BIOTECHNOLOGY
EXAMINATION TOPICS FOR
BACHELOR'S DIPLOMA EXAM
VALID FROM 2022/2023

1. Propose a method to assess the quality of a bacterial or cell culture using microscopic techniques.
2. Present the possibilities of using databases to obtain information concerning amino acid sequences of proteins with industrial potential.
3. Explain the significance of cell death type in terms of the efficacy of cancer therapy.
4. Describe the known molecular mechanisms that violate the basic principles of the central dogma of molecular biology.
5. Describe the mechanism of immune response evasion by bacteria.
6. Present the mechanisms of DNA damage repair.
7. Present the molecular mechanisms of inheritance and sex-linked diseases.
8. How does regulating metabolic processes affect bioprocess performance?
9. Present selected metabolic pathways and cycles as tools in biotechnology.
10. Present how the mechanisms of substance transport in biological systems affect the efficiency of a biotechnological process.
11. Applying atomic force microscopy in biological research.
12. Present the functions of the blood and the process of haematopoiesis.
13. What impact does plant and cell water metabolism have on the process of obtaining plant biomass.
14. Discuss the use of *in vitro* plant tissue cultures in biotechnology.
15. Characteristics of antibodies, their types and functions.
16. Propose the application of a biotechnological process involving environmental bacteria to bioremediate an environment contaminated with heavy metals.
17. Using horizontal gene transfer to construct bacterial strains with industrial potential.
18. Present enzyme testing methods - isolation and purification, determination of enzyme activity.
19. Present the stages of protein biosynthesis.
20. GMO raw materials used in food production: economic meaning, environmental aspects, and regulations related to their use.
21. Present the basics of phylogenetic tree formation.
22. Describe the methods for improving industrial microorganisms.
23. Present the stages for preparing and running a bioprocess in a bioreactor.
24. Characterise the human microbiome and its importance in chronic diseases.
25. Describe a selected biotechnological process in food production.
26. The importance of isotopes in chemistry, biology, and medicine. The characteristics of spontaneous nuclear transformations.
27. Enzymatic reactions. Provide examples and methods for determining the rate of an enzymatic reaction.
28. Discuss the theories of acids and bases using selected chemical compounds as examples.
29. Provide the definition of a buffer solution. Using selected examples, discuss chemical/biochemical reactions or processes in terms of which the buffering process is crucial.

30. Colloids and surfactants - definitions and properties. Examples of application in biotechnology processes.
31. Strong oxidants and reducing agents and their importance in biotechnology. Examples of redox reactions (the impact of pH on the course of processes).
32. What is a chiral atom in a chemical molecule? Provide examples of chemical compounds containing chiral atoms and the importance of chirality in biochemical processes.
33. Carbohydrates - division, structure. Examples of carbohydrate catabolic processes.
34. Aromatic compounds - structure, methods of preparation, and use.
35. Discuss the physical and chemical properties of amino acids. Briefly discuss the chemical structure of proteins. Explain the terms 1st, 2nd, 3rd, and 4th order structure.
36. Construction and structure of nucleic acids.
37. Structure and properties of fatty acids and glycosides, biological functions and applications in biotechnology.
38. Discuss spectroscopic methods used for determining the structure of chemical compounds.
39. Discuss the theoretical basics and differences between IR, UV-VIS, and Raman spectroscopy. Provide examples of applying these methods in biotechnology research.
40. What are the principles of applying spectroscopy in structural and quantitative analysis of proteins? What spectroscopic methods/techniques are used here?
41. A random variable and its distribution versus statistical analysis and selection of a statistical test.
42. How to use a given statistical test to assess the statistical significance of a test sample in relation to a control sample.
43. Characterise the biotechnological methods of dealing with wastewater and waste.
44. What is chemical equilibrium? What factors have an impact on the position of the chemical equilibrium and what relevance do they have for biotechnological processes?
45. Hydrogen bonds and their role in biological systems.