

# 231 KNEC BIOLOGY SYLLABUS

## **FORM 1**

### **1. Introduction to Biology**

1. Definition of Biology
2. Branches of Biology
3. Importance of Biology
4. Characteristics of living organisms
5. Comparison between plants and animals

### **2. CLASSIFICATION 1**

1. Review and use of magnifying lens
2. External features of plants and animals
3. Necessity and significance of classification
4. Major units of classification( naming)
  1. Kingdoms
5. Discussion of Binomial nomenclature

### **3. THE CELL**

1. Definition of cell
2. Structure and functions of parts of a light microscope
3. Use and care of the light microscope
4. Cell structure and functions as seen under microscope
5. Preparation of temporary slides of plant cells
6. Estimation of cell size
7. Cell specialization, tissues, organs, and organ systems.

#### **2. Practical activities**

1. Observe, identify, draw and state the functions of parts of the light microscope
2. Prepare and observe temporary slides of plant cells
3. Observe permanent slides of animal cells
4. Comparison between plant and animal cells
5. Observe, estimate size and calculate magnification of plant cells

### **4. CELL PHYSIOLOGY**

1. Meaning of cell physiology
2. Structure and properties of cell membrane (Theories of membrane structure not required)
3. Physiological properties- diffusion, osmosis and active transport
4. Factors affecting diffusion, osmosis and active transport in living organisms
5. Role of diffusion, osmosis and active transport in living

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organisms

6. Water relations in plant and animal cells: turgor, plasmolysis, wilting and haemolysis

1. Diffusion as demonstrated with potassium permanganate or potassium iodide/ flower dyes/ coloured plant extracts/ smoke
2. Experiments with visking tubing and living tissues: fresh arrow roots/ cassava/ sweet potatoes/ leaf petioles/ irish potatoes
3. Demonstration of plasmolysis

## **5. NUTRITION IN PLANTS AND ANIMALS**

1. Meaning, importance and types of nutrition

2. Nutrition in plants

1. Definition of photosynthesis and its importance in nature
2. Adaptations of leaf to photosynthesis
3. Structure and function of chloroplast
4. Process of photosynthesis- light and dark stage
5. Factors influencing photosynthesis

3. Chemical compounds which constitute living organisms

1. Chemical composition and functions of carbohydrates, proteins and lipids
2. Properties and functions of enzymes

## **4. Nutrition in animals**

1. Modes of feeding in animals

2. Dentition of a named carnivorous, herbivorous and omnivorous mammal

3. Adaptation of the three types of dentition of feeding.

4. Internal structure of mammalian teeth.

5. Common dental diseases, their causes and treatment

## **5. Digestive system and digestion in a mammal human)**

1. Digestive system, regions, glands and organs associated with digestion.

2. Ingestion, digestion, absorption, assimilation and egestion.

6. Importance of vitamins, mineral salts, roughage and water in human nutrition

7. Factors determining energy requirements in humans

## **FORM 2**

## **1. TRANSPORT IN PLANTS AND ANIMALS**

1. Meaning and importance of transport systems

2. Absorption of water and mineral salts

1. Internal structure of root and root hairs

2. Absorption of water

3. Active intake of mineral salts

## **3. Transpiration**

1. Definition of transpiration

2. Review of structure of the leaf.
3. Structure and function of xylem
4. Factors affecting transpiration
5. Forces involved in water movement in plants

#### **4. Translocation**

1. Structure and function of phloem
2. Materials translocated
5. Comparison between closed and open circulatory system.
6. Mammalian circulatory system
  1. Structure and function of heart, arteries, veins and capillaries
  2. Diseases and defects of the heart, arteries, veins, and capillaries
  3. Diseases and defects of the circulatory system.
7. The structure and functions of blood
  1. Composition of blood
  2. Functions of blood plasma
  3. The structure and functions of red blood cells and white blood cells
  4. Mechanism of blood clotting and its importance
8. Blood groups (ABO system and rhesus factor)
9. Immune responses
  1. Natural and artificial immunity
  2. Allergic reactions
  3. Importance of vaccinations against diseases
10. Practical Activities
  1. Observe permanent slides of sections of stems and roots
  2. Carry out experiments to compare transpiration on lower and upper surfaces
  3. Observe wall charts/models
  4. Analyse data on transpiration rate under different environmental conditions in plants
  5. Dissect a small mammal and observe its transport system.
  6. Make longitudinal section of the mammalian heart to display the chambers and associated blood vessels
  7. Record pulse rate at the wrist before and after vigorous activities and analyse the results
  8. Demonstrate the unidirectional flow of blood in the cutaneous veins of the fore arm

## **2. GASEOUS EXCHANGE**

1. Gaseous exchange in living organisms
2. Gaseous exchange in plants
  1. Mechanism of opening and closing of the stomata
  2. The process of gaseous exchange in roots, stem and leaves of both aquatic and terrestrial plants
3. Gaseous exchange in animals
  1. Types and characteristics of Respiratory surfaces- cell membrane, gills, buccal cavity, skin and lungs
  2. Mechanism of gaseous exchange in protozoa, insect (grasshopper), fish (bonnyfish), Frog and human
  3. Factors affecting rate of breathing in humans
4. Respiratory diseases: Asthma, Bronchitis, Pulmonary

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Tuberculosis, Pneumonia and Whooping cough

### **3. RESPIRATION**

1. Meaning and significance of respiration
2. Tissue respiration
  1. Mitochondrion- structure and functions
  2. Aerobic respiration
  3. Anaerobic respiration in plants and animals
  4. Application of anaerobic respiration in industry and at home
  5. Compare energy output of aerobic and anaerobic respiration

### **4. EXCRETION AND HOMEOSTASIS**

1. Excretion in Plants
  1. Methods of excretion in plants
  2. Useful and harmful excretory products of plants and their economic importance e.g. coffee, caffeine
2. **Excretion and homeostasis in animals**
  1. Difference between excretion, homeostasis and egestion
  2. Excretion in a named unicellular organism (protozoa)
  3. Structure and functions of skin and kidney
  4. Neuro-endocrine system and homeostasis
  5. Common kidney diseases, their symptoms and possible methods of prevention and control
  6. The role of skin in thermoregulation, salt and water balance
  7. Major functions of liver and their contributions to homeostasis
  8. Common diseases of liver, their symptoms and possible methods of prevention, control

### **FORM 3**

#### **1. CLASSIFICATION II**

1. Review of binomial nomenclature
2. General principles of classification
3. General characteristics of kingdoms
  1. Monera
  2. Protocista
  3. Fungi
  4. Plantae
  5. Animalia
4. Main characteristics of major divisions of plantae
  1. Bryophyta
  2. Pteridophyta
  3. Spermatophyta
5. Main characteristics of phyla Arthropoda and Chordata
  1. Arthropoda
  2. Diplopoda

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3. Chilopoda
4. insecta
5. crustacea
6. arachnida

6. Construction and use of simple dichotomous keys based on observable features of plants and animals

## **2. ECOLOGY**

1. Concepts of ecology

1. Habitat
2. Niche
3. Population
4. Community
5. Ecosystem
6. Biomass
7. Carrying capacity

### **2. Factors in an ecosystem**

1. Abiotic factors
2. Biotic factors
3. Inter-relationships:- Competition, predation, saprophytism, parasitism and symbiosis

### **4. Nitrogen cycle**

3. Energy flow in an ecosystem:- Food chains, food webs, decomposers, pyramid of numbers and pyramid of biomass

4. Population estimation methods

1. Quadrat method
2. Line transect
3. Belt transect
4. Capture-recapture method

5. Adaptations of plants to various habitats

1. Xerophytes
2. Mesophytes
3. Hydrophytes
4. Halophytes

6. Effect of pollution on human beings and other organisms  
Causes, effects and control of pollutants in air, water and soil

### **7. Human diseases**

1. Bacterial diseases- Cholera and Typhoid
2. Protozoa- malaria and amoebic dysentery
3. Ascaris lumbricoides and schistosoma

## **3. REPRODUCTION IN PLANTS AND ANIMALS**

1. Concept of reproduction
1. Importance of reproduction
2. Chromosomes, meiosis and mitosis
3. Asexual reproduction
  1. Binary fission in amoeba
  2. Spore formation/ reproduction in mucor / Rhizopus
  3. Budding in yeast

#### **4. Sexual reproduction in plants**

1. Structure and function of parts of named insect and wind pollinated flowers
2. Pollination and agents of pollination
3. Features and mechanisms that hinder self fertilization and self pollination
4. The process of fertilization
5. Fruit and seed formation and dispersal

#### **5. Sexual reproduction in animals**

1. External fertilization in amphibians
2. Structure of the reproductive system of a named mammal (human)
3. Functions of the parts of reproductive system
4. Fertilization, implantation and role of placenta.
5. Gestation period
6. Role of hormones in reproduction in humans

#### **6. Sexually transmitted infections (S.T.Is)**

1. Gonorrhea
2. Herpes Simplex
3. Syphilis, Trichomoniasis, hepatitis, Candidiasis
4. HIV/AIDS

#### **7. Advantages and disadvantages of asexual and sexual reproduction**

### **4. GROWTH AND DEVELOPMENT**

1. Concepts of growth and development
2. Growth and development in plants
  1. Dormancy and ways of breaking it
  2. Conditions necessary for germination
  3. Measurement of one aspect of growth in a named seedling e.g. region of growth
  4. Primary and secondary growth
  5. Role of growth hormone in plants
  6. Apical dominance
3. Growth and development in animals
  1. Complete and incomplete metamorphosis in insects
  2. Role of growth hormones in insects

#### **\* FORM 4**

## **1. GENETICS**

### **1. Concept of genetics**

1. Variation within plant and animal species
2. Review of chromosomes
3. Brief mention of genes and DNA (Without details of molecular structure of genes and DNA)

### **2. First law of heredity**

1. Mendel's experiments- monohybrid inheritance(3:1 ratio)
2. Complete and incomplete dominance, back/ testcross
3. Inheritance of ABO blood groups and Rh factor

### **3. Sex determination in humans**

4. Linkage: sex linked genes, sex linked characteristics e.g. colour blindness, Haemophilia, Hairy ears and nose

### **5. Mutations**

1. Types of mutations
2. Causes and consequences of chromosomal mutations
3. Gene mutations

## **2. EVOLUTION**

1. Meaning of evolution

### **2. The origin of life**

1. Special creation
2. Chemical evolution

### **3. Evidence of organic evolution**

1. Fossil records
2. Geographical distribution - Continental drift
3. Comparative embryology
4. Comparative anatomy
5. Cell biology- occurrence of cell organelles and blood pigments

### **4. Mechanisms of evolution**

1. Lamarck's theory (Brief mention)
2. Evolution by natural selection
3. Natural selection in action e.g. peppered moth
4. Resistance to drugs, pesticides and antibiotics

## **3. RECEPTION, RESPONSE AND COORDINATION IN PLANTS AND ANIMALS**

1. Meaning of stimulus, response and irritability
2. Reception, response and coordination in plants

1. Response to a variety of external stimuli
2. Tropisms and tactic movements and their survival values

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3. Production of auxins and their effects on plant growth

**3. Reception, responses and coordination in animals**

1. Components of the nervous system in a mammal
2. Structure and functions of the neurones
3. Functions of major parts of human brain
4. Simple and conditioned reflex actions

**4. The role of hormones in coordination in a mammal**

1. Effects of over secretion and under secretion of adrenaline and thyroxine in humans

**5. Effects of drug abuse on human health**

6. Structure and functions of parts of the mammalian eye
  1. Accommodation, image formation and interpretation
  2. common eye defects and their corrections
7. Structure and functions of parts of the mammalian ear (human)
  1. Hearing
  2. Balance and posture

**4. SUPPORT AND MOVEMENT IN PLANTS AND ANIMALS**

**1. Plants**

1. Necessity for support and movement in plants
2. Review of tissue distribution in monocotyledonous and dicotyledonous plants

**2. Animals**

1. Necessity for support and movement in animals
2. Types and functions of the skeleton

**3. Locomotion in a finned fish**

4. Identification of the bones of axial and appendicular skeletons (names of individual bones of coccyx not required)
5. Types and functions of movable joints (ball and socket, hinge joint)
6. Structure, function and location of cardiac, smooth and skeletal muscles