

4.5 INDUSTRIAL PHARMACOGNOSY (THEORY)

50 hours ; 2 hours/week

1. Introduction: 2 hours;2-5 marks

- a) Importance and status of herbal drugs in national and international market.
- b) A brief account of plant based industries and research institutions in India.

2. Phytopharmaceuticals: 10 hours;10-15 marks

Detail method of isolation, identification and estimation of the following: Quinine, Cassinosides, Diosgenin, Glycyrrhizin, Hesperidine, Andrographolides, Curcumin, Podophyllotoxin, Solasodine and Caffeine.

3. Quality control and Standardization of Herbal drugs: 10 hours;10-15 marks

- a) Definition of the terms: evaluation, quality control and standardization.
- b) Importance of standardization of raw materials, extracts and formulations with suitable examples.
- c) Quality control methods for Herbal drugs as per WHO guidelines.
- d) Applications of HPTLC and HPLC techniques for evaluation of crude drugs and extracts. Role of marker compounds in evaluation and chromatographic finger printing analysis.
- e) Monographic analysis of the following drugs for Standardization: i) Vasaka ii) Gokhru iii) Ashwagandha iv) Guduchi v) Guggulipid

4. Herbal Cosmetics and Nutraceuticals: 3 hours;2-5 marks

- a) Role of following herbs in cosmetics.
 - i) Skin Care: Aloe vera, Neem, Turmeric, Saffron, Sandalwood
 - ii) Hair Care: Soapnut, Amla, Henna, Hybiscus, Bringaraj
- b) Nutraceuticals: Source and importance of antioxidants, probiotics and polyunsaturated fatty acids. Study of nutritional value of Spirulina and Garlic

5. Natural sweeteners and bitters 2 hours; 2-5 marks

6. Patenting and Regulatory requirements of natural products: 3 hours; 2-5 marks

- a) Definition of the terms: Patent, IPR, Farmers right, Breeder's right, Bioprospecting and Biopiracy
- b) Patenting aspects of Traditional Knowledge and Natural Products. Case study of Curcuma & Neem.
- c) WHO guidelines for regulation of herbal medicines in South-East Asian region.

7. Plant Biotechnology: 7 hours;5-10 marks

- a) Chemodemes, Polyploidy and Hybridization and their applications in improving the quality of medicinal plants.
- b) Tissue Culture:
 - i) Types, techniques and applications
 - ii) Methods for enhancing the production of secondary metabolites.
 - iii) Transgenic plants and their applications

8. Enzyme Biotechnology: 3 hours; 2-5 marks

- a) Immobilization of cells and enzymes
- b) Bio-transformation

c) Source, isolation and uses of plant enzymes: Papain, Bromelin

9. Complementary and Alternative Medicines:

5 hours;5-8 marks

a) General introduction to Ayurveda, Siddha, Unani, and Homeopathy systems of medicines.

b) Method of preparation of some Ayurvedic formulations: Aristas, Asavas, Ghutika, Taila, Churna, Leha, and Bhasma.

c) Determination of alcohol content in Aristas and Asavas.

10. Study of some Traditional drugs:

5 hours;5-8 marks

Common and vernacular names, source, active constituents and uses of

i) Acorus ii) Apamarg iii) Bael iv) Brahmi v) Chirata vi) Coleus vii) Gudmar
viii) Kantakari ix) Methi x) Pippali xi) Punarnava xii) Rasna xiii) Shatavari xiv)
Shankapushpi xv) Shilajit

INDUSTRIAL PHARMACOGNOSY PRACTICALS

75 hours ; 3 hours/week

1. Isolation of Phytopharmaceuticals**
 - i) Quinine
 - ii) Ammonium glycyrrhizinate
 - iii) Ca-sennosides
 - iv) Caffeine
 - v) Hesperidin
 - vi) Curcumin
2. Estimation of Phytopharmaceuticals**
 - i) Quinine
 - iv) Caffeine
 - v) Hesperidin
 - vi) Curcumin[By Fluorimetric, Spectrophotometric or Chromatographic methods]
 - ii) HPTLC and HPLC profiles of a few drugs
3. Thin layer chromatography of Alkaloids*
4. Estimation of bitters in Kalmegh**
5. Determination of swelling index in mucilage containing drugs*
6. Determination of microbial contamination in plant drugs
7. Initiation of callus culture
8. Immobilization of enzymes and determination of its activity*
9. Estimation of alcohol content in traditional preparations*
10. Study of morphology of traditional drugs mentioned in theory*

Note: ** Denotes major experiments * Denotes minor experiments

SCHEME OF EXAMINATION

1. Synopsis	10 marks
2. Identification of traditional drugs	10 marks
3. Isolation/ Estimation of phytoconstituents	25 marks
4. Minor experiment*	15 marks
5. Viva-Voce	10 marks
Total	70 marks

INDUSTRIAL PHARMACOGNOSY REFERENCE BOOKS

1. Chaudhri RD. Herbal drug industry, 1st ed. New Delhi:Eastern publishers;1996.
2. Rajpal V. Standardisation of botanicals. 1st ed. New Delhi:Eastern publishers; 2002.
3. Vinod DR. Pharmacognosy and phytochemistry. 1st ed. Nashik:Career publications; 2003.
4. Harborne JB. Phytochemical methods, 3rd ed. New Delhi:Springer (India) Pvt Ltd; 1998.
5. Indian Pharmacopoeia. Delhi:The Controller of Publications, Ministry of Health and Family Welfare; 2007.
6. Indian Herbal Pharmacopoeia Vol I & Vol II. Mumbai:Government of India, Ministry of Health. A Joint Publication of RRL, Jammu and IDMA; 1998, 1999.

7. Agrawal SS, Paridhavi M. Herbal drug technology. 1st ed. Hyderabad:Universities Press (India);2007.
8. Pulok M. Quality control of herbal drugs. 1st ed. New Delhi:Business horizons;2002.
9. WHO-Quality control methods for Medicinal plant materials;2011.
10. Wealth of India, A Dictionary of Indian Raw Materials & Industrial Products (All Volumes). New Delhi:NISCAIR, CSIR: 2000.
11. Kokate CK, Purohit AP, Gokhale SB. Pharmacognosy. 45th ed. Pune:Nirali Prakashan; 2010.
12. Evans WC. Trease and Evans Pharmacognosy. 15th ed. Philadelphia:Elsevier Science Ltd;2002.
13. Ashutosh K. Pharmacognosy and pharmacobiotechnology. 2nd ed. New Delhi:New Age International Publishers;2006.
14. Veeresham C. Medicinal Plant Biotechnology 1st ed. New Delhi:CBS publishers and distributors;2004.
15. Vyas SP, Dixit. Pharmaceutical Biotechnology. 1st ed. New Delhi:CBS Publishers & distributors;1998.
16. Gaud RS, Gupta GD, Gokhale. Practical Biotechnology. 1st ed. Pune:Nirali Prakashan;2000.
17. Indian Medicinal Plants - A Compendium of 500 species. Kottakal:Arya Vaidya Sala; 1997.
18. The Ayurvedic Pharmacopoeia of India Vol I & II, 1999. Government of India, Ministry of Health and Family Welfare, Department of ISM & H.
19. The Ayurvedic Formulary of India, 2000. Government of India, Ministry of Health and Family Welfare, Department of ISM & H.
20. National and International Journals- Phytochemistry, Pharmacognosy Reviews, Fitoterapia, Journal of Natural Products, Journal of Ethnopharmacology, Planta Medica, Phytotherapy Research

LIST OF MINIMUM EQUIPMENTS REQUIRED

1. Heating mantle	10
2. Soxhlet apparatus	10
3. TLC chamber & sprayer	10
4. Hot air oven	01
5. Water bath	20
6. Autoclave	01
7. Laminar air flow	01
8. B.O.D. Incubator	01
9. Microscope	20
10. Balance (Digital)	02
11. Spectrophotometer	01
12. Flourimeter	01
13. Reflux flasks & condensers	20

14. Distillation units	05
15. Vacuum pump	02
16. HPTLC	Desirable
17. HPLC	Desirable