



**FEDERAL BOARD OF INTERMEDIATE
AND SECONDARY EDUCATION
H-8/4, ISLAMABAD**



No.1-10/FBISE/RES/652

30 August, 2024

Subject: IMPLEMENTATION OF ASSESSMENT FRAMEWORKS AND MODEL QUESTION PAPERS DEVELOPED ON NATIONAL CURRICULUM OF PAKISTAN (NCP) 2022-2023

In continuation to this office Notifications bearing No.1-10/FBISE/RES/383 dated 14 March 2024 and No.1-10/FBISE/RES/422 dated 19 March 2024 on the subject of Implementation of National Curriculum of Pakistan (NCP) 2022-23, Assessment Frameworks, Model Question Papers along with SLOs Alignment Charts and Tables of Specifications (ToS) at SSC-I and HSSC-I levels in the subjects of English Compulsory, Urdu Compulsory, Pakistan Studies (SSC-I), Islamiyat Compulsory (HSSC-I), Physics, Chemistry, Biology, Mathematics and Computer Science are hereby uploaded on FBISE Website www.fbise.edu.pk. The Weblink is https://fbise.edu.pk/curriculum_model_paper.php.

2. It is important to note that the Assessment Frameworks which contain all the SLOs of the curriculum 2022-23 will guide students, teachers and paper setters. Students will receive clear instructions on how to prepare for examinations. Teachers will use the Frameworks to understand what to teach in class and to prepare their students for the final examinations. Similarly, paper setters will use these documents for guidance in creating examination papers. It may be noted that the SLOs of Summative Assessment mentioned in the Assessment Frameworks will be included in the Final Board Examinations, whereas the SLOs of Formative Assessment will NOT be included in the Final Board Examinations; however, they will be part of teaching-learning activity in the class.

3. It is reiterated that the examinations of all the above mentioned subjects will be based on Student Learning Outcomes (SLOs) given in the respective curriculum (Assessment Frameworks) instead of textbooks. Educational institutions, students and teachers may consult the books of publishers reviewed by National Curriculum Council available on its Weblink <https://ncc.gov.pk/SiteImage/Misc/files/Annexures.pdf>. Moreover, the institutions are free to rely on any other valid and reliable instructional/reference material to fulfil the instructional requirements of the SLOs of these subjects.

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ASSESSMENT FRAMEWORK AND MODEL QUESTION PAPER

BIOLOGY

Grade XI

NATIONAL CURRICULUM
2022-23



FEDERAL BOARD OF
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H-8/4, ISLAMABAD



**ASSESSMENT FRAMEWORK
FOR
BIOLOGY GRADE-XI
CURRICULUM 2022-23**

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-XI. 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-XI 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
2. Ms. Ruqayya Shaikh, Associate Professor, Islamabad Model College for Girls, F-6/2, Islamabad
3. Dr. Kashif Ali, Associate Professor, Islamabad Model College for Boys, F-7/3, Islamabad
4. Mrs. Samina Tahira, Associate Professor, Islamabad Model College for Girls, Korang Town, Islamabad

The whole work was successfully accomplished under the able supervision and guidance of Syed Junaid Akhlaq, 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 AF.

MIRZA ALI
Director (Research & Academics)
FBISE, Islamabad

ASSESSMENT FRAMEWORK FOR BIOLOGY GRADE-XI, 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 2022-2023
ASSESSMENT FRAME WORK BIOLOGY Grade-XI (HSSC I)
Details of Content Areas/ SLOs

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
B	[SLO:B-11-B-01] Explain that evolution happens due to variation in organisms and the selection pressures that organisms face	Summative	U	Question(s) will be asked in annual examination.	15
	[SLO:B-11-B-02] Discuss the evidence that is provided by biogeography	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-B-03] Analyse the evidence of evolution that comes from molecular biology.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-B-04] Differentiate between convergent and divergent evolution on the basis of inheritance of the homologous and analogous structures.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-B-05] Describe the Endosymbiotic theory about the mechanism of evolution of eukaryotes from prokaryotes	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-B-06] Describe the theory of inheritance of acquired characters, as proposed by Lamarck with example of giraffe neck	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-B-07] State the drawbacks in Lamarckism.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-B-08] Describe non vascular plants (Bryophytes,)	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-B-09] Explain the life cycle of polytrichome	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-B-10] Describe the general features of vascular plants	Summative	U	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-B-11] Identify the division between vascular plants (pteridophytes, gymnosperms, angiosperms)	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-B-12] Explain the general characteristics pteridophytes	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-B-13] Explain the life cycle of ferns	Summative for Practical Based Assessment (PBA)	U	Laboratory work- will be assessed in PBA.	
	[SLO:B-11-B-14] Describe the general characteristic of gymnosperms and classify them	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-B-15] Describe the life cycle of pinus	Summative for PBA	U	Laboratory work- will be assessed in PBA.	
	[SLO:B-11-B-16] Describe the general characteristic of angiosperms and classify them	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-B-17] Explain the life cycle of angiosperms	Formative	U	Same as [SLO: B-09-Q-21] This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-B-18] Describe general characteristics and economic importance of the following angiospermic families Brassicaceae SolanaceaePoaceae	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-B-19] Identify that animals are divided into two major groups as invertebrate and vertebrate	Summative	K	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-B-20] Describe the general characteristics, importance and example of sponges cnidarians, Platyhelminthes, Aschelminthes (nematodes), molluscs, annelid, arthropods and echinoderms	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-B-21] Describe the general characteristics of chordates and vertebrates.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-B-22] Describe the general characteristics of amphibians, reptiles, birds and mammals.	Summative For PBA	U	Laboratory work- will be assessed in PBA.	
C	[SLO:B-11-C-01] Define biochemistry/molecular biology	Summative	K	Question(s) will be asked in annual examination	13
	[SLO:B-11-C-02] Describe Briefly the different types of bonds found in biology (hydrogen bonds, covalent bonds, interactions, ionic, hydrophobic and hydrophilic interactions etc.)	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (Studied in grade 10 th will be covered in first year chemistry)	
	[SLO:B-11-C-03] Distinguish carbohydrates, proteins, lipids and nucleic acids as the four fundamental kinds of biological molecules.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-C-04] Describe and draw sketches of the condensation - synthesis and hydrolysis reactions for the making and breaking of macromolecule polymers.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-C-05] State the properties of water (high polarity, hydrogen bonding, high specific heat, high heat of vaporization, cohesion, hydrophobic exclusion, ionization and lower density of ice) allow it to be the medium of life.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-C-06] Define carbohydrates and classify them.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-C-07] Compare and contrast the properties and roles of monosaccharides and write their formula	Summative	A	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-C-08] Compare the isomers and stereoisomers of glucose.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.(Will study in chemistry as well)	
	[SLO:B-11-C-09] Distinguish the properties and roles of disaccharides	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-C-10] Describe glycosidic bonds in disaccharides.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-C-11] Describe the structure properties and roles of polysaccharides starch, glycogen, cellulose and chitin.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-C-12] Define protein, amino acid and recognized essential amino acid and structural formula of amino acid.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-C-13] Outline the synthesis and breakage of peptide linkages.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-C-14] Justify the significance of the sequence of amino acids through the example of sickle cell haemoglobin.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-C-15] Classify proteins as globular and fibrous proteins.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-C-16] List the roles of structural proteins and functional proteins with 3 examples	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-C-17] Define lipids	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-C-18] Describe the properties and roles of acylglycerols, phospholipids, terpenes and waxes.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-C-19] Illustrate the molecular structure (making and breaking) of an acylglycerol, a phospholipid and a terpene	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-C-20] Evaluate steroids and prostaglandins as important groups of lipids	Summative	A	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-C-21] Describe nucleic acids and molecular structure of nucleotides.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-C-22] Distinguish among the nitrogenous bases found in the nucleotides of nucleic acids.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-C-23] Outline the examples of a mononucleotide (ATP) and a dinucleotide (NAD).	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-C-24] Illustrate the formation of phosphodiester bond.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-C-25] Explain the double helical structure of DNA as proposed by Watson and Crick.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-C-26] Explain the general structure of RNA.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-C-27] Distinguish in terms of functions and roles, the three types of RNA	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-C-28] Discuss the Central Dogma.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (Discussed in [SLO: B-11-H-48])	
	[SLO:B-11-C-29] Define conjugated molecules and describe the roles of common conjugated molecules i.e. glycolipids, glycoproteins, lipoproteins and nucleoproteins.	Summative	K	Question(s) will be asked in annual examination	
D	[SLO:B-11-D-01] Describe that cells are the basic unit of life with respect to 7 properties of Life. (Movement, Respiration, Homeostasis, Growth, Reproduction, Excretion, Nutrition)	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	11

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-D-02] Identify the ultrastructure of animal and plant cells.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-D-03] Describe the structure and functions of subcellular organelles. (mitochondria, nucleus -cell membrane, chloroplast, lysosomes, cell wall, centrioles, - Golgi apparatus, smooth endoplasmic reticulum, rough endoplasmic reticulum, vesicles, peroxisome, vacuoles, ribosomes)	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-D-04] Define cell signalling.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-D-05] Discuss the pathway of a signal from outside the cell to the inside. (Protein signal and steroid signal)	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-D-06] Define Stem cells and advantages of using stem cells	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-D-07] Categorize different types of stem cells	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-D-08] Evaluate the advantages and disadvantages of using induced Pluripotent Stem Cells.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-D-09] Explain the structure of the cell membrane and the techniques that can be used to study it.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-D-10] Explain the 4 membrane transport mechanisms with diagrams: (simple diffusion, Facilitated diffusion, Osmosis, Active transport).	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-D-11] Differentiate between prokaryotic and eukaryotic cells with diagrams.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-D-12] State cell theory (including how to validate it and exceptions to it.)	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-D-13] Compare and contrast the workings of a light microscope and electron microscope with focus on resolution and magnification and live vs dead samples.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (Basic techniques related more to physics)	
	[SLO:B-11-D-14] Write the chemical structure of a single phospholipid (Glycerol as a three carbon molecule, phosphate group, one unsaturated fatty acid tail and one saturated fatty acid tail).	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-D-15] Describe endocytosis and exocytosis with diagrams.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-D-16] Compare and contrast simple and facilitated diffusion.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (Information given in SLO:B-11-D-10.)	
	[SLO:B-11-D-17] Explain the steps of mitosis and meiosis with diagrams.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.(Same as [SLO: B-09-D-09])	
F	[SLO:B-11-F-01] Identify the role and component parts of the active site of an enzyme.	Summative	K	Question(s) will be asked in annual examination	15
	[SLO:B-11-F-02] Differentiate among the three types of cofactors i.e. in organic ions, prosthetic group and coenzymes, with examples.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-03] Explain the mechanism of enzyme action through the Induced Fit Model, including comparing it with Lock and Key Model.	Summative	U	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-F-04] Explain enzyme catalysis with example of specific reactions	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-05] Define energy of activation and discuss through graph how an enzyme speeds up a reaction by lowering the energy of activation.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-06] Explain the effect of temperature on the rate of enzyme action with example of human and thermophilic bacteria	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-07] Investigate the effect of pH on enzyme activity Compare the optimum pH of different enzymes like trypsin, pepsin, papain.	Summative for PBA	A	Laboratory work- will be assessed in PBA.	
	[SLO:B-11-F-08] Demonstrate that the concentration of enzyme affects the rate of enzyme action	Summative for PBA	A	Laboratory work- will be assessed in PBA.	
	[SLO:B-11-F-09] Describe enzymatic inhibition, its types and its significance with examples.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-10] Name the molecules which act as inhibitors.	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-F-11] Categorize inhibitors into competitive and non-competitive inhibitors.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-12] Explain feedback inhibition.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-13] Classify enzymes on the basis of the reactions catalysed (oxido-reductases, transferases, hydrolases, isomerases, and ligases).	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-F-14] Classify enzymes on the basis of the substrates they use (lipases, diastase, amylase, proteases etc.)	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-F-15] Explain the role of light, carbon dioxide and water in photosynthesis	Summative	U	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-F-16] Identify the two general kinds of photosynthetic pigments (carotenoids and chlorophylls)	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-F-17] Describe the roles of photosynthetic pigments in the absorption and conversion of light energy	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-18] Differentiate between the absorption spectra of chlorophyll 'a' and 'b'	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-F-19] Describe the arrangement of photosynthetic pigments in the form of Photosystem-I and II.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
F	[SLO:B-11-F-20] Describe the events of non-cyclic photophosphorylation and cyclic photophosphorylation.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-F-21] Explain the Calvin cycle (the regeneration of RuBP should be understood in outline only.)	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-F-22] Explain the process of anaerobic respiration in terms of glycolysis and conversion of pyruvate into lactic acid or ethanol.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-23] Illustrate the links reaction as conversion of pyruvate to acetyl CoA.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-F-24] Outline the steps of Krebs cycle.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-25] Trace the passage of electrons through the electron transport chain.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-F-26] Describe chemiosmosis and Relate it with electron transport chain.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-F-27] Explain the substrate level phosphorylation during which exergonic reactions are coupled with the synthesis of ATP.	Summative	U	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-F-28] Justify the importance of G3P in photosynthesis	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-F-29] Outline the formation of acetyl CoA from fats	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (Discussed in [SLO: B-11-F-23])	
	[SLO:B-11-F-30] Compare and contrast respiration of fats and glucose.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-F-31] Define photorespiration	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-F-32] Outline the events occurring through photorespiration.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-F-33] Rationalize how the disadvantageous process of photorespiration evolved.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-F-34] Explain the effect of temperature on the oxidative activity of RuBP carboxylase.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-F-35] Outline the process of C 4 photosynthesis as an adaptation evolved in some plants to deal with the problem of photorespiration.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
H	[SLO:B-11- H-01] Describe the structures of the male reproductive system and identify their functions	Summative	U	Question(s) will be asked in annual examination	26
	[SLO:B-11-H-02] Define male reproductive hormones and explain their functions	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-03] Explain the structures of female reproductive system and describe their functions	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-04] Describe the menstrual cycle and the hormones involved.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-H-05] Define gene (as a sequence of nucleotides as part of DNA, which codes for the formation of a polypeptide.)	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-H-06] Explain the law of segregation and independent assortment, using a suitable example related to the pea plants.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (Same as [SLO: B-10-H-07])	
	[SLO:B-11-H-07] Relate the Law of independent assortment to random orientation of chromosomes during Meiosis.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (Same as [SLO: B-10-H-07])	
	[SLO:B-11-H-08] Express limitations of independent assortment and its usefulness.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-09] Show that independent assortment leads to variation in the gametes.	Formative	U	This SLO is part of regular teaching and learning but	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
				will not be assessed in annual examination.	
	[SLO:B-11-H-10] Evaluate that inheritance of genes and their mixing during fertilization is based on mathematical probabilities.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-11] Describe the exceptions to the Mendel's laws of inheritance.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-12] Explain incomplete dominance and exemplify it through the inheritance of flower colour in 4 O' clock plant	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-H-13] Differentiate between incomplete dominance and codominance.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-14] Define alleles and multiple alleles	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-H-15] State the alleles responsible for the trait of ABO blood groups.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-H-16] Explain the case where two alleles have equal dominance through the genetics of human blood group AB.	Summative for PBA	U	Laboratory work- will be assessed in PBA.	
	[SLO:B-11-H-17] Name the various human blood group systems.	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-18] Investigate the reasons for O -ve individual as the Universal donor and AB +ve as the Universal recipient.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-H-19] Describe the occurrence of some other blood group systems.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (As	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
				there are more than 30 blood group systems)	
	[SLO:B-11-H-20] Associate the positive and negative blood groups with the presence and absence of Rh factor.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-21] Justify why Rh incompatibility could be a danger to the developing foetus and mother.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-22] Explain Erythroblastosisfetalis in the light of antigen-antibody reaction.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-23] Suggest measures to counter the problem of Erythroblastosisfetalis before it occurs.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-24] Define and relate the terms; polygenic and epistasis.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-H-25] Describe polygenic inheritance using suitable examples from plants (grain colour in wheat) and animals (skin colour in man).	Summative	A	Only one example i.e., grain colour in wheat will be asked in annual examination	
	[SLO:B-11-H-26] List at least five polygenic traits discovered in humans.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-H-27] Give one example of epistasis from mammals (coat colour inheritance in Labrador retrievers) and one from plants (pigment phenotype in foxgloves) and justify modified Mendelian ratios.	Summative	A	Only one example i.e., coat colour inheritance in Labrador retrievers will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-H-28] Describe the terms gene linkage and crossing over.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-29] Explain that gene linkage counters independent assortment and crossing-over modifies the progeny.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-30] Suggest that linkage can be observed / evaluated only if the number of progeny is quite large.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-31] Explain the XX-XY mechanism of sex determination in mammals.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-32] Identify male and female individuals from the karyotype of man.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-H-33] Solve the genetics problems related to XX-XY, sex determination.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-H-34] Describe the concept of sex linkage.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-35] Explain the inheritance of sex linked traits (eye colour) in Drosophila.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-36] Describe the sex linked inheritance of male characters due to Y-chromosome and the effect of Hollandric genes.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-37] Describe the X linked disorders with reference to the patterns of inheritance.	Summative	U	Only one example Haemophilia will be asked in annual examination	
	[SLO:B-11-H-38] Name some of the sex-linked disorders of man (Red green colour blindness, Haemophilia) .	Summative	K	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-H-39] Explain the techniques employed for embryonic screening e.g., Amniocentesis and Chorionic Villus Sampling	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-40] Annotate the detailed structure of a chromosome.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-41] Narrate the experimental work of Griffith and Hershey Chase, which proved that DNA is the hereditary material.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-H-42] Describe the three models proposed about the mechanism of DNA replication.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-43] Narrate the work of Meselson and Stahl to justify the semiconservative replication as the correct method of replication.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-44] Describe the events of the process of DNA replication.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-45] Describe DNA stability and variability as two characters of the replicating DNA molecule.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-46] Describe the characteristics of genetic code (universal, triplet, non-overlapping, degenerate, has no punctuation).	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-47] Differentiate between the terms genetic code and codon.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-48] Explain the mechanism of transcription.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-H-49] Explain why the length of transcribed mRNA molecule (in Eukaryotes) shortens as it enters the cytoplasm for translation.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-50] Describe the mechanism of protein synthesis.	Summative	A	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-H-51] State the difference between protein synthesis in prokaryotes and eukaryotes.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-52] Suggest possible ways in which the synthesized protein can be used within or outside a cell that synthesized it.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-53] State the importance of the regulation of gene expression.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-H-54] Describe the negative control of gene expression by repressor proteins.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-55] Describe the positive control of gene expression by activator proteins.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-H-56] Define mutation and identify various sources of mutation.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-H-57] Differentiate between natural and induced mutations and mutagens.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-H-58] Justify most mutations are harmful.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-H-59] Rationalize that mutations might be a contributing factor towards evolution.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-H-60] Describe the symptoms, causes and possible available treatments of some of the chromosomal mutations. (Down's, Klinefelter's and Turner's syndrome)	Summative	U	Only one example Down's syndrome will be asked in annual examination	
	[SLO:B-11-H-61] Describe the symptoms, causes and possible available treatments of some of the gene mutations.	Summative	U	Only one example Sickle cell anaemia will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
N	[SLO:B-11-N-01] Define species, population, community and ecosystem.	Summative	K	Question(s) will be asked in annual examination	10
	[SLO:B-11-N-02] Distinguish between the various modes of nutrition different species possess.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-N-03] Identify plants as producers for converting light energy to chemical energy	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (Discussed in bioenergetics)	
	[SLO:B-11-N-04] Define trophic levels.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-N-05] Discuss the loss of energy between trophic levels.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-N-06] Explain the greenhouse effect with examples of gases that exhibit this behaviour.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-N-07] Describe the harmful effects of greenhouse gases on the environment.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-N-08] Explain with regards to ocean acidification coral reefs are used as a barometer for the health of an aquatic ecosystem.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-N-09] Define biogeochemical cycles and locate the primary reservoirs of the chemicals in these cycles.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-N-10] Describe the water cycle in detail.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-N-11] Define the terms aquifers and water table.	Summative	K	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-N-12] Discuss nitrogen cycle in detail.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-N-13] Describe productivity in terms of gross primary productivity and net primary productivity.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-N-14] Interpret the pyramids of number, biomass and energy.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-N-15] Define ecological succession as the process through which ecosystems change from simple to complex.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-N-16] Describe primary and secondary succession.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-N-17] Differentiate between xerarch and hydrarch succession.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-N-18] Explain the xerarch succession on a bare rock starting from the small pockets of lichens to the vegetations of flowering plants.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-N-19] Describe characteristics of a population, such as growth, density, distribution, carrying capacity, minimum/viable size.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-N-20] Explain the effect of growth of human population on the ecosystem.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-N-21] Describe the 4 important ecosystems of Pakistan	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
O	[SLO:B-11-0-01] Outline the taxonomic position of prokaryotes in terms of domains archaea and bacteria and in terms of kingdom monera.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	22
	[SLO:B-11-0-02] Explain the phylogenetic position of prokaryotes.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-0-03] Justify the occurrence of bacteria in the widest range of habitats.	Summative	A	Question(s) will be asked in annual examination	
[SLO:B-11-0-04] Draw an annotated diagram of a generalized bacterial cell.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.		
[SLO:B-11-0-05] Justify cyanobacteria are considered as the most prominent of the photosynthetic bacteria	Summative	A	Question(s) will be asked in annual examination		
[SLO:B-11-0-06] Describe detailed structure and chemical composition of bacterial cell wall and other coverings.	Summative	U	Question(s) will be asked in annual examination		
[SLO:B-11-0-07] Compare cell wall differences in Gram-positive and Gram negative bacteria.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.		
[SLO:B-11-0-08] Illustrate with diagrams the great diversity of shapes and sizes found in bacteria.	Summative	A	Question(s) will be asked in annual examination		
[SLO:B-11-0-09] Justify the endospore formation in bacteria as a mechanism of survival to withstand unfavourable conditions.	Summative	A	Question(s) will be asked in annual examination		
[SLO:B-11-0-10] Explain motility in bacteria.	Summative	U	Question(s) will be asked in annual examination		
[SLO:B-11-0-11] Describe with diagram structure of bacterial flagellum.	Summative	U	Question(s) will be asked in annual examination		

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	[SLO:B-11-0-12] Describe genomic organization of bacteria with respect to circular DNA and plasmids.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-0-13] Classify bacteria on the basis of methods of obtaining energy and carbon.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-0-14] Differentiate between the photosynthesis mechanisms in cyanobacteria and other photosynthetic bacteria.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-0-15] List the phases in the growth of bacteria.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-0-16] Describe different methods of reproduction in bacteria.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-0-19] Describe bacteria as recyclers of nature. Outline the ecological and economic importance of bacteria.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-0-20] Explain the use of bacteria in research and technology.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-0-21] Describe important bacterial diseases in man e.g. cholera, typhoid, tuberculosis, and pneumonia; emphasizing their symptoms, causative bacteria, treatments, and preventative measures.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-0-22] Describe important bacterial diseases in plants in terms of spots, blights, soft rots, wilts, and galls; emphasizing their symptoms, causative bacteria, and preventative measures.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-0-23] Define the term normal flora.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-0-24] Describe the benefits of the bacterial flora of humans.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-0-25] List the chemical and physical methods used to control harmful bacteria.	Summative	K	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-0-26] Explain protists as a diverse group of eukaryotes that has polyphyletic origin and defined only by exclusion from other groups.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-0-27] Describe the salient features with examples of protozoa, algae, myxomycota and oomycota as the major groups of protists.	Summative for PBA	U	Laboratory work- will be assessed in PBA. (Life cycles not required Classification of algae not required)	
	[SLO:B-11-0-28] Justify how protists are important for humans.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-0-31] Classify fungi into zygomycota, ascomycota, deutromycota and basidiomycota and give the diagnostic features of each group.	Summative for PBA	U	Laboratory work- will be assessed in PBA. (Life cycles not required)	
	[SLO:B-11-0-32] Explain yeast as unicellular fungi that are used for baking and brewing and are also becoming very important for genetic research.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-0-33] Name a few fungi from which antibiotics are obtained.	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-0-34] Explain the mutualism established in mycorrhizae and lichen associations.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-0-35] Give examples of edible fungi.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-0-36] Describe the ecological impact of fungi causing decomposition of recycling of materials.	Summative	U	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-0-37] Discuss the pathogenic role of fungi	Summative	U	Question(s) will be asked in annual examination	
P	[SLO:B-11-P-01] Justify the status of viruses among living and non-living things.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination. (Already covered in SSC)	15
	[SLO:B-11-P-02] Trace the history of viruses since their discovery.	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-P-03] Classify viruses on the bases of their hosts and structure.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-P-04] Describe the structure of a model bacteriophage, and HIV	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-P-05] Justify that a virus must have a host cell to parasitize in order to complete its life cycle.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-P-06] Explain a virus survives inside a host cell, protected from the immune system.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-P-07] Determine the method a virus employs to survive/pass over unfavourable conditions when it does not have a host to complete the life cycle.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-P-08] Describe the Lytic and Lysogenic life cycles of a virus.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-P-09] Outline the usage of bacteriophage in genetic engineering.	Formative	U	This SLO is part of regular teaching and learning but	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
				will not be assessed in annual examination.	
	[SLO:B-11-P-10] Explain the life cycle of HIV.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-P-11] Justify the name of the virus i.e., “Human Immunodeficiency Virus” by establishing T helper cells as the basis of immune system.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-P-12] Reason out the specificity of HIV on its host cells.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-P-13] List the symptoms of AIDS.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-P-14] Explain opportunistic diseases that may attack an AIDS victim.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-P-15] Describe the treatments available for AIDS.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-P-16] List some common control measures against the transmission of HIV.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-P-17] Describe the causative agent, symptoms, treatment and prevention of the following viral diseases: hepatitis C, herpes, polio and leaf curl virus disease of cotton.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-P-18] List the sources of transmission for each of the above-mentioned diseases.	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-P-19] Describe the structure of prions and viroids.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-P-20] List the diseases caused by prions and viroids.	Summative	K	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-P-21] Interpret how viral infections cause global economic loss.	Formative	A	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-P-22] Describe the limitations of the vaccine for the common cold / flu virus	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
Q	[SLO:B-11-Q-01] List the macro and micronutrients of plants highlighting the role of each nutrient	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	22
	[SLO:B-11-Q-02] State the examples of carnivorous plant.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-03] Explain the role of stomata and palisade tissue in the exchange of gasses in plants.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-04] Relate transpiration with gas exchange in plants.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-05] Assess the structure of xylem vessel elements, sieve tube elements, companion cells, tracheids and relate their structures with functions.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-06] Discuss the movement of water between plant cells, and between the cells and their environment in terms of water potential.	Formative	U	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-Q-07] Describe the movement of water through roots in terms of symplast, apoplast and vacuolar pathways.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-08] Explain the movement of water in xylem through TACT mechanism.	Summative	A	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-Q-09] Describe the mechanisms involved in the opening and closing of stomata.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-10] Explain the movement of sugars within plants.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-11] Define osmotic adjustment.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-12] - State movement of water into or out of the cell in isotonic, hypotonic, and hypertonic conditions.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-13] Explain the osmotic adjustments in hydrophytic (marine and freshwater), xerophytic and mesophytic plants and plants in saline soil.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-14] List the adaptations in plants to cope with low and high temperatures	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-15] Describe Explain the turgor pressure and its significance in providing support to herbaceous plants.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-16] Describe the structure of supporting tissues in plants.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-17] Define growth and explain primary and secondary growth in plants.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-18] Justify the formation of annual rings	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-19] Explain influence of apical meristem on the growth of lateral shoots.	Summative	U	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-20] Outline the role of important plant growth regulators.	Formative	K	This SLO is part of regular teaching and learning but will not be assessed in annual examination.	
	[SLO:B-11-Q-21] Explain the types of movement in plants in response to light, force of gravity, touch and chemicals.	Summative	U	Question(s) will be asked in annual examination	

Content Domain / Area	NCP SLOs Description	Form of Assessment	Cognitive Level	Remarks	Number of Periods Required (1 period=40 minutes)
	[SLO:B-11-Q-22] Define photoperiodism.	Summative	K	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-23] Classify with examples plants on the basis of photoperiodism and Describe the mechanism of photoperiodism with reference to the mode of action of phytochromes.	Summative	A	Question(s) will be asked in annual examination	
	[SLO:B-11-Q-24] Explain the role of low temperature treatment on flower production especially to biennials and perennials.	Summative	U	Question(s) will be asked in annual examination	

PRACTICAL SLOs

NCP SLOs Description	Form of Assessment	Cognitive domain	Remarks	Number of Periods Required (1 period=40 minutes)
[SLO:B-11-X-01] Decisions relating to measurements and observations	Formative for PBA	Psychomotor	Question will not be asked in PBA, however, it will be part of Lab work.	16
[SLO:B-11-X-02] Within an investigation, students should be able to:	Formative for PBA	Psychomotor	Question will not be asked in PBA, however, it will be part of Lab work.	
<ul style="list-style-type: none"> identify the independent variable and dependent variable 	Formative for PBA		As above	
<ul style="list-style-type: none"> decide a suitable range of values to use for the independent variable at which measurements of the dependent variable are recorded 	Formative for PBA		As above	
<ul style="list-style-type: none"> decide the number of different values of the independent variable (a minimum of five) and the intervals between them 	Formative for PBA		As above	
<ul style="list-style-type: none"> decide how to change the value of the independent variable 	Formative for PBA		As above	
<ul style="list-style-type: none"> decide how the dependent variable should be measured 	Formative for PBA	As above	As above	

NCP SLOs Description	Form of Assessment	Cognitive domain	Remarks	Number of Periods Required (1 period=40 minutes)
<ul style="list-style-type: none"> • decide the number of replicates at each value • decide on appropriate controls for the experiment or investigation • decide which variables need to be standardized and how to standardize them. (Variables expected to have a minimal effect, such as variation between test-tubes of the same type, do not need to be standardized. When using the light microscope and photomicrographs, students should be able to: • set up a light microscope to view and observe specimens • follow instructions to find and draw particular tissues in plant and animal specimens and label the drawings appropriately • follow instructions to find and draw particular cells and structures within the cells • make a temporary slide of stained cells or tissues • calculate actual sizes of tissues or cells from measurements of photomicrographs, using magnifications, scale bars or representations of eyepiece graticules and stage micrometers • estimate the number of cells or cell organelles in a given area using a sampling method, such as grids or fields of view. 	<p>Formative for PBA</p> <p>Formative for PBA</p> <p>Formative for PBA</p> <p>Summative for PBA</p> <p>Summative for PBA</p> <p>Summative for PBA</p> <p>Summative for PBA</p> <p>Summative for PBA</p> <p>Summative for PBA</p>		<p>As above</p> <p>As above</p> <p>As above</p> <p>Laboratory work- will be assessed in PBA.</p> <p>As above</p> <p>As above</p> <p>As above</p> <p>As above</p> <p>As above</p>	
<p>[SLO:B-11-X-03] Within an investigation, students should be able to:</p> <ul style="list-style-type: none"> • follow instructions to collect results • consider the hazards of the procedure, including the use of any solutions and reagents, and assess the risk as low, medium or high • take readings to obtain accurate data (quantitative results) or observations (qualitative results). When using the light microscope and photomicrographs, Students should be able to: 	<p>Formative for PBA</p> <p>Formative for PBA</p> <p>Formative for PBA</p>	Psychomotor	<p>Question will not be asked in PBA, however, it will be part of Lab work.</p> <p>As above</p> <p>As above</p>	

NCP SLOs Description	Form of Assessment	Cognitive domain	Remarks	Number of Periods Required (1 period=40 minutes)
<ul style="list-style-type: none"> • draw plan diagrams to show the distribution of tissues in a specimen, with no cells drawn and the correct proportions of layers of tissues • draw the observable features of cells in a specimen showing: — the correct shapes — the thicknesses of cell walls where applicable (drawn with two lines or drawn with three lines where two cells touch) — the relative sizes and proportions — observable cell contents only • measure tissue layers or cells from photomicrographs using a ruler or given scale, including representations of eyepiece graticule • make accurate observations from specimens including counting numbers of cells or cell organelles • record similarities and differences between two specimens using only their observable features. 	<p>Formative for PBA</p> <p>Formative for PBA</p> <p>Summative for PBA</p> <p>Formative for PBA</p> <p>Formative for PBA</p>		<p>Question will not be asked in PBA, however, it will be part of Lab work As above</p> <p>Laboratory work- will be assessed in PBA.</p> <p>Question will not be asked in PBA, however, it will be part of Lab work As above</p>	
<p>[SLO:B-11-X-04] Recording data and observations Within an investigation, students should be able to:</p> <ul style="list-style-type: none"> • record raw results (unprocessed) and calculated results (processed) in an appropriate table with: — descriptive headings, including any required units (no units in body of table) — heading for the independent variable to the left of (or above, if the table is in rows) the dependent variable • record quantitative data to the number of decimal places that is appropriate for the measuring instrument used • record qualitative observations using clear descriptions - record calculated values (processed results) in an appropriate table. • When using the light microscope and photomicrographs, Students should be able to: • record the fine details of the specimen, including drawing the detailed shapes of layers or outlines of specimens in plan diagrams and drawing the shape and position of observable cell organelles in cells. 	<p>Formative for PBA</p>	<p>Psychomotor</p>	<p>Question will not be asked in PBA, however, it will be part of Lab work.</p>	

NCP SLOs Description	Form of Assessment	Cognitive domain	Remarks	Number of Periods Required (1 period=40 minutes)
[SLO:B-11-X-05] Display of calculation and reasoning	Formative for PBA	Psychomotor	Question will not be asked in PBA, however, it will be part of Lab work.	
[SLO:B-11-X-06] Within an investigation and when using the light microscope and photomicrographs, students should be able to: <ul style="list-style-type: none"> • display calculations clearly, showing all the steps and reasoning • use the correct number of significant figures for calculated quantities. This should be the same as, or one more than, the smallest number of significant figures in the data used in the calculation. 	Formative for PBA Formative for PBA	Psychomotor	Question will not be asked in PBA, however, it will be part of Lab work.	
[SLO:B-11-X-07] Within an investigation, Students should be able to: <ul style="list-style-type: none"> • display data as a graph (continuous data), bar chart (discontinuous or categorical) or histogram (frequency data) • draw a graph, bar chart or histogram clearly and accurately with: — the independent variable on the x-axis and the dependent variable on the y-axis — axes labelled to match the relevant table headings, including units where appropriate — a scale where both axes should use most or all of the grid available and allow the graph to be read easily to within half a square — all graph points plotted accurately using a sharp pencil, as a small cross or a small dot in a circle, with the intersection of the cross or center of the dot exactly on the required point — the plotted points of a graph connected with a clear, sharp and unbroken line, either as a line of best fit, a smooth curve or with ruled straight lines joining the points — no extrapolation of graph lines unless this can be assumed from the data — all bars on a bar chart or histogram plotted accurately, with clear, unbroken lines that are drawn with a sharp pencil and ruler. 	Formative for PBA	Psychomotor	Question will not be asked in annual examination, however, it will be part of Lab work.	
[SLO:B-11-X-08] When using the light microscope and photomicrographs, students should be able to: <ul style="list-style-type: none"> • make drawings, using a sharp pencil to give finely drawn lines that are clear and unbroken • make drawings that use most of the available space and show all the features observed in the specimen, with no shading 	Formative for PBA	Psychomotor	Question will not be asked in annual examination, however, it will be part of Lab work.	

NCP SLOs Description	Form of Assessment	Cognitive domain	Remarks	Number of Periods Required (1 period=40 minutes)
<ul style="list-style-type: none"> organize comparative observations, showing differences and similarities between specimens. 				
[SLO:B-11-X-09] Interpreting data and observations	Formative for PBA	Psychomotor	Question will not be asked in PBA, however, it will be part of Lab work.	
[SLO:B-11-X-10] Within an investigation, students should be able to: <ul style="list-style-type: none"> calculate an answer with the correct number of significant figures using quantitative results or data provided use a graph to find unknown values estimate the concentrations of unknown solutions from qualitative results identify the contents of unknown solutions using biological molecule tests identify anomalous results and suggest how to deal with anomalies describe patterns and trends using the data provided in tables and graphs evaluate the confidence with which conclusions might be made. When using the light microscope and photomicrographs, Students should be able to: <ul style="list-style-type: none"> calculate an answer with the correct number of significant figures using quantitative results or data provided compare observable features of specimens of biological material including similarities and differences between specimens on a microscope slide and specimens in photomicrographs 	Formative for PBA	Psychomotor	Question will not be asked in PBA, however, it will be part of Lab work.	
[SLO:B-11-X-11] From results, observations or information provided, students should be able to: <ul style="list-style-type: none"> summarize the main conclusions state and explain whether a hypothesis is supported make predictions from the patterns and trends in data suggest explanations for observations, results, patterns, trends and conclusions. 	Formative for PBA	Psychomotor	Question will not be asked in PBA, however, it will be part of Lab work.	
[SLO:B-11-X-12] Within an investigation and when using the light microscope and photomicrographs, students should be able to: <ul style="list-style-type: none"> identify systematic or random errors in an investigation, understanding that systematic errors may not affect the trend in results whereas a random error may affect the trend 	Formative for PBA	Psychomotor	Question will not be asked in PBA, however, it will be part of Lab work.	

NCP SLOs Description	Form of Assessment	Cognitive domain	Remarks	Number of Periods Required (1 period=40 minutes)
<ul style="list-style-type: none"> • identify the main sources of error in a particular investigation suggest improvements to a procedure that will increase the accuracy of the observations or measurements, Formative • including: — using a more effective method to standardize relevant variables — using a more accurate method of measuring the dependent variable — using smaller intervals for the values of the independent variable — collecting replicate measurements so that a mean can be calculated • suggest how to extend the investigation to answer a new question, for example by investigating a different independent variable or applying the method to a new context • describe clearly, in words or diagrams, improvements to the procedure or modifications to extend the investigation. 				

Note: PBA STANDS FOR “PRACTICAL BASED ASSESSMENT”



Federal Board HSSC-I Examination

Biology Model Question Paper

(Curriculum 2022-2023)

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.

ROLL NUMBER					

Version No.			

0	0	0	0	0	0
1	1	1	1	1	1
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Candidate Sign. _____

Invigilator Sign. _____

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

S #	Question	(A)	(B)	(C)	(D)	(A)	(B)	(C)	(D)																									
(i)	A certain poison disrupts the cytoskeleton of cell. Which of the following functions would be affected most probably by the poison?	Digestion within lysosomes	Protein synthesis	Cell division	Cellular respiration	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																									
(ii)	Identify hetero polysaccharide from the following:	Chitin	Glycogen	Pectin	Cellulose	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																									
(iii)	Glycolysis is a process that:	Produces ATP and NADH	Produces ATP only	Is not a net producer of energy rich molecules	Consumes as much ATPs as is produced	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																									
(iv)	What will happen to reaction if activation energy is decreased?	Rate of reaction decreases	Rate of reaction increases	No effect on the rate of reaction	Reaction is reversed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																									
(v)	One of the following viruses have complex capsid:	Influenza virus	Adenovirus	Bacteriophage	Tobacco mosaic virus	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																									
(vi)	We have 1 billion bacteria per square centimetre of our skin. Why we have so many bacteria on our skin?	To produce acne, eczema and pimples on the skin	To limit the growth of pathogens by colonization resistance	To provide essential minerals and nutrients to the body	To help in decomposition after the death of a person	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																									
(vii)	Sundew is a/an:	Mutualistic plant	Parasitic plant	Carnivorous plant	Autotrophic plant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																									
(viii)	Identify the column given in table that contains correct substances related to acylglycerols?	<table border="1" style="width: 100%; text-align: center;"> <tr> <th>Substances</th> <th>A</th> <th>B</th> <th>C</th> <th>D</th> </tr> <tr> <td>Amino acid</td> <td>✓</td> <td>x</td> <td>x</td> <td>x</td> </tr> <tr> <td>Glucose</td> <td>x</td> <td>x</td> <td>✓</td> <td>✓</td> </tr> <tr> <td>Fatty acid</td> <td>x</td> <td>✓</td> <td>x</td> <td>x</td> </tr> <tr> <td>Glycerol</td> <td>x</td> <td>✓</td> <td>x</td> <td>x</td> </tr> </table>				Substances	A	B	C	D	Amino acid	✓	x	x	x	Glucose	x	x	✓	✓	Fatty acid	x	✓	x	x	Glycerol	x	✓	x	x	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Substances	A	B	C	D																														
Amino acid	✓	x	x	x																														
Glucose	x	x	✓	✓																														
Fatty acid	x	✓	x	x																														
Glycerol	x	✓	x	x																														
(ix)	Trees with mycorrhizal association grow:	Slower than other trees	Better than other trees	Small roots and leaves	Only in favourable conditions	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>																									

(x)	The function of saprotrophs in an ecosystem is to:	Provide oxygen to producers	Return nutrients to the environment	Increase complexity of food chain	Decrease competition among consumers	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(xi)	Which of the following is not common to all divisions of vascular plants?	Development of seeds	Alternation of generations	Xylem and phloem	Dominance of diploid generation	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(xii)	All organ systems are less developed in parasitic flat worms EXCEPT:	Circulatory system	Digestive system	Reproductive system	Respiratory system	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(xiii)	Traits which exhibit continuous phenotypic variation are typically determined by this inheritance form:	Incomplete dominance	Polygenic inheritance	Multiple-allele inheritance	Sex-linked inheritance	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(xiv)	When two golden <i>Labrador retriever</i> cross with each other, they produce golden offsprings:	Zero %	25%	50%	100%	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(xv)	Ovulation is stimulated by the sharp increase of which of the following hormone?	SH	Estrogen	LH	Progesterone	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(xvi)	All organisms share the same genetic code. This commonality is evidence that:	Evolution is occurring now	Convergent evolution has occurred	All organisms are descended from common ancestor	Evolution occurs gradually	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>
(xvii)	If you want to label amino acids but not DNA, which of the following radioactive isotopes would you use?	^{18}F	^{35}S	^{14}C	^{32}P	<input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/>



Federal Board HSSC-I Examination

Model Question Paper Biology

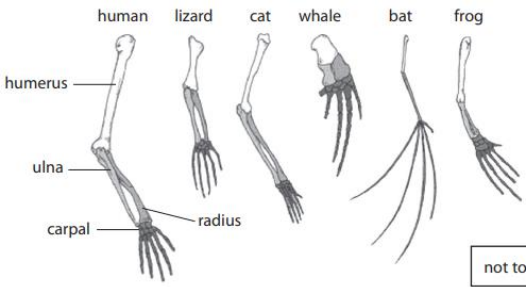
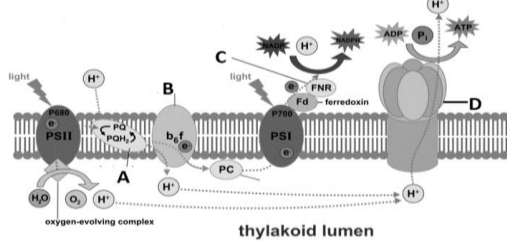
(Curriculum 2022-23)

Time allowed: 2:35 hours

Total Marks: 68

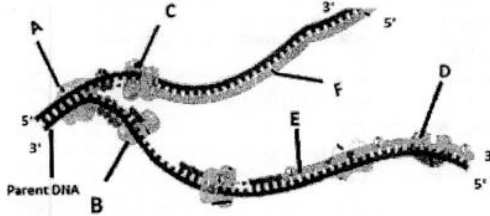
Note: Answer all parts from Section 'B' and all questions from Section 'C' on the **E-sheet**.
Write your answers on the allotted /given spaces.

Q. 2	Attempt the following questions			(14x3 = 42)															
(i)	List any three organelles bounded by a single membrane and three organelles bounded by double membrane.	0.5x6	OR	List six features of seedless vascular plants.	0.5x6														
(ii)	Proteases are used in washing powders. How would it remove a blood stain on clothes? Why these washing powders are recommended for use at low temperatures?	3	OR	A scientist is trying to find best light colour for maximum yield. Which type of spectrum graph will he refer? Give reason.	3														
(iii)	Why Echinoderms are considered close to Chordates although they have many simplest systems? Give three reasons.	3	OR	Why mice were killed by non-virulent type R bacteria in last step of Griffith's experiment?	3														
(iv)	Justify the significance of sequence of amino acids in normal and sickle cell haemoglobin.	3	OR	Why HIV virus contains two enzymes? What will happen if HIV virus is without these enzymes?	3														
(v)	Differentiate between photoperiodism and phototropism.	3	OR	How chemosynthetic bacteria are autotrophic in nature?	3														
(vi)	List six features of Bryophytes which helped them to adapt land habitat.	0.5x6	OR	Name three chemical methods and three physical methods used to control harmful bacteria.	0.5x6														
(vii)	The graph shows the effects of temperature on the rate of reaction of an enzyme. <div style="text-align: center;"> </div> (a) What is indicated by X? (b) What is happening in region A? (c) What is happening in region B?	1x3	OR	Complete the table below which shows functional categories of proteins. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">Category</th> <th style="padding: 5px;">Example</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">Haemoglobin</td> </tr> <tr> <td style="padding: 5px;">Enzyme</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">Insulin</td> </tr> <tr> <td style="padding: 5px;">Defensive</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">Actin and Myosin</td> </tr> <tr> <td style="padding: 5px;">Storage</td> <td style="padding: 5px;"></td> </tr> </tbody> </table>	Category	Example		Haemoglobin	Enzyme			Insulin	Defensive			Actin and Myosin	Storage		0.5x6
Category	Example																		
	Haemoglobin																		
Enzyme																			
	Insulin																		
Defensive																			
	Actin and Myosin																		
Storage																			
(viii)	Why spore forming bacteria are more virulent and lethal? Give reasons.	3	OR	Can nitrogen cycle take place in a bacteria free soil? Give reasons.	3														
(ix)	Complete the given table according to structures and functions of male reproductive systems. <table border="1" style="margin-left: auto; margin-right: auto; border-collapse: collapse;"> <thead> <tr> <th style="padding: 5px;">Structure</th> <th style="padding: 5px;">Function</th> </tr> </thead> <tbody> <tr> <td style="padding: 5px;">Epididymis</td> <td style="padding: 5px;"></td> </tr> <tr> <td style="padding: 5px;"></td> <td style="padding: 5px;">Testosterone production</td> </tr> <tr> <td style="padding: 5px;">Urinogenital duct</td> <td style="padding: 5px;"></td> </tr> </tbody> </table>	Structure	Function	Epididymis			Testosterone production	Urinogenital duct		3	OR	Corpus luteum acts as an endocrine gland, <ol style="list-style-type: none"> a) Where it is located? b) When it is formed? c) Which hormone is secreted by it 	3						
Structure	Function																		
Epididymis																			
	Testosterone production																		
Urinogenital duct																			
(x)	Two pink flowered four o' clock plants are crossed with each other. What is F1 generation probability and ratio?	3	OR	Carefully observe the following stretch of antisense strand of DNA <div style="text-align: center; margin: 10px 0;"> $5' \qquad \qquad \qquad 3'$ TACGAGCTTCCGATTCGA </div> Codons for amino acids are: GCU : Alanine, AUG : Methionine, CUC : Leucine, GAA : Glutamate, GGC : Glycine, UAA : Stop <p>Using the provided data, determine the primary structure of protein produced from this segment of DNA, during translation.</p>	3														
(xi)	What are useful aspects of mutations. Give examples.	3	OR	Name the more scientifically acceptable theory explaining evolution of eukaryotes	1+2														

				from prokaryote and give salient points of that theory.	
(xii)	State Lamarck's assumptions for the explanation of evolution.	3	OR	Give three unique features of angiosperms and their benefits.	3
(xiii)	Diagram shows the fore limb of different vertebrates. Evolutionists believe that all these vertebrates evolved from one common origin. Describe the evolutionary evidence that support this belief. 	3	OR	In the following diagram a segment of thylakoid membrane is depicted showing an important metabolic process. 	1+2
(xiv)	All chordates go through few similar stages in life. Summarize any three of them.	3	OR	Kingdom Protista is considered a polyphyletic group. Give reasons.	3

Section – C (Marks 26)

Note: Attempt all questions. Marks of each question are given along with each question.

Q.3	What is plasma membrane? Explain in detail fluid mosaic model of plasma membrane.	7	OR	The given figure shows the process of DNA replication. 	2+5
Q.4	The two strands of DNA are not identical but are complementary. Give reasons. Also explain the double helical structure of DNA molecule.	2+5	OR	Differentiate between xerarch and hydrarch succession. Explain the xerarch succession.	2+5
Q.5	How opening and closing of stomata is controlled?	3+3	OR	How do bacteriophages reproduce? Explain lytic and lysogenic cycle in detail.	3+3
Q.6	How X- linked recessive characters are inherited in humans? Explain with an example.	2+4	OR	What are the events that capture light and convert it into chemical energy during light dependent non-cyclic reactions?	6

Federal Board HSSC-I Examination
Biology Model Question Paper
(Curriculum 2022-23)
Alignment of Questions with Student Learning Outcomes

Sr No	Section: Q. No. (Part no.)	Student Learning Outcomes	Cognitive Domain	Allocated Marks in Model Paper
1.	A: Q1(i)	[SLO:B-11-D-03] Describe the structure and functions of subcellular organelles. (mitochondria, nucleus -cell membrane, chloroplast, lysosomes, cell wall, centrioles, - Golgi apparatus, smooth endoplasmic reticulum, rough endoplasmic reticulum, vesicles, peroxisome, vacuoles, ribosomes	U	1
2.	A: Q1(ii)	SLO:B-11-C-11] Describe the structure properties and roles of polysaccharides starch, glycogen, cellulose and chitin	K	1
3.	A: Q1(iii)	[SLO:B-11-F-22] Explain the process of anaerobic respiration in terms of glycolysis and conversion of pyruvate into lactic acid or ethanol	K	1
4.	A: Q1(iv)	[SLO:B-11-F-05] Define energy of activation and discuss through graph how an enzyme speeds up a reaction by lowering the energy of activation	U	1
5.	A: Q1(v)	[SLO:B-11-P-03] Classify viruses on the bases of their hosts and structure	K	1
6.	A: Q1(vi)	[SLO:B-11-0-24] Describe the benefits of the bacterial flora of humans	A	1
7.	A: Q1(vii)	[SLO:B-11-Q-02] State the examples of carnivorous plants	K	1
8.	A: Q1(viii)	[SLO:B-11-C-19] Illustrate the molecular structure (making and breaking) of an acylglycerol, a phospholipid and a terpene	K	1
9.	A: Q1(ix)	[SLO:B-11-0-34] Explain the mutualism established in mycorrhizae and lichen associations	U	1
10.	A: Q1(x)	[SLO:B-11-N-02] Distinguish between the various modes of nutrition different species possess	K	1
11.	A: Q1(xi)	[SLO:B-11-B-10] Describe the general features of vascular plants	U	1
12.	A: Q1(xii)	[SLO:B-11-B-20] Describe the general characteristics, importance and example of sponges cnidarians, Platyhelminthes, Aschelminthes (nematodes), molluscs, annelid, arthropods and echinoderms	K	1
13.	A: Q1(xiii)	[SLO:B-11-H-25] Describe polygenic inheritance using suitable examples from plants (grain colour in wheat) and animals (skin colour in man)	K	1
14.	A: Q1(xiv)	[SLO:B-11-H-27] Give one example of epistasis from mammals (coat colour inheritance in Labrador retrievers) and one from plants (pigment phenotype in foxgloves) and justify modified Mendelian ratios	A	1
15.	A: Q1(xv)	[SLO:B-11-H-04] Describe the menstrual cycle and the hormones involved	K	1
16.	A: Q1(xvi)	[SLO:B-11-B-03] Analyse the evidence of evolution that comes from molecular biology	U	1
17.	A: Q1(xvii)	[SLO:B-11-H-41] Narrate the experimental work of Griffith and Hershey Chase, which proved that DNA is the hereditary material	A	1
18.	B: Q 2 (i)	[SLO:B-11-D-03] Describe the structure and functions of subcellular organelles. (mitochondria, nucleus -cell membrane, chloroplast, lysosomes, cell wall, centrioles, - Golgi apparatus, smooth endoplasmic reticulum, rough endoplasmic reticulum, vesicles, peroxisome, vacuoles, ribosomes OR [SLO:B-11-B-12] Explain the general characteristics pteridophytes	K	3
19.	B: Q 2 (ii)	[SLO:B-11-F-14] Classify enzymes on the basis of the substrates they use (lipases, diastase, amylase, proteases etc.) OR [SLO:B-11-F-18] Differentiate between the absorption spectra of chlorophyll 'a' and 'b'	A	3
20.	B: Q 2 (iii)	[SLO:B-11-B-20] Describe the general characteristics, importance and example of sponges cnidarians, Platyhelminthes, Aschelminthes (nematodes), molluscs, annelid, arthropods and echinoderms OR [SLO:B-11-H-41] Narrate the experimental work of Griffith and Hershey Chase, which proved that DNA is the hereditary material	A	3
21.	B: Q 2 (iv)	[SLO:B-11-C-14] Justify the significance of the sequence of amino acids through the example of sickle cell haemoglobin OR [SLO:B-11-P-10] Explain the life cycle of HIV	A	3
22.	B: Q 2 (v)	[SLO:B-11-Q-21] Explain the types of movement in plants in response to light, force of gravity, touch and chemicals + [SLO:B-11-Q-23] Classify with examples	U	3

		plants on the basis of photoperiodism and Describe the mechanism of photoperiodism with reference to the mode of action of phytochrome OR [SLO:B-11-0-13] Classify bacteria on the basis of methods of obtaining energy and carbon		
23.	B: Q 2 (vi)	[SLO:B-11-B-08] Describe non vascular plants (Bryophytes) OR [SLO:B-11-0-25] List the chemical and physical methods used to control harmful bacteria	K	3
24.	B: Q 2 (vii)	[SLO:B-11-F-06] Explain the effect of temperature on the rate of enzyme action with example of human and thermophilic bacteria OR [SLO:B-11-C-16] List the roles of structural proteins and functional proteins with 3 examples	K	3
25.	B: Q 2 (viii)	[SLO:B-11-0-09] Justify the endospore formation in bacteria as a mechanism of survival to withstand unfavourable conditions OR [SLO:B-11-N-12] Discuss nitrogen cycle in detail	A	3
26.	B: Q 2 (ix)	[SLO:B-11- H-01] Describe the structures of the male reproductive system and identify their functions OR [SLO:B-11-H-04] Describe the menstrual cycle and the hormones involved	K	3
27.	B: Q 2 (x)	[SLO:B-11-H-12] Explain incomplete dominance and exemplify it through the inheritance of flower colour in 4 o' clock plant OR [SLO:B-11-H-50] Describe the mechanism of protein synthesis	A	3
28.	B: Q 2 (xi)	[SLO:B-11-H-59] Rationalize that mutations might be a contributing factor towards evolution OR [SLO:B-11-B-05] Describe the Endosymbiotic theory about the mechanism of evolution of eukaryotes from prokaryotes	K	3
29	B: Q 2 (xii)	[SLO:B-11-B-06] Describe the theory of inheritance of acquired characters, as proposed by Lamarck with example of giraffe neck OR [SLO:B-11-B-16] Describe the general characteristic of angiosperms and classify them	K	3
30.	B: Q 2 (xiii)	[SLO:B-11-B-04] Differentiate between convergent and divergent evolution on the basis of inheritance of the homologous and analogous structures OR [SLO:B-11-F-26] Describe chemiosmosis and Relate it with electron transport chain	U	3
31.	B: Q 2 (xiv)	SLO:B-11-B-21] Describe the general characteristics of chordates and vertebrates OR [SLO:B-11-0-26] Explain protists as a diverse group of eukaryotes that has polyphyletic origin and defined only by exclusion from other groups	U	3
32.	C: Q3	[SLO:B-11-D-03] Describe the structure and functions of subcellular organelles. (mitochondria, nucleus -cell membrane, chloroplast, lysosomes, cell wall, centrioles, - Golgi apparatus, smooth endoplasmic reticulum, rough endoplasmic reticulum, vesicles, peroxisome, vacuoles, ribosomes) OR [SLO:B-11-H-44] Describe the events of the process of DNA replication.	U	7
33.	C: Q4	[SLO:B-11-C-25] Explain the double helical structure of DNA as proposed by Watson and Crick OR [SLO:B-11-N-17] Differentiate between xerarch and hydrarch succession + [SLO:B-11-N-18] Explain the xerarch succession on a bare rock starting from the small pockets of lichens to the vegetations of flowering plants	U	7
34.	C: Q5	[SLO:B-11-Q-09] Describe the mechanisms involved in the opening and closing of stomata OR [SLO:B-11-P-08] Describe the Lytic and Lysogenic life cycles of a virus	U	6
35.	C: Q6	[SLO:B-11-H-37] Describe the X linked disorders with reference to the patterns of inheritance OR	U	6

		[SLO:B-11-F-20] Describe the events of non-cyclic photophosphorylation and cyclic photophosphorylation		
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**Table of specifications (ToS)
Model Paper Biology Grade XI (HSSC I)**

Domains	Cells and subcellular organelles	Molecular biology	Metabolism		Acellular life	Prokaryotes, Protists and fungi		Evolution, Biodiversity and classification	Plants	Evolution, Biodiversity and classification	Reproduction and inheritance			Evolution, Biodiversity and classification	Ecology	Total Marks	% age
			Unit 3: Enzymes (F1-F14)	Unit 4: Bioenergetics (F15-F35)		Unit 6: Prokaryotes (O1-O25)	Unit 7: Protista and fungi (O26-O37)				Unit 8: Plantae (B8-B18)	Unit 9: Diversity in plant functions (Q1-Q24)	Unit 10: Animalia (B19-B22)				
K (Knowledge)	Q2 (i/f) 3	Q1 (ii) 1 Q1 (viii) 1 Q2 (vii/s) 3	Q2(vii /f)3	Q1(iii)1	Q1(v) 1	Q2(vi/s) 3		Q2(i/s)3 Q2(vi/f)3 Q2(xii/s) 3	Q1(vii)1	Q1(xii)1	Q1(xv)1 Q2(ix/f) 3 Q2(ix/s) 3	Q1(xiii) 1	Q2(xi/f) 3	Q2(xi/s) 3 Q2(xii/f) 3	Q1(x)1	45	29 %
U (Understanding)	Q1 (i) 1 Q3 (f) 7	Q4(f)7	Q1 (iv) 1	Q2(xiii/s) 3 Q6(s) 6	Q5(s)6	Q1(vi)1 Q2(v/s) 3	Q1(ix) 1 Q2(xiv /s)3	Q1(xi)1	Q2(v/f)3 Q5(f) 6	Q2(xiv/f) 3		Q6(f)6	Q3(s)7	Q1(xvi) 1 Q2(xiii/f) 3	Q4(s)7	76	50 %
A (Application)		Q2 (iv/f) 3	Q2 (ii/f)3	Q2 (ii/s)3	Q2(iv/s)3	Q2(viii/f)3				Q2(iii/f)3		Q1(xiv) 1 Q2(x/f) 3	Q1(xvii) 1 Q2(iii/s) 3 Q2(x/s) 3		Q2(viii/s) 3	32	21 %
Total Marks	11	15	7	13	10	10	4	10	10	7	7	11	17	10	11	153	

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 $\pm 5\%$ 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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