

Secondary School Certificate Examination Syllabus

BIOLOGY

(Based on National Curriculum 2006)

Class X examination in 2011 and onwards

Part II (Class X)

10. Gaseous Exchange:

10.1 Introduction:

10.1.1 Differentiate among respiration, gaseous exchange and breathing

10.2 Gaseous Exchange in Plants:

10.2.1 Describe the process of gaseous exchange in plants by comparing photosynthesis and respiration

10.3 Gaseous Exchange in Man:

10.3.1 Explain how alveoli are adapted for gaseous exchange by diffusion between air in the lungs and blood in the capillaries

10.3.2 Describe the mechanism of breathing in term of movements of ribs and diaphragm

10.3.3 Analyze the effect of exercise on the rate of breathing

10.3.4 Differentiate between the composition of inspired and expired air

10.4.1 Describe briefly diseases related to respiratory system like bronchitis, emphysema, pneumonia, asthma, and lung cancer

10.4 Respiratory Disorders and their Causes Asthma, Bronchitis, Pneumonia, Lung Cancer

10.4.2 Describe the biological consequences of smoking in relation to the lungs and circulatory system

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11. Homeostasis:

11.1 Introduction:

11.1.1 Define homeostasis and describe its importance

11.2 Homeostasis in Plants:

11.2.1 Describe the mechanisms / adaptations in plants for the excretion / storage of CO₂, H₂O, O₂, latex, resins and gums

11.2.2 Explain osmotic adjustments in plants

11.3 Homeostasis in Man:

11.3.1 State skin, lungs and kidneys as the major organs involved in homeostasis;

11.3.2 Explain the role of skin in regulating body temperature

11.3.3 Describe how lungs keep the carbon dioxide concentration down to certain level

11.3.4 Explain that kidneys control the blood composition

11.4 Urinary System of Man:

11.4.1 Identify the different organs of urinary system

11.4.2 Relate the structure of kidney with its function

11.4.3 State that nephron is the excretory unit of kidney

11.4.4 Locate the different parts of nephrons and relate them with their function

11.4.5 State that main role of kidney is urine formation

11.4.6 Describe that urine formation involves three processes i.e. filtration, selective reabsorption and secretion

11.4.7 Discuss the role of kidney in osmo regulation

11.5 Disorders of Human:

11.5.1 Identify the causes of kidney stone; Excretory System

11.5.2 Describe lithotripsy and surgery as the methods to remove kidney stones;

11.5.3 Outline the causes of kidney failure

11.5.4 Explain that dialysis is one of the treatments in kidney failure

11.5.5 Describe the contributions of Al-Farabi and Abul-Qasim in introducing the method of removing stone from the urinary bladder

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12. Coordination:

12.1 Introduction:

12.1.1 Define coordination

12.2.1 Describe the two main types of coordination in living organisms, i.e. nervous and hormonal (chemical)

12.2 Types of Coordination (Nervous and Chemical Coordination):

12.2.2 Differentiate between the modes of coordination i.e., electrical in case of nervous and chemical in case of hormonal

12.2.3 Identify the main organs responsible for coordination and control

12.2.4 State that receptors receive stimuli and transmit information to effectors through central nervous system

12.3 Human Nervous System:

12.3.1 Label the diagram of human brain

12.3.2 Explain the function of the parts of brain; cerebrum, cerebellum, pituitary gland, thalamus, hypothalamus, medulla oblongata

12.3.3 Differentiate between the cross sectional views of brain and spinal cord, with reference to white and grey matter

12.3.4 Define neuron and describe the structure of a general neuron

12.3.5 Describe the types of neurons (sensory, motor and relay)

12.3.6 Define voluntary and involuntary actions with examples

12.3.7 Define reflex action and reflex arc

12.3.8 Name the three types of neuron involved in reflex action

12.3.9 Trace the path of a nervous impulse in case of a reflex action with examples from daily life

12.4 Receptors of Man:

- 12.4.1 Describe the structure of human auditory and visual receptors; (Eyes and Ears)
- 12.4.2 Describes the pupil reflex in dim and bright light
- 12.4.3 Explain the defects of eye (short sightedness and long sightedness)
- 12.4.4 State how short and long sightedness can be treated
- 12.4.5 Associate the role of Vitamin A with vision and effects of its deficiency on retina
- 12.4.6 Relate the contribution of Ibn-al-Haitham and Al-lbn-lsa with knowledge about the structure of eye and treatment of various ophthalmic diseases

12.5 Endocrine System:

- 12.5.1 Define the terms hormone and endocrine system
- 12.5.2 Outline the parts of endocrine system; major glands of this system (Pituitary, Thyroid, Pancreas, Adrenal, Testes, Ovary) and names of their respective hormone
- 12.5.3 Describe the term "Negative feedback" with reference to Insulin and Glucagon
- 12.5.4 Explain how adrenaline may be involved in exercise and emergency conditions and use gained knowledge to apply to different hormones

12.6 Nervous Disorders (Paralysis and Epilepsy):

- 12.6.1 Explain the two common kinds of nervous disorders (vascular i.e. paralysis and functional i.e. epilepsy)
- 12.6.2 Enlist some of the symptoms and treatments of paralysis and epilepsy

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13. Support and Movement:

- 13.1.1 Define skeleton and differentiate between cartilage and bone
- 13.1.2 Describe the role of skeleton in support and movement

13.1 Human Skeleton (Axial Skeleton and Appendicular Skeleton):

- 13.1.3 Explain that skeleton system is actually a dynamic, living tissue that is capable of growth adapts to stress and repairs itself after injury
- 13.1.4 Describe the main components of the axial skeleton and the appendicular skeleton
- 13.1.5 Describe the contribution of Vi Salius in describing the bones and muscles I human

13.2 Ball-and- Socket and Hinge Joints:

- 13.2.1 Define joint
- 13.2.2 Differentiate between moveable joints and immovable joints
- 13.2.3 State the role of ligaments and tendons
- 13.2.4 Describe the location and movement of hinge joints
- 13.2.5 Identify ball-n-socket joints in the human body

13.3 Muscles and Movement:

- 13.3.1 Define antagonism
- 13.3.2 Describe the action of flexors and extensors as a pair of opposing muscles selecting biceps and triceps as example

13.4 Disorders of Skeletal System:

- 13.4.1 Describe the effect of deficiency of calcium on bones and relate this deficiency with osteoporosis
- 13.4.2 Discuss the causes, symptoms, and treatment of arthritis

13.4.3 Relate the onset of arthritis with age and weight-bearing joints.

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14. Reproduction:

14.1 Introduction:

14.1.1 Define reproduction and describe its importance

14.1.2 Differentiate between asexual and sexual reproduction

14.2.1 Describe different types of asexual reproduction i.e. binary fission, budding, spore formation and vegetative propagation

14.2 Asexual Reproduction in Protists, Bacteria and Plants:

14.2.2 Distinguish between vegetative propagation and artificial propagation;

14.2.3 Explain vegetative propagation in plants (through stem, suckers and leaves)

14.2.4 Describe the methods of artificial vegetative propagation (stem cuttings and grafting)

14.2.5 Rationalize how parthenogenesis is a type of asexual reproduction

14.2.6 Define cloning

14.3 Sexual Reproduction in Plants (Pollination and Fertilization):

14.3.1 Define pollination and its types

14.3.2 Describe sexual reproduction in plants by explaining the life cycle of a flowering plant

14.3.3 Describe the adaptations in the structure of wind-pollinated and insect pollinated flowers

14.4 Germination of Seed:

14.4.1 Describe the structure of seed (monocot and dicot)

14.4.2 Distinguish between epigeal and hypogeal germination

14.4.3 Describe the conditions necessary for germination of seeds

14.5 Asexual Reproduction in Animals:

14.5.1 Describe the binary fission, multiple fission, budding and fragmentation as asexual methods of reproduction in animals

14.6.1 Define fertilization and differentiate between external and internal fertilization

14.6.2 Describe different organs of the male and female reproductive systems of rabbit

14.6.3 Describe the processes of gameteogenesis in rabbit

14.6 Sexual Reproduction in Animals:

14.6.4 Rationalize the need for population planning

14.7 Sexually Transmitted Diseases (AIDS):

14.7.1 Explain AIDS as an example of sexually transmitted diseases;

14.7.2 State the role of National AIDS Control Program and different NGOs in educating people with reference of AIDS

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15. Inheritance:

15.1 Introduction:

15.1.1 Define genetics

15.1.2 Explain how genes control inheritance of characters

15.2 Chromosomes and Genes:

15.2.1 Define chromosomes and chromatids

15.2.2 Describe the composition of chromatin material

15.2.3 Describe a DNA molecule as two strands coiled to form a double helix, the strands being linked by a series of paired bases

15.2.4 State the difference between a gene and an allele

15.2.5 Describe the central dogma stating the role of gene in protein synthesis

15.3 Mendel's Law of Segregation and Independent Assortment:

15.3.1 Describe complete dominance using the terms dominant, recessive, phenotype, genotype, homozygous, heterozygous, P1, F1, F2 generations and proving it diagrammatically through a monohybrid genetic cross;

15.3.2 Describe complete and incomplete dominance with examples;

15.3.3 Demonstrate that the 3:1 monohybrid F-2 phenotypic ratio is an evidence of segregation of alleles

15.3.4 State Mendel's Law of Segregation

15.3.5 Demonstrate that 9:3:3:1 dihybrid F-2 phenotypic ratio is an evidence of independent assortment

15.3.6 State Mendel's Law of Independent Assortment

15.3.7 Explain co-dominance selecting the example of ABO blood group system

15.3.8 Explain incomplete dominance in Japanese 4 O' Clock plant

15.4 Variation and Evolution:

15.4.1 Describe the sources of variation (genetic, environmental, or both)

15.4.2 Relate meiosis with variation

15.4.3 Describe variation and explain difference between continuous and discontinuous variation by giving examples like, height, weight, IQ, gender, tongue rolling, ear lobes and blood groups in population

15.4.4 Define organic evolution and explain how variation can lead to evolution

15.4.5 Describe how variation leads to competition in a population and differential survival by best fitting the environment

15.4.6 Assess selection as a possible means of evolution

15.4.7 Develop an understanding of artificial selection as a means of improvement of yield in economically important plants, like wheat, rice etc.

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16. Man and his Environment:

16.1 The Ecosystem: Levels of Ecological Organization Components:

16.1.1 Describe levels of ecological organization (species, population, community, habitat, ecosystem, biosphere)

16.1.2 Define ecosystem

16.1.3 Describe components of the ecosystem

16.1.4 Describe the interrelationships between biotic and abiotic components of the ecosystem

16.2.1 Explain that the sun is the principal source of energy for all biological systems;

16.2 Flow of Materials and Energy in the Ecosystem:

16.2.2 Compare and contrast the flow of materials (cyclic) and the flow of energy (non-cyclic) in the ecosystem

16.2.3 Construct and describe food chains and food webs

16.2.4 Describe and compare energy relations between different trophic levels

16.2.5 Interpret pyramids of numbers and biomass

16.3 Biogeochemical Cycles:

16.3.1 Describe carbon and nitrogen cycles; (Carbon Cycle & Nitrogen Cycle)

16.3.2 Relate biogeochemical cycles with flow of energy and ecological balance;

16.4.1 Explain competition, predation and symbiosis (parasitism, mutualism, commensalisms)

16.4 Interactions in the Ecosystem (Competition; Predation; Symbiosis)

16.4.2 Relate competition, predation, and parasitism with population growth;

16.5 Ecosystem Balance and Human Impact on Environment (Population growth, Urbanization, Industrialization, Deforestation):

16.5.3 Explain the damages caused by some global and regional environmental problems (population growth, urbanization, global warming, deforestation, acid rain and eutrophication)

16.6 Pollution, its Consequences and Control:

16.6.1 Explain causes of air, water, and land pollution; Consequences and

16.6.2 Describe effects of pollution on plants, animals and human beings

16.6.3 Describe possible actions to control pollution

16.7 Conservation of Nature:

16.7.1 Explain conservation of nature

16.7.2 Explain different strategies for conservation of nature (reduced resource use, reuse and recycling of materials, control over hunting especially of rare species)

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17. Biotechnology:

17.1 Introduction:

17.1.1 Define biotechnology and explain its importance;

17.1.2 Relate biotechnology with genetic engineering and fermentation;

17.1.3 Explain that plants and animals with desired characteristics can be developed by selective breeding

17.2.1 Define fermentation:

17.2.2 Explain the method of fermentation by yeast and bacteria;

17.2 Fermentation and Baking Industry:

17.2.3 Measure the significance of different fermentation products and their importance in daily life i.e. yogurt making, bread making, making of cheese and production of alcohol

17.2.4 Explain the use of fermenter in large-scale production of micro-organisms and their products

17.2.5 Describe the procedure of using fermenters

17.2.6 Describe the advantages / profitability of using fermenters in preparing medical

products

17.3 Genetic Engineering:

- 17.3.1 Define genetic engineering and describe its objectives;
- 17.3.2 Describe how a gene is transplanted;
- 17.3.3 Describe major achievements of genetic engineering with reference to improvement in agricultural crops (herbicide resistance, virus resistance and insect resistance)
- 17.3.4 Describe major achievements of genetic engineering in curing animal diseases (Foot-and-Mouth disease, Coccidiosis, Trypanosomiasis) and in animal propagation (animal cloning);
- 17.3.5 Describe the application of genetic engineering in the production of human insulin and growth hormones

17.4 Single Cell Protein and its Uses:

- 17.4.1 Describe single-cell protein and its importance
- 17.4.2 Describe the significance of single-cell protein in animal feed
- 17.4.3 State the significance of single-cell protein in human food.

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18. Pharmacology:

18.1 Introduction:

- 18.1.1 Define pharmacology as the detailed study of drugs
- 18.1.2 Define the term 'drug' (the substance or product that is used to modify physiological systems of the body)
- 18.1.3 Enlist the various sources of drugs i.e. minerals, animals, plants, synthetics, microorganisms
- 18.1.4 Describe the principle usages of painkillers, antibiotics, vaccines and sedatives;
- 18.1.5 State the contributions of Joseph Lister in the discovery of antiseptics and of Alexander Fleming in the discovery of penicillin

18.2 Medicinal Drugs and Addictive Drugs:

- 18.2.1 Categorize addictive drugs and describe their effects (sedatives, narcotics and hallucinogens)
- 18.2.2 Define hallucinogen (drugs that alter ordinary mental and emotional processes) and relate it with Marijuana
- 18.2.3 Define narcotics (drugs that produce semi-consciousness and sleep to get relieve from pain) and relate it with Morphine and Heroine (as the most widely used / abused)
- 18.2.4 State the associated problems of drugs addictions i.e. severe social abandonment and crimes
- 18.2.5 Identify the symptoms of addiction
- 18.2.6 Name different plants, which are common in Pakistan and used for getting hallucinogens and narcotics

18.3 Antibiotics and Vaccines:

- 18.3.1 Categorize sulfonamides, tetracyclines and cephalosporins as the major groups of

antibiotics being used

- 18.3.2 Identify major antibiotics as per their bactericidal and bacteriostatic effects
- 18.3.3 Rationalize the resistance developed in bacteria against the widely used antibiotics
- 18.3.4 Describe the role of vaccines in producing immunity against specific diseases.
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- 18.3.4 Describe the role of vaccines in producing immunity against specific diseases. Describe the differences in the structure and function of prokaryotic and eukaryotic cells
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Prepare the details of events during mitosis in animal and plant cells

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