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## **Aims**

1. To enable candidates to acquire the knowledge and to develop an understanding of biological terms, concepts, facts, principles, formulae, etc.
2. To develop the ability to apply the knowledge of biology in unfamiliar situations.
3. To develop experimental skills required in biology practical work.
4. To create awareness about the problems of the environment and the manner in which these problems can be overcome.
5. To develop the ability to appreciate biological phenomena in nature and the contribution of biology to human welfare.
6. To develop interest in plants and animals and in their respective environments.
7. To develop scientific attitude towards biological phenomena.
8. To create awareness of the fundamentals of human biology, food, health, nutrition and population control.

There will be two papers in the subject.

**Paper I Theory: 3 hours (70 marks)**

**Paper II Practical: 3 hours (20 marks, 10 marks)**

**Project work: 7 marks**

**Practical file: 3 marks**

## **PAPER I: THEORY – 70 Marks**

There will be one paper of 3 hours duration divided into 2 parts.

**Part 1 (20 marks)** will consist of compulsory short answer questions, testing knowledge, application and skills relating to elementary/fundamental aspects of the entire syllabus.

**Part 2(50 marks)** will be divided into two Sections A and B. Candidates are required to answer **three** out of five questions from Section A and **two** out of **four** questions from Section B. Each question in this part shall carry 10 marks.

## **SECTION A**

### **1. Multicellularity: Structure and function – Plant Life**

#### **Forms and functions**

#### **Tissues types of plant tissues**

Meristematic: Classification of Meristematic tissue, tunica-cornu theory, histogen theory, root apex.

#### **Permanent tissues**

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Structure and function of simple tissues (parenchyma, collenchyma and sclerenchyma) and complex tissues (xylem and phloem), types of vascular bundles, T.S of young dicot and monocot root and V.S of dicot and monocot leaf. Secondary growth: brief idea of formation of secondary xylem and secondary phloem by cambium ring formation, annual rings, heartwood and sapwood.

***Absorption and movement of water in plants***

Diffusion, osmosis, osmotic pressure, turgor pressure, wall pressure, water potential, pressure potential, diffusion pressure deficit. Types of soil water, mechanism of water absorption (active and passive absorption), root pressure, guttation, transpiration pull theory for ascent of sap, transpiration, mechanism of opening and closing of stomata (active potassium theory), guttation.

***Mineral nutrition***

Macronutrients and micronutrients (role and deficiency symptoms), criteria for essentiality of elements, aeroponics and hydroponics, passive absorption (ion exchange mechanism) and active absorption of mineral nutrients, nitrogen nutrition in plants.

***Modes of nutrition***

Parasitic, saprophytic, symbiotic and insectivorous (brief idea with examples), transport of solutes, photosynthesis: ultra structure of chloroplast, photochemical and biosynthetic phases, absorption and action spectra, factors influencing photosynthesis, photophosphorylation; photorespiration.

***Reproduction and development in angiosperms***

Vegetative reproduction, sexual reproduction: development of male and female gametophytes, types of ovules, pollination, fertilization and development of endosperm, embryo, seed and fruits (broadly classified). Apomixes, Polyembryony.

***Differentiation and organ formation***

***Plant growth***

Phases of growth, measurement of growth, factors affecting growth, role of growth regulators, seed dormancy and germination, apical dominance, senescence and abscission, movements in plants (tropic and nastic).

***Photomorphogenesis in plants including a brief account of phytochrome.***

***2. Multicellularity: Structure and function – animal life forms and functions***

***Tissues***

Epithelial, connective, muscular, nervous (location, structure and function).

***Nutrition***

(human) organs of digestion (histology not required), digestive process; process and disorders of the digestive system.

***Respiration***

(human) Organs of respiration, breathing mechanism (inspiration and expiration), pulmonary gas exchange, transport of respiratory gases, chloride shift, pulmonary air volumes and lung capacities. Disorders of respiratory system.

***Circulation***

Closed and open vascular systems, structure of heart (human), cardiac cycle, systemic and pulmonary circulation, portal system, arterial blood pressure, types of hearts, origin and

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conduction of heart beat, blood vessels (structure and adaptation), lymphatic system. ABO group, coagulation of blood.

### **Excretion**

Ammonotelism, ureotelism, uricotelism, structure of human kidney (L.S), structure of nephron, role of skin and lungs in excretion, physiology of urine formation, counter current system; functions of the kidney; diagraphy. Disorders of the excretory system.

### **Endocrine system**

(Human) hormones of pituitary, thyroid, parathyroid, thymus, pancreas, adrenal glands and gonads, effect of hyposecretion and hypersecretion, feedback mechanism.

### **Nervous system**

(Human) Central, autonomic and peripheral, structure of spinal cord, reflex action, transmission of nerve impulse, salutatory conduction; receptors (mechano, chemo, photo and thermoreceptors), sense organs (eye and ear).

### **Locomotion**

Joints, structure of skeletal muscle, sliding filament theory of muscle contraction, classification of muscles on the basis of functions, properties of muscles, red and white muscle fibres, isotonic and isometric contraction, summation, tetanus and rigor mortis. Disorders of muscular and skeletal system.

### **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.

### **Growth, ageing and death**

Types of growth, growth curve, morphological and physiological changes during ageing, causes of death.

## **SECTION B**

### **3. Origin and evolution of life**

#### **Origin of life**

Living and nonliving; chemical evolution; organic evolution – Oparin ideas, Miller-Urey experiments; interrelationship among organisms and evidences of evolution –morphological evidence, homology and analogy, vestigial organs, physiological, embryological, palaeontological (fossils) and biogeographical evidences.

#### **Theory of evolution**

Lamarckism: evidences in favour of Lamarckism (giraffe's neck and feet of modern horse), criticism of Lamarckism, Darwinism: basic postulates of Darwinism, drawbacks of Darwinism, Neo-Darwinism; variations: causes of variation, selected examples of natural selection (DDt resistance in mosquito, malaria in relation to G-6-PD deficiency and sickle-cell anaemia); artificial selection; adaptations (Lederberg's replica plating experiment), speciation, sympatric and allopatric speciation, sympatric and allopatric speciation, reproductive isolation. Human evolution: Dryopithecus, Australopithecus, Homo Erectus, Homo Neanderthalensis, Cromagnon man and Homo Sapiens; differences between apes and man.

### **4. Applications of biology**

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### **Domestication of plants and crop improvement**

Methods of crop improvement: selection, hybridisation, plant breeding, plant introduction, tissue culture; uses of medicinal plants: Cinchona calisaya (Quinine), Ocimum sanctum (tulsi), Aegle marmelos (bel), Emblica officinalis (amla), Adhatoda vasica (vasaka), Withana somnifera (ashwagandha), Aloe vera.

### **Crops today**

Gene pool and genetic conservation, gene banks, cryopreservation; potential uses of underutilized crops (winged bean, jojoba, guayule, leucaena, triticale).

### **Biofertilisers**

Green manure, nitrogen fixation – symbiotic and non-symbiotic.

### **Pesticides**

Advantages and disadvantages of pesticides. Bioinsecticides and bioherbicides. Integrated Pest Management (IPM).

### **Human Diseases**

Body's defence mechanisms: (specific and non-specific); immune disorders (SCID and AIDS); allergies, interferons, communicable diseases; causative agent, symptom and cure of bacterial diseases (tuberculosis, typhoid, leprosy, cholera, diphtheria, tetanus and pertussis), viral disease (chicken pox), measles, poliomyelitis, rabies, mumps and hepatitis), protozoa (malaria and amoebiasis), helminthes (ascariasis, filriasis and taeniasis); non-communicable diseases: diseases of the heart diabetes, cancer (types, causes, diagnosis and treatment); human genetic disorders: (Rh factor incompatibility, amniocentesis, Down's syndrome, Klinefelter's syndrome, Turner syndrome). Genetic counseling; a brief idea of stem cells, organ transplants and immunosuppression.

### **Mental Health and Community Health:**

Types, causes and treatment of mental illness; causes of addiction; activities of community health services.

### **Biomedical Engineering**

(only basic concepts) Instruments – ECG, EEG, CT scan, ultrasound, MRI, pacemakers, implants, disposable, external prosthesis.

### **Human population growth**

Population growth curves, causes of increase in population.

## **PAPER II: PRACTICAL WORK – 20 Marks**

1. Taxonomy: Study floral characteristics through dissection of flowers, drawing floral formula and diagrams of following families:
  - (i) Malvaceae - type-china rose / hollyhock.
  - (ii) Compositae – type -sunflower/ Cosmos/ marigold (with single whorled ray florets).
  - (iii) Leguminosae - subfamily - papilionaceae - type-sweet pea/ pea /bean.
  - (iv) Solanaceae - type – petunia / datura.
  - (v) Liliaceae - type – onion or Amarallydaceae - type – lily.
2. Simple biochemical and physiological experiments –
  - (i) Demonstration of plasmolysis.
  - (ii) Demonstration of osmosis in living plant cells (potato osmoscope).
  - (iii) Demonstration of unequal transpiration in leaves.
  - (iv) To demonstrate the effect of different intensities of light on photosynthesis.

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- (v) To demonstrate that oxygen is evolved during photosynthesis.
- (vi) Effect of different carbon dioxide concentrations on the rate of photosynthesis.
3. Studies of the following with the help of models. (Students would be required to sketch, label and identify the various parts in the organ/system and know their role in the body).
- (i) Human digestive system.
  - (ii) Human heart (V.S.).
  - (iii) Human eye (V.S.).
  - (iv) Human ear (V.S.).
  - (v) Human brain (external and V.S.).
  - (vi) Human kidney (V.S.).