Biology Syllabus

There is one paper of 3 hours duration divided into two parts.

Part I (20 marks) consists of compulsory short answer questions, testing knowledge, application and skills relating to elementary/fundamental aspects of the entire syllabus.

Part II (50 marks) is divided into three Sections A, B and C. You are required to answer two out of three questions from Section A (each carrying 5 marks), two out of three questions from Section B (each carrying 10 marks) and two out of three questions from Section C (each carrying 10 marks). Therefore a total of six questions are to be answered in Part II.

SECTION A

1. Origin and Evolution of Life

(i) Origin of life: living and nonliving; chemical evolution; organic evolution - Oparin ideas, Miller-Urey experiments; interrelationship among organisms and evidences of evolution: morphological evidences - homology and analogy, vestigial organs, atavism; embryological, palaeontological (fossils) and biogeographical evidences, molecular (genetic) evidences.

(ii) Theories of evolution: Lamarckism: evidences in favour of Lamarckism (giraffe's neck), criticism of Lamarckism; Darwinism: basic postulates of Darwinism, drawbacks of Darwinism, Neo-Darwinism (Modern Synthetic Theory); Hardy Weinberg's principle; variations: causes of variation, mutation, selected examples and types of natural selection (DDT resistance in mosquito, sickle-cell anaemia); artificial selection; adaptations. Human evolution: Dryopithecus, Australopithecus, Homo erectus, Homo neanderthalensis, Cromagnon man and Homo sapiens; differences between apes and man.

SECTION B

2. Multicellularity

A. Plants

(i) T. S of young dicot and monocot stem, T. S of young dicot and monocot root and V. S. of dicot and monocot leaf. Secondary growth in stem: brief idea of formation of secondary xylem and secondary phloem by cambium ring formation, annual rings.

(ii) Absorption and movement of water in plants: diffusion, imbibition, osmosis, osmotic pressure, turgor pressure, wall pressure, water potential, diffusion pressure deficit. Mechanism of water absorption (active and passive absorption), root pressure,

transpiration, transpiration pull theory for ascent of sap, mechanism of opening and closing of stomata (active potassium theory), guttation.

(iii) Photosynthesis: ultra structure of chloroplast, photochemical and biosynthetic phases, absorption and action spectra, factors affecting photosynthesis, photophosphorylation; photorespiration, transport of solutes.

(iv) Reproduction and development in angiosperms: vegetative reproduction, structure of a typical flower, types of inflorescence (racemose and cymose), sexual reproduction: development of male and female gametophytes, placentation, pollination, fertilisation (Amphimixis) and formation of endosperm, embryo, seed and fruits (broadly classified). Apomixis, Polyembryony, Parthenocarpy. Significance of seed and fruit formation.

(v) Differentiation and organ formation.

B. Animals

Reproduction (human): internal structure of human testis and ovary, menstrual cycle, gametogenesis, embryonic development in mammals (up to three germ layers). Medical termination of pregnancy, infertility. Amniocentesis. Assisted reproductive technologies.

SECTION C

3. Genetics

(i) Fundamentals of Genetics: concept of alleles: dominant and recessive; phenotype and genotype, homozygous and heterozygous, mono and dihybrid crosses.

(ii) Mendel's experiments with peas; Mendel's Principles of inheritance, incomplete dominance, co-dominance and multiple alleles, Polygenic inheritance, Pleiotropy.

(iii) Genes: packaging of hereditary material in chromosomes. Linkage and crossing over; mutation, sex determination and sex linkage, search for DNA as genetic material, central dogma; genetic code, protein synthesis. Human genome project. DNA finger printing.

(iv) Recombinant DNA technology and its applications.

4. Applications of Biology

(i) Crop improvement: methods of crop improvement: selection, hybridisation, plant breeding, plant introduction, tissue culture; single cell protein; biofortification; biopesticides.

(ii) Biotic community: intraspecific and interspecific relationship, commensalism, predation, scavenging, parasitism, symbiosis, biotic stability, biotic succession and ecological adaptations.

(iii) Biodiversity today: importance of biodiversity, types of biodiversity, genetic conservation, gene banks and cryopreservation. Loss of biodiversity - threatened,

endangered and extinct species. Strategies for conservation of biodiversity - in-situ and ex-situ.

(iv) Biofertilisers: green manure, nitrogen fixation - symbiotic and non-symbiotic organisms, nitrogen cycle.

(v) Human Diseases: Body's defence mechanisms: (specific and non-specific); immune disorders (SCID and AIDS); allergies, interferons. Communicable diseases: causative agent, symptoms and prevention of the following: bacterial diseases (typhoid and pneumonia), viral diseases (common cold, swine flu and dengue), protozoa (malaria, and amoebiasis), helminthes (ascariasis, ringworm, and filariasis); sexually transmitted diseases (STD). Non-communicable diseases: cancer (types, causes, diagnosis and treatment); human genetic disorders: (haemophilia, thalassaemia, Down's syndrome, Klinefelter's syndrome, Turner syndrome). Rh factor incompatibility - during transfusion and pregnancy. Genetic counselling; a brief idea of stem cells, organ transplants and immunosuppression.

(vi) Adolescent issues: alcoholism and drugs.

(vii) Biomedical Engineering: (only applications) Instruments - ECG, EEG, CT scan, ultrasound, MRI, pacemakers, implants, dialysis, external prosthesis.

(viii) Human population: population growth curves, causes of increase in population.

(ix) Animal Husbandry: Dairy farm management, poultry farm management, apiculture, pisiculture.