AWADHESH PRATAP SINGH UNIVERSITY, REWA (M.P.) 486003

Pre-Ph.D. Entrance Test Syllabus

Biotechnology

2022-23 Onwards

Awadhesh Pratap Singh University, Rewa (M.P.)486003

Syllabus for Ph.D. Entrance test (2022)

Subject- Biotechnology

Part-A

Paper-I - Research Methodology

Unit-I

Databases and research metrics, Database indexing database, citation databases: Web of science Scopus, etc.

Research matrics: impact factor of journal as per journal citation report. SNIP, SIR, IPP, cite score.

Matrics: h-index, g index, i10 index, altmatrics, population genetics, hardy-Weinberg law, genotype and allele frequency distribution, genetic drift.

Unit-II

Paper writing and report and report generation: Basic concept of paper/thesis writing and report generation, writing research abstract, introduction, Review of literature. Result, Conclusion, concept of Bibliography and References, significance of report writing steps of report writing, formats of publication in research journal/ book/ conference etc.

Unit-III

Publication Ethics: definition, introduction and importance, best practices/ standards setting.

Initiatives and guidelines: COPE, WAME, etc.

Publication misconduct: definition, concept, problems that lead to unethical behaviour and Vice-versa, types violation of publication ethics, authorship and contributor ship, identification of publication misconduct, complaints and appeals, predatory publishers and journals.

Unit-IV

Using computer in research: Basics of operating system-handling different operating system (Windows).

Bioinformatics: Genomics, proteomics, NCBI, Pubmed, BLAST, FASTA, literature survey using web, handling search engines(Wolfram and google scholar),

Preparation Presentations: Research paper using word processing software- Ms Word, drawing graphs and diagram- Excel,

Seminar Presentation: power point for oral and poster presentations.

Unit-V

Analytical & chromatographic methods: affinity chromatography, paper and thin layer chromatography, size exclusion chromatography, HPLC, TLC, Gas chromatography.

Microscopic technique: Light microscope, compound microscope, phase contrast microscope, Electron microscope, TEM and SEM.

DNA Damage analysis, comet assay, cloning and transformation techniques.Spectroscopic technique of analysis, spectrophotometers single and double beam, UV Visible spectrophotometry, IR-spectroscopy, NMR, Mass spectroscopy, Raman spectrophotometer, Atomic absorption spectrophotometer, flame photometer.

Part -B

Unit-I

Subject- Cell Biology & Biochemistry

Protein targeting and molecular mechanisms of vesicular transport.

Intracellular digestion: Ultra-structure and function of lysosomes nutrient uptake and excretion, transport by vesicle formation, Endocytosis and Exocytosis, Cell signaling, signaling via G-Protein linked and enzyme linked cell surface receptors, MAP kinase pathways, interaction and regulation of signalling pathways, Bacterial chemotaxis and quorum sensing.

Lipids: classification, nomenclature Role of prostaglandin leukotrins and thromboxans, lipids associated with disease, diagnosis and treatment.

Polypeptides- conformational properties of polypeptides, protein sequencing methods.

Methods of enzyme assay: continuous & sampling techniques, coupled kinetic assays significance of enzyme turn over number, specific activity.

Enzyme immobilization: experimental procedures and effect on kinetic parameters.

Unit-II

Molecular biology and genetic engineering

Human genetics (pedigree analysis, karyotypes and genetic disorder)

Regulation of gene expression in prokaryotes: operon concept, induction and repression, structure and regulation of lactose, arabinose and tryptophan operons, post transcriptional modification eukaryotes, 5' and 3' modification of m-RNA, molecular recombination.

DNA libraries: types, advantages and disadvantages of different types of libraries: different methods for constructing genomic and fulllength cDNA libraries.

Si RNA technology: Micro RNA construction of Si RNA vectors, gene silencing and its applications in agro industry.

(3) **Statistical Inference:** Estimation and hypothesis testing, Statistical estimation, Statistical hypothesis, Testing, Comparison of variances in independent samples, Test of equality of more than two variances. Confidence limits for a variance. T-test.

UNIT-IV

(1) **Introduction to computers and their applications:** Concepts of operating system, Software and database management system, Basics of internet and e-mailing. Microsoft office.

(2) **Computer networks and internet** (ftp, http, www) Introduction to neural networks. Exploring various website, search engines for collection of quality literature and secondary data.

(3) **Introductory bioinformatics:** Scope, application and challenges of bioinformatics. Useful bioinformatics websites. Introduction to genetic algorithms.

(4) **Retrieval of biological data** (entrez, srs and dbget/linkdb) Database searches: FASTA and BLAST, sequence filters, iterative database searches and psi-BLAST).

(5) **Sequence alignment:** Methods and applications of gene and protein families. Methods and applications of phylogenetic trees (phylip etc.)

(6) **Genomics and Proteomics:** Whole genome analysis, comparative genomics, paralogs and orthologs, second generation sequence analysis, Structure prediction and 2D analysis of protein.

(7) Introduction to drug designing, primer designing.

UNIT - V

(1) **Bioenergetics:** First and Second Law of Thermodynamics, Concept of enthalpy (H) entropy (S) and free energy (G), High and low energy phosphate compounds, Oxidation - reduction reaction, Activation energy, ATP and its hydrolysis, Types of bonds.

(2) **Buffers:** The Henderson-Hasselbalch equation, Titration and buffers, Physiological buffers(bi-carbonate buffer, protein/ amino acids and buffer system).

(3) **Principles and applications**: Microscopy, Chromatography, Electrophoresis, centrifugation, Spectro-photometry and Colorimetry.

(4)Radioactivity: Disintegration of radionuclide, Half life of radioactive compounds, Measurement of radioactivity, Scintillation counting, isotopic tracer technique, Autoradiography, Use of isotopes in vivo and in vitro labeling, Radio-diagnosis.

(5) **Techniques used in Recombinant DNA technology:** Cloning vectors, Cloning in Bacteria and Eukaryotes, Construction ans screening of genomic and cDNA library, Application of recombinant DNA technology in medicine and agriculture, GMO, Application of gene cloning in synthesis of drug and enzymes (insulin, interferons).

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