

# West Bengal Board Class 12 Biological Sciences Syllabus

## BIOLOGICAL SCIENCES (BIOS)

### CLASS – XII

Full Marks - 100

THEORY - 70 Marks

<b>Unit-1</b>	<b>REPRODUCTION IN ORGANISMS</b>	<b>14 marks</b>
<b>Unit-2</b>	<b>GENETICS AND EVOLUTION</b>	<b>18 marks</b>
<b>Unit-3</b>	<b>BIOLOGY AND HUMAN WELFARE</b>	<b>14 marks</b>
<b>Unit-4</b>	<b>BIOTECHNOLOGY AND ITS APPLICATIONS</b>	<b>10 marks</b>
<b>Unit-5</b>	<b>ECOLOGY AND ENVIRONMENT</b>	<b>14 marks</b>

### Unit I      **REPRODUCTION IN ORGANISMS**

#### **1. Reproduction in Organisms**

- 1.1 Introduction: Reproduction a characteristic features of all organism froms, continuation of species.
- 1.2 Modes of reproduction: Asexual and sexual
- 1.3 Asexual reproduction: definition, characteristics
- 1.4 Modes of asexual reproduction: General discussion of the following types in brief with common examples & diagram of each type:
  - a) Binary fission
  - b) Sporulation
  - c) Budding

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- d) Gemmule
- e) Fragmentation
- f) Regeneration
- 1.5 Vegetative propagation in plants:
  - a) Natural: (general discussion in brief, Mention common example and give figures)
  - b) Artificial: (brief description of method, example and diagram)- cutting grafting layering and gootee.

## 2. Sexual Reproduction In flowering Plants

- 2.1 Flower structure: Typical structure of a complete regular flower with diagram.
- 2.2 Pollination: Definition, types-Self pollination ( autogamy and geitonogamy) and cross pollination. (allogamy and xenogamy); agents of pollination- wind, water, animals, insects and birds- brief description with example, significance.
- 2.3 Development of male gametophyte
- 2.4 Development of female gametophyte
- 2.5 Outbreeding devices
- 2.6 Pollen- pistil interaction
- 2.7 Double fertilization
- 2.8 Post fertilisation events - development of endosperm and embryo (details not required).
- 2.9 Formation of fruit and development of seed (elementary)
- 2.10 Special modes - apomixes, parthenogenesis, Parthenocarp and Polyembryony (brief account)
- 2.11 Significance of seed and fruit formation

### 3. Human Reproduction

- 3.1 Introduction
- 3.2 Male Reproductive system  
(outline with diagram)
- 3.3 Female Reproductive system  
(outline with diagram)
- 3.4 Microscopic anatomy of testis and ovary
- 3.5 Gametogenesis- Definition and type
- 3.6 Spermatogenesis (brief account)
- 3.7 Oogenesis (brief account)
- 3.8 Menstrual cycle
- 3.9 Fertilization and development of embryo upto blastocyst formation and implantation.
- 3.10 Pregnancy and Placenta formation  
(elementary idea)
- 3.11 Parturition (elementary idea)
- 3.12 Lactation (elementary idea)

### 4. Reproductive Health

- 4.1 Introduction: what is reproductive health?
- 4.2 Need for reproductive health
- 4.3 Sexually Transmitted diseases (STD)  
And its prevention
- 4.4 Birth control- Needs and Methods:
  - i) Contraception
  - ii) Medical termination of pregnancy (MTP)
- 4.5 Amniocentesis: What it is and its Significance
- 4.6 Infertility and assisted reproductive Technologies - IVF (in vitro fertilization), ZIFT (Zygote intrafallopian transfer), GIFT (Gamete intrafallopian transfer), Elementary idea for general awareness.

**Unit- II**      **GENETICS AND EVOLUTION**

**5. Heredity and Variation**

- 5.1 Introduction
- 5.2 Mendelian Inheritance (laws only)
- 5.3 Deviations from Mendelism
  - i) Incomplete dominance
  - ii) Co-dominance
  - iii) Multiple alleles and Inheritance of Blood groups (ABO & Rh)
  - iv) Pleiotroph
- 5.4 Polygenic inheritance (elementary)
- 5.5 Chromosome theory of inheritance
- 5.6 Chromosomes and genes
- 5.7 Sex determination in - human, bird and honey bee
- 5.8 Linkage and crossing over
- 5.9 Sex- linked inheritance - Haemophilia and colour blindness
- 5.10 Mendelian disorder in human:  
Chromosomal disorders:
  - i) Autosomal - thalassemia
  - ii) Sex-linked - Down's Syndrome, Turner's Syndrome and Klinefelter's Syndrome (cause & symptoms only, process of inheritance is not required)

**6. Molecular Basis of Inheritance**

- 6.1 Search for genetic material
- 6.2 DNA as genetic material:  
(experiments on Bacterial transformation by F. Griffith; Avery, McLeod and Harshey & Chase)

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- 6.3 Structure of DNA
- 6.4 Structure of RNA
- 6.5 Types of RNA - mRNA; rRNA & tRNA
- 6.6 DNA Packaging
- 6.7 Central dogma (elementary),  
DNA replication, transcription,  
genetic code and translation.
- 6.8 Regulation of Gene expression  
(elementary) Lac Operon
- 6.9 Genome and Human genome project
- 6.10 DNA finger printing

## 7. Evolution

- 7.1 Introduction
- 7.2 Origin of life - Origin of earth-  
theories on the origin of life on earth:
  - i) Special creation
  - ii) Spontaneous generation
  - iii) Extra-terrestrial or cosmic origin  
(all with brief statement)
  - iv) Abiogenic origin or chemical  
origin of life - Oparin-Haldane  
Hypothesis supported by Miller's  
experiment, conclusion
- 7.3 Biological Evolution
  - a) What is biological Evolution?
  - b) Evidence for Biological Evolution
    - i) Paleontological
    - ii) From comparative anatomy
    - iii) Embryological
    - iv) Molecular
- 7.4 Theories of organic evolution  
Introduction - Darwin's contribution-  
Modern Synthetic Theory-  
Hardy Weinberg's Principle

## **8. Mechanism of Evolution**

- 8.1 Variation- Sources of variation
- 8.2 Mutation as a sources of variation  
(types not needed, mention only Hugo de V ries experiment)
- 8.3 Recombination as a source of Variation  
(process is not needed)
- 8.4 Natural selection with examples:  
Types of Natural selection
- 8.5 Gene Flow and genetic drift;  
Hardy-Weinberg's Principle
- 8.6 Adaptive radiation  
Human evolution (with diagram)

### **Unit-III      BIOLOGY AND HUMAN WELFARE**

## **9. Health and Diseases**

- 9.1 Basic concept of immunology - vaccines  
Introduction-immune system- Antigen, Antibody, Antigen-Antibody reaction-Types of immunity-vaccines and vaccination
- 9.2 Pathogens, parasites causing human diseases- Malaria, Filariasis, Ascariasis, Typhoid, Psneumonia,common cold, Amoebiosis and ring worm. (symptoms of Disease, name of causative agent, mode of Transmission, preventive measures)
- 9.3 Cancer, HIV and AIDS - Symptoms of disease, causative agent, mode of transmission, preventive measures
- 9.4 Adolescence : drug and alcohol abuse

## **10.Improvement in Food Production**

- 10.1 Plant breeding
- 10.2 Tissue culture

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- 10.3 Single cell protein (SCP)
- 10.4 Biofortification
- 10.5 Animal husbandary (poultry and diary, farm management, animal breeding, beekeeping and fisheries)

### **11. Microbes In Human Welfare**

- 11.1 In household food processing
- 11.2 Industrial production
- 11.3 Sewage treatment
- 11.4 Energy generation
- 11.5 Bio control agents and bio fertilizers

## **Unit- IV      BIO TECHNOLOGY ITS APPLICATION**

### **12. Biotechnology and its Application**

- 12.1 Introduction
- 12.2 Principle
- 12.3 Process - Genetic Engineering (Recombinant DNA technology)
- 12.4 Application of Biotechnology in health and agriculture – introduction
- 12.5 Human insulin and vaccine production- gene therapy
- 12.6 Genetically modified organisms- BT crops (What is G.M.O.? example- cotton), Transgenic animals.
- 12.7 Bio safety issues
- 12.8 Bio piracy and patents

## **Unit- V      ECOLOGY AND ENVIRONMENT**

### **13. Ecology Environment & Population**

- 13.1 Meaning of ecology, environment, habitat and niche

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- 13.2 Organisms and environment
  - i) Introduction- biome concept and distribution
  - ii) Major abiotic factors- water, light, temperature and soil
  - iii) Responses to abiotic factors
  - iv) Adaptations
- 13.3 Population and ecological adaptations-
  - i) Population interactions – mutualism, competition, predation, parasitism
  - ii) Population attributes – growth, birth rate and death rate, age distribution

### **14. Ecosystem**

- 14.1 What is ecosystem and its pattern
- 14.2 Components of ecosystem
- 14.3 Energy flow
- 14.4 Nutrient cycling (carbon and phosphorus)
- 14.5 Productivity and Decomposition
- 14.6 Pyramids of number, biomass and energy
- 14.7 Ecological Succession
- 14.8 Ecological service: Carbon fixation, Pollination and Oxygen release

### **15. Biodiversity And Conservation**

- 15.1 What is biodiversity?
- 15.2 Levels of biodiversity (genetic, species and Ecological) Patterns of biodiversity Importance and loss of Biodiversity
- 15.3 Threats to need for biodiversity conservation
- 15.4 Hotspots, endangered organisms, extinction, Red Data book
- 15.5 Biodiversity conservation –



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- a) Biosphere reserve
- b) National parks and sanctuaries

### **16. Environment Issues**

- 16.1 Introduction
- 16.2 Air Pollution and its control
- 16.3 Water Pollution and its control
- 16.4 Agro-Chemicals and their effects
- 16.5 Solid waste management
- 16.6 Radioactive waste management
- 16.7 Green House effect and global warming
- 16.8 Ozone depletion
- 16.9 Deforestation
- 16.10 Three success stories addressing environmental issues – Chipko movement, Dasholi Gram Swarajya Mandal (DGSM) movement; Silent valley or Amrita Devi – Bishnoi (Jaipur) movements