UNIVERSITY OF DELHI

CNC-II/093/1(22)/2022-23/253

Dated: 07.11.2022

N O T I F I C A T I O N

Sub: Amendment to Ordinance V

[E.C Resolution No. 18-1-22 dated 18.08.2022]

Following addition be made to Appendix-II-A to the Ordinance V (2-A) of the Ordinances of the University;

Add the following:

Syllabus of Semester-I of BSc. Applied Life Science – Agrochemicals and Pest Management based on Undergraduate Curriculum Framework 2022 under Swami Shraddhanand College to be implemented from academic year 2022-2023

B.Sc. (Hons.)
in
Applied Life Sciences with Agrochemicals and Pest Management

DISCIPLINE SPECIFIC COURSE (DSC) -1
Course: Microbial World and Plant Diversity

Total Credits: 04
Lectures: 30 Hours, Tutorial: 0, Practical: 60 Hours

Objectives: To make students aware about the diversity of plants and microbes present on the planet and their evolutionary relationships.

Learning Outcomes:

- This course will impart basic knowledge on:
- the diversity of plants and microbes.
- their general characteristics.
- various groups of plants and their evolutionary relationships.
- basic principles and concepts of evolution that contribute to diversity.

Theory:

Unit 1. Origin of life: 2 Hours

Principles and concepts of evolution and classification (up-to six kingdoms).

Unit 2. Bacteria: 3 Hours

General characteristic features, cell structure, wall-less forms (L-forms and Mycoplasma), asexual reproduction and modes of gene transfer (conjugation, transformation and transduction), a brief introduction to Archaebacteria.

Unit 3. Viruses: 2 Hours

General characteristic features, replication, RNA virus (structure of TMV), DNA virus (structure of T-phage), Lytic and Lysogenic life cycle (Lambda phage).

Unit 4. Algae: 3 Hours

General characteristic features, Reproduction, Classification of Lee (only up to groups). A brief account of Volvox and Polysiphonia.

Unit 5. Fungi: 4 Hours

General characteristic features, Reproduction, Classification (Webster and Weber, 2007), A brief account of Rhizopus, Penicillium, and Agaricus.

Unit 6. Bryophytes: 4 Hours

General characteristic features and reproduction, adaptation to land habit, broad classification, Evolutionary trends in Bryophytes. Brief account of Marchantia and Funaria.

Unit 7. Pteridophytes: 4 Hours

General characteristic features and reproduction, broad classification, Evolutionary trends in Pteridophytes, affinities with Bryophytes. A brief account of Equisetum and Pteris.

Unit 8. Gymnosperms: 4 Hours

General characteristic features and reproduction, broad classification, evolutionary trends in Gymnosperms, affinities with Pteridophytes. A brief account of Pinus.

Unit 9. Angiosperms: 4 Hours

General characteristic features and reproduction, concept of natural, artificial and phylogenetic system of classification, APG-IV (a brief reference), affinities with Gymnosperms.

Practical: 60 Hours

1. To study structure of TMV and Bacteriophage (electron micrographs/models).

2. To study Gram negative and positive bacteria through Gram's Staining Technique.

3. To study Bacteria through Electron Micrograph, Binary fission, Conjugation, Root nodules through digital resources /specimen.

4. To study morphology of Volvox and Polysiphonia through temporary preparations and slides.

5. To study Rhizopus, Penicillium and Agaricus through temporary preparations, specimens and slides.

Additional Readings:

1. Parihar, N.S. (1991). An Introduction to Embryophyta, Pteridophytes (Vol. II). Central Book Depot.
2. Singh, V., Pandey, P.C., & Jain, D.K. (2001). A Text Book of Botany. Rastogi and Co.
3. Webster, J., & Weber, R. (2007). Introduction to Fungi. Cambridge University Press.

Keywords:

Evolution, Bacteria, Viruses, Bryophytes, Pteridophytes, Gymnosperms, Angiosperms.

Teaching Learning Process:

Learning material will be delivered through a series of lectures with conventional chalk and talk method, supported by power point presentations, charts, flow charts and video education resources. Emphasis would be on an interactive classroom environment so as to encourage students to ask questions and clarify their doubts. Students would also be encouraged to refer to the referenced books in the library to inculcate reading habits for better understanding of the subject.

Assessment Methods:

Performance of the students will be evaluated on the basis of regular class test, presentations and assignments as a part of internal assessment during the course, as per the curriculum. There would be a continuous evaluation of laboratory exercises and the record files. End semester university examination will be held for both theory and practical components. In practical, assessment will be done based on continuous evaluation and performance in the practical examination.

DISCIPLINE SPECIFIC COURSE (DSC) - 02
COURSE : INORGANIC CHEMISTRY

Total Credits: 04
Lectures: 30 Hours, Tutorial: 0, Practical: 60 Hours

Objectives:

The course introduces the students to basics of coordination chemistry and organometallics which are of immense importance to biological systems. Nomenclature, isomerism, bonding in coordination compounds has been dealt with in sufficient detail along with special emphasis on important coordination compounds in the biological system. In organometallic chemistry, the students are introduced to classification of organometallic compounds, the concept of hapticity and the 18-electron rule governing the stability of a wide variety of organometallic species with special emphasis on metal carbonyls.

Learning Outcomes:

- By the end of the course, the students will be able to:
- Understand term like; ligand, chelate, coordination number. Systematic naming of coordination compounds.
- Learn various types of isomerism possible in Octahedral and Tetrahedral coordination compounds.
- Use Valence Bond Theory to predict the structure and magnetic behaviour of metal complexes and understand the terms inner and outer orbital complexes.
- Understand meaning of the terms Δo, Δt, pairing energy, CFSE, high spin and low spin and how CFSE affects thermodynamic properties like lattice enthalpy and hydration enthalpy.
- Analyse IR data to understand the extent of back bonding in metal carbonyls.

Theory:

Unit 1. Introduction to Coordination compounds: 6 Hours

Brief discussion with examples of types of ligands, denticity and concept of chelate. IUPAC system of nomenclature of coordination compounds (mononuclear and binuclear) involving simple monodentate and bidentate ligands. Structural and stereoisomerism in complexes with coordination number 4 and 6.

Unit 2. Bonding in Coordination compounds: 14 Hours

Valence Bond Theory (VBT): Salient features of theory, concept of inner and outer orbital complexes, Drawbacks of VBT.

Crystal Field Theory: Splitting of d orbitals in octahedral symmetry. Crystal field effects for weak and strong fields, Crystal field stabilization energy (CFSE), concept of pairing energy,

Factors affecting the magnitude of Δ, Spectrochemical series, Splitting of d orbitals in tetrahedral symmetry, Comparison of CFSE for octahedral and tetrahedral fields, tetragonal distortion of octahedral geometry, Jahn-Teller distortion.

Unit 3. Organometallic chemistry: 10 Hours

Definition and classification with appropriate examples based on nature of metal-carbon bond (ionic, sigma, pi and multicentre bonds), Structure and bonding of methyl lithium and Zeise's salt, Structure and bonding of ferrocene, mononuclear and polynuclear carbonyls of 3d metals, 18-electron rule as applied to carbonyls, π -acceptor behaviour of carbon monoxide (MO diagram of CO to be discussed), synergic effect and use of IR data to explain extent of back bonding.

Practical: 60 Hours

1. Estimation of Mg^{2+} by direct complexometric titration using EDTA.
2. Estimation of Zn^{2+} by direct complexometric titration using EDTA.
3. Estimation of Ca^{2+} by direct complexometric titration using EDTA.
4. Estimation of total hardness of a given sample of water by complexometric titration.
5. Determination of the composition of the Fe^{3+}-salicylic acid complex/Fe^{2+}-1, 10 phenanthroline complex in solution by Job's method.
6. Determination of the composition of the Fe^{3+}-salicylic acid complex/Fe^{2+}-1,10-phenanthroline complex in solution by mole ratio method.
7. Preparation of the following inorganic compounds:

    a) Tetraamminecopper (II) sulphate
    b) Potassium trioxalatoferrate (III) trihydrate
    c) Chrome alum
    d) Cuprous chloride
    e) Manganese (III) phosphate ($MnPO_4.H_2O$)
    f) Potash alum
    g) Acetylacetonate complex of Cu^{2+} and Fe^{3+}

Suggested Readings:

Theory:

1. Huheey, J.E., Keiter, E.A., Keiter, R. L., & Medhi, O.K. (2009). Inorganic Chemistry-Principles of Structure and Reactivity. Pearson Education.
2. Shriver, D. D., Atkins, P., & Langford, C.H. (1994). Inorganic Chemistry (2nd Ed.). Oxford University Press.
3. Atkins, P.W., Overton, T.L., Rourke, J.P., Weller, M.T., & Armstrong, F.A. (2010), Inorganic Chemistry (5th Ed.). W. H. Freeman and Company.
4. Cotton, F.A. Wilkinson, & G. Gaus, P.L. Basic Inorganic Chemistry (3rd Ed.). Wiley India.
5. Douglas, B.E., McDaniel, D.H., & Alexander, J.J. (1994). Concepts and Models of Inorganic Chemistry. John Wiley & Sons.

6. Greenwood, N.N.; Earnshaw, A. (1997). Chemistry of the Elements (2nd Ed.). Elsevier.
7. Sahoo, et al. Inorganic Chemistry. PHI Learning Private Limited.

Practical:

1. Jeffery, G.H., Bassett, J., Mendham, J., & Denney, R.C. (1989). Vogel's Textbook of Quantitative Chemical Analysis. John Wiley and Sons.
2. Marr, G., & Rockett, B.W. (1972). Practical Inorganic Chemistry. Van Nostrand Reinhold.

Keywords:
Crystal field theory, Dq, CFSE, Nomenclature, Valence bond theory, Crystal field theory, Magnetic properties, 18 electron rule, metal carbonyls, hapticity.

Teaching Learning Process:

- Conventional chalk and board teaching.
- Class interactions and discussions.
- Power point presentation on important topics.

Assessment Methods:

- Presentations by Individual Student/ Group of Students.
- Class Tests at Periodic Intervals.
- Written assignment(s).
- End semester University Theory Examination.

DISCIPLINE SPECIFIC COURSE (DSC) - 03
Course: Animal Forms and Structure

Total Credits: 04
Lectures: 30 Hours, Tutorial: 0, Practical: 60 Hours

Objectives:

Zoology is the scientific study of animal life. Animals are the most diverse creatures on this planet. This course gives knowledge about the diversity within different groups, and their interrelationships. The course is designed to understand the general characteristics, classification, basic body plan and levels of organizations in different groups of animals.

Learning Outcomes:

On completion of the course, students will be able to:

- Distinguish between major phyla of animals through characteristic features and diversity.
- Understand the fundamental differences among animal body plans among different phyla.
- Illustrate structure, function and processes related to different groups of animals.
- Observe living animals in the environment and relate observations to theory from the course.

Theory:

Unit 1: 2 Hours

An introduction to the animal kingdom: Non-chordates vs Chordates, Coelom, Body symmetry, Levels of organization.

Unit 2: 1 Hour

Protista: General characters of Protozoa; Locomotory organelles: Pseudopodia, Flagella and Cilia.

Unit 3: **2 Hours**

Porifera: General characters of phylum Porifera, Canal system in Porifera (in brief).

Unit 4: **2 Hours**

Radiata: General characters of phylum Cnidaria and Ctenophora; Polymorphism.

Unit 5: **2 Hours**

Helminthes: General characters of Helminthes (Platyhelminthes and Nemathelminthes).

Unit 6: **7 Hours**

Coelomates (Non-chordates):

General characters of phylum Annelida; Metamerism.

General characters of phylum Arthropoda; Vision in insects.

General characters of phylum Mollusca; Pearl Formation.

General characters of phylum Echinodermata; Water Vascular system in starfish.

Unit 7: **2 Hours**

Protochordates: Salient features of Hemichordates, Urochordates and Cephalochordates.

Unit 8: **12 Hours**

Vertebrates: Brief description of vertebrates.

General characters of Agnatha.

General characters of Pisces; Cartilaginous and Bony fishes, Catadromous and Anadromous migration.

General characteristics of Amphibia; Adaptations for terrestrial life.

General characteristics of Reptilia; Biting mechanism of snakes.

General characteristics of Aves; Flight adaptations in birds.

General characteristics of Mammals; Brief description of prototherian, metatherian and eutherian mammals; Dentition.

Practical: 60 Hours

1. Study of specimens:

Non-chordates: Euglena, Noctiluca, Paramecium, Sycon, Physalia, Tubipora, Meandrina, Taenia, Ascaris, Nereis, Heteronereis, Aphrodite, Hirudinaria, Peripatus, Limulus, Cancer, Daphnia, Julus, Scolopendra, Apis, cockroach, termite, butterfly, Chiton, Dentalium, Octopus, Asterias and Antedon.

Chordates: Balanoglossus, Herdmania, Amphioxus, Petromyzon, Sphyrna, Pristis, Hippocampus, Exocoetus, Diodon/ Tetradon, Icthyophis/ Uraeotyphlus, Bufo, Hyla, Salamandra, Rhacophorus, Draco, Uromastix, Naja, Viper, identification of poisonous and non-poisonous Any three common birds, Funambulus, Loris and Bat.

2. Study through permanent slides:
   (a) Cross section of Sycon and Ascaris (male and female).
   (b) Septal and pharyngeal nephridia of earthworm.
   (c) Placoid, cycloid and ctenoid scales of fishes.

3. Study of organ systems: (Subject to permission from animal ethics committee as per UGC guidelines/ from suitable models).
   (a) Digestive system of cockroach.
   (b) Urinogenital system of rat.

Suggested Readings:

1. Barnes, R.D. (1992). Saunders College Pub. USA.

2. Ruppert, E. E., Fox, R. S., & Barnes, R. D. (2004). Invertebrate zoology: A functional evolutionary approach (5th ed.). Brooks/Cole Publishing Company.

3. Campbell and Reece (2005). Biology, Pearson Education, (Singapore) Pvt. Ltd.
4. Young, J.Z. (2004). The Life of Vertebrates. III Edition, Oxford University Press.
5. Raven, P.H. and Johnson & G.B. (2004). Biology, VI Edition, Tata McGraw Hill Publications

E- contents:

- http://vle.du.ac.in
- Animal Diversity Web (ADW); an online database of animal natural history, distribution, classification, and conservation biology. Web resource https://animaldiversity.org/
- Online Zoo; https://www.activewild.com/online-zoo/.

Keywords:

Coelomates, Chordates, Non chordates, Vertebrates, Metamerism, Coelom, Migration.

Teaching and Learning Process:

Teaching-Learning process will include delivery of lectures using boards, multimedia presentation, short documentaries on animal diversity, imparting practical based knowledge through specimens, live demonstration of diversity in surroundings.

Assessment methods:

- Continuous assessment during entire semester along with the summative assessment by the semester-end.
- Testing through multiple choice questions at the end of each lecture.
- Assess through the project-based work.

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