

Semester VI

Paper No- 16: Toxicology

Marks: 150

Different types of poisons have been known to humans since ages. Even in early times when science was in its infancy, curious people such as “Paracelsus” could predict “Every substance is a poison and, it is the right dose of the substance which differentiates remedy from poisons”. This thought is fundamental even to modern toxicology and pharmacology. There is an increasing use of chemicals in the modern society and hence, toxicology is becoming a more important subject to study with the passage of time. Modern toxicology is a vast, multidisciplinary subject encompassing various other basic fields of science. The present course content is designed to provide the basics of toxicology. Relevant importance has been given to those topics which can build a strong foundation in the subject, based on which, facts can be assimilated during subsequent higher studies.

THEORY

Total Lectures 48

Unit I: Introduction (Chapter 2: Cassarett)

(2 Lectures)

Brief history, Different areas of modern toxicology, classification of toxic substances, various definitions of toxicological significance.

Unit II: Toxic exposure and response (Chapter 2: Cassarett)

(5 Lectures)

Effect of duration, frequency, route and site of exposure of xenobiotics on its toxicity. Characteristic and types of toxic response. Types of interactions between two and more xenobiotics exposure in humans. Tolerance and addiction.

Unit III: Evaluation of toxicity (Chapter 3: Cassarett; Chapter 1: Timbrell)

(2 Lectures)

Various types of dose response relationships, assumptions in deriving dose response, LD50, LC50, TD50 and therapeutic index.

Unit IV: Mechanism of toxicity (Chapter 3: Cassarett)

(10 Lectures)

Delivery of the toxicant, mechanisms involved in formation of ultimate toxicant, detoxification of ultimate toxicant.

Unit V: Fate of xenobiotics in human body (Chapter 5 and 6: Cassarett; Chapter 2: Timbrell)

(10 Lectures)

Absorption, Distribution, Excretion and Metabolism of xenobiotics (biotransformation, Phase- I reactions including oxidations, hydrolysis, reductions and phase II conjugation reactions). Toxic insult to liver, its susceptibility to toxicants with reference to any two hepatotoxicants.

Unit VI: Toxic agents (8 Lectures)
(Chapter 22 and 23: Cassarett; Chapter 8: Timbrell)

Human exposure, mechanism of action and resultant toxicities of the following xenobiotics:
Metals: lead, arsenic, **Pesticides:** organophosphates, carbamates, organochlorine, bipyridyl compounds and anticoagulant pesticides.

Unit VII: Eco-toxicology (7 Lectures)
(Chapter 29: Cassarett; Chapter 8 and 9: Timbrell)

Brief introduction to avian and aquatic toxicology, movement and effect of toxic compounds in food chain (DDT, mercury), bioaccumulation, biomagnification, acid rain and its effect on ecosystems, concept of BOD and COD.

Unit VIII: Clinical toxicology (4 Lectures)
(Chapter 22: Cassarett)

Management of poisoned patients, clinical methods to decrease absorption and enhance excretion of toxicants from the body use of antidotes.

PRACTICALS

1. Separation of a mixture of benzoic acid, beta- naphthol and naphthelene by solvent extraction and identification of their functional Groups.
2. Determination of Dissolved oxygen (DO) using Winkler's method.
3. Determination of Biological oxygen demand (BOD) of water.
4. To perform quantitative estimation of residual chlorine in water samples.
5. To determine the total hardness of water by complexo-metric method using EDTA.
6. To determine acid value of the given oil sample.
7. To estimate formaldehyde content of given sample.
8. Calculation of LD50 value of an insecticide from the data provided.
9. Determination of COD (chemical oxygen demand) of the given water sample.

ESSENTIAL BOOKS

1. Cassarett and Doull's Toxicology "The Basic Science of The Poisons" 7th edition (2008), Curtis D. Klaassen Editor, McGrawHill Medical.
2. Cassarett and Doull's "Essentials of Toxicology" 2nd edition (2010), Klaassen and Whatkins, McGraw Hill Publisher.

3. Introduction to Toxicology, 3rd edition (2001), John Timbrell, Taylor and Francis Publishers.

SUGGESTED READINGS

1. Principles of Toxicology, 2nd edition (2006), Stine Karen and Thomas M Brown, CRC press.
2. Lu's basic toxicology: Fundamentals target organ and risk assessment, 5th edition (2009), Frank C Lu and Sam Kacow, Informa Health care.