

# ADVANCE CHEMISTRY- VIII (AGRICULTURAL CHEMISTRY)

CREDIT HOURS: 3

## Objectives

The students will learn about:

- Discipline of Agricultural Chemistry and its applications
- Upgrade and update the knowledge regarding the progress in Agricultural Chemistry and related disciplines
- Bring uniformity in curricula taught in different universities offering Agricultural Chemistry as major
- Provide recent trends and skills to help in an agricultural system which can meet the need of our country and contribute to global requirement as well
- Achieve the highest possible standards in teaching and research in Agricultural Chemistry and related disciplines.
- The physical aspects of bio-macromolecules
- Functions in living organisms
- Food security in relation to food production in Pakistan
- Taxonomy of medicinal plants
- Essential chemical components of medicinal herbs, including appropriate extraction and quantization methods, and strategies for structure elucidation
- Biosyntheses and synthetic methodologies, involved in deriving the active components of medicinal herbs.

## COURSE CONTENT

**Agricultural chemistry:** Introduction, history, contribution and scope.

**Bio-Organic Chemistry :** General concepts, Chemistry of natural products (alkaloids, flavonoids and terpenes), organic matter , Stereochemistry, Chemistry and application.

**Bio-Physical chemistry :**Introduction and scope, modern concepts of acids and bases, pH measurement, buffers and their role in biological system. Biophysical phenomena.

**Food chemistry:** Introduction: Color, flavor and taste of foods, sensory evaluation of foods. Composition of Foods, Methods of improving protein quality of food, Enzymes and vitamins, Mineral elements, Food additives and value addition, Toxicity of food, Water activity.Principles Of Food Security, Introduction: Food security, international commitment to end hunger and malnutrition. Food security and human rights, Factors affecting food security, Food safety and food quality.

**Protein Chemistry :**Introduction: Structural and functional proteins, importance of proteins. Amino Acids: Structure, classification and properties, essential and non essential, occurrence in animals and plants.

**Plant Biochemistry :** Cell: Structure, functions, origin and nature of bio-molecules, chemical composition of cell membrane, cell wall and transport processes. Plant Enzyme and co-enzymes, Nucleic acids ,Secondary Metabolites, Growth Hormones ,Photosynthesis.

**Clinical Biochemistry:** Role of clinical Biochemistry in health and diseases, factors causing diseases. Biochemistry of blood, Chemistry of gastrointestinal tract, Immunology.

**Agrochemical pollution:** Impact of fertilizer and pesticide industry, residual effect of pesticide, plant response to metals in soil and water, biosorption of metals, bioremediation. Anthropogenic activities.

**Agricultural Microbiology :**Introduction, Definition and history. Microbiological techniques: Pure and sterilize culture media, selective media, and light microscopy, antimicrobial activity. Viruses, Bacteria, Rhizobacteria, Fungi, Toxicity, Microbial transformations.

**Applied Biochemistry :** Fermentation: Aerobic and anaerobic fermentation, production of bio-fuels. Pulp and Paper Industry: Sulfite, sulfate pulp, types of paper and production processes. Oils and Ghee Industry, Soap Industr, Sugar and Starch industry, Starch, Fertilizer Industry.

**Pesticide Chemistry :**Introduction: History, importance, current application status, international concern about pesticide usage, role of pesticides in agriculture. Formulation of Pesticides, Groups of Pesticides, Herbicides, Fungicides, Pheromones, Environmental Hazards of Pesticides.

**Fundamentals Of Phytochemistry:** Introduction: History, scope and development of phytochemistry. Plant taxonomy, Record keeping (Herbarium),The classification and nomenclature of important medicinal herbs, Factors influencing cultivation of medicinal plants, Study of important chemical classes found in medicinal herbs (including their role and ecological function).**Soil Chemistry :** Soil, Definition, type and composition. Nature of soil elements, Properties of soil.

## ADVANCE CHEMISTRY- VIII LAB (AGRICULTURAL CHEMISTRY)

CREDIT HOURS: 1

- Microscopic examination of cell
- Determination of phytic acid in cereal and legume
- Laboratory equipment and apparatus, name and use, general lab instructions
- Preparation and standardization of solutions
- Qualitative tests of carbohydrates and protein
- Use of food composition tables
- Determination of dietary intake through questionnaire
- Use of questionnaire to measure household food security
- Designing home gardens for food security
- Determination of food insecurity in terms of malnutrition
- Determination of molecular weight by osmometry
- Determination of viscosity
- Determination of surface tension
- Determination of pH
- Staining Techniques: Simple, Microbial tests for drinking water quality.
- Fermentation of milk
- Identification of sugars
- Extraction of crude oil from oil seeds
- Macroscopic Examination of Natural Products.
- Collection and preparation of soil sample, Determination of soil pH
- Determination of electrical conductivity (EC) of saturated soil extract

### Evaluation Criteria

Examination	Type	Marks
Internal Examination	Sessional Work	15%
	Mid-Semester	25%
External Examination	Final Semester	60%

### Books Recommended:

1. David, H. 2000. Modern Analytical Chemistry. International ed. McGraw Hill Co. Inc. New York.
2. Jain, J.L., S. Jain and N. Jain. 2006. Fundamentals of Biochemistry. S.Chand company Ltd. Ram Nagar, New Delhi.
3. Khalil, I. A. and H. Shah. 2003. Basic Biochemistry. National Book Foundation Islamabad, Pakistan.
4. Lehninger, A.L. 2000. Principles of Biochemistry. 3<sup>rd</sup> ed. Worth Publisher, New York. USA.
5. Rupm, H. and H. Krist, 1992. Laboratory Manual for the Examination of Water, Wastewater and Soil. 2<sup>nd</sup> ed. Weinheim, Fed. Rep. Germany.
6. Stryer, L. 1994. Biochemistry. 5<sup>th</sup> ed. W. H. Freeman and Co. London UK.

7. Vogel, A. I. 1995. A Text Book of Macro and Micro Quantitative Inorganic Analysis. 1<sup>st</sup> ed. Longman Green and Co. Inc, New York
8. Bansel, R.K. 1998. Synthetic Approaches in Organic Chemistry. 2<sup>nd</sup> ed. Jones and Bartlett Publishers Inc., New York, USA.
9. Bansel, R.K. 2001. Heterocyclic Chemistry. Weig Eastern Ltd. New Delhi, India.
10. Clayden, J., N. Greeves, S. Warren, P. Wothers, 2001. Organic Chemistry. Oxford, UK.
11. Finar, I.L. 2000. Organic chemistry. 6<sup>th</sup> ed. John Wiley and Sons Inc., New York, USA.
12. Morrison, R.T., and Boyd, R.N., 2001. Organic Chemistry. 6<sup>th</sup> Ed. Prentice Hall. NY.
13. Blei, I. and G. Odian, 2006, Organic Biochemistry 2<sup>nd</sup> Ed. Freeman, USA
14. Adamson, A.W. and P.G. Alice. 1997. Physical Chemistry of Surfaces. 6<sup>th</sup> ed. John Wiley and Sons Inc., New York, USA.
15. Alberty, R.A. and R.J. Silbey. 1992, Physical Chemistry. 5<sup>th</sup> ed. John Wiley and sons Inc., New York, USA.
16. Atkins, P. and J. de Paula, 2005, Physical Chemistry for the Life Sciences. Freeman, USA.
17. Dykstra, C.E. 1997. Physical Chemistry, A modern Introduction. International ed. Prentice Hall International Inc., USA.
18. Hammes, G.G. 2007, Physical Chemistry for the Biological Sciences, John Wiley, USA.
19. Sheehan, D., 2009, Physical Biochemistry: Principles and Applications. 2<sup>nd</sup> Ed. John Wiley, USA.
20. Van Holde, K. E., Johnson, C. and P.S. Ho, 2005. Principles of Biochemistry. 2<sup>nd</sup> Ed. Printice Hall, USA
21. Campbell, M.K. 1991. Biochemistry. Saunders College Pub. Philadelphia USA.