

Biochemistry-genomics spec.

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| 1. | Genetic background of diseases affecting large populations (at least three examples): from the genes to functional proteins. |
| 2. | The role of oncogenes and tumor suppressor genes in cell proliferation: diseases caused by these mutations. |
| 3. | Molecular biology techniques and model systems used in mapping the molecular mechanisms of diseases. |
| 4. | DNA and protein sequence databases: description of their structure and research applications through specific examples for each. |
| 5. | Gene expression databases, statistical methods used in gene expression analyses. |
| 6. | Derived (non-sequence) databases and their utilization in molecular biology. |
| 7. | Protein structure, methods for the structural analysis of proteins. |
| 8. | Protein motifs and domains, their significance in protein structures. |
| 9. | Protein-nucleotide and protein-DNA interactions with specific examples for each. |
| 10. | Methods and strategies for protein purification. Chromatographic methods in protein purification. |

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| 11. | Qualitative and quantitative characterisation of purified proteins. Electrophoretic methods in protein biochemistry. |
| 12. | Mass spectrometry in proteomics. MALDI and electrospray ionization techniques. |
| 13. | Characterisation of protein expression patterns: 2D electrophoresis, 2D chromatography. |
| 14. | Detection of protein-protein interactions, analysis of protein networks. |
| 15. | Characterization of enzymes. The Michaelis-Menten kinetics. |
| 16. | Types of enzyme inhibition and their kinetic description. |
| 17. | Practical aspects of enzyme quantification. |
| 18. | Enzyme regulation. Kinetics of allosteric enzymes. |
| 19. | Levels and significance of enzyme organization. |
| 20. | Mechanisms of activation and inactivation of signal transduction pathways. |

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| 21. | Secondary messengers (cAMP, cGMP, IP3, phospholipids) and their role in regulating cellular processes. |
| 22. | The role of phosphorylation and dephosphorylation in signal transduction: classification of protein kinases and phosphatases and their roles in signal transduction. |
| 23. | The correlation between diseases and signal transduction defects: description of 3 signalling related human diseases. |
| 24. | Experimental approaches to study eukaryotic gene expression. |
| 25. | Modulation of gene expression, gene therapy. |