

Maharashtra Educational Society's  
**H. K. COLLEGE OF PHARMACY**  
 Oshiwara, Jogeshwari (W), Mumbai – 400 102

**Academic Year: 2018- 2019**

**Exam Session: First Half 2019 (End Semester University Examination)**

**Year/Semester: Final Year B.Pharm (Sem-VIII)**

**Syllabus: CBGS**

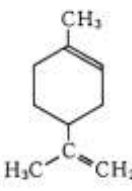
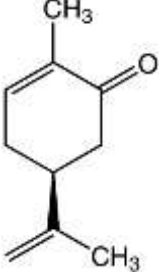
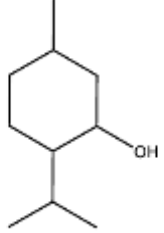
**Subject: Pharmacognosy & Phytochemistry-III, QP Code: 70393**

**Date of Examination: 8/5/2018**

**Marks: 70**

**Course Coordinator/s: Dr. Priyanka Goswami**

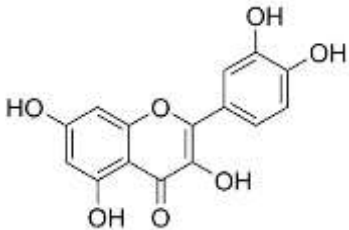

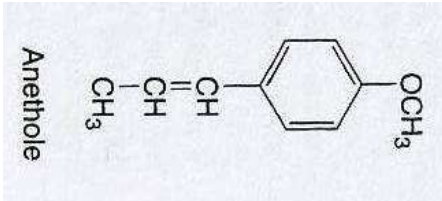
**Answer Key**

Q.1	(1x15=5M)	15
Q.1 a	<p>One monocyclic monoterpenoid volatile oil: Limone, Carvone, Menthol</p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Limone</p> </div> <div style="text-align: center;">  <p>Carvone</p> </div> <div style="text-align: center;">  <p>Menthol, Thymol</p> </div> </div> <p>Note: Anyone can be considered                  Name &amp; Structure (0.5M) each</p>	
Q.1 b	<p>Preferred method of extraction: Steam distillation</p> <p>Name</p>	1
Q.1 c	<p>Advantages of Terpeneless volatile oil</p> <p>Better stability, Better flavor</p> <p>Two advantages</p>	1
Q.1 d	<p>Two species of Brahmi</p> <p>One: Bacopa monnieri (Scrophulariaceae)</p> <p>Two: Hydrocotyl (Centella) asiatica (Umbelliferae)</p> <p>Each Species BS (0.5M) each</p>	
Q.1	Chemical Test for saponin	

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e	1. Foam test: powder – persistent foam 2. RBC hemolysis – powder in blood → hemolysis of blood Each Test (0.5 M) each	
Q.1 f	Steroidal saponin constituent: <b>Glycyrrhizin, Diosgenin</b>	
	Name & Structure (0.5M) each	
Q.1 g	ANY ONE oleo resin drug: Capsicum <b>OR</b> Ginger <b>OR</b> Turmeric Capsicum: <i>Capsicum annum</i> (Solanaceae) Ginger: <i>Zingiber officinale</i> (Zingiberaceae) Turmeric: <i>Curcuma longa</i> (Zingiberaceae) Name & Source (0.5M) each	
Q.1 h	Pungent principle of Capsicum: Capsaicin Coloring principle : Capsanthin Each principle (0.5M) each	
Q.1 i	ANY ONE herbal photo sensitizer: <b>Ammi majus</b> <b>OR</b> <b>Psoraleae</b> Ammi majus: <i>Ammi majus</i> (Umbelliferae) Psoralea: <i>Psoralea corylifolia</i> (Leguminosae) Name & Source (0.5M) each	
Q.1 j	Biopotential of RUTIN: capillary bleeding, retinal hemorrhage Each use (0.5M) each	
Q.1 k	Source of LYCOPENE: Tomato ( <i>Lycopersicon esculentum</i> ), Spinach ( <i>Spinacea oleraceae</i> ) Name & Source (0.5M) each	
Q.1 l	Traditional uses of Ashoka <ul style="list-style-type: none"> <li>• <b>Oxytocic: To stimulate the uterus</b></li> <li>• Leucorrhoea, internal bleeding, Haemorrhagic dysentery</li> </ul> Two points	1
Q.1 m	ANY ONE herbal binding agent: Guar gum <b>OR</b> Starch Guar gum: <i>Cyamopsis tetragonolobus</i> (Leguminosae) Starch: Corn: <i>Zea mays</i> , Wheat: <i>Triticum aestivum</i> , Rice: <i>Oryza sativa</i> (Gramineae), Potato: <i>Solanum tuberosum</i> (Solanaceae), Name & Source (0.5M) each	

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	Source	
Q.1 n	<b>TWO</b> examples of ayurvedic arishta: Ashokarishta Arjunarishta Each example (0.5M) each	
Q.1 o	<b>Flavonoid marker: ANY ONE: Quercetin OR Rutin</b>  <div style="text-align: center;">  </div> Name & Structure (0.5M) each	
Q.2	a+b+c = 4+4+3	11
Q.2 a	<p>Pharmacognosy of Fennel OR Dill</p> <p><b>Fennel</b>  <b>Pharmacognostical account of Fennel</b></p> <ul style="list-style-type: none"> <li>• <b>Source:</b> dried ripe fruits of <i>Foeniculum vulgare</i> subsp. Vulgare, var. vulgare, NLT 0.6% of anethole</li> <li>• Family: Umbelliferae</li> <li>• Distribution: Europe (Russia, Romania, Germany, France), India, Japan. India: GJ, PB, MH, RJ, UP, WB</li> <li>• The commercial drug consists partly of whole cremocarp and partly of isolated mericarps.</li> <li>• <b>Constituents:</b> 3-7% Volatile oil, 20% Protein, Fixed oil, chief constituent is ketone (Fenchone 20%), Phenolic ether (anethole 50%), phellandrene, limonene, methyl chavicol, anisic aldehyde</li> <li>• <b>Use:</b> aromatic, carminative, stimulant, flavoring agent and as expectorant</li> <li>• <b>Sweet Fennel:</b></li> <li>• Source: derived from <i>F.vulgare</i> subsp. Vulgare; var. dulce Included in BP/EP</li> <li>• Fruits resemble those of the bitter variety but have a sweet taste and lower volatile oil content (NLT 2%).</li> <li>• NLT 80% of the oil is required to be anethole, NMT 7.5% fenchone, and NMT 10% estragole.</li> </ul> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Fenchone</p> </div> <div style="text-align: center;">  <p>Anethole</p> </div> </div>	

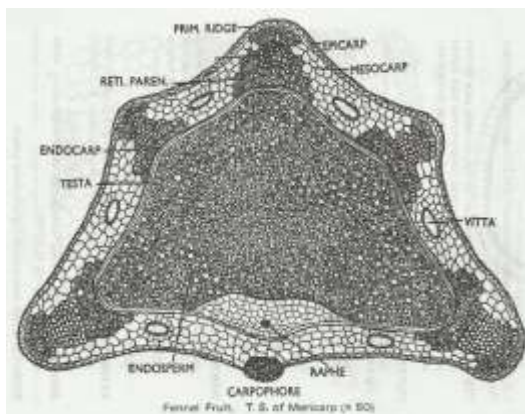
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- **Morphology:** Color: Green to Yellowish brown, Odor: Sweet, aromatic, Taste: Strongly aromatic
- **Cultivation:**
- Method: Dibbling (making small holes in the ground for seeds or plants)
- Sowing period (best quality): Before spring (Jan-Feb)
- Plenty of spaces between two rows and two plants
- 4-5 seeds, distance: 25 cm in between
- Soil: well drained, calcareous
- Weather: sunny
- Fertilizer: suitable, bear flowers in 2<sup>nd</sup> yr
- India: 90% production from Gujarat
- Collection: when ripe, harvesting done, SUN drying and separated by thrashing



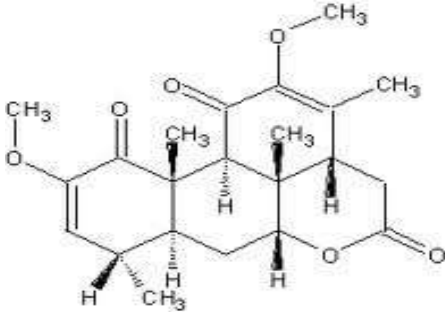
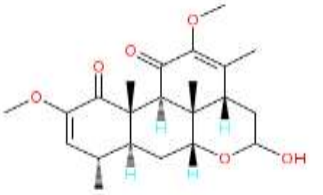
Dibbling Method

- **Microscopy:**



- **Adulterants:**
- The fruits from which volatile oil is removed by treating with alcohol, contain less % of volatile oil and have a typical odour of fusel oil. Such fruits don't contain fenchone.
- If the fruits are exhausted by the application of steam, they look dark greenish-brown in colour and contain only traces of volatile oil and sink in water

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	Source + Uses Constituents + Structure Cultivation + Collection Morphology + Microscopy	1 1 1 1
Q.2 b	<p><b>Kalmegh</b></p> <ul style="list-style-type: none"> <li>• Syn: King of bitter,</li> <li>• Source: leaves or entire aerial part of “<i>Andrographis paniculata</i>”</li> <li>• Family: Acanthaceae</li> <li>• GS: through India</li> <li>• Constituents: Andrographolides (Liver), Kalmeghin, Andrographiside</li> <li>• Beta sitosterol glucoside, eugenol, andrograpanin, andrographidines</li> <li>• Use: Hepatoprotective, Jaundice</li> <li>• Febrifuge, tonic, alterative, anthelmintic, astringent,</li> <li>• Debility, cholera, diabetes, swelling, itching, piles, STDs, bronchitis, dysentery, dyspepsia, fever, weakness</li> <li>• Decoction: blood purifier and in Jaundice</li> <li>• Market formulation: Sage liverex (Sage), Vasu-liv (Vasu herbal)</li> </ul> <p><b>Quassia</b></p> <ul style="list-style-type: none"> <li>• Syn: Bitter wood, Jamaica Quassia</li> <li>• <b>Source:</b> dried wood of the stem of <i>Aeschrion excelsa</i> (<i>Picroena</i> or <i>Picrasma excelsa</i>)</li> <li>• Family: Simaroubaceae</li> <li>• GS: West indies, Jamaica, Guadeloupe, Martinique, Barbados, St. Vincent</li> <li>• <b>Constituents:</b></li> <li>• Terpenoid: Amaroid, quassin (an intensely bitter lactone), Neoquassin, Isoquassin (picrasmin), 18-hydroxy quassin, Scopoletin</li> <li>• Alkaloid: Cathine-6-one</li> <li>• Volatile Oil</li> </ul> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">  <p>Quassin</p> </div> <div style="text-align: center;">  <div style="border: 1px solid green; padding: 2px; display: inline-block;">Neo Quassin</div> </div> </div> <ul style="list-style-type: none"> <li>• <b>Uses:</b> Bitter tonic, Insecticide, vermicide for thread worms, slightly narcotic &amp; acts on</li> </ul>	

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	<p>flies, increase appetite</p> <p>Each Drug                  Source + Uses                  Constituents + Structure</p>	<p>2 1 1</p>
Q.2 c	<p>TWO Herbal Skin care: Aloe vera, Turmeric</p> <ul style="list-style-type: none"> <li>• Syn: Haridra, Haldi</li> <li>• Source: dried rhizomes of <i>Curcuma longa</i>, <i>C. domestica</i></li> <li>• Family: Zingiberaceae</li> <li>• Constituents: 5% curcuminoids, 5% essential oil (25% zingiberene), poly saccharide</li> <li>• Cosmetic Uses:</li> <li>• In India, turmeric has been used for centuries as a natural cleanser; the powder is mixed with milk to bring a healthy glow to the skin.</li> <li>• In the form of a paste (made by rubbing the prepared rhizome on a hard wet surface) turmeric is used as a facial cosmetic possibly for its antimicrobial effect</li> <li>• Such an application is believed to improve skin appearance by eliminating superfluous hair and easing out wrinkles.</li> <li>• Today turmeric and its derived chemicals are extensively included in cosmetic formulations.</li> <li>• Turmeric powder, extracts are reported to have powerful antioxidant, anti-inflammatory, cholerectic, immunomodulatory and antimicrobial properties.</li> <li>• It is recommended for treatment of eczema and acne as it moisturizes skin and accelerates healing.</li> <li>• On account of its wound healing a minor proportion of bioactive polysaccharide fraction.</li> </ul> <p><b>Aloe vera</b></p> <ul style="list-style-type: none"> <li>• Syn: Kumari</li> <li>• Source: dried leaf juice of <i>Aloe vera</i></li> <li>• Family: Liliaceae</li> <li>• GS: Western and Northern India</li> <li>• Constituents: Poly saccharide Glucomanna (Acemannan), Magnesium lactate, Bradykininase, Tannins</li> <li>• Cosmetic Use: It has antiseptic and antibiotic properties that make it very effective topically for treating cuts and abrasions.</li> <li>• It is used to treat first and second-degree burns, sunburns, eczema, as well as poison oak, poison ivy and poison sumac infections</li> <li>• Acemannan: Skin healing and soothing agent</li> <li>• Magnesium lactate: anti pruritic</li> <li>• Bradykininase: anti-inflammatory</li> </ul> <p>Each Drug</p>	<p>2</p>

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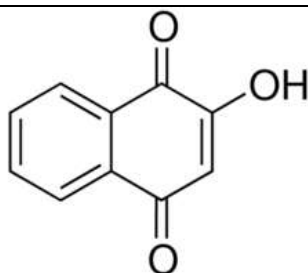
	Source + Uses Constituents	1 1
Q.3		11
Q.3 a	<p>Note on Dioscorea</p> <ul style="list-style-type: none"> <li>• Syn.: Yam, Rheumatism root</li> <li>• Source: Dried tubers of <i>Dioscorea deltoidea</i>, <i>D. composita</i> &amp; other species of <i>Dioscorea</i></li> <li>• Family: Dioscoreaceae</li> <li>• G.S.: North western Himalaya, USA, Mexico</li> <li>• Chemical Constituents: Non-edible as very bitter.</li> <li>• Rhizome: 75% starch &amp; phenol</li> <li>• Roots: Diosgenin (4-6%) steroidal saponin, glycoside: smilagenin, epismilagenin, B-isomer of yammogenin,</li> </ul> <div style="text-align: center;"> <p>Sarsasapogenin</p> <p>Diosgenin</p> <p>Progesterone</p> </div> <ul style="list-style-type: none"> <li>• Enzyme: sapogenase; Diosgenin is hydrolytic product of saponin dioscin. progesterone, steroidal drugs, contraceptive)</li> <li>• Uses: Source of diosgenin (in manufacturing &amp; in treatment of arthritis)</li> </ul> <p>Sources Constituents &amp; Structure Uses</p>	1 2 1
Q.3 b	<p><b>Tulsi</b></p> <ul style="list-style-type: none"> <li>• Syn: Holy basil, Sacred basil</li> <li>• Source: dried leaves of “<i>Ocimum sanctum</i>”</li> <li>• Family: Labiatae</li> <li>• GS: Throughout world</li> <li>• Constituents: Volatile oil: 21% Eugenol, 37% caryophyllene, bornyl acetate, methyl</li> </ul>	

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	<p>eugenol, neral, alpha-beta pinene, camphene</p> <ul style="list-style-type: none"> <li>• Ursolic acid, campesterol, cholesterol, stigmasterol, beta sitosterol</li> <li>• Aromatic, carminative, stimulant, flavouring agent</li> <li>• Hypoglycemic, Immunomodulator, anti stress, analgesic, antipyretic, anti inflammatory, CNS depressant, radio protective, antiseptic</li> <li>• Used in bronchitis, cough, cold, fever, gastric disorder</li> <li>• Seeds in genitourinary disorders</li> <li>• Scorpion sting and snake bite</li> <li>• Market formulation: Respinova (Lupin), Sualin (Hamdard)</li> </ul> <p><b>Lehsun</b></p> <ul style="list-style-type: none"> <li>• Syn: Garlic</li> <li>• Regional Name: Marathi: Lasun</li> <li>• Source: bulbs of "Allium sativum"</li> <li>• Family: Liliaceae</li> <li>• GS: Europe, Central Asia, US, India</li> <li>• Constituents: Sulphur containing volatile oil: allyl disulphide, alliin, allicin, allyl propyl disulphide, diallyl disulphide</li> <li>• Thioglycoside, Amino acids, flavonols, Vitamins, mucilage</li> <li>• Use: Antithrombotic, Hypolipidemic, Hypoglycemic (allicin, allyl propyl disulphide), Hypotensive, Diaphoretic, Expectorant, Antibiotic</li> <li>• Anthelmintic, Antiasthmatic, Anticholesterolemic, Antiseptic, Diuretic, Cholagogue, Febrifuge, Stomachic, Vasodilator</li> <li>• Colon cancer, cough, flatulence, Nervous disorder, gangrene of lung, dilated bronchi, pulmonary phthisis</li> <li>• Market formulation: Lashunadi bati (Baidynath), Lasuna (Himalaya co.)</li> </ul> <p>Each Drug                  Source                  Constituents &amp; Uses</p>	2 1 1
Q.3 c	<p>Any one Hair colorant: Henna/ Bixa/Turmeric</p> <p><b>Henna</b></p> <p>Source: dried leaves of <i>Lawsonia inermis</i> (<i>L. alba</i>)</p> <p>Family: Lythraceae</p> <p>GS: North Africa, India, Srilanka</p> <p>Constituents: Phenolic glycosides, Coumarins, Xanthene, Flavonoids, Fats, Resin and Henna tannin</p> <p>Coloring matter: Lawesone, which can be extracted from the leaves by NaHCO<sub>3</sub>.</p>	



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Lawsone is 2,5-dihydroxy-1,4-naphthoquinone used to dye protein fiber in an orange shade, in conjunction with dihydroxyacetone as a sunscreen agent

Source  
 Constituent  
 Uses

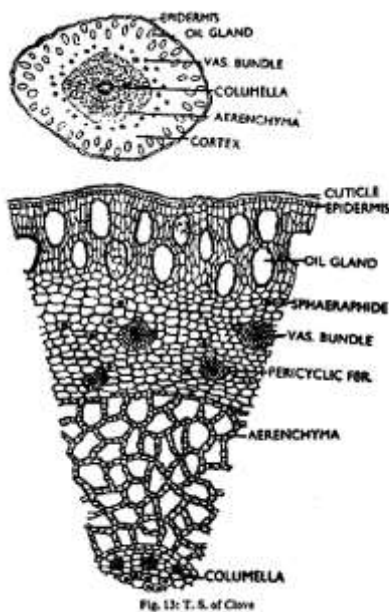
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 1  
 1

Q.4	a+b+c=4+4+3	11
Q.4 a	<ul style="list-style-type: none"> <li>• Syn: Caryophyllum, Lavang</li> <li>• <b>Source:</b> dried flower buds of <i>Syzygium aromaticum</i> (<i>Eugenia caryophyllus</i>), NLT 7% Eugenol</li> <li>• Family: Myrtaceae</li> <li>• GS: Indigenous to Molucca or Clove Islands, cultivated in Zanzibar, Pemba, Madagascar, Caribbean island Sri Lanka, India</li> <li>• India: Nilgiri, Tenkasi Hills, Kanyakumari Dist (TN), Kottayam, Quilon (KL)</li> <li>• <b>Cultivation:</b></li> <li>• Soil: deep rich loamy with high humus, sandy loam with laterite</li> <li>• Water logging to be avoided</li> <li>• Climate: warm and humid, Grows well – vicinity of sea</li> <li>• Altitude: sea level to 900 m</li> <li>• Rainfall- 150-200 cm</li> <li>• Propagation: seedling</li> <li>• Sowing Period: August to October</li> <li>• First in nursery beds</li> <li>• Germination period: 5 weeks</li> <li>• Transplant: after 6 months to pots and allowed to grow for a year</li> <li>• Transfer: Field in shade</li> <li>• Can be grown along with Areca nut, coconut, nutmeg</li> <li>• Fertilizers: Ammonium sulphate, super phosphate and potash (2 doses, first: May/June &amp; second: October)</li> <li>• Yield: normal production: 3 kg drug</li> <li>• <b>Collection &amp; Preparation:</b></li> <li>• Collection: After 7-8 years</li> <li>• Picking: Hand picking or beating with bamboos</li> <li>• The operation commences when the cloves start changing their colour from green to</li> </ul>	

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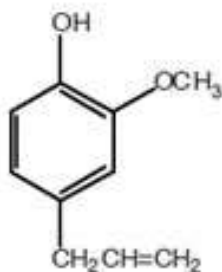
slightly pink

- When tree is tall and cloves are beyond reach, platform ladders are used for collection.
- Drying: Sun drying preferred
- **Morphology:**
- Colour change: after drying it becomes crimson to brownish black in colour
- Colour: crimson to dark brown
- Odour: Aromatic
- Taste: Pungent and aromatic, followed by numbness
- Shape: Hypanthium is surrounded by 4 thick acute divergent sepals surrounded by dome shaped corolla
- **Microscopy:**
- Heavy cuticularized epidermis
- Anomocytic stomata in epidermis
- Numerous oil cells (shizolysigenous)
- Phloem fibers
- Calcium oxalates (cluster crystals & prisms)
- Lignified sclereids
- \*does not contain starch grains, Starch (Fruit – “mother cloves”)

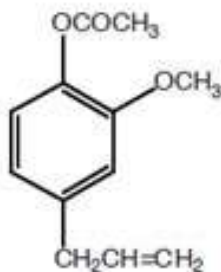


- **Constituents:**
- 14-21% Volatile oils
- 10-13% tannin (gallotannic acid), resin, chromone, eugenil
- Volatile oil: 70-90% Eugenol, Eugenol acetate, Caryophyllene

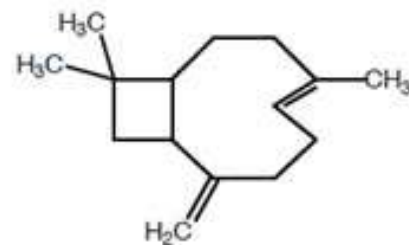
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**Eugenol**



**Eugenol Acetate**



**Caryophyllene**

- Small quantity of ester, ketone and alcohol
- Chemical Test: When TS of clove is treated with strong KOH, needle shaped crystals of potassium eugenate are observed
- **Use:** Dental analgesic, Carminative, Stimulant, Flavouring agent, Aromatic, Antiseptic, preparation of Cigarettes, Perfumery, Manufacturing of Vanillin
- **Adulterants:**
- Mother cloves: presence of starch grains (old)
- Blown cloves: less volatile oil
- Clove stalks: stone cells are detected, less oil
- Exhausted clove: float on water, less oil

Source

Chemical constituent & Structure

Morphology & Microscopy

Adulterants & Uses

1  
1  
1  
1

**Q.4** Concept of Detoxification in Ayurveda (**Two Example**)

**b**

The detoxification or purification process of any toxic material used for medicinal purposes is termed as “Śodhana”.

- Śodhana (detoxification/purification) involves the conversion of any poisonous drug into beneficial, non-poisonous/nontoxic ones.

Various sodhana process includes

- Simple boiling with water or lemon juice
- Triturating with borax
- Swedana (heat treatment with liquids)
- Treating with cows urine
- Treating with cow milk
- Frying with cow ghee or castor oil

**Abrus**

- Guñjā (*Abrus precatorius* Linn., Family: Fabaceae) roots, seeds, and leaves have been used traditionally for their purgative, emetic, tonic, aphrodisiac, and hair growth promoting properties after being processed through Śodhana.
- Abrus seeds contain a toxic lectin, abrin (an albumotoxin), a fat-splitting enzyme, a

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glucoside (abruassic acid), urease, abarnin, trigonelline, choline, hypaphorine, and steroidal oil that have abortive effects.

- Abrin has a fatal dose of 0.1–1 µg/kg in humans and it is reported that boiling renders the seed harmless.
- In Śodhana of Guñjā seeds, they are subjected to the svedana in dolā yantra with Godugdha or Kāñji for 3–6 h.
- The Śodhita material is then subjected to washing with hot water and drying under shade.
- During the Śodhana process, color of the media changes due to the removal of colored materials from the endosperm of the seeds and subsequently there is loss in weight.
- According to Singh et al. High performance liquid chromatography (HPLC) study of the Guñjā extract before and after the Śodhana process showed that the level of toxic hypaphorine decreases, whereas the less toxic alkaloid abrine increases.
- Perhaps during Śodhana process, a major part of hypaphorine might have undergone transformation into abrine by reduction of its tertiary amino group into the primary amino group.
- Percentage of protein present in Guñjā also reduces after Śodhana.
- In another study, chromatographic evaluation confirms the absence of the steroidal oil in Śodhita Guñjā seed, which is responsible for the abortifacient effect. The LD50 dose of Guñjā was reported to increase from 2 to 5 g/kg (āsodhita) to ≥5 g/kg (Śodhita).
- The efficacy studies on hair growth and antibacterial effect of the Śodhita Guñjā show significant result

#### Aconite

- Many species of the genus Aconitum viz., Aconitum ferox Wall., Aconitum napellus Linn., and Aconitum chasmanthum Holmes ex. Stapf. are known under the common name “Vatsanābha” in Sanskrit and “Aconite” in English.
- The roots of all the three plants are extremely poisonous but useful in the treatment of various diseases such as fever, rheumatoid arthritis, sciatica, hypertension, and acts as “rasāyana” (immunomodulators) after their detoxification.
- Most of the alkaloids present in the root of Aconitum species at higher doses are reported to have cardiotoxic and neurotoxic effects. Severe Aconite poisoning results mainly due to the accidental ingestion of wild plant or excess consumption of herbal decoction made from the Aconite roots.
- Isolated compound (Aconite) from Vatsanābha at a dose of 2 mg can cause death, while 1 g of Vatsanābha is fatal for human being.
- The root of Vatsanābha was used as poison for hunting animals in ancient times by tribals.
- Overdosing of traditional Ayurvedic formulations of Vatsanābha may cause hypotension, bradycardia or bidirectional tachycardia.
- Due to such reasons, the therapeutic dose of Vatsanābha mentioned in Ayurvedic system of medicine is 8 mg to 16 mg/day.
- Its purification process includes svedana (boiling) in dola yantra using Godugdha (cow milk) for 3 h daily for three continuous days, followed by washing with water thrice and drying under sun light.
- After Śodhana process, the total alkaloid content decreases, but the contents of less toxic substances such as aconine, hypoaconine, and benzyloaconine increases possibly due to conversion of the toxic aconitine into aconine or hydrolysis of the alkaloids to their

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respective amino alcohols after Śodhana process.

- In another study, it has been reported that the purified form of *A. carmichaeli* produces cholinergic stimulation which prevents the cold-stress-induced hypothermia and immunosuppression.
- Moreover, the unpurified root of *A. napellus* has been reported to cause a significant rise in heart rate and changes in electrocardiogram as compared to purified Aconite. It has been reported that Gomūtra (cow urine) converts Aconite to a compound with cardiac stimulant property, whereas, raw Aconite showed cardiac depressant properties.
- Śodhana by both Gomūtra and Godugdha makes Aconite devoid of cardiac and neuromuscular toxic effects without affecting its antipyretic activity.
- *A. chasmanthum* is another species which is well known for its cardiac and neurotoxicity.
- *A. chasmanthum* showed toxic effects, which leads to the impairment in kidney and liver functions. Śodhana with Gomūtra reduces the toxic effects of Aconite significantly.
- In vivo and in vitro studies on frog heart showed that *A. ferox* has potential effect to depress the heart rate by its positive inotropic and negative chronotropic effects and these effects may be mediated through cholinergic stimulation or by direct action on the heart muscle.

#### Sodhana of *Nux vomica*

- Classical method of purification includes soaking of Kupīlu seeds in liquid media (one after another) for 3–20 days. The liquid media include kāñji (soaking for 3 days), Godugdha (boiling for 3 h), Gomūtra (7 days soaking) and Goghrita (cow ghee) (fried till brownish red in color and swollen) After Śodhana process, the seeds are washed with lukewarm water where the outer seed coat and embryo are removed from the cotyledons.
- Similarly in Chinese system of medicine, *nux-vomica* is fried with sesame oil for detoxification.
- Kupīlu after Śodhana exhibits low percentage of total alkaloid content (strychnine and brucine); and the toxic loganin glycoside is eliminated. Detoxification of Kupīlu might be due to the chemical changes that causes the enhance N-oxidation and conversion of strychnine and brucine into less toxic derivatives such as isostrychnine, isobrucine, strychnine N-oxide, brucine N-oxide, and reduced level of loganic acid content of the seed.
- Being acidic in nature, kāñji is a better extraction medium because it may facilitate the extraction of alkaloids and other phytochemicals.
- Though larger doses of strychnine are known to be lethal, in lower doses it is known to be a stimulator.
- Gomūtra Śodhita Kupīlu shows better pharmacological potency than the raw seeds. Śodhana enhances its hepatoprotective potency.

#### Sodhana of *Datura*

- Dhattūra (*Datura metel* Linn., Family: Solanaceae) seeds are highly toxic and may be fatal, due to the presence of alkaloids in them.
- Most of the side-effects (dryness of the mouth, excessive thirst, cramps, unconsciousness, and giddiness) are due to anticholinergic property of the alkaloids present in this plant.
- In the purification process of Dhattūra, seeds are soaked in freshly collected Gomūtra and kept aside for 12 h.

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	<ul style="list-style-type: none"> <li>• After washing, the seeds are transferred to the dolā yantra for svedana process for 3 h.</li> <li>• The seeds are again washed with lukewarm water, allowed to dry and the seeds testa are removed.</li> <li>• Reduction in total alkaloid content and increase in total protein content of seed were observed after Śodhana.</li> <li>• Complete removal of scopolamine and partial removal of hyosciamine reflects the importance of Śodhana of Dhattūra by means of which the toxic effects are removed</li> </ul> <p>Each example                  Process                  Mechanism + Uses</p>	2 1 1
Q.4 c	Herb drug interactions (Any 2) <ul style="list-style-type: none"> <li>• Many medicinal herbs and pharmaceutical drugs are therapeutic at one dose and toxic at another.</li> <li>• Interactions between herbs and drugs may increase or decrease the pharmacological or toxicological effects of either component.</li> <li>• Synergistic therapeutic effects may complicate the dosing of long-term medications-</li> <li>• E.g. herbs traditionally used to decrease glucose concentrations in diabetes I could theoretically precipitate hypoglycaemia if taken in combination with conventional drugs.</li> </ul> <p><b>Allium sativum</b> (garlic) decreased the area under the plasma concentration-time curve (AUC) and maximum plasma concentration of saquinavir, but not ritonavir and paracetamol (acetaminophen), in volunteers.</p> <ul style="list-style-type: none"> <li>• A. sativum increased the clotting time and international normalised ratio of warfarin and caused hypoglycaemia when taken with chlorpropamide.</li> <li>• <b>Ginkgo biloba</b> (ginkgo) caused bleeding when combined with warfarin or aspirin (acetylsalicylic acid), raised blood pressure when combined with a thiazide diuretic and even caused coma when combined with trazodone in patients.</li> </ul> <p>Explanation                  Each example</p>	1. 5
Q.5	a+b+c=4+4+3	
Q.5 a	Cardenolide: Unsaturated butyrolactone ring, Lactone has single double bond & attached at C-17 of steroidal nucleus 5 membered lactone ring & form a C23 steroid Found in Leguminosae, Cruciferae, Euphorbiaceae family	

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e.g. Digitalis

Bufadienolide:

- Pyrone ring
- 2 double bond attached at 17<sup>a</sup> position
- 6 membered lactone ring & form a C<sub>24</sub> steroid
- Found in Liliaceae, Ranunculaceae family
- e.g. Squill

Squill

- Source: Dried slices of the bulb of
- White variety: *Urginea maritima*,
- Red variety: *Urginea maritima*
- Family: Liliaceae
- Syn. : Scillae bulbos, Urginea scilla, Drimia maritime, European Scilla
- G.S. : Spain, Portugal, Morocco, Algeria, Southern France, Italy, Dalmatia, Greece, Syria
- **White variety**
- Cardiac glycoside: Bufadienolide: Scillaren A (2/3<sup>rd</sup> of total glycoside content, responsible for activity ) & Scillaren B
- Scillaren A → acid hydrolysis → Scillarenin + Scillabiose (Glucose + Rhamnose)
- Scillaren A → enzyme hydrolysis → Proscillaridin A + Glucose
- Glucosyllaren A: Scillarenin + Rhamnose + Glucose + Glucose
- Proscillaridin A → acid hydrolysis → Scillarenin A + Rhamnose
- Xanthosyllide, flavonoids, mucilage, Calcium oxalate, sinistrin (carbohydrate similar to inulin), volatile substances (causing irritation)
- **Red variety**
- Anthocyanin (red color),
- Scilliroside (glycoside which is toxic to rat)
- White & Red variety is chemical races.
- NOT POSITIVE Baljet Test & Legal Test:
- Liberman's sterol Test: Squill glycoside
- Squill mesophyll region: mucilage, calcium oxalate and yellow coloring matter xanthosyllide is present.
- Mucilage not pink color with ruthenium red but stains red with corallin soda & pale yellow with iodine
- Due to mucilage, it is very much susceptible for moisture & with moisture it forms clumpy mass.
- Moisture → hydrolysis → glycoside, content → aglycone → become less active
- Calcium oxalate, as a bundle of long acicular crystal, which easily penetrate skin when bulbs are handled, cause intense irritation, sometimes eruptions
- Stimulating, expectorant, diuretic property, cardiac tonic, same like digitalis (but more irritating to GI mucus membrane), chronic bronchitis, catarrhal affection, asthma

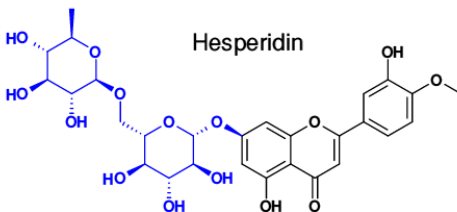
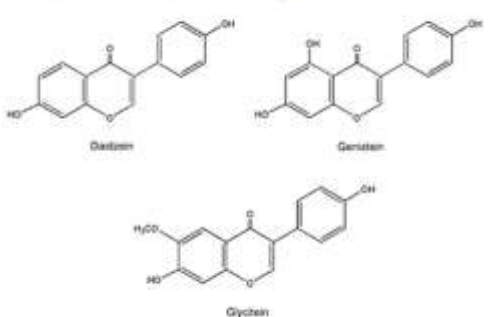
Difference

Squill

Source + Uses

Constituents

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Q.5 b	<p><b>Orange peel</b></p> <ul style="list-style-type: none"> <li>Source: peels of <i>Citrus aurantium</i></li> <li>Family: Rutaceae</li> <li>Constituent: Flavonoid (Hesperidin)</li> </ul> <div style="text-align: center; margin: 10px 0;">  <p>Hesperidin</p> </div> <ul style="list-style-type: none"> <li>Colorless needle like crystals, closely related to Vitamin P (Citrin), readily soluble in hot water, sparingly soluble in alcohol and cold water and practically insoluble in ether, benzene and chloroform</li> <li>Use: prevention and management of capillary fragility so used in hypertension, CVS disorders, Cerebrovascular diseases.</li> </ul> <p><b>Soybean</b></p> <ul style="list-style-type: none"> <li>Source: dried seeds of <i>Glycine max</i></li> <li>Family: Leguminosae</li> <li>Constituents: Isoflavones</li> </ul> <div style="text-align: center; margin: 10px 0;"> <p style="color: red; font-size: small;">Figure 1. Chemical Structures of Soy Isoflavone Aglycones</p>  </div> <ul style="list-style-type: none"> <li>Use: Soy flavonoids (isoflavones) can also reduce blood cholesterol and can help to prevent osteoporosis. Soy flavonoids are also used to ease menopausal symptoms.</li> <li>CVS, Mental and Women's health, cancer prevention</li> </ul>	2 1 1
Q.5 c	<p>Schedule T</p> <ul style="list-style-type: none"> <li>➤ PART-I</li> <li>➤ GOOD MANUFACTURING PRACTICES</li> <li>➤ Factory Premises:</li> </ul>	



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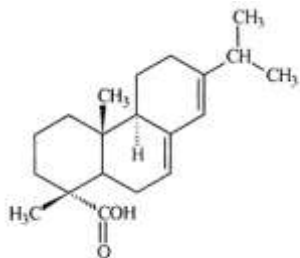
	<ul style="list-style-type: none"> <li>➤ The manufacturing plant should have adequate space for:-             <ul style="list-style-type: none"> <li>(i) Receiving and storing raw material</li> <li>(ii) Manufacturing process areas</li> <li>(iii) Quality control section</li> <li>(iv) Finished goods store</li> <li>(v) Office</li> <li>(vi) Rejected goods/drugs store</li> </ul> </li>   <li>➤ General Requirements:             <ul style="list-style-type: none"> <li>➤ Location and surroundings</li> <li>➤ Buildings</li> <li>➤ Water supply</li> <li>➤ Disposal of waste</li> <li>➤ Containers' cleaning</li> <li>➤ Stores                     <ul style="list-style-type: none"> <li>➤ Raw materials</li> <li>➤ Packaging material</li> <li>➤ Finished goods stores</li> <li>➤ Working space</li> <li>➤ Health, clothing, sanitation and hygiene of workers</li> <li>➤ Medical services</li> <li>➤ Machinery and equipment's</li> <li>➤ Batch manufacturing records</li> <li>➤ Distribution records</li> <li>➤ Record of market complaints</li> <li>➤ Quality control</li> <li>➤ Requirement for Sterile product</li> <li>➤ Manufacturing areas</li> <li>➤ Precautions against contamination and mix</li> </ul> </li> </ul> </li>   <li>➤ <b>Requirement for Space for ASU</b> <ul style="list-style-type: none"> <li>➤ 200 sq. feet: Asava, Arishta, Churna / Nasya/Manjan/Lepa/Kwath Churn Sufoof (powder)</li> <li>➤ 150 sq. feet: Kupa pakava/Ksara/ Parpati/Lavana Bhasma Satva/Sindura Karpu/ Uppu /Param, Panak, Syrup / Pravahi Kwath Manapaku,</li> <li>➤ 100 sq. feet: Anjana/Pisti, Pills/Vati /Gutika, Matirai and tablets, Kajal, Capsule, Marham, ointment, Pak/Avaleh/Khand/ Modak/Lakayam, Ark Tinir, Sura, Taila, Ghrit ney, Aschyotan / Netra Malham, Panir/Karn Bindu/Nasabindu, Habb (Pills) and tablets, Arq,</li> </ul> </li> </ul> <p>Factory premises          General requirements          Space requirements</p>	<p>1 1 1</p>
Q.6	a+b+c=4+4+3	11
Q.6		

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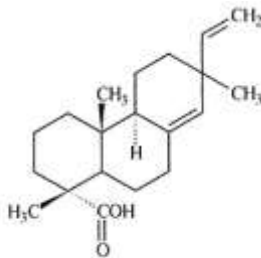
a

**Asafoetida**

- Syn: Rosin, Amber resin, Coloponium, Abietic anhydride
- Source: Solid residue obtained after distillation of volatile oil (turpentine) from the oleo-gum-resin of various species of *Pinus* like *P. palustris*, *P. pinaster*, *P. halepensis*, *P. carribaceae*
- Family: Pinaceae
- GS: North America, North Europe, Pakistan, India (Himalaya)



abietic acid



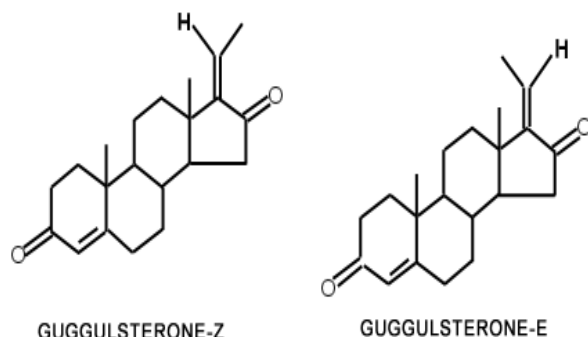
pimaric acid

- 90% Resin acid,
- esters of fatty acid,
- Resene
- 90%  $\alpha, \beta, \gamma$ -abietic acids, pimaric acid, sapinic acid, hydrocarbon.
- Powder + Acetic anhydride → dissolve in a dry test tube → conc. HCl → purple color
- Alcoholic solution is acidic to litmus paper.
- Powder + light petroleum → dissolve → filtered → filtrate → dilute copper acetate → petroleum layer shows emerald green color (due to formation of the copper salt of abietic acid)
- Use:
- preparation of Zinc oxide, adhesive plaster, ointment
- much rosin is artificially modified by hydrogenation or polymerization-products involving printing inks, rubber, linoleum, thermoplastic floor tiles and surface coating.
- the abietic acids shows antimicrobial, antiulcer and CVS activity.
- Stimulant and diuretic
- Adulterants: black resin or apic resin (confirmed by solubility)

**Guggul**

- Syn: Guggulu, Maishaksha
- Source: gum resin obtained from *Commiphora mukul*, *Commiphora wightii*
- Family: Burseraceae
- GS: native to Africa but throughout India (Gujarat, Rajasthan)
- C21-C27 compounds; steroids, diterpenoids, carbohydrates and aliphatic esters
- Does not contain cinnamic acid, benzoic acid
- Sugar: Pentosan, pentose and furfural
- Terpene: Myrcene, caryophyllene
- Sterone: Z & E- guggulusterone
- Guggulosterol I, II, III
- Gum
- Flavonoids: quercetin, ellagic acid

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**Chemical Test:**

- Ethyl acetate ext + Acetic anhydride → boil, cool and 2 ml of H<sub>2</sub>SO<sub>4</sub>, green color develops at the junction due to presence of sterols

Source

CC

Chemical Test

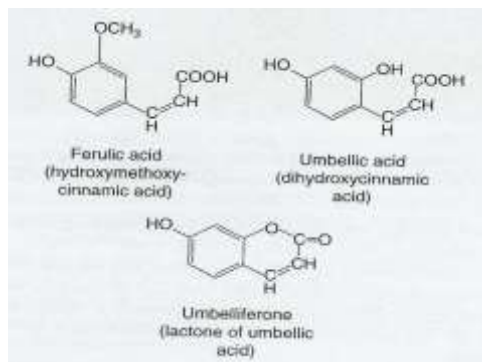
Uses

1  
1  
1  
1

**Q.6 Asafoetida**

b

- Syn: Hing, Devil's dung, Asant, Asafoda
- Source: Oleogum resin obtained from the incision of rhizome and root of *Ferula foetida*, *F. rubricaulis*, *F. asafoetida* & other species of *Ferula*
- Family: Umbelliferae
- Constituents
- Resin: 40-65%
- Gum: 20-25%
- Volatile oil: 4-20%
- Chief: asaresinotannol, ferulic acid, umbellic acid
- Butyl propanyl disulphide



Collection:

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	<ul style="list-style-type: none"> <li>• Resin is obtained from carrot shaped massive roots and rhizomes of the plants which are about 4-5 years of age</li> <li>• March-April, just before the flowering season of the plant, the upper part of the roots, very close to crown is cut off</li> <li>• The milky juice oozes out of the cut surface and starts coagulating</li> <li>• The cut surface is covered by dome shaped device made up of leaves and branches to avoid the contamination with sand and foreign matter</li> <li>• After few days, coagulated matter is scrapped off and the fresh cuts are given to collect more exudate</li> <li>• This continued for about 3 months until the plants cease to produce latex</li> <li>• Plant yield 1 kg oleo resin</li> <li>• After collection, dried thoroughly and packed in suitable containers</li> </ul> <p>Chemical Test:                  Combined umbelliferone Test: Powder+ HCl → boil → filter → filtrate + NH<sub>3</sub> blue fluorescence</p> <p>Source                  CC + Structure                  CT + Collection                  Uses</p>	1 1 1 1
Q.6 c	Biosynthetic pathway for any one Mono terpenoid	

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