

PLANT BIOTECHNOLOGY SYLLABUS FOR CONDUCTING WRITTEN EXAMINATION FOR DIRECT RECRUITMENT OF TEACHING POSTS IN THE CADRE OF ASSISTANT PROFESSORS AT UASM		
Sl. No.	Subject	Content
1.	Cell Structure and Function	Prokaryotic and eukaryotic cell architecture, Cell wall, plasma membrane, Structure and function of cell organelles: vacuoles, mitochondria, plastids, golgi apparatus, ER, peroxisomes, glyoxisomes. Cell division, regulation of cell cycle, Protein secretion and targeting, Cell division, growth and differentiation.
2.	Biomolecules and Metabolism	Structure and function of carbohydrates, lipids, proteins and nucleic acids, Synthesis of carbohydrate, glycolysis, HMP, Citric acid cycle and metabolic regulation, Oxidative phosphorylation and substrate level phosphorylation, Vitamins, plant and animal hormones. Functional molecules, antioxidants, nutrient precursor, HSPs, anti-viral compounds.
3.	Enzymology	Enzymes, structure conformation, classification, assay, isolation, purification and characterization, catariysis specificity, mechanism of action, active site, regulation of enzyme activity, multienzyme complexes, immobilized enzymes and protein engineering, immobilized enzymes and their application.
4.	Molecular Genetics.	Concept of gene, Prokaryotes as genetic system, Prokaryotic and eukaryotic chromosomes, methods of gene isolation and identification, Split genes, overlapping genes and pseudo genes, Organization of prokaryotic and eukaryotic genes and genomes including operan, exon, intron, enhancer promoter sequences and other regulatory elements. Mutation spontaneous, induced and site-directed, recombination in

		bacteria, fungi and viruses, transformation, transduction, conjugation, transposable elements and transposition.
5.	Gene Expression	Expression of genetic information, operon concept, Transcription mechanism of transcription in prokaryotes and eukaryotes, transcription unit, regulatory sequences. and enhancers, activators, repressors, co-activators, Co-repressors in prokaryotes and eukaryotes, inducible genes and promoters, Transcription factors post transcriptional modification and protein transport, DNA-protein interaction, Genetic code. Mechanism of translation and its control, post translational modifications.
6.	Molecular Biology Techniques	Isolation and purification of nucleic acids. Nucleic acids hybridization: Southern, northern and western blotting hybridization. Immune response monoclonal and polyclonal antibodies and ELISA, DNA sequencing Construction and screening of genomic and C-DNA libraries. Gel electrophoretic techniques. Polymerase chain reactor spectroscopy, rtPCR ultracentrifugation, chromatography, FISH, RIA etc.
7.	Gene Cloning	Restriction enzymes and their uses. Salient features and uses of most commonly used vectors ie. plasmids, bacteriophages, phagmids, cosmids, BACA, PACs and YACS, binary vectors, expression vectors Gene cloning and sub-cloning strategies, chromosome walking, genetic transformation, Basis of animal cloning. Biology. Risk assessment and IPR.
8.	Molecular Biology	Ribosome structure and function. Protein biosynthesis in prokaryotes and ekaryotes. Post-translational modification. Gene regulation, RNA processing and Post transcriptional

		modifications. Bioprospecting, biofortification, gene pyrimiding and gene fusion, nhozyme technology.
9.	Plant Molecular Biology	Photoregulation and phytochrome regulation of nuclear and chloroplastic gene expression. Molecular mechanism of nitrogen fixation. Molecular biology of various stresses, viz abiotic stresses like drought, salt, heavy metals and temperature, and biotic stresses like bacterial, fungal and viral diseases. Signal transduction and its molecular basis, molecular mechanism of plant hormone action mitochondrial control of fertility, structure, organization and regulation of nuclear gene concerning storage proteins and starch synthesis.
10.	Tissue Culture	Basic techniques in cell culture and somatic cell genetics. Regulation of cell cycle and cell division... Clonal propagation. Concept of cellular totipotency. Anther culture, somaclonal and gametoclonal variations. Hybrid embryo culture and embryo rescue, somatic hybridization and cybridization. Application of tissue culture in crop improvement Secondary metabolite production. In vitro, mutagenesis, cryopreservation and plant tissue culture repository.
11.	Plant Genetic Engineering	Isolation of genes of economic importance. Gene constructs for tissue-specific expression. Different methods of gene transfer to plants, viz direct and vector- mediated. Molecular analysis of transformants. Potential applications of plant genetic engineering for crop improvement, i.e. insect-pest resistance (insect, viral, fungal and bacterial disease resistancej, abiotic stress resistance, herbicide resistance, storage protein quality, increasing shelf-life, oil quality,

		Current status of transgenics, biosafety norms and controlled field trials and release of transgenics (GMOs).
12.	Molecular Markers and Genomics	DNA molecular markers: Principles, type and applications; restriction fragment length. polymorphism (RFLP), amplified fragment length polymorphism (AFLP), randomly amplified polymorphic DNA sequences (RAPD), Simple sequence repeats (SSR), Single nucleotide polymorphism (SNP), Structural and functional genomics, gene mapping, genome mapping, gene tagging and comparative genomics and application of genomics.