

Food Science and Technology MSc Final exam II.
Differentiated Professional Knowledge
Food biotechnology specialization
Academic year 2022/2023

A. Applied biotechnology

- 1) Kinetics of microbial growth and formation of products
- 2) Microbial and enzymic hydrolysis, oxidation/reduction: biocatalysts and processes
- 3) Principle of downstream process. Design and optimisation
- 4) Cell disruption: structure of cell wall, kinetics, methods and equipment
- 5) Chromatography in food biotechnology: importance, principle, process and methods.
- 6) Immobilisation of biocatalysts: importance, theory and methods. Criteria for selection of carriers for food application.
- 7) Immobilized biocatalysts in food biotechnology: production of isosugar, lactose-free milk, treatment of whey, integrated system for alcoholic fermentation, transesterification.
- 8) Malting technology: physiology and biochemistry. Production of different malts.
- 9) Mashing technology in alcoholic fermentation: importance, principles, biochemistry, state-of-art mashing technology. Methods for pretreatment of raw materials.
- 10) Fermentation technology: principle and technology of batch fermentation, fed-batch fermentation, semi-continuous and continuous fermentation. Production yield, efficient and economical aspects
- 11) Alcoholic fermentation: metabolism, formation of aromatic compounds. Production of alcoholic drinks.
- 12) Fermented foods: biochemistry, physiology and stability. Changes (nutrient, taste, texture, sensory) of foods during fermentation process. Concept of functional foods.

B. Microbial genetics and Molecular biology

- 1) Prokaryotic genome: Structure and function of prokaryotic chromosomes; transposons and plasmids. Genetic map of bacteria.
- 2) Eukaryotic genome: Structure and function of nuclear genome. Transposons and plasmids, VLPs in fungi. Mitochondrial genome.
- 3) Mutation: mutant types. Mutagenes and their mode of action. Reversion, reparation of mutations. Detection of mutagenes (Ames test).
- 4) Horizontal gene transfer and natural recombination in prokaryotes: transformation, transduction and conjugation.
- 5) Yeast as an eukaryotic cell model. Life cycle and mating process in *Saccharomyces cerevisiae*. Nuclear and mitochondrial inheritance in yeasts.
- 6) Structure and characteristics of nucleic acids (DNA and RNA). DNA replication: general mechanism and replication of circular and linear DNA genomic constituents.
- 7) Gene expression: transcription and translation in prokaryotic and eukaryotic organisms. Regulation of gene expression in bacteria and eukaryotes.
- 8) Basic methods of molecular biology: isolation, and denaturation of nucleic acids. Separation of DNA by gel electrophoresis. Labelling of nucleic acids and molecular hybridization methods.
- 9) Enzymes used in molecular biology (restriction endonucleases, DNA polymerases, reverse transcriptase and ligase). Polymerase chain (PCR) reaction. DNA sequencing methods.
- 10) Molecular analysis of microbes. Methods used for identification and typing of microbes (Non-PCR and PCR based methods).
- 11) Molecular cloning. Cloning vectors for cloning in prokaryotic and eukaryotic organisms. Construction of genomic and cDNA libraries.
- 12) Application of genetic engineering for production of genetically modified organisms (GMOs). Application of genetically modified microorganisms (GMMs) for biotechnological purposes.