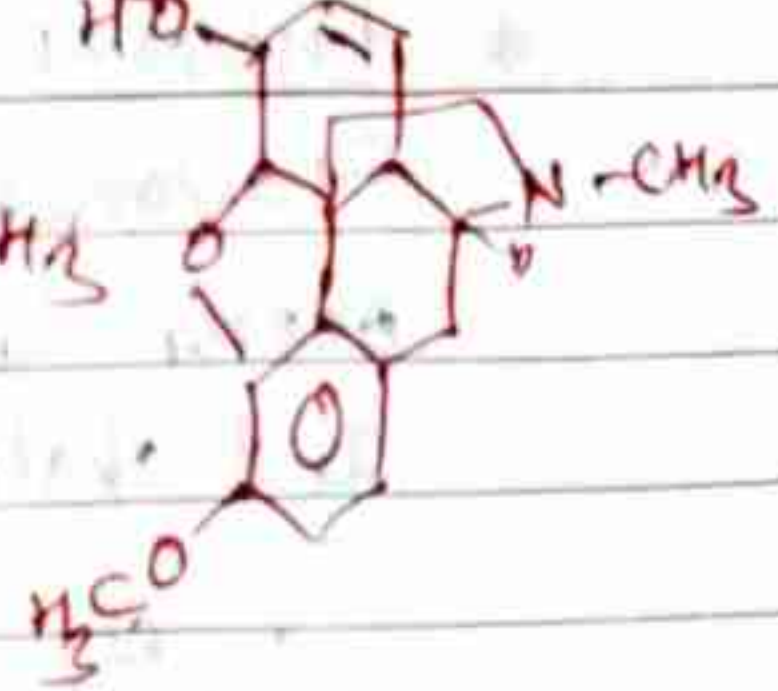
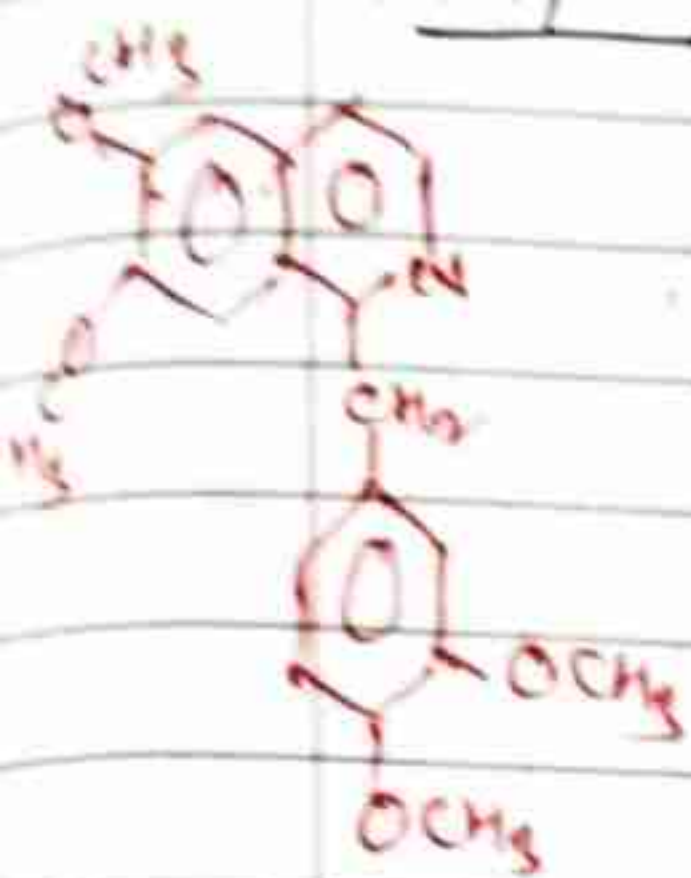
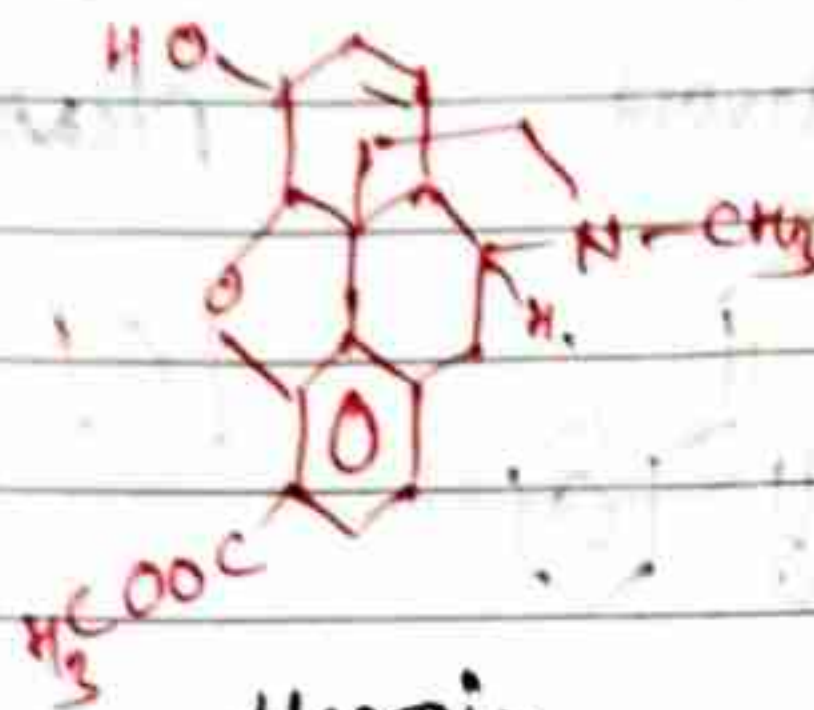
* Chemical test:-

1. The general test to detect opium by testing presence of meconic acid. The alkaloids are present as the salt of meconic acid. Opium is dissolved in water and to the filtrate, ferric chloride solution is added by which deep reddish purple colour is obtained. Opium does not contain tannins, starch and calcium oxalate.

- ② Morphine when sprinkled on nitric acid gives orange red colour. codeine does not respond to this test.
- ③ The treatment of morphine solution with potassium ferricyanide and ferric chloride solution gives bluish green colour. codeine does not respond to this test.
- ④ Papaverine solution in HCl gives a lemon yellow colour with potassium ferrocyanide solⁿ.

* Chemical Constituent :-



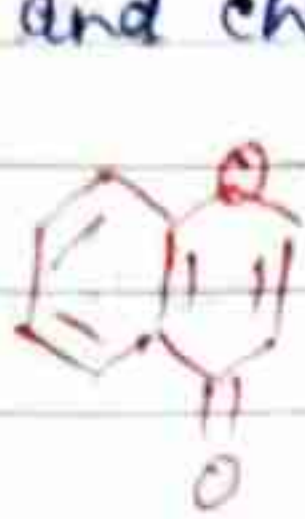
morphineThebainecodeinepapaverineheroin

* Uses :-

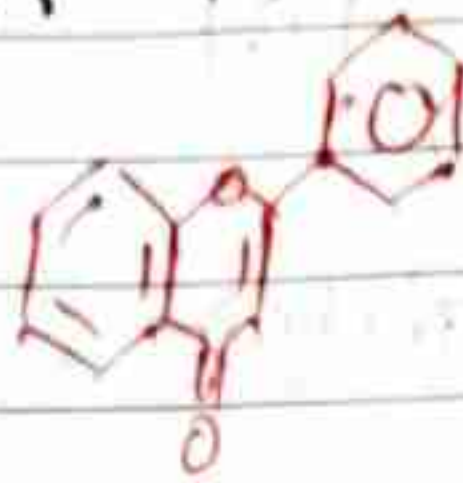
- ⇒ Opium and Morphine have narcotic, analgesic and sedative action and used to relieve pain, diarrhoea, dysentery & cough.
- ⇒ Poppy capsules are astringent, somniferous, soporific, sedative and narcotic and used as anodyne and emollient.
- ⇒ Codeine is mild sedative and is employed in cough mixtures.
- ⇒ Naloxepine is not narcotic and has a cough suppressant action acting as a central antitussive drug.
- ⇒ Papaverine has smooth muscle relaxant action and is used to cure muscles spasm.
- ⇒ Opium, morphine and the diacetyl derivative heroin, cause drug addiction.

* PHENYL PROPANOIDS AND FLAVONOIDS :-

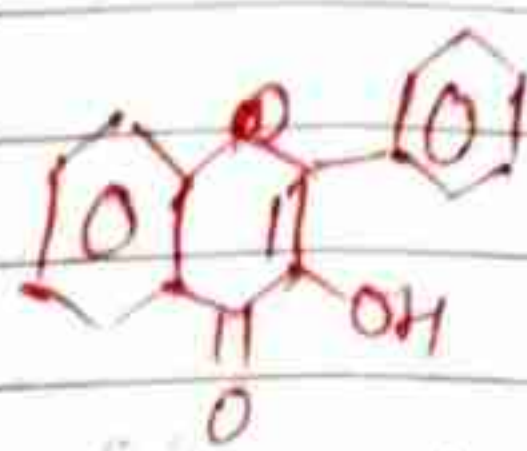
Flavones are phenyl benzo- γ -pyrone derivative and occur as flavone, flavonol, flavanone, isoflavone and chalcone.



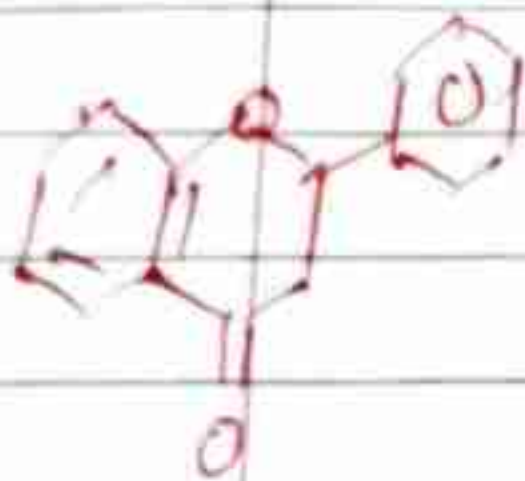
Chroomone



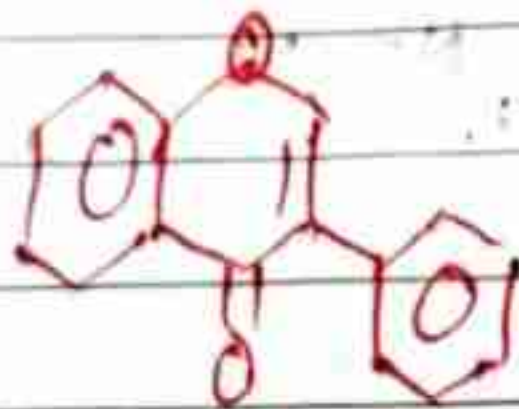
Flavone



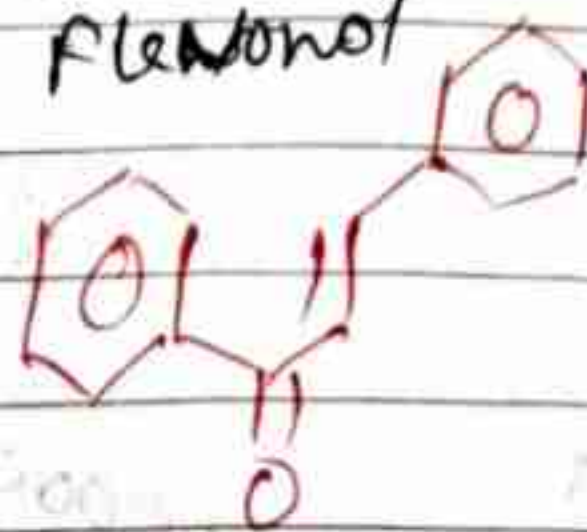
Flavonol



Flavonone



Isoflavonone



Chalcone

* LIGANS :-

→ Ligans are a type of plant compound known as polyphenols.

- Ligans are phytonutrients that have both soluble and insoluble fiber.

- Ligans are antioxidants that may also support the immune system and excellent for balancing hormone level in the body.

- Ligans found in seeds (like sesame seeds), berries, fruits, vegetables and whole grains.

- In women they help balance estrogen level & its ability to block the effects of estrogen could potentially help reduce the risk of hormone associated cancer (breast, uterine, ovarian & prostate).

- Post menopausal women who have a high intake of dietary ~~intake~~ Ligans have a 15% lower risk of breast cancer and lower risk of heart disease.

- In men they help balance of testosterone - DHT relationship and inhibit certain enzymes needed to convert testosterone to DHT. This results in lower DHT levels, which may improve prostate health and may help maintain testosterone levels.
- They also have anti-estrogenic effects and can prevent naturally occurring hormones from binding to estrogen receptors and exerting their negative effect.

* TEA :-

Synonyms - Camellia thea

* Biological source -

It contains the prepared leaves and leaf buds of Thea sinensis belonging to family - Theaceae

* Geographical sources -

Cultivation of tea in India, Sri Lanka, China, Indonesia, Japan. It is available as black tea from India & Sri Lanka and green tea from China & Japan.

* Macroscopic characters :-

It is a small evergreen shrub when cultivated reaches to the height of 1.0-1.5 meters, while wild growing plants reach upto 6.0 meters. Plant is much branched and bears grey bark.

Leaves - Dark green, lanceolate or elliptical, blunt at apex base is tapering shortly serrate. Young leaves are hairy while matured leaves are glabrous.

Flowers - are solitary or in groups of 2 or 3 on the leaf axils and drooping.

Colour - characteristic

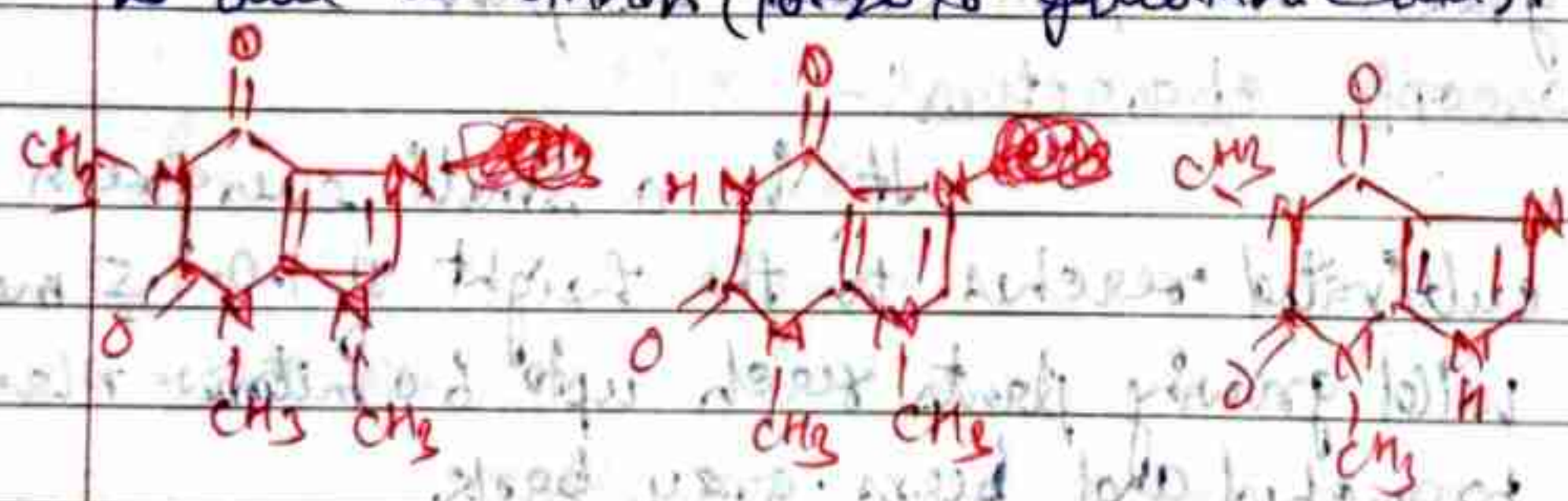
Taste - Bitter

* Preparation of Green Tea:-

- It is prepared by exposing the freshly collected leaves to the air untill most of the moisture is removed.
- Then they are roasted and stirred continuously untill leaves become moist and flaccid.
- Then they are passed to rolling table and rolled into balls and subjected to a pressure which removes the moisture.
- Then the leaves are shaken out on the copper pans and roasted again till the leaves assume dull green colour.
- Then the leaves are winnowed, screened and graded into various varieties.

* Chemical constituents:-

Tea leaves are considered as a rich source of caffeine (1-3%). It is extract from tea dust and tea leaf waste. The colour of tea leaves is due to tannin (10-20% galloic acid).



Caffeine

Theobromine

Theophylline

* Chemical Test:-

Caffeine and other purine alkaloids give murexide colour reaction. Caffeine is taken in a test tube to which HCl and potassium chlorate are added and heated to dryness. A purple colour is obtained by exposing the residue to vapours of dilute ammonia. In addition of fixed alkali the purple colour disappears.

② Caffeine also produces white precipitate with tannic acid solution.

Uses: It is used as stimulant, Astringent & Diuretic.

* RUTA :-

* Synonyms:- Garden Rue, Herby Cross.

* Biological source:- It consists of dried herb of *Ruta graveolens* belonging to family Rutaceae.

* Geographical sources:-

The plant is indigenous to Southern Europe and often cultivated in Britain & India.

* Organoleptic character:-

It is an erect, scented, glabrous herb about 30 to 40 cm in height.

Colour:- leaves are blue green in colour.

Odour:- Characteristic and strongly aromatic.

Taste:- Pungent.

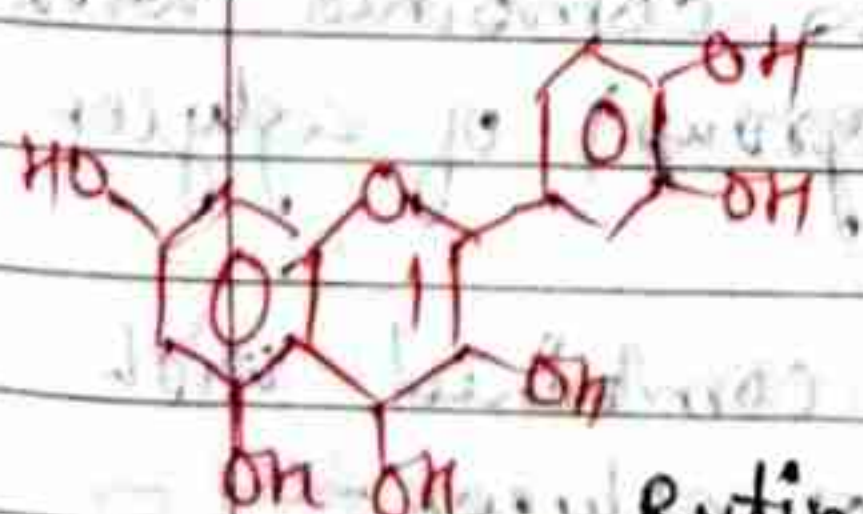
Leaves:- leaves are oblanceolate in shape, fragrant.

Flower:- flowers are greenish yellow in colour.

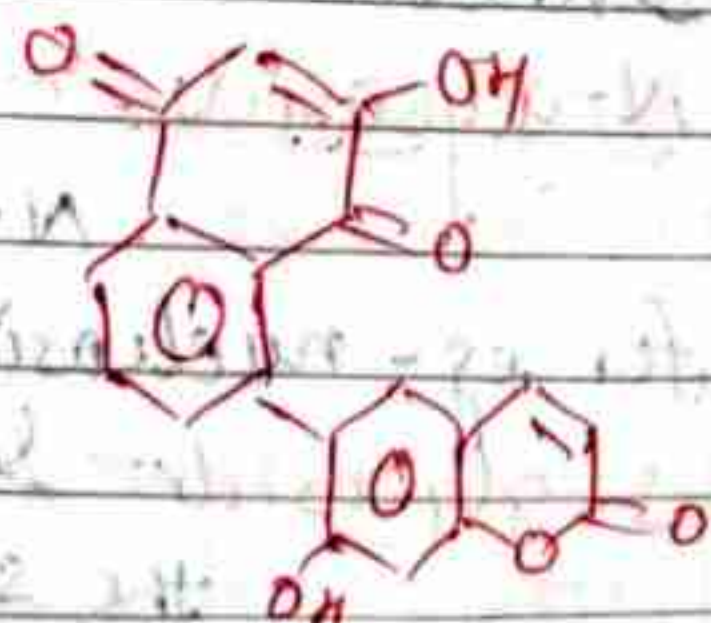
Fruits:- fruits are sub cylindrical, brown greenish capsule 4 to 5 lobed, rough externally.

Stem:- cylindrical branched 2-3 cm in length and 1 mm wide.

* Chemical constituents



Rutin



- Uses:- Rutin is used as capillary protectant.
- Rutin has antitussive and spasmolytic action.

* STEROIDS, CARDIAC GLYCOSIDES & TRITERPENOIDS

A glycoside is any molecule in which a sugar group is bonded through its anomeric carbon to another group via glycosidic bond.

* Classification:-

The glycosides can be classified by the glycone, by the type of glycosidal linkage and by the aglycone.

i) On the basis of Glycone:- If the glycone group of a glycoside is glucose, then the molecule is a glucoside. If it is fructose, then the molecule is a fructoside. If it is glucuronic acid, then the molecule is a glucuronide etc.

ii) On the basis of Aglycone Glycosidic linkage:-

① O-glycosides:- Sugar molecule is combined with phenol or -OH group of aglycone for eg - amygdalin, arbutin, salicin, cardiac glycoside like sennoside.

② N-glycosides:- Sugar molecule is combined with N of the -NH (amino group) of aglycone for eg - nucleosides.

③ S-glycoside:- Sugar molecule is combined with the S or SH (thiol group) of aglycone - eg - Sinigrin.

(H) C-glycosides - Sugar molecule is directly attached with C-atom of aglycone. for eg- Anthraquinone glycoside like aloin, barbaloin, cascuroside and flavon glycoside.

(iii) On the basis of Aglycone:-

- ① Anthraquinone glycoside - Senna, aloe, shubarb etc.
- ② Sterol or cardiac glycoside - Digitalis, thevetia, squill
- ③ Saponin glycoside - Dioscorea, liquorice, ginseng
- ④ Cyrogenetic & cyanophoric gly - Bitter almond, wild cherry bark
- ⑤ Thiocyanate & isothiocyanate gly - Black mustard
- ⑥ Flavone glycoside - Ginkgo
- ⑦ Aldehyde glycoside - Vanilla
- ⑧ Phenol glycoside - Berberry
- ⑨ Steroidal glycoside - Solanum
- ⑩ Bitter & miscellaneous gly - Gentian, pteroshiza, chirate etc

* Chemical test for Steroid and triterpenoid glycoside

① Leebemann - Burchard test:- Alcoholic extract of drug was evaporated to dryness and extracted with $CHCl_3$, add few drop of acetic anhydride followed by conc. H_2SO_4 from side well of test tube to the $CHCl_3$ extract. formation of violet to blue coloured ring at the junction of two liquid indicate the presence of steroid moiety.

② Salkowski test:- Alcoholic extract of drug was evaporated to dryness and extracted with $CHCl_3$, add conc. H_2SO_4 from side well of test tube to the $CHCl_3$ extract. formation of yellow coloured ring at the junction of two liquid, which turns red after two minutes the presence of steroid moiety.

③ Peterson's methanol test:- It forms yellow colour with unsaturated steroids and triterpen



④ Antimony trichloride test:-

Alcoholic extract of drug was evaporated to dryness and extracted with CHCl_3 containing 20% acetic acid anhydride. Formation of pink colour on heating indicates presence of steroids and triterpenoids.

⑤ Trichloroacetic acid test:- Triterpenes on addition of saturated solution of trichloroacetic acid forms coloured precipitate.

⑥ Zimmermann test:- Meta dinitrobenzene solution was added to the alcoholic solution of drug containing alkali, on heating it forms violet colour in presence of keto steroid.

* Chemical test for cardiac glycoside:-

1) Keller-Kiliani test:-

To the alcoholic extract of drug equal volume of water and 0.5 ml of strong lead acetate solution was added, shaken & filtered.

- Filtrate was extracted with equal volume of CHCl_3 . Chloroform extract was evaporated to dryness and residue was dissolved in 3 ml of glacial acetic acid followed by addition of few drops of FeCl_3 solⁿ.

- The resultant solution was transferred to a test tube containing 2 ml of conc H_2SO_4 .

Reddish brown layer is formed which turn bluish green after standing due to presence of digitoxose.

② Legal test:-

To the alcoholic extract of drug equal volume of water and 0.5 ml of strong lead acetate solution was added, shaken and filtered.



- Filtrate was extracted with equal volume of CHCl_3 and the chloroform extract was evaporated to dryness.

- The residue was dissolved in 2ml of pyridine and sodium nitroprusside 2ml was added followed by addition of NaOH solution to make alkaline.

- Formation of pink colour in the presence of glycoside

③ Baljet test:-

Thick solution of leaf of digitalis or the part of drug containing cardiac glycoside, when dipped in sodium picrate solution, it forms a yellow to orange colour in the presence of glycoside.

④ 3,5-Dinitro benzoic acid test:-

To the alcoholic solⁿ of drug few drops of NaOH followed by 2% solⁿ of 3,5-dinitro benzoic acid was added. Formation of pink colour indicates presence of cardiac glycoside.

* Glycone & Aglycone:- Herbal glycosides are secondary metabolites, which on hydrolysis yield one or more sugar portions along with a non sugar moiety is called aglycone or genin, whereas sugar part is known as glycone. The sugar & non sugar moiety are linked by the glycosidic linkage.

Steroid:- A steroid is a biologically active organic compound with four rings arranged in a specific molecular configuration.

- Steroids have two principal biological functions - as important component of cell membrane that alter membrane fluidity, and as signalling molecules. Hundred of steroids are found in plants, animals,

- and fungi.

- All steroid manufactured in cell from the sterols, lanosterol.



<u>Name of drug</u>	<u>Biological source</u>	<u>Active constituent</u>	<u>Uses</u>
* <u>Liquorice</u>	- dried root & stolon of - <u>Glycyrrhiza glabra</u> - Leguminosae	- glycyrrhizin (triterpenoid saponin) - 18 β -glycyrrhetinic acid	- Expectorant - peptic ulcers
<u>Dioscorea</u>	- Dried tubers of - <u>Dioscorea debitoria</u> - Dioscoreaceae	- diosgenin (steroidal saponin)	- Synthesis of medicinal steroid.
* <u>Digitalis</u>	- Dried leaves of - <u>Digitalis purpurea</u> - <u>Digitalis lanata</u> - Scrophulariaceae	- Digitoxin - Digoxin	- Cardio tonic
<u>Senna</u> (Senna leaf)	- Dried leaflets of - <u>Cassia acutifolia</u> - <u>Cassia acuta angustifolia</u> - Leguminosae	- Sennosides	- Purgative
<u>Aloe</u>	- Dried leaves of juice of - <u>Aloe vera</u> , <u>Aloe ferox</u> - <u>Aloe barbadensis</u> - Liliaceae	- barbaloin - aloe-emodin	- Purgative
<u>Bitter almond</u>	- dried ripe seed of - <u>Prunus amygdalus</u> - Rosaceae	- Amygdalin	- demulcent, Sedative



Shanmugam

DIGITALIS:-

Synonyms:- Digitalis leaves, foxglove, finger flower, lady's glove

Biological source:- Digitalis consist of Digitalis purpurea, family - Scrophulariaceae, dried at a temperature below 60°C, immediately after collecting the leaves

Geographical source:-

It is cultivated and collected in England, other part of Europe, USA & India.

Macroscopic characters:-

Colour - Dark greyish green

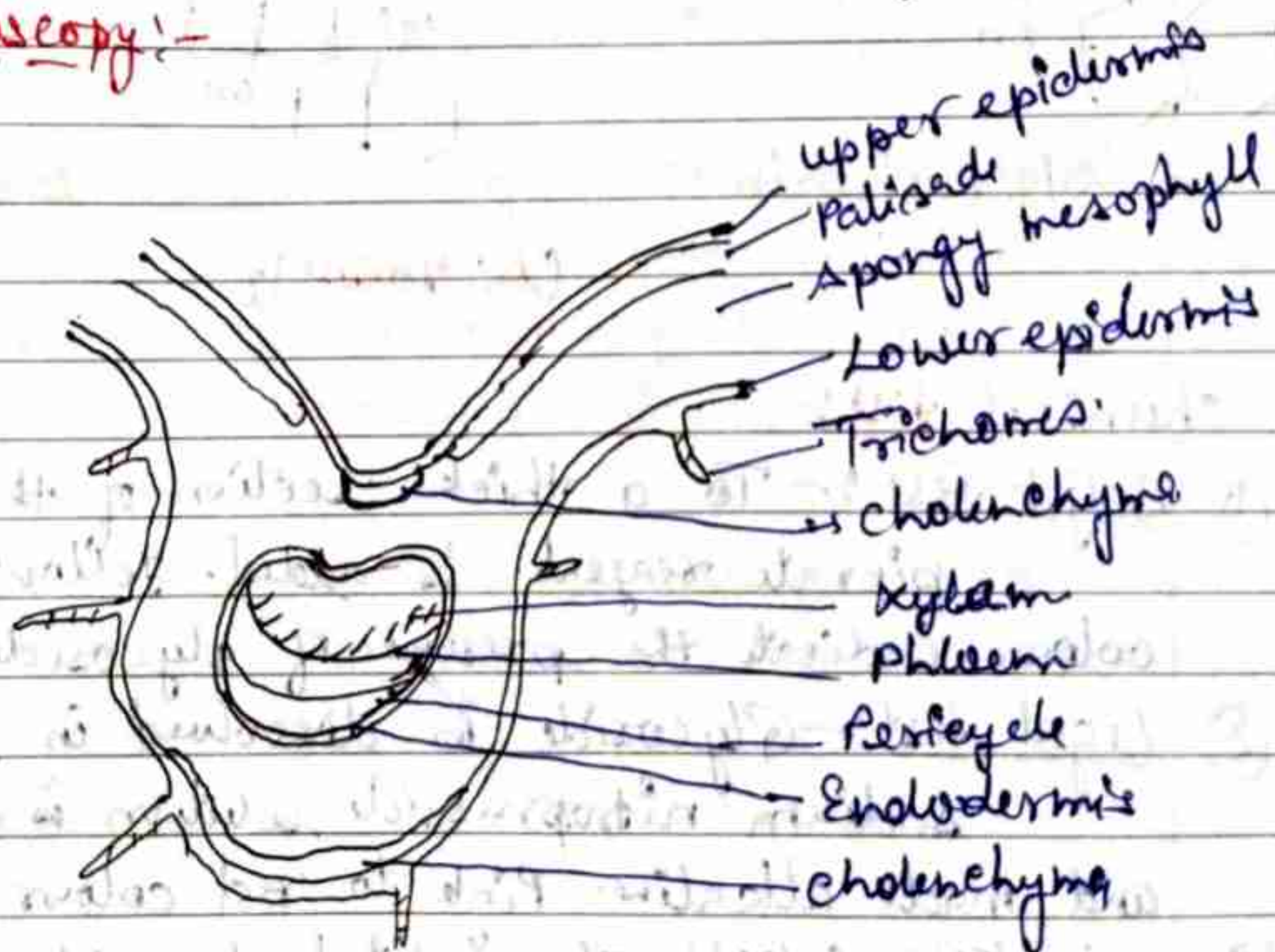
Odour - Slight

Taste - Bitter

Size - 10-40 cm long & 4 to 20 cm wide

Shape - ovate-lanceolate to broadly ovate

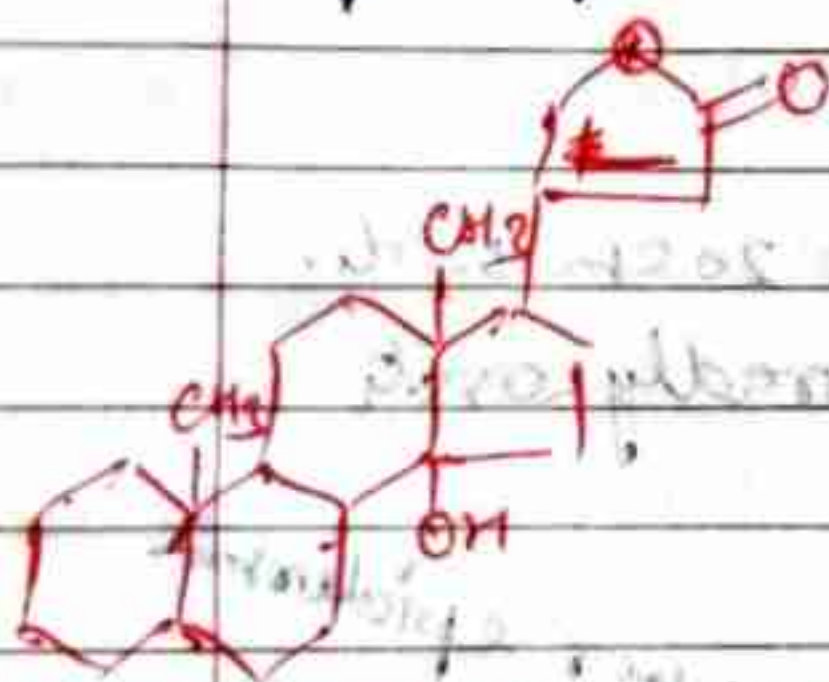
Microscopy:-



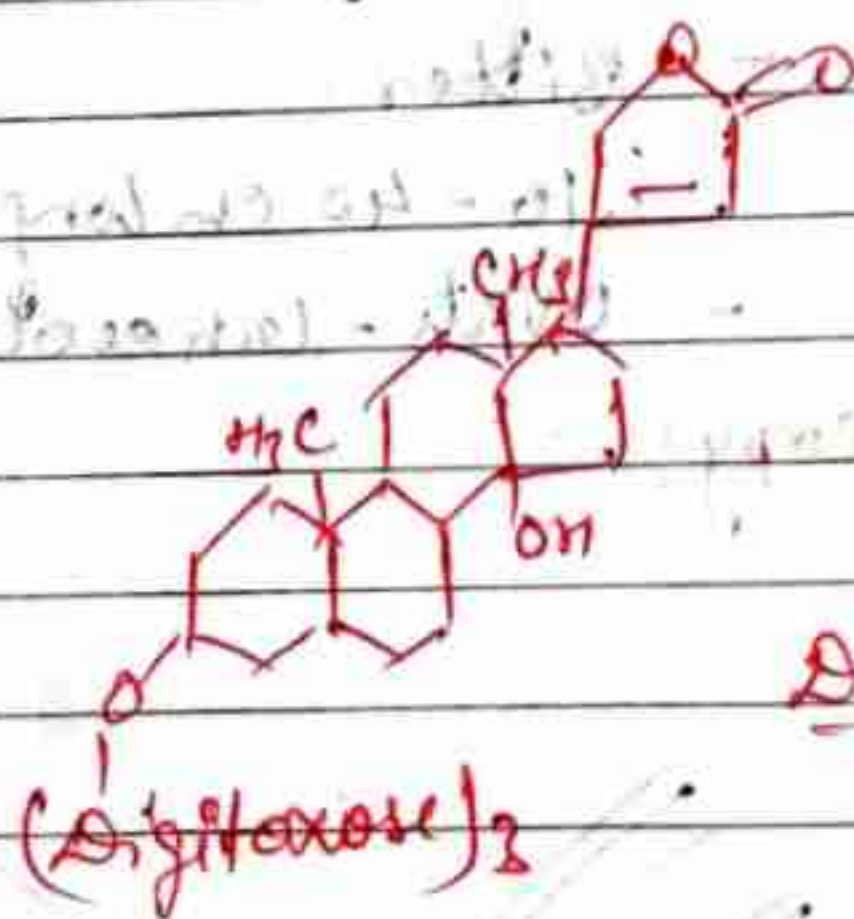
T.S digitalis leaf

Chemical constituent: The products of hydrolysis of purpurea glycoside A and purpurea glycoside B, the chief active constituents of the drug, are as under:

Purpurea glycoside A (fresh leaves)	Purpurea glycoside B (fresh leaves)
↓ Enzymatic Hydrolysis	↓ Enzymatic Hydrolysis
Digitoxin + glucose	Gitoxin + glucose
↓ Hydrolysis	↓ Hydrolysis
Digitoxigenin + 3 digitoxose	Gitoxigenin + 3 digitoxose



Digitoxigenin



Digitoxin

Chemical tests

- ① Baljet Test: - To a thick section of the leaf sodium picrate reagent is added. Yellow to orange colour indicates the presence of glycoside.
- ② Legal test: - Glycoside is dissolved in pyridine and sodium nitroprusside solution is added to it and made alkaline. Pink to red colour produced.
- ③ Keller-Kiliani test: - The isolated glycoside is dissolved in glacial acetic acid and a drop of ferric chloride solution is added followed by the addition of H_2SO_4 which forms the lower layer. A reddish brown colour is seen in between two liquid and the upper layer becomes bluish-green.



- Uses:- The foxglove is a widely used herbal medicine with a recognized stimulatory effect upon the heart.
- It is also used in allopathic medicine in the treatment of heart complaints.
 - It has a profound tonic effect upon a diseased heart, enabling the heart to beat more slowly, powerfully and regularly without requiring more oxygen. At the same time, it stimulates the flow of urine which lowers the volume of the blood and lessens the load on the heart.
 - It is also used in the treatment of External haemorrhage, in inflammatory disease, in delirium tremens, in epilepsy, in acute mania.

* LIQUORICE:-

Synonyms - meilethi, Glycyrrhiza, liquorice root.

- * Biological source:- Liquorice consists of dried, peeled or unpeeled, root and stolon of *Glycyrrhiza glabra* belonging to family Leguminosae. Liquorice should have a water soluble extractive not less than 20% w/w.

- * Geographical source:- It is mainly found in China, Europe, India, Iraq, Japan, Spain, Turkey, USA.

* Macroscopic Character:-

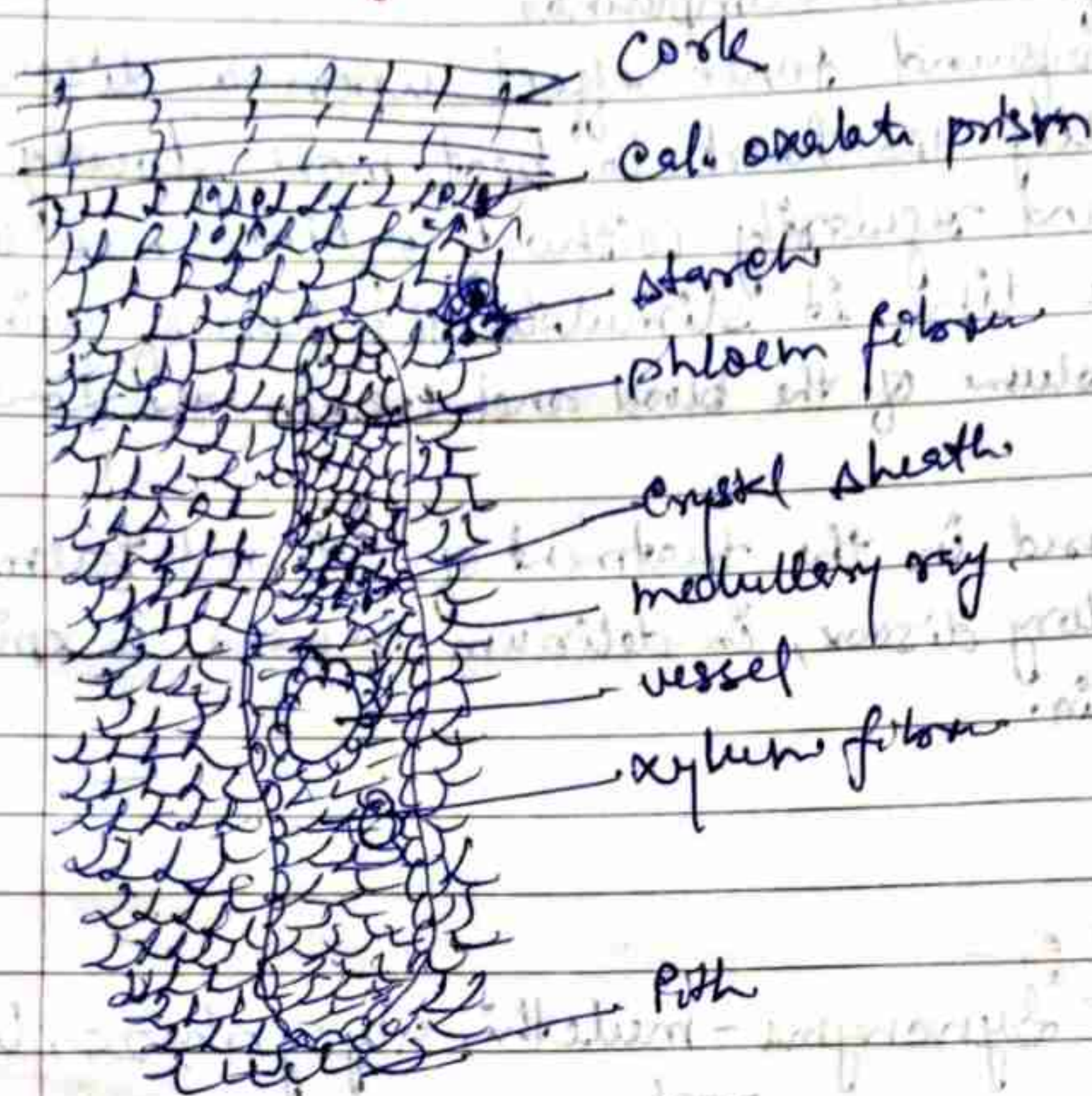
Colour - Unpeeled yellowish brown & peeled liquorice is pale yellow in colour.

Odour - faint & characteristic

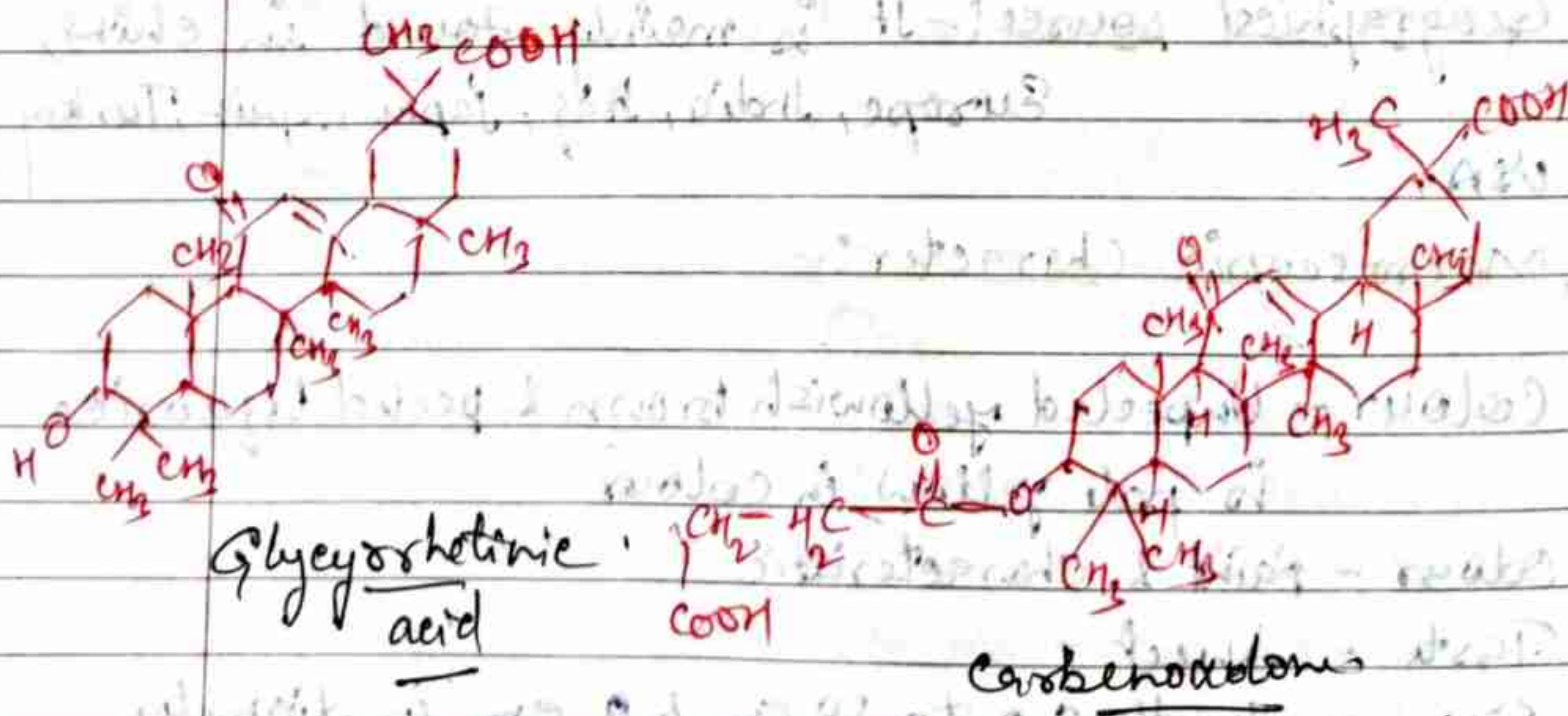
Taste - Sweet

Size - length 20 to 50 cm & 2 cm in diameter

A. Microscopy



* Chemical Constituents :- The chief constituent of liquorice is triterpenoid saponin known as glycyrrhizin (glycyrrhizic acid), which is a potassium and calcium salt of glycyrrhizic acid.



- * Uses:- Traditionally, liquorice has been used as an expectorant and demulcent.
- Due to flavonoid content it has antigestric effect,
 - It is used in the treatment of peptic ulcer.
 - It is used as antispasmodic effect.
 - It is used in the treatment of rheumatoid arthritis, inflammation
 - Ammoniated glycyrrhiza is used as a flavouring agent in beverages, confectionery and pharmaceuticals

* DIOSCOREA:-

* Synonyms:- Yam, Rheumatism root

* Biological sources:- It consist of dried tubers of the plants, *Dioscorea deltoidea*, *D. composita* belonging to family *Dioscoreaceae*.

* Geographical sources:- It is mainly found in China, Mexico ~~Europe~~, India, North America, Nepal

* Macroscopic character:-

colour - Slightly brown

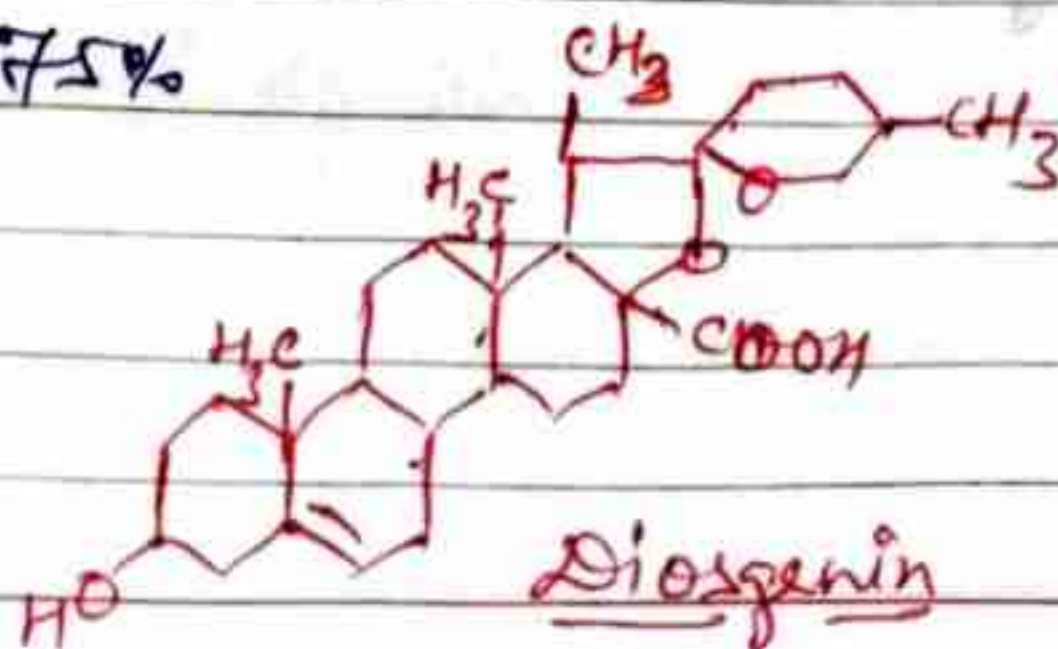
Odour - Odourless

Taste - Bitter

Size - Varies depending upon age of rhizomes

* Chemical constituent:-

- *Dioscorea* rhizomes contain 75% starch





- * Uses - This is widely used in modern medicine in order to manufacture progesterone and other steroid drugs.
- These are used as contraceptive and in the treatment of various disorders of the genitourinary organs as well as in a host of other disease such as asthma and arthritis.

* SENNA :-

* Synonyms :- Senna leaf, Indian Senna, Alexandrian Senna, Cassia Senna, *folia Senna*.

* Biological source :- It consists of dried leaflet of *Cassia angustifolia* belonging to family leguminosae. It contains not less than 25% of anthracene.

* Geographical source :- India Senna is cultivated and collected in India. Tamil Nadu, Andhra Pradesh, Gujarat and Rajasthan.

* Macroscopic character :-

Colour - Yellowish green

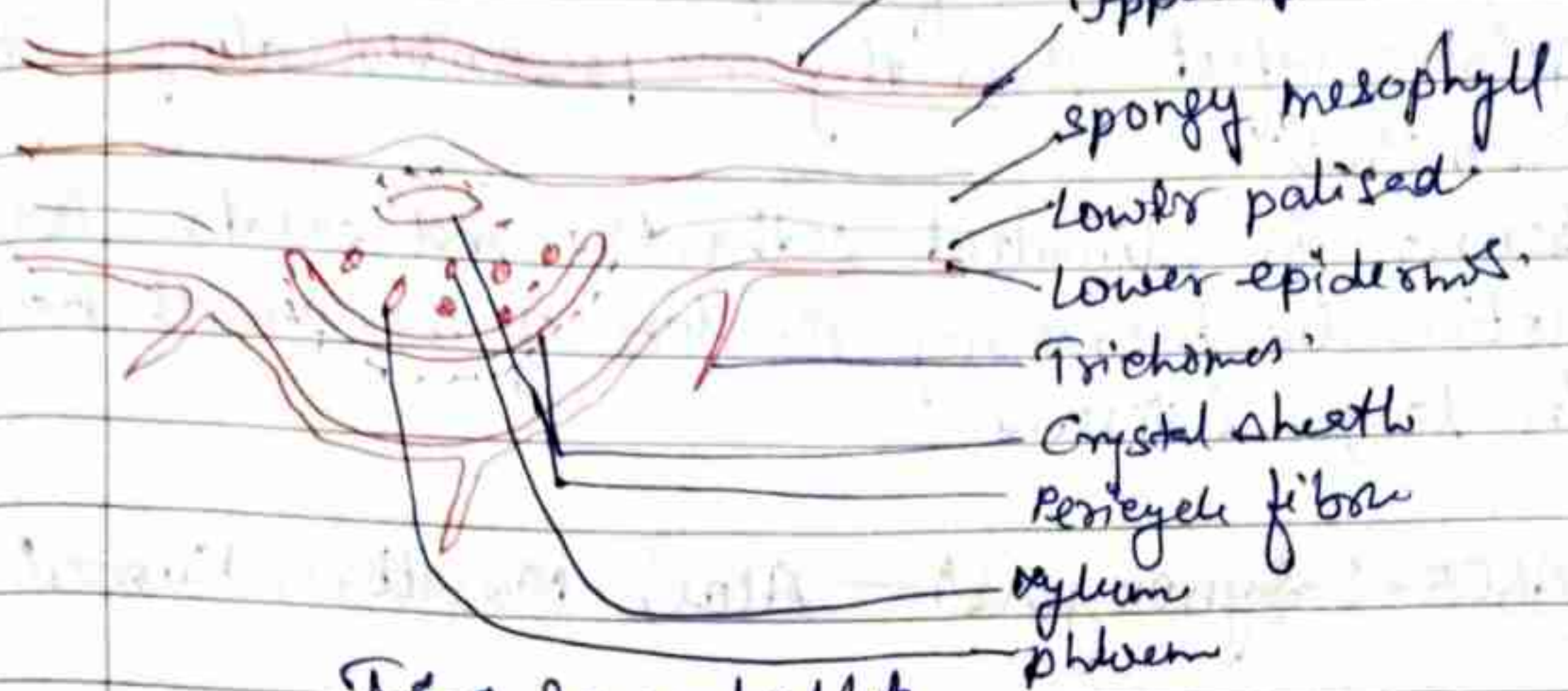
odour - slight

Taste - mucilaginous, bitter & characteristic

Size - 7-12 cm width, 25-30 cm in length

Shape - leaves are lanceolate,

* Microscopic characters :-



T.S of Senna leaflet

* Chemical constituent :- Senna contains two anthro-quinone glycoside called as sennoside A and sennoside B which account for its purgative property.

	R	10-10'	Glycoside
	COOH	trans	Sennoside A
	COOH	meso	B
	CH2OH	trans	C
	CH2OH	meso	D

Sennosides

* Chemical test :- Brountrager's test is employed for presence of anthraquinones in Senna leaves.

- The drug is boiled with dil. H_2SO_4 , filtered and to the filtrate, benzene or ether or chloroform is added and shaken.
- The organic layer is separated to which ammonia is added slowly. The ammoniacal layer shows pink to red colour due to presence of anthraquinone glycoside.

- * Uses: - Senna leaves are used as laxative. It causes irritation of large intestine and have some gripping effect. Thus they are prescribed along with -
- Carminative
 - Senna is stimulant cathartics and exerts its action by increasing the tone of the smooth muscle in large intestine

* ALOES: - Synonyms: - Aloe, Musabbar, Kumari

* Biological sources: - Aloes is the dried juice of the leaves of Aloe barbadensis Miller known as Curacao aloes, or of Aloe pernyi Baker known as Socotrine aloes, belonging to family Liliaceae.

* Geographical source: - Aloes is Endigenous to eastern and southern Africa and grown in Cape Colony, Zanzibar and Islands of Socotra. It is also cultivated in Caribbean islands, Europe and many parts of India, including North West Himalayan region

⇒ The word aloes has originated from an Arabic word viz. alloch meaning a shining bitter substance

* Description:

i) Curacao aloes: - It occurs as 'Cape' Barbadas and Livery variety. Both these varieties have strong odour, some what resembling to Godeform and an intensely bitter taste. It occurs as brownish black, opaque mass. It is waxy and somewhat resinous.

ii) Cape aloes:- It occurs as dark brown or greenish brown to olive brown masses. It has a nauseating and bitter taste. It breaks with a glassy fracture. It has a sour but distinct odour.

iii) Socotrine aloes:- It occurs as brownish yellow, opaque mass with a pasty or semisolid consistency. The fractured surface is conchoidal. Socotrine aloes has an extremely bitter nauseous taste. with ~~an~~ unpleasant odour. It is totally soluble in 60% alcohol.

iv) Zanzibar aloes:- This variety shows a liver brown colour with a dull, waxy, smooth and even fracture. It has a characteristic but not much disagreeable odour and a bitter taste.

* Microscopic characters of aloes powder:-

- The microscopy of the different varieties of aloes is more significant for identification of their powdered forms.

- The microscopic characters are studied in lactophenol because in this reagent the particles are gradually solubilized so that crystals are clearly and quickly observed.

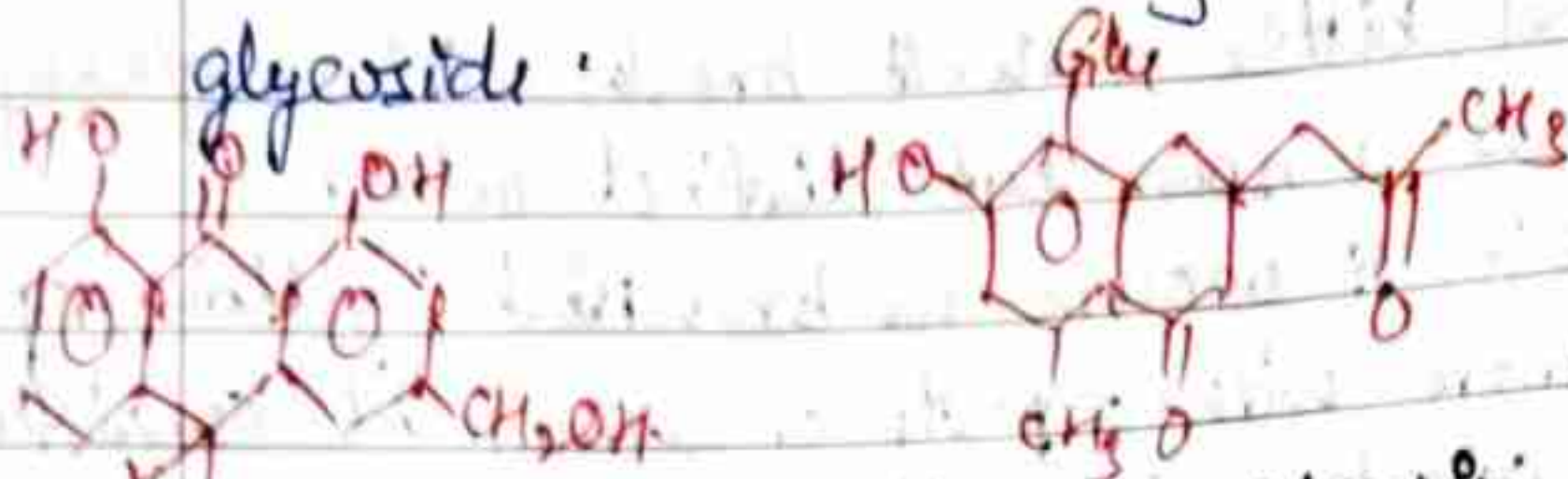
i) Curacao aloes:- It shows fragments consisting of a large number of very small needles or slender prisms.

ii) Cape aloes:- This variety appears as transparent, brown, angular or irregular fragments.

iii) Socotrine aloes:- It is characterized by fragments consisting of quite large prisms either present in group or in dispersed form.

iv) Zanzibar aloes:- It exhibits irregular lumps in which nodular masses are embedded.

Chemical constituent! - All varieties of aloe are the major source of anthraquinone



Aloesin

- Aloetic acid; homonataloin,
 - aloesone, chrysophanic acid,
 - Chrysaminic acid, galactouronic acid,
 - Choline, choline salicylate, saponins,
 - Micropoly saccharide, glucosamins,
 - Hexuronic acid, coniferyl alcohol
- Barbaloin

Chemical test

(1) General test! - For these tests, 1 g. of aloe powder is boiled with 10 ml water and filtered with the help of kieselguhr. The filtrate is used for bromine test and Schaeffer's reaction.

(2) Bromine test! - Freshly prepared bromine solution is added to a small quantity of above filtrate. The test gives a pale yellow precipitate of tetrabromaloin.

(3) Borax test! - Little quantity of above filtrate is treated with borax and shaken well till borax dissolves. When few drops of this solution are added to a test tube nearly filled with water, a green fluorescence appears.

(4) Nitrous acid test! - To 5 ml of aloe solution add little of sodium nitrite and few drops of dilute acetic acid. It produces purplish or pink colour.

* Uses: - The drug aloes is one of the safest and stimulant-purgatives, in higher doses may act as abortifacient.

- Its action is exerted mainly on the large intestine also it is useful as a vermifuge.
- Extracts of the plant have antibacterial activity.
- The clear gel of the leaf makes an excellent treatment for wounds, burns and other skin disorder, placing a protective coat over the affected area, speeding up the rate of healing and reducing the skin infection.
- To obtain this gel, the leaves can be cut in half along their length and the inner pulp rubbed over the affected areas of skin.

* BITTER ALMOND:-

Synonyms - *Amygdala amara*

* Biological Source: - Bitter almonds are dried ripe seeds of plants, *Prunus amygdalus* belonging to family Rosaceae.

* Geographical Sources:- Bitter almond trees are native of Iran and Asia minor.

At present, they are extensively cultivated in Sicily, Italy, Spain, Portugal, South France and Morocco.

* Macroscopic Character:-

Colour - Brown

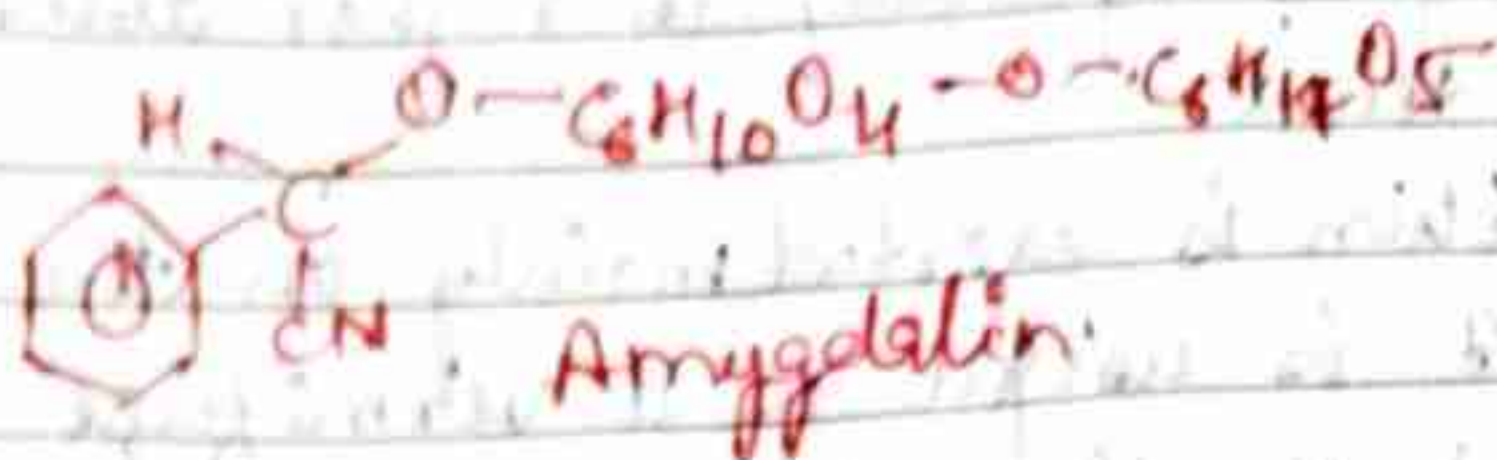
Odour - Odourless

Taste - Bitter

Size - About 20 mm length, 12.5 mm width, 20 mm thickness

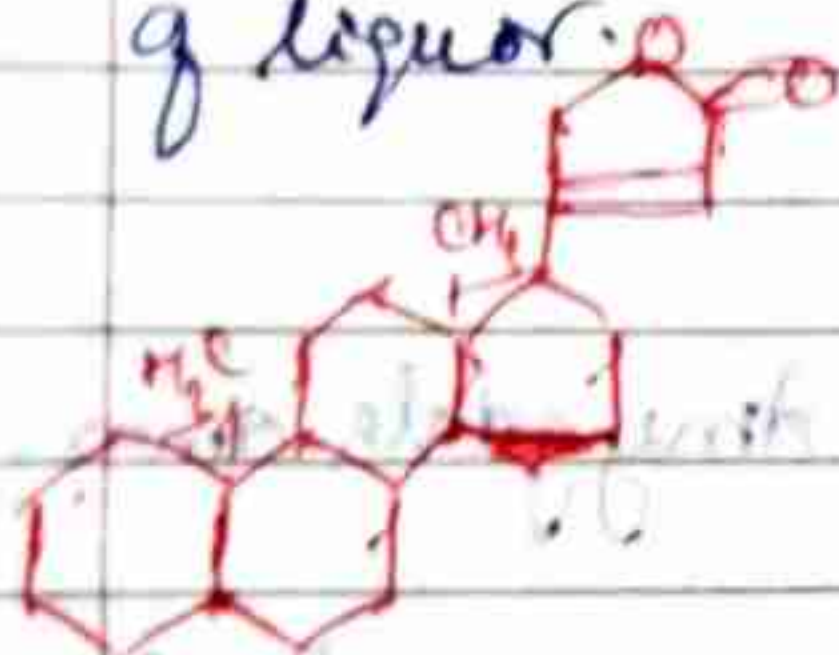
Shape - Flattened, oblong, ovoid in shape with markings on tests,

* Chemical constituent :-



Uses :- Bitter almonds are used as sedative due to HCl content.

- The oil is used in demulcent skin lotion.
- It is also used in the preparation of amygdalin, bitter almond water, in perfumery and in the form of liquor.

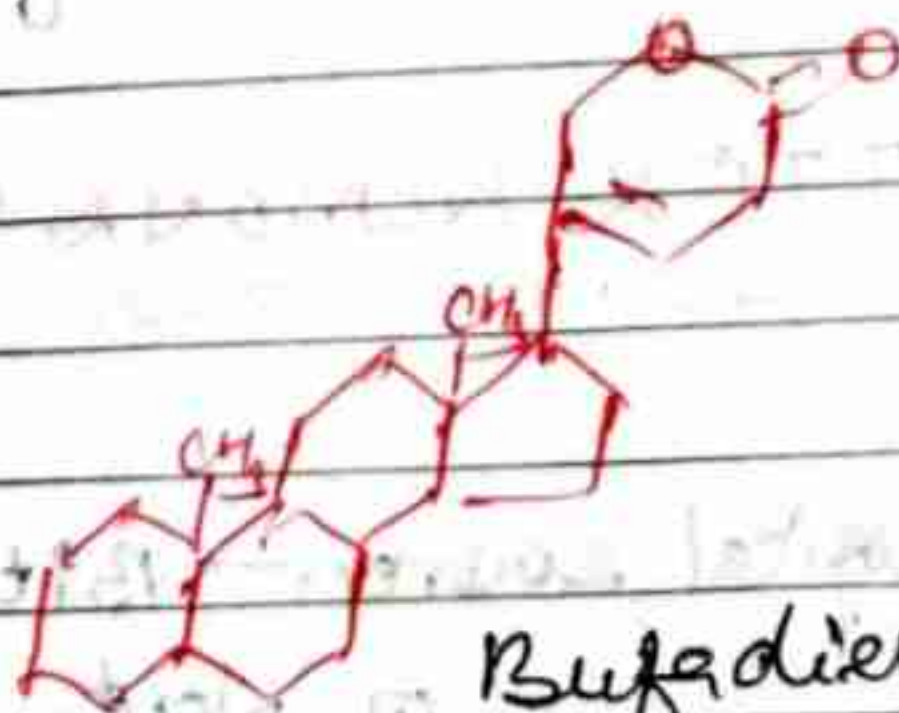


Cardenolide

⇒ Those with five membered lactone ring are called as cardenolides, while six membered lactone ring are termed as bufadienolides.

⇒ The lactone of cardenolide contain only one double bond and is attached to steroidal nucleus through C-13 position. In bufadienolide, the lactone ring contain 2-double bonds and is attached to steroidal nucleus through 17 β -position.

• The term bufadienolide has been derived from bufalin obtained from skin of toad.



Bufadienolide