**Agronomy**

1. Land management in modern Europe
2. Role of grasslands in the environment
3. Plant raw materials as foodstuffs and feedstuffs
4. Water resources management in agriculture
5. Specific characteristics of agricultural production
6. Land use structure in Poland and Europe
7. Agricultural management systems
8. Major factors of crop production
9. World and domestic cereal grain markets – changing trends
10. World and domestic starch and sugar markets – changing trends
11. World and domestic legume markets – changing trends
12. World and domestic oilseed markets – changing trends
13. Soil management systems
14. Technological progress and its determinants
15. Factors affecting the quality of plant raw materials. Quality assessment
16. Biological, breeding and varietal progress
17. GMO – legislation, benefits and threats
18. Non-agricultural functions of rural areas
19. Non-food agriculture
20. Biomass as a source of renewable energy – today and tomorrow

**ANIMAL SCIENCES**

1. What is the Three Rs (3Rs) principle that must be followed in animal testing and experimentation?
2. Vegetable protein sources used in monogastric animal nutrition
3. Transgenic animals.
4. Factors affecting the quality of basic row materials obtaining from cattle.
5. Central dogma in molecular biology.
6. The importance of cattle rearing and breeding in the world.
7. Factors influencing the slaughter value of animals
8. Directions of using livestock.
9. Livestock maintenance systems.
10. Modern systems for maintaining dairy cows.
11. Gene mutations and their effect on the animals phenotype.
12. Genetic markers and their practical application in animal husbandry.
13. The role of carbohydrate compounds in animal nutrition.
14. Purpose and principles of using light programs in poultry breeding.
15. Factors influencing the slaughter value of poultry.
16. DNA structure and organization of genetic material in animals.
17. The main stages of egg cell fertilization.
18. Single genes of major effect in livestock.
19. Applications of biotechnological methods in animal reproduction.
20. Sperm biochemical markers and their role in semen quality assessment

**BIOLOGY**

1. Model organisms in biological research.
2. The concept of the species - types and mechanisms of speciation.
3. Natural selection and genetic drift - importance in evolution.
4. Integration of metabolic processes.
5. Integration of ecological system functions.
6. Signaling and transmission of information in an animal cell.
7. Quorum sensing - the molecular basis and the importance of intercellular signaling in bacteria.
8. Application of molecular biology methods in medicine - disorders of gene expression in disease states, gene therapy.
9. Application of molecular biology methods in ecology and species protection.
10. Application of molecular biology methods in evolutionary biology - molecular clock concept, phylogenesis, gene flow, sexual selection.
11. Genetic markers and their use.
12. The concept of a selfish gene.
13. Regulation of gene expression
14. Adaptations to environment on the molecular, physiological and morphological level.
15. Bacterial biofilms and their role in nature, medicine and environmental protection.
16. Hormonal regulation of seed dormancy and germination.
17. Hormonal regulation of reproduction of animals.
18. Biological basis of tolerance to environmental stress.
19. Global changes of the Earth's environment - time and space in the dynamics of natural systems.
20. Projected impact of climate change on populations, species and ecosystems.

**BIOTECHNOLOGY**

1. Model organisms in biotechnology research.
2. Biological concept of the species – reproductive and genetic isolation and horizontal gene transfer.
3. Ecological systems – homeostasis, dynamics and evolution of systems.
4. Are transgenic organisms a threat to species diversity of the biosphere?
5. Integration of metabolic processes.
6. Signaling and transmission of information in an animal cell - characterization of basic signal transduction pathways.
7. Regulation of gene expression.
8. Epigenetic changes.
9. Modern methods for the analysis of gene and protein expression.
10. Cloning of mammals - biotechnology and ethics.
11. Molecular mechanisms of fertilization in mammals - in vitro fertilization technology.
12. Application of molecular biology methods in biotechnology - animal transgenesis, tissue engineering, manipulation of gametes and embryos, gene therapies.
13. Stem cells in organ regeneration - biotechnology opportunities.
14. Mechanisms of action of biologically active substances in cells.
15. Genetic markers and their use.
16. Bacterial biofilms and their role in nature, medicine and environmental protection.
17. Hormonal regulation of dormancy and germination of seeds.
18. Hormonal regulation of reproduction of animals.
19. Diagnostic and research methods used in biotechnology.
20. Bioinformatic analysis of High-Throughput Genomic Sequence data.

**ECOLOGICAL ENGINEERING**

1. Main sources of pollution of surface waters.
2. Eutrophication of lakes - causes and effects.
3. Chemical methods of lakes reclamation.
4. Technologies for the removal of natural organic pollutants from drinking water.
5. Membrane technologies used for water treatment.
6. Technologies and mechanism for removing nitrogen compounds from wastewater.
7. Technologies and mechanism for the removal of phosphorus from wastewater.
8. Methods of sewage sludge processing.
9. Biological-mechanical treatment (BMT) of solid waste.
10. Biofuels, types, production technologies, examples of application.
11. Technologies for biodiesel production.
12. Technologies for bioethanol production.
13. Technologies for biogas production.
14. Technologies for sewage sludge composting.
15. Stabilization processes used to dispose of mixed municipal waste.
16. Soil remediation techniques, design principles.
17. Characteristics of water and wastewater systems.
18. Water and wastewater systems used in industrial plants.
19. Alternative and renewable energy sources - similarities and differences.
20. Methods of direct sun energy processing.

**Environmental Management**

1. Sources of environmental pollution
2. Sustainable civilization development
3. Renewable and non-renewable energy resources
4. Remediation of degraded lands (stages, directions, methods)
5. Non-agricultural uses of crop plants
6. Genetically modified crops
7. Water resources management
8. Role of water in the environment
9. Sustainable industrial waste management
10. Sustainable municipal waste management
11. Role of microorganisms in the environment
12. Biodiversity
13. Air pollution and protection
14. Greenhouse effect
15. Importance of forests in the environment
16. Pollinators and their importance in changing landscapes
17. Role of insects in ecosystems
18. Chemical crop protection vs. environmental protection
19. Ecological importance of trees
20. Research methods for environmental studies (observations, experiments)

**FISHERIES**

1. Global water resources in aquaculture and fishery management.
2. The impact of fisheries and aquaculture on the aquatic environment.
3. Aquatic ecosystems protection (aquatic organisms protection).
4. The economic importance of salmonid and sturgeon fish in Poland.
5. The biological and economic importance of *Cyprinidae* in Poland.
6. Biology and economic importance of *Pericidae* in Poland.
7. Migration of fish.
8. Fishery economy in dam reservoirs.
9. Fisheries and limnological classifications of lakes.
10. The impact of river and stream regulation on the ichthyofauna and aquatic environment.
11. Fish protection (methods, classification).
12. Intensive technologies for fish production.
13. Technologies of fish stocking materials (reproduction, rearing, transport, release).
14. Natural reproduction of fish (migratory and stationary fish).
15. Artificial (controlled) fish reproduction; methods, technologies.
16. Fish nutrition - types of food, technologies of feed production.
17. Capture of aquatic organisms; types of instruments and methods of fishing.
18. Biotechnological methods in fisheries and aquaculture.
19. Processing of fish and aquatic organisms.
20. Fish and crayfish diseases; identification, prevention, treatment.

**FOOD TECHNOLOGY AND NUTRITION**

1. Characteristics of conventional and non-conventional resources of food industry
2. Biologically active food components.
3. Water, its consumption, quality and technological significance in food industry.
4. Packages – technology, classification, materials and new trends.
5. New categories of food (functional, convenience, transgenic).
6. Utilization of waste and waste-free technologies in food industry.
7. Preservation of resources and products of food industry.
8. Characteristics of main food components (proteins, sugars, lipids).
9. Enzymatic and chemical processes in food technology.
10. Utilization of microorganisms and fermentation in food production.
11. Technological processes and their influence on biological value of food.
12. Biological methods of food preservation.
13. Food preservation – novel methods and techniques.
14. Energy balance of human organism and nutritional status.
15. Nutritional value of food and methods of its evaluation.
16. Principles of nutrition and basics of nutritional prophylaxis.
17. Food additives – classification, nutritional, technological and legal aspects.
18. Sensory properties of food – their significance and methods of evaluation.
19. Risks associated with foods and their prevention.
20. Food balance in Poland and in the world.

**VETERINARY MEDICINE**

1. Reaction of cells and tissues to viral, bacterial and fungal infections.
2. Stem cells in veterinary medicine – present and perspectives.
3. Ectoparasites in farm and pet animals.
4. Intoxications with poisonous plants in farm animals.
5. Mechanisms of bacterial pathogenicity.
6. Mechanisms of organism resistance.
7. Autoimmune diseases in animals.
8. Endocrine regulations in animal organism.
9. Functions and pathology of urinary tract.
10. Digestion and absorption in animals – interspecies differences.
11. Positive effects of microorganisms in food and fodder – selected examples.
12. Threats to humans associated with the presence of Salmonella sp. in food.
13. Diagnostic imaging in veterinary medicine.
14. Wound treatment in veterinary medicine.
15. Drugs metabolism in organism.
16. Drug interactions in veterinary medicine.
17. Inflammatory conditions therapy.
18. Laboratory diagnostics in liver diseases.
19. Carcinogenesis and malignant cells characteristics.
20. Inflammation and pyrexia pathogenesis.