

## Gujarat University

B.Sc. (Environmental Science) CBCS Syllabus (June 2011) Semester I and II

### **ENVSC-101 Life at a Glance (40 Hours)**

#### **Origin and evolution of life**

History of Earth, Determination of age of the Earth

Theories of origin of life, Millers experiment, Spontaneous generation

Cell Theory, Cell differentiation, Levels of organization, Nature of the earliest organisms, Evolution of Prokaryotes, Eukaryotes, Mitochondria and Chloroplast

Quest for extra-terrestrial life

Whittaker's five-kingdom classification

#### **Plant Kingdom**

General characters of plant, Body organization: Root, Stem and Leaves; Tissues: Dermal, Vascular and Ground

Growth: Primary, Secondary, Morphogenesis and Differentiation

Common types of plants: Primitive plants Bryophytes, Traditional plants, Vascular plants, Adaptation to land and response to environment

Outline of Kingdom *Plantae*

#### **Animal Kingdom**

General characters of animal, Animal evolution, Body organization: Systems, Organs, Tissues, Coordination, Energy requirements

Primitive and advanced marine animals, Adaptation to land, Exchange with Environment, Outline of Kingdom *Animalia*

#### **The Microbial World**

Structure, General character, Reproduction, Classification and Economic importance of Fungi, Algae and Protozoa

Structure, Chemistry and Reproduction of viruses

Microbes in Environment: Role in Pathogenesis and Elemental cycling

Extreme environments, Biodiversity therein

#### **Reference**

1. Elden D Enger, FC Ross and DB Bailey (2005) Concepts in Biology, (11<sup>th</sup> Edn), TMH
2. Reece JB, Urry LA, Cain ML Wasserman SA, Minorsky PV and RB Jackson (2010) Campbell Biology (9<sup>th</sup> Edn), Pearson
3. Lack Andrew and David Evans (2005) Plant Biology, (2<sup>nd</sup> Edn), BIOS Instant Notes, Taylor and Francis
4. Cowan K and KP Talaro (2009) Microbiology: A Systems Approach, (2<sup>nd</sup> Edn), McGraw-Hill
5. Purves William K, David Sadava, Gordon H. Orians, and H. Craig Heller (2006) Life: The Science of Biology, (7<sup>th</sup> Edn), Academic Internet

### **ENVSC-102 Practical (40 Hours)**

#### **Practical Life at a Glance (101)**

1. Study of Laboratory Equipments
2. Preparation of Standard Solution and Buffers
3. Hanging-drop preparation and observation of motility
4. Microscopic observation of wet-mount preparation from fungi
5. Monochrome Staining of Yeasts
6. Estimation of reducing sugar by Cole's method

7. Colorimetric estimation of Protein using Biuret Reagent
8. Colorimetric estimation of Glucose using Glucose oxidase

## **ENVSC-103 Cell: The Unit of Life (40 Hours)**

### **Structure of cell**

Chemistry and Ultrastructure of Cell wall, Membrane, Flagella and Cilia  
Organelles Mitochondria, Chloroplast, Golgi bodies, Peroxysome, Endoplasmic reticulum, Ribosome

Nature of Cytosol, Cytoskeleton structures

Cellular diversity at structural and compositional levels among Prokaryotes, Archeobacteria, and Eukaryotes (Plant, Animal and Fungi)

### **Cellular Metabolism**

Oxidation-Reduction, Energy and Carbons source utilization, Electron transport chain and ATP generation

Metabolism: Anabolism, Catabolism, Respiration, Fermentation, Photosynthesis

Nutrient uptake Active transport, Passive transport, Facilitated diffusion, Group translocation

Enzymes: Properties, Mechanism of catalysis, Allosteric controls

### **Cell Division**

Cell division, Phases, Mitosis and Meiosis

Growth and Tumour

Cell cycle, Senescence and Apoptosis

### **Cell Expression**

Central dogma of Life, Concept of Gene, Transcription, Translation and expression

Operon model, Coordination of Metabolism at enzyme Activity and Synthesis levels

Cell communication: Signal molecules, Receptors, Junction, Plasmodesmata and Cell signalling

### **Reference**

1. BIOTOL Series (1991) The Molecular Fabric of Cells (Biotechnology by Open Learning), Butterworth Heinmann
2. BIOTOL Series (1991) Infrastructure and Activities of Cell (Biotechnology by Open Learning), Butterworth Heinmann
3. BIOTOL Series (1992) Principles of Cell Energetics, (Biotechnology by Open Learning), Butterworth Heinmann
4. Elden D Enger, FC Ross and DB Bailey (2005) Concepts in Biology, (11<sup>th</sup> Edn), TMH
5. Purves William K, David Sadava, Gordon H. Orians, and H. Craig Heller (2006) Life: The Science of Biology, (7<sup>th</sup> Edn), Academic Internet
6. Lodish Harve et al (2008) Molecular Cell Biology, (6<sup>th</sup> Edn), Freeman
7. Karp Gerald (2005) Cell and Molecular Biology – Concepts and Experiments, (4<sup>th</sup> Edn), Wiley
8. Robertiis EDP De and EMF De Robertis, Jr (2001) Cell and Molecular Biology (8<sup>th</sup> Edn), Lippincott William and Wilkins
9. Cassimeris Lynne, VR Lingappa and G Plopper (2011) Lewin's Cells (2<sup>nd</sup> Edn), Jones and Bartlett
10. Pollard Thomas D and WC Earnshaw (2008) Cell biology, (2<sup>nd</sup> Edn), Elsevier

## **ENVSC-104 Practical (40 Hours)**

### **Practical Cell: The Unit of Life (103)**

1. Aseptic handling and transfer of microorganisms
2. Differential staining by Gram stain
3. Nucleus Staining from human WBCs/ *Chiromonas*
4. Preparation of permanent slides showing stages of Mitosis (Onion) and Meiosis (Anther)
5. Human Karyotype staining and banding patterns
6. Counting of cell count and viability ratio by vital stain in Haemocytometer
7. Colorimetric estimation of DNA using Diphenylamine
8. Colorimetric estimation of RNA using Orcinol