



University of Pretoria Yearbook 2017

Macromolecules of life: Structure-function and Bioinformatics 356 (BCM 356)

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| Qualification | Undergraduate |
| Faculty | Faculty of Natural and Agricultural Sciences |
| Module credits | 18.00 |
| Programmes | BSc Biochemistry BSc Biotechnology BSc Chemistry BSc Entomology BSc Genetics BSc Human Genetics BSc Human Physiology BSc Microbiology BSc Nutrition BSc Plant Science BSc Zoology |
| Prerequisites | BCM 251 and BCM 252 |
| Contact time | 180 minute practical per week, 2 lectures per week |
| Language of tuition | Afrikaans and English is used in one class |
| Academic organisation | Biochemistry |
| Period of presentation | Semester 1 |



Module content

Perspectives on the flow of information from nucleic acids to proteins, the structure and functions of nucleic acids and proteins and their organisation into hierarchical, interdependent systems. Nucleic acid structure as observed in fibres and crystals as well as global DNA and RNA analyses (methods and bioinformatic analyses). Biochemical analyses of nucleotides. DNA-DNA recognition: non-standard and higher order DNA structures. The RNA structural world, RNAi, miRNA and ribosomes. Cellular functions of coding and non-coding nucleic acids. Principles of small molecule-DNA recognition. Principles of protein-DNA recognition and interactions. Bioinformatics predictions of protein and small molecule DNA interactions. Chemical reactivity of amino acids. Domain structures of proteins and Ramachandran plots. Protein folding, sequence motifs and domains, higher order and supramolecular structure, self-assembly, conjugated proteins, post-translational modifications, conjugated proteins and bioinformatics predictions. Principles of protein function and protein structure relationships. Protein-ligand and protein-protein interactions. Protein aggregation in disease. Examples of the diverse functions of proteins and peptides, including enzymes, hormones, neurotransmitters, antibodies, receptors, transport and membrane proteins. Global analysis of proteins through proteomics. Basic principles of nuclear magnetic resonance, mass spectrometry and X-ray crystallography. Protein purification and characterization including, pI, molecular mass, amino acid composition and sequence. Practical training will include interactive computer-guided demonstrations of protein analysis, hands-on practical sessions for nucleic acid purification and chemical structure characterisation, protein expression and purification (including SDS-PAGE), protein sequence analysis including mass spectrometry, protein structure analysis by 3D protein modelling and protein folding (Bioinformatics).

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