ASSESSMENT FRAMEWORK AND MODEL QUESTION PAPER

BIOLOGY

Grade XII

NATIONAL CURRICULUM OF PAKISTAN
2022-23

SCHEME OF STUDIES 2006

FEDERAL BOARD
OF INTERMEDIATE AND SECONDARY
EDUCATION, ISLAMABAD

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H-8/4, ISLAMABAD

ASSESSMENT FRAMEWORK

FOR

BIOLOGY GRADE-XII

CURRICULUM 2022-23

SCHEME OF STUDIES 2006

ACKNOWLEDGEMENT

It is a great honour that we, at the Federal Board of Intermediate and Secondary Education, have developed the Assessment Framework (AF) for the subject of Biology for Grade-XII. The primary objective of the AF is to optimize the current curriculum 2022-23. This comprehensive framework has been crafted meticulously by subject matter and assessment experts who conducted an in-depth review of all learning outcomes for Grade-XII Biology curriculum. They evaluated these outcomes in terms of their scope, cognitive level, and progression across the grade.

This significant undertaking was the result of a series of extensive meetings and collaborative efforts of the subject and assessment experts. Their dedication and expertise have been instrumental in bringing this framework to fruition.

The Assessment Framework will serve as a guiding document for students, teachers and paper setters. Students will receive clear directions for preparing themselves for the annual examination. Similarly, teachers will use it as a guide to understand what to teach in class and to prepare students for the final examinations accordingly. Similarly paper setters will also seek guidance from this document.

Following subject as well as assessment experts/committee members remained constantly engaged in the development of the AF:

1. Dr. Muhammad Ilyas, Associate Professor, Islamabad Model College for Boys, G-10/4, Islamabad
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6. Ms. Saima Aftab, Section Head, Army Public School & College Pasban Rawalpindi

The whole work was successfully accomplished under the able supervision and guidance of Dr. Ikram Ali Malik, Chairman, FBISE and due to the hard work and dedication of the staff of Research Section of FBISE, in particular, Syed Zulfiqar Shah, Deputy Secretary, Research and Academics who played a pivotal and leading role in finalizing the Assessment Framework.

MIRZA ALI
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ASSESSMENT FRAMEWORK FOR BIOLOGY GRADE-XII, CURRICULUM 2022-23

To ensure clarity and precision in assessment, the learning outcomes have been categorized into two distinct groups: formative and summative. This classification helps in effectively measuring student progress and understanding. Each Student learning outcome (SLO) has been carefully marked as either formative or summative within the newly developed Assessment Framework. SLOs of Summative Assessment Format will be part of the Final Examination while SLOs of Formative Assessment will although be part of the teaching-learning activity but they will **NOT** be part of Final Examinations. Estimated cognitive levels i.e Knowledge (K), Understanding (U) and Application (A) of all the SLOs have also been indicated. It may be noted that all the higher cognitive levels have been collectively accumulated in the cognitive level of 'Application'. In subjects involving Practicals (Lab work), it has been mentioned categorically whether an SLO is summative for theory or summative for Practical Based Assessment (PBA). If an SLO is summative for PBA, it means that Laboratory work is required in the teaching-learning activity and it will be part of the Practical Examination/ Practical Based Assessment.

The Assessment Framework will act as a comprehensive guide for students, teachers and paper setters. Students will have clear instructions on how to prepare for the annual examinations. Teachers will use the framework to understand the curriculum and effectively prepare their students for the final examination. Additionally, paper setters will refer to this document for guidance in setting examination papers.

A model question paper has also been developed to provide a clear structure and format for upcoming examinations. The model question paper ensures consistency and fairness, offering students a comprehensive understanding of what to expect in their examinations. By aligning the paper with the Student Learning Outcomes (SLOs) of the curriculum, we ensured that the questions accurately reflect the skills and knowledge that students are expected to acquire.

A detailed Table of Specifications (ToS) has been created to ensure equitable coverage of cognitive levels and content domains in order to generate a balanced question paper. The ToS serves as drawing scale and action plan for the question paper, ensuring that all important areas of the curriculum are adequately and proportionately assessed.

FORMATIVE ASSESSMENT: AN ESSENTIAL COMPONENT OF EFFECTIVE LEARNING

Formative assessment is a pivotal element in the educational process, distinguished by its role in providing ongoing feedback to both students and educators. Unlike summative assessments, which evaluate student learning at the end of an instructional period, formative assessments are integrated into the learning process to monitor student understanding and guide instructional decisions.

The primary objective of formative assessment is to identify learning gaps and misunderstandings as they occur, enabling timely interventions. This dynamic approach allows teachers to adjust their teaching strategies to better meet the needs of their students. For instance, if a teacher notices through a quick quiz or class discussion that a significant portion of the class struggles with a particular concept, they can revisit that topic, providing additional explanations or alternative methods of instruction. This adaptability is crucial for fostering a deeper understanding of the material.

Formative assessments come in various forms, ranging from informal methods like classroom discussions, observations, and questioning, to more structured approaches such as quizzes, peer assessments, and self-reflections. These methods are not limited to paper-and-pencil tasks but can include digital tools that provide instant feedback. The versatility of formative assessments allows educators to cater to diverse learning styles and preferences, ensuring that all students are engaged and supported in their learning journey.

Formative assessment plays a significant role in creating a supportive classroom environment. It shifts the focus from merely achieving grades to understanding the learning process. This approach reduces the pressure on students, as they perceive assessments not as a final judgment of their abilities but as a part of their learning journey. Consequently, formative assessment can lead to increased student motivation and engagement.

In conclusion, formative assessment is a powerful tool that, when effectively implemented, can significantly enhance the learning experience. It provides invaluable insights for both teachers and students, promotes a growth-oriented learning environment, and supports the continuous development of essential skills. As education evolves, the role of formative assessment will undoubtedly continue to be central in fostering successful and meaningful learning experiences.

SUMMATIVE ASSESSMENT: EVALUATING LEARNING OUTCOMES IN THE FORM OF TERMINAL/FINAL EXAMINATION

Summative assessment is a fundamental component of the educational process, designed to evaluate student learning at the conclusion of an instructional period. Unlike formative assessment, which provides ongoing feedback during the learning process, summative assessment serves as a final measure of what students have learned. Typically administered at the end of a unit, course, or academic year. Summative assessment aims to determine the extent to which educational objectives have been achieved.

The primary purpose of summative assessment is to assess the overall effectiveness of instruction and learning. It provides a conclusive evaluation of student performance, often in the form of tests, final projects, or standardized exams. These assessments generate grades or scores that reflect a student's achievement in a given subject area over a specific period or time duration.

Summative assessment is often used to make critical decisions regarding student progression, certification, or placement in subsequent educational levels. Additionally, summative assessments provide valuable data that inform curriculum development and instructional strategies. By analyzing summative assessment results, educators can identify trends, strengths, and weaknesses within their instructional approaches, allowing for improvements in future teaching.

In conclusion, summative assessment plays a critical role in the educational process by providing a final evaluation of student learning. While it differs from formative assessment in its focus and application, it is an essential tool for measuring academic achievement. When balanced with formative assessments, summative assessments contribute to a well-rounded and effective approach to evaluating and supporting student learning.

National Curriculum of Pakistan 2023
Assessment Framework BIOLOGY Grade-XII (12)
Details of Content Areas/ SLOs

Domain Title/ Content area	Chapter Title	SLO No./ Description	Form of Assessment	Cognitive domain (Knowledge, Understanding, Application)	Remarks	No. of periods required (1 Period = 40 Min)
Domain G: Nervous System	Nervous system	[SLO:B-12-G-01] Recognize receptors as transducers sensitive to various stimuli.	Summative for theory	Understanding	Question(s) will be asked in annual examination	30 Periods
		[SLO:B-12-G-02] Trace the path of a message transmitted to the CNS (central nervous system)for processing.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO:B-12-G-03] Identify the three neurons (sensory, intermediate, motor) involved in nervous transmission.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-G-04] Identify muscles and glands as the effectors.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-G-05] Annotate the detailed structure of a sensory neuron, associative and a motor neuron	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-G-06] Relate the structure of neurons with functions.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-07] Differentiate between myelinated and non-myelinated neurons.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-08] Explain the function of the three types of neurons with the help of a reflex arc.	Summative for theory	Understanding	Question(s) will be asked in annual examination	

		[SLO: B-12-G-09] Define nerve impulse.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-G-10] Describe the generation and transmission of nerve impulse	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-11] Name the factors responsible for the resting membrane potential of neuron.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-12] Evaluate from a graph the phenomena of polarization, depolarization and hyperpolarization of membrane.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-G-13] Compare the velocities of nerve impulse in the axon membrane and in the synaptic cleft.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-14] Describe the role of local circuits in saltatory conduction of nerve impulse.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-15] Outline the structure of synapse.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-16] Explain synaptic transmission of nerve impulse.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-17] Classify neurotransmitters as inhibitory and excitatory and list some common examples.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-18] Identify the main components of the nervous system	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-G-19] Explain briefly the major parts functions of major divisions of the brain and its functions of brain.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-G-20] Describe the architecture of human brain	Summative for theory	Application	Question(s) will be asked in annual examination	

		[SLO: B-12-G-21] Describe cranial and spinal nerves in man.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-22] Explain the structure, types and functions of the autonomic of autonomic nervous system.	Summative for theory	Application	Question(s) will be asked in annual examination	
	Endocrine system	[SLO: B-12-G-23] State the role of hormones as chemical messengers.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-G-24] Describe the chemical nature of hormones and correlate it with important hormones.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-25] Locate the endocrine glands in human body name the hormones they release and their functions ; (pituitary, thyroid, parathyroid, pancreas, adrenal, gonads.)	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-26] Relate the problems associated with the imbalance of these hormones.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-G-27] Explain the neurosecretory role of hypothalamus.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-28] Outline the concept of Feedback mechanism of hormones and .Describe positive feedback with reference to Oxytocin and negative feedback with reference to Insulin and Glucagon	Summative for theory	Application	Question(s) will be asked in annual examination	
	Nervous system	[SLO: B-12-G-29] Explain the structure and functioning of the receptors for smell, taste and touch / pain.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-30] Define narcotic drugs as agents that interact with the normal nervous activity.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-31] Compare the use and abuse of drugs with respect to heroine, Cannabis, nicotine, alcohol and inhalants like nail polish remover and glue.	**Formative**	Understanding	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	

		[SLO: B-12-G-32] Explain the terms; drug addiction and drug tolerance with reference to caffeine and nicotine and their adverse effects.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-33] Associate the effects of drug addiction and tolerance with the functioning of the nervous system.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-34] Describe the way how pain medicines can reduce or numb pain in the human body.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-35] Discuss that certain pain medications are addictive.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-G-36] Classify nervous disorders into vascular, infectious, structural, functional and degenerative disorders	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-G-37] Describe the causes, symptoms and treatment of one type of each category of disorders outlined above (e.g., , stroke as vascular, meningitis as infectious, brain tumor as structural, headache as functional, and Alzheimer disease as degenerative disorder).	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-G-38] Explain the principles of the important diagnostic tests for nervous disorders i.e. EEG, CT scan and MRI	Summative for theory	Application	Question(s) will be asked in annual examination	16 Periods
Domain I: Disease and Immunity	Immunity	[SLO: B-12-1-01] List the structural features of human skin that make it an impenetrable barrier against invasion by microbes. (1st line of defence)	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-02] Explain how oil and sweat glands within the epidermis inhibit the growth and also kill microorganisms. (1st line of defence)	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-03] Recognize the role of the acids of the digestive tract as killing bacteria present in food.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-04] State the role of the ciliated epithelium of the nasal cavity and the mucous of the bronchi and bronchioles in trapping airborne microorganisms.	Summative for theory	Understanding	Question(s) will be asked in annual examination	

		[SLO: B-12-1-05] Describe the role of macrophages and neutrophils in killing bacteria.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-06] Explain how Natural Killer (NK) cells kill cells infected by microbes and cancer cells.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-07] State the way proteins of the complement system kill bacteria and that interferons inhibit viruses from infecting cells.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-08] State the events of the inflammatory response as a generalized, nonspecific defence.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-09] Outline the release of pyrogens by microbes and their effect on the hypothalamus to boost the body's temperature.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-1-10] List the ways that fever affects microbes.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-11] Define the specific immune system as providing specific defence and acting as the most powerful means of resisting infection.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-12] Identify monocytes, T-cells, and B-cells as components of the immune system.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-13] State inborn and acquired immunity as the two basic types of immunity.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-14] Differentiate between active and passive immunity as the two types of acquired immunity.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-1-15] Describe the role of T-cells in cell-mediated immunity.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-I-16] Describe the role of B-cells in antibody-mediated immunity.	Summative for theory	Understanding	Question(s) will be asked in annual examination	

		[SLO: B-12-1-17] Discuss the role of T-cells and B-cells in transplant rejections.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-18] Evaluate the discovery of monoclonal antibodies and justify how this accomplishment revolutionized many aspects of biological research.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-I-19] Identify the process of vaccination as a means to develop active acquired immunity.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-1-20] Draw the structural model of an antibody molecule.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-I-21] Explain the role of memory cells in long term immunity.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-1-22] Define allergies and correlate the symptoms of allergies with the release of histamines.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-1-23] Describe the autoimmune diseases with examples.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
Domain J: Biotechnology	Biotechnology	[SLO:B-12-)-01] Introduce genetic engineering	Summative for theory	Application	Question(s) will be asked in annual examination	6 Periods
		[SLO: B-12-J-02] Explain polymerase chain reaction (PCR)	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-J-03] Outline the Function of Restriction Enzymes	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-J-04] Describe plasmid as vector prokaryotes and Explain how recombinant plasmids can be formed	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-J-05] Define Genetically modified organism	Summative for theory	Knowledge	Question(s) will be asked in annual examination	

		[SLO: B-12-J-06] Explain the formation of human insulin protein in bacteria	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-J-07] Describe how vertical food farms (soil free) work.	**Formative**	Application	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
		[SLO: B-12-J-08] Compare and contrast the advantages of vertical food farms with general agricultural practices prevalent in Pakistan.	**Formative**	Understanding	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
Domain K: Biostatistics and Data Handling	Biostatistics and data analyzing	[SLO: B-12-K-01] Define biostatistics and its use.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	8 Periods
		[SLO: B-12-K-02] Define mean, median, mode, standard deviation, range, percentile.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-K-03] Calculate mean, median, mode, standard deviation, range, percentile from a given set of data.	**Summative for both theory and PBA**	Application	Question(s) will be asked in annual examination and will also be assessed in PBA	
		[SLO: B-12-K-04] Sketch a bar chart for a given set of data.	**Summative for both theory and PBA**	Application	Question(s) will be asked in annual examination and will also be assessed in PBA	
		[SLO: B-12-K-05] Sketch error bars based off of range or standard deviation for a a given set of data on bar chart.	**Summative for PBA**	Application	Lab work will be assessed in PBA	
		[SLO: B-12-K-06] Evaluate the appropriate type of figure or chart for a given set of data and/or experiment (bar chart, pie chart, x- y axis data figure etc).	**Summative for both theory and PBA**	Application	Question(s) will be asked in annual examination and	

					will also be assessed in PBA	
		[SLO: B-12-K-07] Make the appropriate chart with proper title, labelled axes, legend, axes units.	**Summative for both theory and PBA**	Application	Question(s) will be asked in annual examination and will also be assessed in PBA	
		[SLO: B-12-K-08] Design an appropriate experiment with a control group and dependent, independent and control variables.	**Summative for PBA**	Application	Lab work will be assessed in PBA	
Domain L: Structural Biology and Computational Biology	Structural biology and computational biology	[SLO: B-12-L-01] Define structural biology.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	6 Periods
		[SLO: B-12-L-02] Explain that structure determination of biomolecules are important	**Formative**	Understanding	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
		[SLO: B-12-L-03] Describe how X-ray crystallography works.	**Formative**	Understanding	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
		[SLO: B-12-L-04] Outline the online databases where biomolecule structures are available.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-L-05] Describe computational Biology.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-L-06] Define Sequence Homology	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-L-07] Define Structural Homology	Summative for theory	Knowledge	Question(s) will be asked in annual examination	

Domain R: Human Physiology	Respiratory system	[SLO: B-12-R-01] Define the respiratory surface and list its properties	Summative for theory	Understanding	Question(s) will be asked in annual examination	50 Periods
		[SLO: B-12-R-02] Describe the main structural features and functions of the components of human respiratory system.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-03] Explain the ventilation mechanism in humans.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-04] Discuss the transport of oxygen and carbon dioxide through blood.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-05] Outline the role of respiratory pigments.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-06] State the causes, symptoms and treatment of upper Respiratory Tract Infections (sinusitis, otitis media) and lower Respiratory Tract Infections (pneumonia, pulmonary tuberculosis).	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-07] Describe the disorders of lungs (emphysema and COPD)	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-08] List the effects of smoking on respiratory system	Summative for theory	Application	Question(s) will be asked in annual examination	
	Urinary system	[SLO: B-12-R-09] List various nitrogenous compounds excreted during the process of excretion.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-R-10] Explain the nature of excretory products in relation to habitat.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-11] Outline different organs of the urinary system.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-12] Describe the structure of kidney	Summative for theory	Understanding	Question(s) will be asked in annual examination	

		[SLO: B-12-R-13] Relate the structure of the kidney with its function.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-14] Explain the detailed structure of a nephron.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-15] Explain the processes of glomerular filtration, selective re-absorption and tubular secretion as the events in kidney functioning.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-16] Explain regulatory mechanism involved in concentration of urine	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-17] Justify the functioning of kidneys as both excretion and osmoregulation.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-18] Compare the function of two major capillary beds in kidneys i.e. glomerular capillaries and peritubular capillaries.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-19] List urinary tract infections and the bacteria responsible.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-R-20] Explain the causes and treatments of kidney stones.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-21] Outline the causes of kidney failure.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-22] Explain in detail the mechanism and problems related to dialysis.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-23] Describe the principles and the problems associated with kidney transplant	Summative for theory	Application	Question(s) will be asked in annual examination	
	Digestive system	[SLO: B-12-R-24] Describe the mechanical and chemical digestion in the oral cavity.	Summative for theory	Understanding	Question(s) will be asked in annual examination	

		[SLO: B-12-R-25] Explain swallowing and peristalsis.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-26] Illustrate with a diagram the structure of the stomach and relate each component with the mechanical and chemical digestion in the stomach.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-27] Identify the role of the nervous system and gastrin hormone on the secretion of gastric juice.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-28] Describe the major actions carried out on food in the three regions of the small intestine.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-29] Trace the absorption of digested products from the small intestine lumen to the blood capillaries and lacteals of the villi.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-30] Describe the component parts of large intestine with their respective roles.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-31] Correlate the involuntary reflex for egestion in infants and the voluntary control in adults.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-32] Explain the storage and metabolic role of the liver.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-33] Describe composition of bile and relate the constituents with respective roles.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-34] Outline the structure of pancreas and explain its function as an exocrine gland.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-35] Relate the secretion of bile and pancreatic juice with the secretin hormone.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
	Blood circulatory system	[SLO: B-12-R-36] State the location of heart in the body and define the role of pericardium.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	

		[SLO: B-12-R-37] Describe the structure of the walls of heart and rationalize the thickness of the walls of each chamber.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-38] Trace the flow of blood through the heart as regulated by the valves.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-39] State the phases of heartbeat.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-40] Explain the role of SA node, AV node and Purkinje fibers in controlling the heartbeat.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-41] List the principles and uses of Electrocardiogram.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-42] Describe the detailed structure of arteries, veins and capillaries.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-43] Describe the role of arterioles in vasoconstriction and vasodilation.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-44] Describe the role of precapillary sphincters in of regulating the flow blood through capillaries.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-45] Trace the path of the blood through the pulmonary and systemic circulation (coronary, hepatic- portal and renal circulation.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-46] Compare the rate of blood flow through arteries, arterioles, capillaries, venules and veins.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-47] Define blood pressure and explain its periods of systolic and diastolic pressure.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-48] State the role of baroreceptors and volume receptors in regulating the blood pressure.	Summative for theory	Understanding	Question(s) will be asked in annual examination	

		[SLO: B-12-R-49] Define the term thrombus and differentiate between thrombus and embolus.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-50] Identify the factors causing atherosclerosis and arteriosclerosis.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-51] Categorize Angina pectoris, heart attack, and heart failure as the stages of cardiovascular disease development.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-52] State the congenital heart problem related to the malfunctioning of cardiac valves.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-53] Describe the principles of angiography.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-54] Outline the main principles of coronary bypass, angioplasty and open-heart surgery.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-55] Define hypertension and describe the factors that regulate blood pressure and can lead to hypertension and hypotension.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-56] List the changes in lifestyles that can protect man from hypertension and cardiac problems.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-57] Describe the formation, composition and function of intercellular fluid.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-58] Compare the composition of intercellular fluid with that of lymph.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-59] State the structure and role of lymph capillaries, lymph vessels and lymph trunks.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-60] Describe the functions of lymph nodes and state the role of spleen as containing lymphoid tissue.	Summative for theory	Understanding	Question(s) will be asked in annual examination	

	Skeletal system	[SLO: B-12-R-61] Describe the structure of bone and compare it with that of cartilage.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-62] Explain the functions of osteoblasts, osteoclasts and osteocytes.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-63] Identify the main divisions of the human skeleton. List the bones of the appendicular and axial skeleton of man.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-R-64] Describe three types of joints i.e. fibrous joints, cartilaginous joints and synovial joints and give example of each.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-65] Describe the disorders of human skeleton (disc-slip, spondylosis, sciatica, arthritis, osteoporosis) and their causes.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-66] State different types of fractures (simple, compound and complicated) and describe the repair process of simple fractures.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-67] Describe the injuries in joints (dislocation and sprain) and their first aid treatment.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-68] Compare smooth muscles, cardiac muscles and skeletal muscles.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-69] Annotate the ultrastructure of the skeletal muscle.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-R-70] Explain the sliding filaments model of muscle contraction.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-71] Describe the action of antagonistic muscles in the movement of knee joint.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-72] Explain muscle fatigue, cramps and tetany.	Summative for theory	Application	Question(s) will be asked in annual examination	

		[SLO: B-12-R-73] Differentiate between tetanus and muscle tetany.	Summative for theory	Application	Question(s) will be asked in annual examination	
	Thermoregulation, homeostasis	[SLO: B-12-R-74] Define thermoregulation and explain its needs.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-75] Classify animals on the basis of the source of body heat i.e. ectotherms and endotherms.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-76] Classify the animals on the basis of the ability to thermoregulate i.e. poikilotherms and homeotherms.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-77] Describe the regulatory strategies in man for thermoregulation.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-78] Describe three elements i.e. receptors, control center and effectors which operate homeostatic mechanisms.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-79] Relate the homeostatic mechanisms with the negative and positive feedback systems.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-80] Differentiate between osmoconformers and osmoregulators.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-81] Define osmoregulation.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-R-82] Explain the problems faced by osmoregulators.	Summative for theory	Understanding	Question(s) will be asked in annual examination	
		[SLO: B-12-R-83] Explain the different methods of osmoregulation found in freshwater, marine water and terrestrial	Summative for theory	Understanding	Question(s) will be asked in annual examination	
Domain T: Pharmacological drugs	pharmacological drugs	[SLO: B-12-T-01] Explain the drug discovery and development process.	Summative for theory	Understanding	Question(s) will be asked in annual examination	3 Periods

		[SLO: B-12-T-02] Define 4 classes of antibiotics (penecillins, Tetracyclins, Fluriquinolones and Sulfonamides) and describe their mode of action.	**Summative for PBA**	Understanding	Lab work will be assessed in PBA	
		[SLO: B-12-T-04] Define antivirals and antiretrovirals	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
		[SLO: B-12-T-05] Describe advantages of monoclonal antibodies enjoy compared to other drug classes.	Summative for theory	Application	Question(s) will be asked in annual examination	
Domain U: Climate Change	Climate change	[SLO: B-12-U-01] Describe how climate change impacts flora and fauna	Summative for theory	Application	Question(s) will be asked in annual examination	5 Periods
		[SLO: B-12-U-02] Describe how climate change can impact ocean biology in terms of its temperature and acidity as well as the resulting harmful effects.	Summative for theory	Application	Question(s) will be asked in annual examination	
		[SLO: B-12-U-03] Name species that have gone extinct due to climate change.	Summative for theory	Knowledge	Question(s) will be asked in annual examination	
Domain V: Selected Topics	Selected topics	[SLO: B-12-V-01] Explain the role of biological warfare occurs with examples.	**Formative**	Application	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	3 Periods
		[SLO: B-12-V-02] Describe how biodefense could work to protect from biological warfare with examples.	**Formative**	Application	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
		[SLO: B-12-V-03] Examine the hype behind the comics “genomics, transcriptomics, proteomics metabolomics”, to what extent is it valid or overblown?	**Formative**	Application	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	

		[SLO: B-12-V-04] Explain synthetic biology with examples	Summative for theory	Application	Question(s) will be asked in annual examination	

PRACTICAL SLOs

Domain	NCP SLOs Description	Form of Assessment	Cognitive domain	Remarks	Number of Periods Required (1 period=40 minutes)
Domain X: Experimentation Skills	Defining the problem [SLO: B-12-X-01] Using the context provided, students should be able to: • state a relevant prediction, either in words or in the form of a sketch graph showing the expected result, and link this to an underlying hypothesis • identify the independent and dependent variables • Identify which key variables must be standardised in order to test a hypothesis. (Variables expected to have minimal effect, such as variation between test-tubes of the same type, do not need to be standardised.)	**Summative for PBA**	Application	Lab work will be assessed in PBA	20 periods
	Methods [SLO: B-12-X-02] Using the context provided, students should be able to: • describe how to vary the independent variable • describe how to measure the values of the independent and dependent variables accurately and to an appropriate precision • describe how to standardise each of the other key variables • describe, where appropriate, suitable volumes and concentrations of reagents. Concentrations may be specified in % (w/v), or mol dm-3 • describe how different concentrations would be prepared by serial dilution or proportional dilution • describe appropriate control experiments • describe, in a logical sequence, the steps involved in the procedure, including how to use the apparatus to collect results • describe how the quality of results can be assessed by considering: o The occurrence of anomalous results o the spread of results including the use of standard deviation, standard error and/or 95% confidence intervals (95% CI). • describe how to assess the validity of the results by considering both the accuracy of the measurements and the repeatability of the results	**Summative for PBA**	Application	Lab work will be assessed in PBA	

	• prepare a simple risk assessment of their plans, taking into account the severity of any hazards and the probability that a problem could occur • describe the precautions that would need to be taken to minimise risks where possible.				
	Dealing with data [SLO: B-12-X-03] From provided data, students should be able to: • use tables and graphs to show the key points in quantitative data • sketch or draw suitable graphs, displaying the independent variable on the x-axis and the dependent variable on the y-axis including, where required, confidence limit error bars • decide which calculations are necessary in order to draw conclusions • carry out appropriate calculations to simplify or explain data, including means, percentages and rates of change • carry out calculations in order to compare data, including percentage gain or loss • use values of standard deviation or standard error, or graphs with standard error bars, to determine whether differences in mean values are likely to be statistically significant • choose and carry out statistical tests (limited to those described in the Mathematical requirements section of the syllabus) appropriate to the type of data collected and justify use of these tests • state a null hypothesis for a statistical test • recognise the different types of variable and the different types of data presented, as shown in the table below.	**Summative for PBA**	Application	Lab work will be assessed in PBA	
	[SLO: B-12-X-04] **Type of variable Type of data** *Qualitative* categoric nominal, i.e. values or observations belonging to it can be sorted according to category, e.g. colour of flowers ordered ordinal, where values can be placed in an order or rank and the interval between them may not be equal, e.g. the order in which test-tubes containing starch and iodine become colourless after adding amylase *Quantitative* continuous, which can have any value within a specific range, e.g. body mass, leaf length	**Summative for PBA**	Application	Lab work will be assessed in PBA	
	Conclusions [SLO: B-12-X-05] Students should be able to: • summarise the main conclusions from the results	**Summative for PBA**	Application	Lab work will be assessed in PBA	

	• identify key points of the raw data and processed data, including graphs and statistical test results • discuss the extent to which a given hypothesis is supported by experimental data and the strengths and weaknesses of the evidence • give detailed scientific explanations of the conclusions • make further predictions and hypotheses based on the conclusions.				

	Evaluation
	[SLO: B-12-X-06] Students should be able to:
	• identify anomalous values in a table or graph of data and suggest how to deal with anomalies
	• suggest possible explanations for anomalous readings
	• assess whether the results have been replicated sufficiently
	• assess whether the range of values of the independent variable and the intervals between the values were appropriate
	• assess whether the method of measuring is appropriate for the dependent variable
	• assess the extent to which selected variables have been effectively controlled
	• make informed judgements about:
	  ○ the validity of the investigation
	  ○ the extent to which the data can be used to test the hypothesis
	  ○ how much confidence can be put in the conclusions
	• suggest how an investigation could be improved to increase confidence in the results.
		Summative for PBA	Application	Lab work will be assessed in PBA	

Federal Board HSSC-II Examination
Biology Model Question Paper
(Curriculum 2022-23) Scheme of Studies 2006

ROLL NUMBER					
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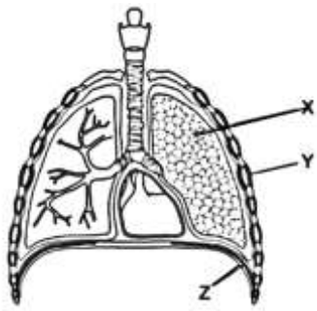
Section - A (Marks 17)

Time Allowed: 25 minutes

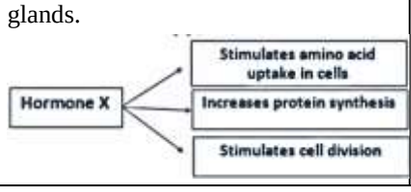
Section – A is compulsory. All parts of this section are to be answered on this page and handed over to the Centre Superintendent. Deleting/overwriting is not allowed. *Do not use lead pencil.*

Candidate Sign. _____ **Invigilator Sign.** _____

Q1. Fill the relevant bubble against each question. Each part carries one mark.

S #	Question	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)
(i)	The diagram below represents the human respiratory system.  Which structures contain muscles that contract during inspiration?	X only	X and Y only	Y and Z only	X, Y and Z	○	○	○	○
(ii)	When the outer temperature is higher than body temperature, which of the following adaptations is most likely to occur?					○	○	○	○
(iii)	Which of the following is associated with muscle relaxation?	Z-line move apart	I band become shorten	H-zone disappeared	Length of sarcomere is reduced	○	○	○	○
(iv)	Maintaining a **resting membrane potential** across the membrane requires energy from ATP. In which of the events ATPs are hydrolyzed?	Movement of Na^+ ions into the neuron	Movement of Na^+ ions out of the neuron	Movement of K^+ ions out of the neuron	Movement of Cl^- ions into the neuron	○	○	○	○
(v)	In small intestines, the dipeptides are converted to amino acids by the enzyme:	Aminopeptidase	Erypsin	Trypsin	Enterokinase	○	○	○	○

	Constriction of blood vessels in skin	Shivering	Sweating
A	√	√	√
B	√	×	×
C	×	√	×
D	×	×	√

(vi)	Antiretroviral drugs differ from general antivirals as they:	only treat bacterial infections	specifically target retroviruses like HIV	cure all viral infections permanently	work only against influenza viruses	○ ○ ○ ○
(vii)	Which of the following events occur during ventricular systole?	Contraction of atria	Relaxation of ventricles	Opening of AV valves	Closing of AV valves	○ ○ ○ ○
(viii)	If you took a drug that inhibited the reabsorption of Na^+ in the loop of Henle, you would:	have an increased urine output	have a decreased urine output	have glucose in urine	have access of Na+ in blood	○ ○ ○ ○
(ix)	A person is injected with gamma globulin (antibodies) against hepatitis B. It is:	Artificially acquired passive immunity	Artificially acquired active immunity	Naturally acquired active immunity	Naturally acquired passive immunity	○ ○ ○ ○
(x)	Which one of the following is **palindromic sequence?**	GATC	GGTT	CGAT	TTCC	○ ○ ○ ○
(xi)	Which oceanic region is more susceptible to ocean acidification?	Equatorial regions	Arctic and Southern Oceans	Subtropical regions	Mediterranean Sea	○ ○ ○ ○
(xii)	Biological computers primarily differ from traditional electronic computers as they:	use microchips, while electronic computers use proteins.	use biological components like cells and proteins instead of electronic circuits.	do not process information, while electronic computers do	require electricity, whereas electronic computers do not	○ ○ ○ ○
(xiii)	The feature which describes **tropomyosin** is/are: I. globular protein II. thin thread-like structure III. wound around actin filament	I only	III only	II and III	I and III	○ ○ ○ ○
(xiv)	Which one of the following **recombinant DNA technology** tools is incorrectly paired with its use?	Restriction endonuclease → production of RFLP	DNA ligase → production of sticky ends fragments	Reverse transcriptase → production of cDNA	PCR → Gene amplification	○ ○ ○ ○
(xv)	Which of the following best defines the **mean** of a data set in biostatistics?	The middle value when data is arranged in ascending order	The most frequently occurring value in a data set	The sum of all values divided by the total number of values	The difference between the highest and lowest values	○ ○ ○ ○
(xvi)	Which of the following is NOT mentioned as an example of biological molecules exhibiting structural homology?	Lipid	RNA	Protein	DNA	○ ○ ○ ○
(xvii)	Identify the hormones X in the given diagram produced by pituitary glands. 	TSH	ACTH	STH	MSH	○ ○ ○ ○

Federal Board HSSC-II Examination
Model Question Paper Biology

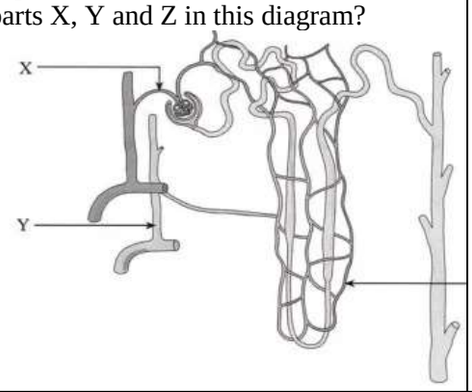
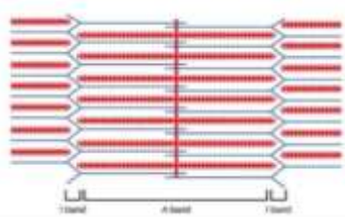
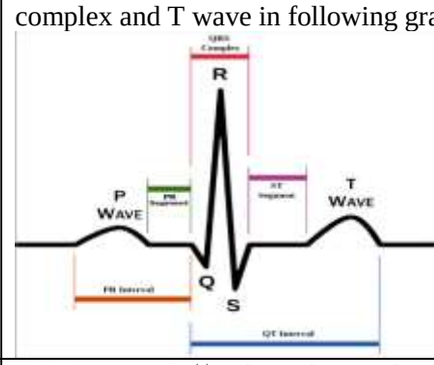
(Curriculum 2022-2023) Scheme of Studies 2006

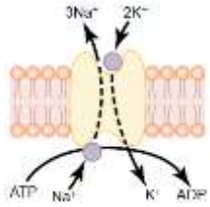
Time allowed: 2.35 hours Total Marks: 68

Note: Answer all parts from Section 'B' and all questions from Section 'C' on the E-sheet. Write your answers on the allotted/given spaces.

SECTION – B (Marks 42)

$(14 \times 3 = 42)$

S #	Question	Marks		Question	Marks
(i)	Name any two types of urinary tract infections (UTI) based on site. Name any one bacterium involved in UTI. How can we prevent UTI?	1+1+1	OR	List three effects of smoking on the respiratory system.	1+1+1
(ii)	Following is the diagram of human nephron, identify and write the role of parts X, Y and Z in this diagram? 	1+1+1	OR	What is meant by respiratory surface, give two characteristics features of a good respiratory surface with reference to the human?	1+2
(iii)	Identify the phenomenon shown in the following diagram:  What changes occur in I-band, A-band, H-zone, and sarcomere length?	1+2	OR	Name the sites of production, storage and action of bile juice. Give the role of bile juice in digestion?	1.5+1.5
(iv)	Define the terms range and percentile in biostatistics with one example of each.	1.5+1.5	OR	What is represented by P wave, QRS complex and T wave in following graph. 	1+1+1
(v)	Enlist three applications of monoclonal antibodies compared to other drug classes.	1+1+1	OR	a) How are Ca^{++} released into the muscle cell? b) From where is Ca^{++} released at the time of muscle contraction? c) How do Ca^{++} play the role in skeletal muscle contraction?	1+1+1

(vi)	Why do most synapses contain microscopic gaps across which an electrical impulse cannot pass directly? How is the transmission of impulse enabled across synapse?	1+2	OR	If the number of macrophages has been decreased in a patient, how it might affect his 2nd line of defense and specific immune response?	1.5+1.5
(vii)	a) What are the main components of an intervertebral disc? b) Give two causes of disc slip or herniation of disc.	1+2	OR	What is pericardium? State its structural composition.	1+2
(viii)	The following diagram shows the movement of Na^+ and K^+ ions across the neuron membrane:  a) Name the transporter protein involved in the diagram. b) Pinpoint the direction of movement of ions with reference to the inside and outside of the neuron.	1+2	OR	Give the names of substrates and products of the following enzymes: a) Amylopsin, b) Trypsin c) Enterokinase. (1+1+1)	1+1+1
(ix)	Write the names of two pituitary gonadotrophins. Give one function of each.	1+2	OR	Enlist osmoregulatory problems faced by freshwater, marine and terrestrial animals. Give at least one problem from each group.	1+1+1
(x)	What are interferons? How do they inhibit viruses from infecting cells?	1+2	OR	Enlist any three natural factors causing climate change. Give the effect of anyone on climate change.	1.5+1.5
(xi)	Name any one plasmid vector being used to transfer human insulin gene. Mention any two properties that should essentially be present in a plasmid vector.	1+2	OR	In which condition is a kidney transplant required? Write two characteristics of matching kidney donors required for successful transplant.	1+2
(xii)	Write any three possible applications of biological computers.	1+1+1	OR	List three ways by which climate change impacts ocean temperature.	1+1+1
(xiii)	What is the scientific term used for the presence of similar 3D structures between two or more biological molecules? What do you conclude through these similarities?	1.5+1.5	OR	Enlist three sensory receptors present in skin and give their specific role.	1+1+1
(xiv)	State any two thermoregulatory strategies in man for heat gain in cold stress.	1.5+1.5	OR	Write three steps of drug discovery.	1+1+1
SECTION – C (Marks 26) **Note:** Attempt **ALL** questions. Marks of each question are given within brackets.					
Q. 3	Describe how **climate change** impacts fauna (animals)	7	OR	Describe the steps of **bone fracture repair** with diagrams.	5+2
Q. 4	Write names and functions of hormones produced by **Thyroid gland**. Write about problems related to abnormal secretion of hormones in different stages.	2+2+2	OR	Describe the role of **B-cells** in **humoral or antibody-mediated immune response** and explain the structure and mode of action of **antibodies**.	3+3
Q. 5	Describe and sketch the internal structure of the **stomach** and relate each component with the **mechanical** and **chemical digestion** in the stomach.	4+2+1	OR	What is pacemaker? Give application of artificial pacemaker. Explain how **SA node, AV node** and **Purkinje fibers** are important in coordinating different phases of heartbeat.	1+1+5
Q. 6	Sketch and describe the mechanism responsible for transporting major percentage of carbon dioxide through blood from tissue bed to lungs.	4+2	OR	Scientists are investigating a crime and found a tiny amount of DNA from a hair. To study it properly, they need to make many copies of that DNA in the lab. Explain how biotechnology helps to copy DNA outside the body (in vitro) using a special method. Also, describe how this method works step by step, and include a labeled diagram to show the process.	4+2

Biology HSSC-II Model Question Paper (Curriculum 2022-23)

Alignment of Questions with Student Learning Outcomes

S. No.	Section: Q. No. (Part no.)	Student Learning Outcomes	Cognitive Domain	Allocated Marks in Model Paper
SECTION-A				
1.	A: Q1 (i)	[SLO: B-12-R-02] Describe the main structural features and functions of the components of the human respiratory system.	U	1
2.	A: Q1 (ii)	[SLO: B-12-R-77] Describe the regulatory strategies in man for thermoregulation.	A	1
3.	A: Q1 (iii)	[SLO: B-12-R-70] Explain the sliding filaments model of muscle contraction.	U	1
4.	A: Q1 (iv)	[SLO: B-12-G-11] Name the factors responsible for the resting membrane potential of neuron.	U	1
5.	A: Q1 (v)	[SLO: B-12-R-28] Describe the major actions carried out on food in the three regions of the small intestine.	K	1
6.	A: Q1 (vi)	[SLO: B-12-T-04] Define antivirals and antiretrovirals	K	1
7.	A: Q1 (vii)	[SLO: B-12-R-38] Trace the flow of blood through the heart as regulated by the valves.	U	1
8.	A: Q1 (viii)	[SLO: B-12-R-15] Explain the processes of glomerular filtration, selective re-absorption and tubular secretion as the events in kidney functioning.	A	1
9.	A: Q1 (ix)	[SLO: B-12-1-14] Differentiate between active and passive immunity as the two types of acquired immunity.	A	1
10.	A: Q1 (x)	[SLO: B-12-J-03] Outline the Function of Restriction Enzymes	U	1
11.	A: Q1 (xi)	[SLO: B-12-U-02] Describe how climate change can impact ocean biology in terms of its temperature and acidity as well as the resulting harmful effects.	U	1
12.	A: Q1 (xii)	[SLO: B-12-V-04] Explain synthetic biology with examples	U	1
13.	A: Q1 (xiii)	[SLO: B-12-R-69] Annotate the ultrastructure of the skeletal muscle.	K	1
14.	A: Q1 (xiv)	[SLO: B-12-J-04] Describe plasmid as vector prokaryotes and explain how recombinant plasmids can be formed	U	1
15.	A: Q1 (xv)	[SLO: B-12-K-02] Define mean, median, mode, standard deviation, range, percentile	K	1
16.	A: Q1 (xvi)	[SLO: B-12-L-07] Define Structural Homology	K	1
17.	A: Q1 (xvii)	[SLO: B-12-G-25] Locate the endocrine glands in the human body name the hormones they release and their functions; (pituitary, thyroid, parathyroid, pancreas, adrenal, gonads.)	U	1
SECTION-B				
18.	B: Q2 (i/f)	[SLO: B-12-R-19] List urinary tract infections and the bacteria responsible	K	3
19.	B: Q2 (i/s)	[SLO: B-12-R-08] List the effects of smoking on respiratory system		
20.	B: Q2 (ii/f)	[SLO: B-12-R-14] Explain the detailed structure of a nephron.	U	3
21.	B: Q2 (ii/s)	[SLO: B-12-R-01] Define the respiratory surface and list its properties		
22.	B: Q2 (iii/f)	[SLO: B-12-R-70] Explain the sliding filaments model of muscle contraction.	U	3
23.	B: Q2 (iii/s)	[SLO: B-12-R-33] Describe composition of bile and relate the constituents with respective roles.		
24.	B: Q2 (iv/f)	[SLO: B-12-K-02] Define mean, median, mode, standard deviation, range, percentile.	K	3
25.	B: Q2 (iv/s)	[SLO: B-12-R-41] List the principles and uses of Electrocardiogram.		

26.	B: Q2 (v/f)	[SLO: B-12-T-05] Describe advantages of monoclonal antibodies enjoy compared to other drug classes.	A	3
27.	B: Q2 (v/s)	[SLO: B-12-R-70] Explain the sliding filaments model of muscle contraction.		
28.	B: Q2 (vi/f)	[SLO: B-12-G-16] Explain synaptic transmission of nerve impulse.	U	3
29.	B: Q2 (vi/s)	[SLO: B-12-1-05] Describe the role of macrophages and neutrophils in killing bacteria.		
30.	B: Q2 (vii/f)	[SLO: B-12-R-65] Describe the disorders of human skeleton (disc-slip, spondylosis, sciatica, arthritis, osteoporosis) and their causes.	K	3
31.	B: Q2 (vii/s)	[SLO: B-12-R-36] State the location of heart in the body and define the role of pericardium.		
32.	B: Q2 (viii/f)	[SLO: B-12-G-10] Describe the generation and transmission of nerve impulse	K	3
33.	B: Q2 (viii/s)	[SLO: B-12-R-28] Describe the major actions carried out on food in the three regions of the small intestine.		
34.	B: Q2 (ix/f)	[SLO: B-12-G-25] Locate the endocrine glands in the human body name the hormones they release and their functions; (pituitary, thyroid, parathyroid, pancreas, adrenal, gonads.)	K	3
35.	B: Q2 (ix/s)	[SLO: B-12-R-82] Explain the problems faced by osmoregulators.		
36.	B: Q2 (x/f)	[SLO: B-12-1-07] State the way proteins of the complement system kill bacteria and that interferons inhibit viruses from infecting cells.	U	3
37.	B: Q2 (x/s)	[SLO: B-12-U-01] Describe how climate change impacts flora and fauna		
38.	B: Q2 (xi/f)	[SLO: B-12-J-04] Describe plasmid as vector prokaryotes and explain how recombinant plasmids can be formed	A	3
39.	B: Q2 (xi/s)	[SLO: B-12-R-23] Describe the principles and the problems associated with kidney transplant		
40.	B: Q2 (xii/f)	[SLO: B-12-V-04] Explain synthetic biology with examples	A	3
41.	B: Q2 (xii/s)	SLO: B-12-U-02] Describe how climate change can impact ocean biology in terms of its temperature and acidity as well as the resulting harmful effects.		
42.	B: Q2 (xiii/f)	[SLO: B-12-L-07] Define Structural Homology	K	3
43.	B: Q2 (xiii/s)	[SLO: B-12-G-29] Explain the structure and functioning of the receptors for smell, taste and touch / pain.		
44.	B: Q2 (xiv/f)	[SLO: B-12-R-77] Describe the regulatory strategies in man for thermoregulation.	K	3
45.	B: Q2 (xiv/s)	[SLO: B-12-T-01] Explain the drug discovery and development process.		
SECTION-C				
46.	C: Q3 (f)	[SLO: B-12-U-01] Describe how climate change impacts flora and fauna?	U	7
47.	C: Q3 (s)	[SLO: B-12-R-66] State different types of fractures (simple, compound and complicated) and describe the repair process of simple fractures.		
48.	C: Q4 (f)	[SLO: B-12-G-25] Locate the endocrine glands in human body name the hormones they release and their functions; (pituitary, thyroid, parathyroid, pancreas, adrenal, gonads.)	U	6
49.	C: Q4 (s)	[SLO: B-12-I-16] Describe the role of B-cells in antibody-mediated immunity.		
50.	C: Q5 (f)	[SLO: B-12-R-26] Illustrate with a diagram the structure of the stomach and relate each component with the mechanical and chemical digestion in the stomach.	A	7
51.	C: Q5 (s)	[SLO: B-12-R-39] State the phases of heartbeat.		

		[SLO: B-12-R-40] Explain the role of SA node, AV node and Purkinje fibers in controlling the heartbeat.		
52.	C: Q6 (f)	[SLO: B-12-R-04] Discuss the transport of oxygen and carbon dioxide through blood.	A	6
53.	C: Q6 (s)	[SLO: B-12-J-02] Explain polymerase chain reaction (PCR)		

Table of Specifications (ToS)

Model Paper Biology Grade XII (HSSC II) Curriculum 2022-23

Domains Code	Domain R:						Domain G:		Domain I:	Domain J:	Domain K:	Domain L:	Domain U:	Domain V:	Domain T:	Total Marks in Specific Level of Cognitive domain	%age of Marks in Specific Level of Cognitive domain
Domain Title	Human Physiology						Nervous System		Disease and Immunity	Biotechnology	Biostatistics and Data Handling	Structural and Computational Biology	Climate Change	Selected Topics	Pharmacological drugs		
Unit No.	Unit 1:	Unit 2:	Unit 3:	Unit 4:	Unit 7:	Unit 8:	Unit 5:	Unit 6:	Unit 9:	Unit 10:	Unit 11:	Unit 12:	Unit 13:	Unit 14:	Unit 15:		
Content Area	Digestive System of Man	Blood Circulatory System of Man	Respiratory System of Man	Urinary System of Man	Skeletal System of Man	Thermoregulation, Homeostasis	Nervous System of Man	Endocrine System of man	Immunity	Biotechnology	Biostatic and Data Analyzing	Structural Biology and Computational Biology	Climate change	Selected Topics	Pharmacological drugs		
SLO: B-12-	(R-24 to R-35)	(R-36 to R-60)	(R-01 to R-08)	(R-09 to R-23)	(R-61 to R-73)	(R-74 to R-83)	(G-01 to G-22 & G-29 to G-38)	(G-23 to G-28)	(I-01 to I-23)	(J-01 to J-08)	(K-01 to K-08)	(L-01 to L-07)	(U-01 to U-03)	(V-01 to V-04)	(T-01 to T-05)		
K (Knowledge) 30%	Q1 (v) 1 Q2 (viii/s) 3	Q2 (iv/s) 3 Q2 (vii/s) 3	Q2 (i/s) 3	Q2 (i/f) 3	Q1 (xiii) 1 Q2 (vii/f) 3	Q2 (xiv/f) 3 Q2 (ix/s) 3	Q2 (viii/f) 3 Q2 (xiii/s) 3	Q2 (ix/f) 3			Q1 (xv) 1 Q2 (iv/f) 3	Q1 (xvi) 1 Q2 (xiii/f) 3			Q1 (vi) 1 Q2 (xiv/s) 3	47	30.72
U (Understanding) 50%	Q2 (iii/s) 3 Q5 (f) 7	Q1 (vii) 1 Q5 (s) 7	Q1 (i) 1 Q2 (ii/s) 3	Q2 (ii/f) 3	Q1 (iii) 1 Q2 (iii/s) 3 Q2 (v/s) 3 Q3 (s) 7		Q1 (iv) 1 Q2 (vi/f) 3	Q1 (xvii) 1 Q4 (f) 6	Q2 (vi/s) 3 Q2 (x/f) 3 Q4 (s) 6	Q1 (x) 1 Q1 (xiv) 1			Q1 (xi) 1 Q2 (x/s) 3 Q3 (f) 7	Q1 (xii) 1	Q2 (v/f) 3	79	51.63
A (Application) 20%			Q6 (f) 6	Q1 (viii) 1 Q2 (xi/s) 3		Q1 (ii) 1			Q1 (ix) 1	Q2 (xi/f) 3 Q6 (s) 6			Q2 (xii/s) 3	Q2 (xii/f) 3		27	17.65
Total Marks	14	14	13	10	18	7	10	10	13	11	4	4	14	4	7	153	100.00
Total Percentage	9.15	9.15	8.50	6.54	11.76	4.58	6.54	6.54	8.50	7.19	2.61	2.61	9.15	2.61	4.58	100.00	

Note:

1- This ToS does not reflect policy, but it is particular to this model question paper.

2- Proportionate / equitable representation of the content areas may be ensured.

3- The percentage of cognitive Level is 30%, 50%, and 20% for knowledge, understanding, and application, respectively with ± 5% variation.

4- While selecting alternative questions for Short Response Questions (SRQs) and Extended Response Questions (ERQs), it must be kept in mind that:

- ➔ Difficulty levels of two alternative questions of the internal choice will be same
- ➔ SLOs of the two alternative questions of the internal choice must be different

Key: Question Number (part/ first choice) marks. Example: Q2 (i/f) 3, Question Number (part/second choice) marks. Example: Q2 (i/s) 3

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