

[SLO: B-11-C-11]	Describe the structure properties and roles of polysaccharides starch, glycogen, cellulose and chitin.	Modified(rephrased) SLO		Understand
[SLO: B-11-C-12]	Define protein, amino acid and recognized essential amino acid and structural formula of amino acid.	Matched SLO		Remember
[SLO: B-11-C-13]	Outline the synthesis and breakage of peptide linkages.	Matched SLO		Understand
[SLO: B-11-C-14]	Justify the significance of the sequence of amino acids through the example of sickle cell hemoglobin.	Matched SLO		Evaluate
[SLO: B-11-C-15]	Classify proteins as globular and fibrous proteins.	Matched SLO		Understand
[SLO: B-11-C-16]	List the roles of structural proteins and functional proteins with 3 examples	Modified(rephrased) SLO		Remember
[SLO: B-11-C-17]	Define lipids	Modified (Split) SLO		Remember
[SLO: B-11-C-18]	Describe the properties and roles of acylglycerols, phospholipids, terpenes and waxes.	Modified (Split) SLO		Understand
[SLO: B-11-C-19]	Illustrate the molecular structure (making and breaking) of an acylglycerol, a phospholipid and a terpene.	Matched SLO		Apply
[SLO: B-11-C-20]	Evaluate steroids and prostaglandins as important groups of lipids	Modified(rephrased) SLO		Understand
[SLO: B-11-C-21]	Describe nucleic acids and molecular structure of nucleotides.	Modified(rephrased) SLO		Understand
[SLO: B-11-C-22]	Distinguish among the nitrogenous bases found in the nucleotides of nucleic acids.	Matched SLO		Analyse
[SLO: B-11-C-23]	Outline the examples of a mononucleotide (ATP) and a dinucleotide (NAD).	Matched SLO		Understand
[SLO: B-11-C-24]	Illustrate the formation of phosphodiester bond.	New SLO	Ambiguous	Apply
[SLO: B-11-C-25]	Explain the double helical structure of DNA as proposed by Watson and Crick.	Matched SLO		Understand
[SLO: B-11-C-26]	Explain the general structure of RNA.	Matched SLO		Understand
[SLO: B-11-C-27]	Distinguish in terms of functions and roles, the three types of RNA	Matched SLO		Analyse
[SLO: B-11-C-28]	Discuss the Central Dogma.	New SLO	Ambiguous	Understand
[SLO: B-11-C-29]	Define conjugated molecules and describe the roles of common conjugated molecules i.e. glycolipids, glycoproteins, lipoproteins and nucleoproteins.	Matched SLO		Remember

Cells and Subcellular Organelles

- 1) Describe the structure and function of cells, including prokaryotic and eukaryotic cells.
- 2) Identify and describe the main subcellular organelles, including the nucleus, mitochondria, ribosomes, endoplasmic reticulum, Golgi apparatus, lysosomes, and peroxisomes.
- 3) Explain the role of the cell membrane and describe its structure.
- 4) Explain the process of cellular respiration and its role in producing energy.
- 5) Describe the process of cellular division, including mitosis and meiosis.

Benchmark 1: Students will be able to describe the function and draw the structure of cells and cell organelles, including the nucleus, mitochondria, ribosomes, and endoplasmic reticulum, and how they interact to maintain cellular homeostasis and communicate with each other.

Benchmark 2: Students will be able to understand terms such as stem cells, the structure of cell membrane and its role in transport of material.

[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)	New SLO	Ambiguous	Understand
[SLO: B-11-D-02]	Identify the ultrastructure of animal and plant cells.	New SLO	Ambiguous	Remember
[SLO: B-11-D-03]	Describe the structure and functions of sub-cellular organelles. (mitochondria, nucleus -cell membrane, chloroplast, lysosomes, cell wall, centrioles, - Golgi apparatus, smooth endoplasmic reticulum, rough endoplasmic reticulum, vesicles, peroxisome, vacuoles, ribosomes)	New SLO	Ambiguous	Understand
[SLO: B-11-D-04]	Define cell signalling.	New SLO	Ambiguous	Remember
[SLO: B-11-D-05]	Discuss the pathway of a signal from outside the cell to the inside. (Protein signal and steroid signal)	New SLO	Ambiguous	Analyse
[SLO: B-11-D-06]	Define Stem cells and advantages of using stem cells	New SLO	Ambiguous	Remember
[SLO: B-11-D-07]	Categorize different types of stem cells	New SLO	Ambiguous	Analyse
[SLO: B-11-D-08]	Evaluate the advantages and disadvantages of using induced Pluripotent Stem Cells.	New SLO	Ambiguous	Analyse
[SLO: B-11-D-09]	Explain the structure of the cell membrane and the techniques that can be used to study it.	New SLO	Ambiguous	Understand
[SLO: B-11-D-10]	Explain the 4 membrane transport mechanisms with diagrams: (simple diffusion, Facilitated diffusion, Osmosis, Active transport) .	New SLO	Ambiguous	Understand
[SLO: B-11-D-11]	Differentiate between prokaryotic and eukaryotic cells with diagrams.	New SLO	Ambiguous	Understand
[SLO: B-11-D-12]	State cell theory (including how to validate it and exceptions to it.)	New SLO	Ambiguous	Remember
[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.	New SLO	Ambiguous	Understand

				[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) .	New SLO	Ambiguous	Remember
				[SLO: B-11-D-15]	Describe endocytosis and exocytosis with diagrams.	New SLO	Ambiguous	Understand
				[SLO: B-11-D-16]	Compare and contrast simple and facilitated diffusion.	New SLO	Ambiguous	Understand
				[SLO: B-11-D-17]	Explain the steps of mitosis and meiosis with diagrams.	New SLO	Ambiguous	Understand
	Define metabolism and describe how it is related to cellular respiration and photosynthesis. Explain the role of enzymes in metabolic reactions and describe the process of enzyme-catalyzed reactions. Define enzymes and explain their role in metabolic reactions. Describe the factors that affect enzyme activity, including temperature, pH, and substrate concentration. Explain the importance of enzymes in maintaining homeostasis and how disturbances can lead to disease.	Benchmark 1: Students will be able to explain the role of enzymes in biological systems, including the facilitation of chemical reactions and regulation of metabolic pathways. Benchmark2: Students will be able to describe the factors that affect enzyme activity, including temperature, pH, substrate concentration, and inhibitors, and explain how these factors can be used to control enzyme activity. Benchmark3: Explain in detail how photosynthesis and Respiration occurs and understand the processes involved.		[SLO: B-11-F-01]	Identify the role and component parts of the active site of an enzyme.	Matched SLO		Remember
				[SLO: B-11-F-02]	Differentiate among the three types of co-factors i.e. in organic prosthetic group and co-enzymes, with examples.	Matched SLO		Understand
				[SLO: B-11-F-03]	Explain the mechanism of enzyme action through the Induced Fit Model, including comparing it with Lock and Key Model.	Matched SLO		Understand
				[SLO: B-11-F-04]	Explain enzyme catalysis with example of specific reactions	Modified(rephrased) SLO		Understand
				[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.	Matched SLO		Remember
				[SLO: B-11-F-06]	Explain the effect of temperature on the rate of enzyme action with example of human and thermophilic bacteria	Modified(rephrased) SLO		Understand
				[SLO: B-11-F-07]	Investigate the effect of pH on enzyme activity Compare the optimum pH of different enzymes like trypsin, pepsin, papain.	Modified(rephrased) SLO		Analyse
				[SLO: B-11-F-08]	Demonstrate that the concentration of enzyme affects the rate of enzyme action	Modified(rephrased) SLO		Understand
				[SLO: B-11-F-09]	Describe enzymatic inhibition, its types and its significance with examples .	Modified(rephrased) SLO		Understand
				[SLO: B-11-F-10]	Name the molecules which act as inhibitors.	Matched SLO		Remember
				[SLO: B-11-F-11]	Categorize inhibitors into competitive and non-competitive inhibitors.	Matched SLO		Understand
				[SLO: B-11-F-12]	Explain feedback inhibition.	Matched SLO		Understand

[SLO: B-11-F-13]	Classify enzymes on the basis of the reactions catalyzed (oxido-reductases, transferases, hydrolases, isomerases, and ligases).	Matched SLO		Analyse
[SLO: B-11-F-14]	Classify enzymes on the basis of the substrates they use (lipases, diastase, amylase, proteases etc)	Matched SLO		Analyse
[SLO: B-11-F-15]	Explain the role of light, carbon dioxide and water in photosynthesis	Modified(rephrased) SLO		Understand
[SLO: B-11-F-16]	Identify the two general kinds of photosynthetic pigments (carotenoids and chlorophylls)	Matched SLO		Remember
[SLO: B-11-F-17]	Describe the roles of photosynthetic pigments in the absorption and conversion of light energy.	Matched SLO		Understand
[SLO: B-11-F-18]	Differentiate between the absorption spectra of chlorophyll 'a' and 'b'	Matched SLO		Understand
[SLO: B-11-F-19]	Describe the arrangement of photosynthetic pigments in the form of photosystem-I and II.	Matched SLO		Understand
[SLO: B-11-F-20]	Describe the events of non-cyclic photophosphorylation and cyclic photophosphorylation.	Modified(rephrased) SLO		Understand
[SLO: B-11-F-21]	Explain the Calvin cycle (the regeneration of RuBP should be understood in outline only.)	Matched SLO		Understand
[SLO: B-11-F-22]	Explain the process of anaerobic respiration in terms of glycolysis and conversion of pyruvate into lactic acid or ethanol.	Matched SLO		Understand
[SLO: B-11-F-23]	Illustrate the links reaction as conversion of pyruvate to acetyl-CoA.	Modified(rephrased) SLO		Apply
[SLO: B-11-F-24]	Outline the steps of Krebs cycle.	Modified(rephrased) SLO		Understand
[SLO: B-11-F-25]	Trace the passage of electrons through the electron transport chain.	Modified(rephrased) SLO		Remember
[SLO: B-11-F-26]	Describe chemiosmosis and Relate it with electron transport chain	Matched SLO		Understand
[SLO: B-11-F-27]	Explain the substrate-level phosphorylation during which exergonic reactions are coupled with the synthesis of ATP.	Matched SLO		Understand
[SLO: B-11-F-28]	Justify the importance of G3P in photosynthesis	Modified(rephrased) SLO		Understand
[SLO: B-11-F-29]	Outline the formation of acetyl CoA from fats	Modified (Split) SLO		Understand
[SLO: B-11-F-30]	Compare and contrast respiration of fats and glucose .	Modified (Split) SLO		Understand

				[SLO: B-11-F-31]	Define photorespiration	Modified (Split) SLO		Remember
				[SLO: B-11-F-32]	Outline the events occurring through photorespiration. .	Modified (Split) SLO		Understand
				[SLO: B-11-F-33]	Rationalize how the disadvantageous process of photorespiration evolved.	Matched SLO		Understand
				[SLO: B-11-F-34]	Explain the effect of temperature on the oxidative activity of RuBP carboxylase.	Matched SLO		Understand
				[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.	Matched SLO		Understand
	Describe the processes of reproduction in organisms, including asexual and sexual reproduction. Explain the role of meiosis in producing genetically diverse offspring. Describe the structure and function of gametes and the role of fertilization in sexual reproduction. Explain the patterns of inheritance, including dominant and recessive traits, and how they are influenced by genes and chromosomes. Describe how genetic variation and mutations can lead to evolutionary change. Describe the central dogma of molecular biology, which outlines the flow of genetic information from DNA to RNA to protein. Explain the basic structure and function of genes, including the role of codons and introns. Distinguish between different types of inheritance patterns, including dominant and recessive traits, and sex-linked traits.	Benchmark 1: Students will be able to explain the laws of inheritance, including the principles of dominant and recessive genes, segregation, and independent assortment, and demonstrate an understanding of how traits are passed from one generation to the next. BENCHMARK2: Students will be to understand mechanism of DNA replication and its discovery. Benchmark 3: Students will be able to understand the process of translation and transcription as part of the protein synthesis process.		[SLO:B-11- H-01]	Describe the structures of the male reproductive system and identify their functions	Grade 12 SLO		Understand
				[SLO:B-11-H-02]	Define male reproductive hormones and explain their functions	New SLO	Ambiguous	Remember
				[SLO: B-11-H-03]	Explain the structures of female reproductive system and describe their functions	Grade 12 SLO		Understand
				[SLO: B-11-H-04]	Describe the menstrual cycle and the hormones involved.	Grade 12 SLO		Understand
				[SLO: B-11-H-05]	Define gene (as a sequence of nucleotides as part of DNA, which codes for the formation of a polypeptide.)	Grade 12 SLO		Remember
				[SLO: B-11-H-06]	Explain the law of segregation and independent assortment, using a suitable example related to the pea plants.	Grade 12 SLO		Understand
				[SLO: B-11-H-07]	Relate the Law of independent assortment to random orientation of chromosomes during Meiosis	Grade 12 SLO		Apply
				[SLO: B-11-H-08]	Express limitations of independent assortment and its usefulness.	Grade 12 SLO		Understand
				[SLO: B-11-H-09]	Show that independent assortment leads to variation in the gametes.	Grade 12 SLO		Understand
				[SLO: B-11-H-10]	Evaluate that inheritance of genes and their mixing during fertilization is based on mathematical probabilities.	Grade 12 SLO		Understand
				[SLO: B-11-H-11]	Describe the exceptions to the Mendel's laws of inheritance.	Grade 12 SLO		Understand
				[SLO: B-11-H-12]	Explain incomplete dominance and exemplify it through the inheritance of flower color in 4 O' clock plant.	Grade 12 SLO		Understand

[SLO: B-11-H-13]	Differentiate between incomplete dominance and codominance.	Grade 12 SLO		Understand
[SLO: B-11-H-14]	Define alleles and multiple alleles	Grade 12 SLO		Remember
[SLO: B-11-H-15]	State the alleles responsible for the trait of ABO blood groups.	Grade 12 SLO		Remember
[SLO: B-11-H-16]	Explain the case where two alleles have equal dominance through the genetics of human blood group AB.	Grade 12 SLO		Understand
[SLO: B-11-H-17]	Name the various human blood group systems.	Grade 12 SLO		Remember
[SLO: B-11-H-18]	Investigate the reasons for O-ve individual as the Universal donor and AB +ve as the Universal recipient.	Grade 12 SLO		Understand
[SLO: B-11-H-19]	Describe the occurrence of some other blood group systems.	Grade 12 SLO		Understand
[SLO: B-11-H-20]	Associate the positive and negative blood groups with the presence and absence of Rh factor.	Grade 12 SLO		Understand
[SLO: B-11-H-21]	Justify why Rh incompatibility could be a danger to the developing fetus and mother.	Grade 12 SLO		Analyse
[SLO: B-11-H-22]	Explain Erythroblastosis fetalis in the light of antigen-antibody reaction.	Grade 12 SLO		Understand
[SLO: B-11-H-23]	Suggest measures to counter the problem of Erythroblastosis fetalis before it occurs.	Grade 12 SLO		Understand
[SLO: B-11-H-24]	Define and relate the terms; polygenic and epistasis.	Grade 12 SLO		Remember
[SLO: B-11-H-25]	Describe polygenic inheritance using suitable examples from plants (grain color in wheat) and animals (skin color in man).	Grade 12 SLO		Understand
[SLO: B-11-H-26]	List at least five polygenic traits discovered in humans.	Grade 12 SLO		Remember
[SLO: B-11-H-27]	Give one example of epistasis from mammals (coat color inheritance in Labrador retrievers) and one from plants (pigment phenotype in foxgloves) and justify modified Mendelian ratios.	Grade 12 SLO		Understand
[SLO: B-11-H-28]	Describe the terms gene linkage and crossing over.	Grade 12 SLO		Understand
[SLO: B-11-H-29]	Explain that gene linkage counters independent assortment and crossing-over modifies the progeny.	Grade 12 SLO		Understand

[SLO: B-11-H-30]	Suggest that linkage can be observed / evaluated only if the number of progeny is quite large.	Grade 12 SLO		Understand
[SLO: B-11-H-31]	Explain the XX-XY mechanism of sex determination in mammals.	Grade 12 SLO		Understand
[SLO: B-11-H-32]	Identify male and female individuals from the karyotype of man.	Grade 12 SLO		Remember
[SLO: B-11-H-33]	Solve the genetics problems related to XX-XY, sex determination.	Grade 12 SLO		
[SLO: B-11-H-34]	Describe the concept of sex-linkage.	Grade 12 SLO		Understand
[SLO: B-11-H-35]	Explain the inheritance of sex-linked traits (eye color) in Drosophila.	Grade 12 SLO		Understand
[SLO: B-11-H-36]	Describe the sex-linked inheritance of male characters due to Y-chromosome and the effect of Hollandric genes.	Grade 12 SLO		Understand
[SLO: B-11-H-37]	Describe the X- linked disorders with reference to the patterns of inheritance.	Grade 12 SLO		Understand
[SLO: B-11-H-38]	Name some of the sex-linked disorders of man (Red green color blindness, Hemophilia) .	Grade 12 SLO		Remember
[SLO: B-11-H-39]	Explain the techniques employed for embryonic screening e.g., Amniocentesis and Chorionic Villus Sampling	Grade 12 SLO		Understand
[SLO: B-11-H-40]	Annotate the detailed structure of a chromosome.	Grade 12 SLO		Understand
[SLO: B-11-H-41]	Narrate the experimental work of Griffith and Hershey-Chase, which proved that DNA is the hereditary material	Grade 12 SLO		Understand
[SLO: B-11-H-42]	Describe the three models proposed about the mechanism of DNA replication.	Grade 12 SLO		Understand
[SLO: B-11-H-43]	Narrate the work of Meselson and Stahl to justify the semi-conservative replication as the correct method of replication.	Grade 12 SLO		Understand
[SLO: B-11-H-44]	Describe the events of the process of DNA replication.	Grade 12 SLO		Understand
[SLO: B-11-H-45]	Describe DNA stability and variability as two characters of the replicating DNA molecule.	Grade 12 SLO		Understand

			[SLO: B-11-H-46]	Describe the characteristics of genetic code (universal, triplet, non-overlapping, degenerate, has no punctuation).	Grade 12 SLO		Understand
			[SLO: B-11-H-47]	Differentiate between the terms genetic code and codon.	Grade 12 SLO		Understand
			[SLO: B-11-H-48]	Explain the mechanism of transcription.	Grade 12 SLO		Understand
			[SLO: B-11-H-49]	Explain why the length of transcribed mRNA molecule (in Eukaryotes) shortens as it enters the cytoplasm for translation.	Grade 12 SLO		Understand
			[SLO: B-11-H-50]	Describe the mechanism of protein synthesis.	Grade 12 SLO		Understand
			[SLO: B-11-H-51]	State the difference between protein synthesis in prokaryotes and eukaryotes	Grade 12 SLO		Understand
			[SLO: B-11-H-52]	Suggest possible ways in which the synthesized protein can be used within or outside a cell that synthesized it.	Grade 12 SLO		Understand
			[SLO: B-11-H-53]	State the importance of the regulation of gene expression.	Grade 12 SLO		Understand
			[SLO: B-11-H-54]	Describe the negative control of gene expression by repressor proteins.	Grade 12 SLO		Understand
			[SLO: B-11-H-55]	Describe the positive control of gene expression by activator proteins.	Grade 12 SLO		Understand
			[SLO: B-11-H-56]	Define mutation and identify various sources of mutation.	Grade 12 SLO		Remember
			[SLO: B-11-H-57]	Differentiate between natural and induced mutations and mutagens.	Grade 12 SLO		Understand
			[SLO: B-11-H-58]	Justify most mutations are harmful.	Grade 12 SLO		Analyse
			[SLO: B-11-H-59]	Rationalize that mutations might be a contributing factor towards evolution.	Grade 12 SLO		Analyse
			[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)	Grade 12 SLO		Understand
			[SLO: B-11-H-61]	Describe the symptoms, causes and possible available treatments of some of the gene mutations	Grade 12 SLO		Understand
	Describe the role of living organisms in their environment, including the relationships between and among biotic and abiotic factors.	Benchmark 1: Students will be able to describe and explain the basic principles of ecology, tropic levels and	[SLO: B-11-N-01]	Define species, population, community and ecosystem.	New SLO	Ambiguous	Remember
			[SLO: B-11-N-02]	Distinguish between the various modes of nutrition different species possess.	New SLO	Ambiguous	Understand

Describe the structure and function of ecosystems, including biomes, communities, populations, and individuals.
Analyze the effects of human activities on the environment and the impact on biodiversity.
Evaluate the methods used to monitor and manage environmental resources, such as habitat restoration and conservation.
Describe the processes that drive the cycling of matter and energy in ecosystems, including photosynthesis, cellular respiration, and decomposition.

energy transfer between them.
Benchmark 2: Students will be able to analyze and interpret ecological data, including species interactions, food webs, energy flow, and nutrient cycling. Additionally, students will be able to evaluate and discuss the impacts of human activities (e.g., pollution, habitat destruction, introduction of non-native species) on ecosystems and biodiversity.

[SLO: B-11-N-03]	Identify plants as producers for converting light energy to chemical energy	New SLO	Ambiguous	Remember
[SLO: B-11-N-04]	Define trophic levels.	New SLO	Ambiguous	Remember
[SLO: B-11-N-05]	Discuss the loss of energy between trophic levels.	New SLO	Ambiguous	Understand
[SLO: B-11-N-06]	Explain the greenhouse effect with examples of gases that exhibit this behavior.	New SLO	Ambiguous	Understand
[SLO: B-11-N-07]	Describe the harmful effects of greenhouse gases on the environment.	New SLO	Ambiguous	Understand
[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.	New SLO	Ambiguous	Understand
[SLO: B-11-N-09]	Define biogeochemical cycles and locate the primary reservoirs of the chemicals in these cycles.	New SLO	Ambiguous	Remember
[SLO: B-11-N-10]	Describe the water cycle in detail.	New SLO	Ambiguous	Understand
[SLO: B-11-N-11]	Define the terms aquifers and water table.	New SLO	Ambiguous	Remember
[SLO: B-11-N-12]	Discuss nitrogen cycle in detail.	New SLO	Ambiguous	Analyse
[SLO: B-11-N-13]	Describe productivity in terms of gross primary productivity and net primary productivity.	New SLO	Ambiguous	Understand
[SLO: B-11-N-14]	Interpret the pyramids of number, biomass and energy.	New SLO	Ambiguous	Apply
[SLO: B-11-N-15]	Define ecological succession as the process through which ecosystems change from simple to complex.	New SLO	Ambiguous	Remember
[SLO: B-11-N-16]	Describe primary and secondary succession.	New SLO	Ambiguous	Understand
[SLO: B-11-N-17]	Differentiate between xerarch and hydrarch succession.	New SLO	Ambiguous	Analyse
[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.	New SLO	Ambiguous	Understand
[SLO: B-11-N-19]	Describe characteristics of a population, such as growth, density, distribution, carrying capacity, minimum/viable size.	New SLO	Ambiguous	Understand
[SLO: B-11-N-20]	Explain the effect of growth of human population on the ecosystem and	New SLO	Ambiguous	Understand
[SLO: B-11-N-21]	Describe the 4 important ecosystems of Pakistan	New SLO	Ambiguous	Understand

Explain the differences in structure and function between prokaryotic and eukaryotic cells.
 Classify and describe the diversity of organisms within the domains of Bacteria and Archaea.
 Describe the unique characteristics and functions of protists, including those that are unicellular, colonial, or multicellular.
 Explain the importance of fungi in the ecosystem, including their role in decomposition, nutrient cycling, and symbiotic relationships with other organisms.
 Compare and contrast the different modes of nutrition and lifestyle of prokaryotes, protists, and fungi.

Benchmark 1: Students will be able to distinguish and compare the structures and functions of prokaryotes, protists, and fungi.
 Benchmark 2: Evaluate the molecular and genetic structures of Bacteria and their life cycles. Benchmark 3: Explain the ecological significance of these organisms, including their role in nutrient cycling, decomposition, and mutualistic relationships.

[SLO: B-11-O-01]	Outline the taxonomic position of prokaryotes in terms of domains archaea and bacteria and in terms of kingdom monera.	Matched SLO		Understand
[SLO: B-11-O-02]	Explain the phylogenetic position of prokaryotes.	Matched SLO		Understand
[SLO: B-11-O-03]	Justify the occurrence of bacteria in the widest range of habitats.	Matched SLO		Create
[SLO: B-11-O-04]	Draw an annotated diagram of a generalized bacterial cell.	Modified(rephrased) SLO		Understand
[SLO: B-11-O-05]	Justify cyanobacteria are considered as the most prominent of the photosynthetic bacteria	New SLO	Ambiguous	Understand
[SLO: B-11-O-06]	Describe detailed structure and chemical composition of bacterial cell wall and other coverings.	Matched SLO		Understand
[SLO: B-11-O-07]	Compare cell wall differences in Gram-positive and Gram-negative bacteria.	Matched SLO		Understand
[SLO: B-11-O-08]	Illustrate with diagrams the great diversity of shapes and sizes found in bacteria.	Matched SLO		Apply
[SLO: B-11-O-09]	Justify the endospore formation in bacteria as a mechanism of survival to withstand unfavorable conditions.	Matched SLO		Understand
[SLO: B-11-O-10]	Explain motility in bacteria.	Matched SLO		Understand
[SLO: B-11-O-11]	Describe with diagram structure of bacterial flagellum.	Matched SLO		Understand
[SLO: B-11-O-12]	Describe genomic organization of bacteria with respect to circular DNA and plasmids..	Matched SLO		Understand
[SLO: B-11-O-13]	Classify bacteria on the basis of methods of obtaining energy and carbon.	Matched SLO		Understand
[SLO: B-11-O-14]	Differentiate between the photosynthesis mechanisms in cyanobacteria and other photosynthetic bacteria.	Modified(rephrased) SLO		Understand
[SLO: B-11-O-15]	List the phases in the growth of bacteria.	Matched SLO		Remember
[SLO: B-11-O-16]	Describe different methods of reproduction in bacteria.	Matched SLO		Understand
[SLO: B-11-O-19]	Describe bacteria as recyclers of nature.Outline the ecological and economic importance of bacteria.	Matched SLO		Understand
[SLO: B-11-O-20]	Explain the use of bacteria in research and technology.	Matched SLO		Understand

Prokaryote			[SLO: B-11-O-21]	Describe important bacterial diseases in man e.g. cholera, typhoid, tuberculosis, and pneumonia; emphasizing their symptoms, causative bacteria, treatments, and preventative measures.	Matched SLO		Understand			
			[SLO: B-11-O-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.	Matched SLO		Understand			
			[SLO: B-11-O-23]	Define the term normal flora.	Matched SLO		Remember			
			[SLO: B-11-O-24]	Describe the benefits of the bacterial flora of humans.	Matched SLO		Understand			
			[SLO: B-11-O-25]	List the chemical and physical methods used to control harmful bacteria.	New SLO	Ambiguous	Remember			
			[SLO: B-11-O-26]	Explain protists as a diverse group of eukaryotes that has polyphyletic origin and defined only by exclusion from other groups.	Matched SLO		Understand			
			[SLO: B-11-O-27]	Describe the salient features with examples of protozoa, algae, myxomycota and oomycota as the major groups of protists.	Matched SLO		Understand			
			[SLO: B-11-O-28]	Justify how protists are important for humans.	Matched SLO		Analyse			
			[SLO: B-11-O-31]	Classify fungi into zygomycota, ascomycota, deuteromycota and basidiomycota and give the diagnostic features of each group.	Matched SLO		Understand			
			[SLO: B-11-O-32]	Explain yeast as unicellular fungi that are used for baking and brewing and are also becoming very important for genetic research.	Matched SLO		Understand			
			[SLO: B-11-O-33]	Name a few fungi from which antibiotics are obtained.	Matched SLO		Remember			
			[SLO: B-11-O-34]	Explain the mutualism established in mycorrhizae and lichen associations.	Matched SLO		Understand			
			[SLO: B-11-O-35]	Give examples of edible fungi.	Matched SLO		Understand			
			[SLO: B-11-O-36]	Describe the ecological impact of fungi causing decomposition and recycling of materials.	Matched SLO		Understand			
			[SLO: B-11-O-37]	Discuss the pathogenic role of fungi.	Matched SLO		Understand			
				Describe the characteristics and diversity of acellular life, including viruses and viroids. Explain the replication and infection cycles of viruses.	Benchmark 1: Students should be able to analyze the role of acellular life forms in maintaining the balance of	[SLO: B-11-P-01]	Justify the status of viruses among living and non-living things.	Matched SLO		Understand
[SLO: B-11-P-02]	Trace the history of viruses since their discovery.	Matched SLO					Understand			

Compare and contrast the structure and function of virus particles.
 Analyze the impacts of viruses on human health and the environment.
 Evaluate the current methods for controlling and preventing viral infections.

ecosystems, causing diseases, and in biotechnology applications. Benchmark 2: Students should be able to analyze the role of acellular life forms in maintaining the balance of ecosystems, causing diseases and the treatment of these diseases.

[SLO: B-11-P-03]	Classify viruses on the bases of their hosts and structure.	Matched SLO		Understand
[SLO: B-11-P-04]	Describe the structure of a model bacteriophage, and HIV and.	Matched SLO		Understand
[SLO: B-11-P-05]	Justify that a virus must have a host cell to parasitize in order to complete its life cycle.	Matched SLO		Evaluate
[SLO: B-11-P-06]	Explain a virus survives inside a host cell, protected from the immune system.	Matched SLO		Understand
[SLO: B-11-P-07]	Determine the method a virus employs to survive/ pass over unfavorable conditions when it does not have a host to complete the life cycle.	Matched SLO		Evaluate
[SLO: B-11-P-08]	Describe the Lytic and Lysogenic life cycles of a virus.	Matched SLO		Understand
[SLO: B-11-P-09]	Outline the usage of bacteriophage in genetic engineering.	Matched SLO		Understand
[SLO: B-11-P-10]	Explain the life cycle of HIV.	Matched SLO		Understand
[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.	Matched SLO		Analyse
[SLO: B-11-P-12]	Reason out the specificity of HIV on its host cells.	Matched SLO		Understand
[SLO: B-11-P-13]	List the symptoms of AIDS.	Matched SLO		Remember
[SLO: B-11-P-14]	Explain opportunistic diseases that may attack an AIDS victim.	Matched SLO		Understand
[SLO: B-11-P-15]	Describe the treatments available for AIDS.	Matched SLO		Understand
[SLO: B-11-P-16]	List some common control measures against the transmission of HIV.	Matched SLO		Remember
[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.	Matched SLO		Understand
[SLO: B-11-P-18]	List the sources of transmission for each of the above-mentioned diseases.	Matched SLO		Remember
[SLO: B-11-P-19]	Describe the structure of prions and viroids.	Matched SLO		Understand
[SLO: B-11-P-20]	List the diseases caused by prions and viroids.	Matched SLO		Remember
[SLO: B-11-P-21]	Interpret how viral infections cause global economic loss.	New SLO	Ambiguous	Apply
[SLO: B-11-P-22]	Describe the limitations of the vaccine for the common cold / flu virus	New SLO	Ambiguous	Understand

Describe the basic structure and anatomy of plant cells and organs, including stems, roots, leaves, and flowers.

Explain the process of photosynthesis, including the role of chlorophyll and other pigments.

Discuss the significance of seeds and the different methods of seed dispersal.

Describe the basic processes of plant growth and development, including germination, shoot and root development, and the role of hormones.

Outline the adaptations that allow plants to survive in different environments, including ways to conserve water, regulate temperature, and defend against herbivores.

Benchmark 1: Students should be able to describe the unique characteristics and adaptations of different types of plants, their life cycles and life processes including respiration, photosynthesis, nutrient intake and movement of water and sugar.

Benchmark 2: Explain osmotic adjustment in plants and be acquainted with growth and movement in plants in response to environmental factors.

[SLO: B-11-Q-01]	List the macro and micronutrients of plants highlighting the role of each nutrient.	Matched SLO		Remember
[SLO: B-11-Q-02]	State the examples of carnivorous plant.	Matched SLO		Remember
[SLO: B-11-Q-03]	Explain the role of stomata and palisade tissue in the exchange of gasses in plants.	Matched SLO		Understand
[SLO: B-11-Q-04]	Relate transpiration with gas exchange in plants.	Matched SLO		Apply
[SLO: B-11-Q-05]	Assess the structure of xylem vessel elements, sieve tube elements, companion cells, tracheids and relate their structures with functions.	Modified(rephrased) SLO		Understand
[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.	Modified(rephrased) SLO		Understand
[SLO: B-11-Q-07]	Describe the movement of water through roots in terms of symplast, apoplast and vacuolar pathways.	Modified(rephrased) SLO		Understand
[SLO: B-11-Q-08]	Explain the movement of water in xylem through TACT mechanism.	Matched SLO		Understand
[SLO: B-11-Q-09]	Describe the mechanisms involved in the opening and closing of stomata.	Matched SLO		Understand
[SLO: B-11-Q-10]	Explain the movement of sugars within plants.	Matched SLO		Understand
[SLO: B-11-Q-11]	Define osmotic adjustment.	Matched SLO		Remember
[SLO: B-11-Q-12]	State movement of water into or out of the cell in isotonic, hypotonic, and hypertonic conditions.	Modified(rephrased) SLO		Understand
[SLO: B-11-Q-13]	Explain the osmotic adjustments in hydrophytic (marine and freshwater), xerophytic and mesophytic plants and plants in saline soil.	Modified(rephrased) SLO		Understand
[SLO: B-11-Q-14]	List the adaptations in plants to cope with low and high temperatures	Matched SLO		Remember
[SLO: B-11-Q-15]	Describe Explain the turgor pressure and its significance in providing support to herbaceous plants.	Matched SLO		Understand
[SLO: B-11-Q-16]	Describe the structure of supporting tissues in plants.	Matched SLO		Understand
[SLO: B-11-Q-17]	Define growth and explain primary and secondary growth in plants.	Matched SLO		Remember
[SLO: B-11-Q-18]	Justify the formation of annual rings	Modified(rephrased) SLO		Understand
[SLO: B-11-Q-19]	Explain influence of apical meristem on the growth of lateral shoots.	Matched SLO		Understand

				[SLO: B-11-Q-20]	outline the role of important plant growth regulators.	Modified(rephrased) SLO		Understand
				[SLO: B-11-Q-21]	Explain the types of movement in plants in response to light, force of gravity, touch and chemicals.	Matched SLO		Understand
				[SLO: B-11-Q-22]	Define photoperiodism.	Matched SLO		Remember
				[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 phytochrome.	Matched SLO		Understand
				[SLO: B-11-Q-24]	Explain the role of low temperature treatment on flower production especially to biennials and perennials.	Matched SLO		Understand

	Students should be understand the essence of scientific experimentation and carry out the necessary steps of understanding the terminology, taking general lab precautions, understanding the lab equipment, recording data and providing suggestions on improving the experimental techniques.	Benchmark 1: Plan the experiment and clearly convey the reasons for the experimental technique to follow. Benchmark 2: Collect data and record observations in the form of readings, estimates and accurate drawings. Benchmark 3: Evaluate and interpret the recorded data and display the calculations and reasoning. Benchmark 4: Analyze the results of the experiment and provide conclusions. Benchmark 5: Identify sources of error and suggesting improvements		[SLO: B-11-X-01]	Decisions relating to measurements and observations	New SLO	Not assessable in summative	Understand
				[SLO: B-11-X-02]	<p>Within an investigation, students should be able to:</p> <ul style="list-style-type: none"> • identify the independent variable and dependent variable • decide a suitable range of values to use for the independent variable at which measurements of the dependent variable are recorded • decide the number of different values of the independent variable (a minimum of five) and the intervals between them • decide how to change the value of the independent variable • decide how the dependent variable should be measured • decide the number of replicates at each value • decide on appropriate controls for the experiment or investigation • decide which variables need to be standardised and how to standardise them. (Variables expected to have a minimal effect, such as variation between test-tubes of the same type, do 	New SLO		Evaluate

				<p>[SLO: B-11-X-03]</p> <p>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). <p>When using the light microscope and photomicrographs, Students should be able to:</p> <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: <ul style="list-style-type: none"> – 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 	New SLO	Not assessable in summative	Understand
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<p>[SLO: B-11-X-04]</p>	<p>Recording data and observations</p> <p>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: <ul style="list-style-type: none"> 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. <p>When using the light microscope and photomicrographs, Students should be able to:</p> <ul style="list-style-type: none"> record the fine details of the specimen, including drawing the detailed shapes of 	<p>New SLO</p>	<p>Not assessable in summative</p>	<p>Understand</p>
<p>[SLO: B-11-X-05]</p>	<p>Display of calculation and reasoning</p>	<p>New SLO</p>	<p>Not assessable in summative</p>	<p>Understand</p>
<p>[SLO: B-11-X-06]</p>	<p>Within an investigation and when using the light microscope and photomicrographs, students should be able to:</p> <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. <p>Layout of data and observations</p>	<p>New SLO</p>		

[SLO: B-11-X-07]	<p>Within an investigation, Students should be able to:</p> <ul style="list-style-type: none"> display data as a graph (continuous data), bar chart (discontinuous or categoric) or histogram (frequency data) draw a graph, bar chart or histogram clearly and accurately with: <ul style="list-style-type: none"> 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 centre 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 	Modified(rephrased) SLO	Not assessable	Understand
SLO: B-11-X-08]	<p>When using the light microscope and photomicrographs, students should be able to:</p> <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 organise comparative observations, showing differences and similarities between specimens. 	New SLO	Not assessable	Understand
[SLO: B-11-X-09]	Interpreting data and observations			Understand

				<p>[SLO: B-11-X-10]</p>	<p>within an investigation, students should be able to:</p> <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. <p>When using the light microscope and photomicrographs, Students should be able to:</p> <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 	<p>Modified(rephrased) SLO</p>	<p>Not assessable in summative</p>	<p>Understand</p>
				<p>[SLO: B-11-X-11]</p>	<p>From results, observations or information provided, students should be able to:</p> <ul style="list-style-type: none"> • summarise 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. 	<p>Modified(rephrased) SLO</p>		

				[SLO: B-11-X-12]	<p>Within an investigation and when using the light microscope and photomicrographs, students should be able to:</p> <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 • 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, including: <ul style="list-style-type: none"> – using a more effective method to standardise 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, 	New SLO	Not assessable in summative	Understand
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