15. (a) Explain the principle and applications of immunofluorescence.

Or

(b) Describe the steps involved in the FlSH technique.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Describe the process of innate and acquired immunity.

17. Outline the mechanisms that contribute to antibody diversity in the immune system.

18. Describe the nature of tumour antigens and the mechanisms by which the immune system recognizes and responds to tumour cells.

19. Outline an overview of the complement system and the biological functions of key complement proteins.

20. Describe the Enzyme-Linked Immunosorbent Assay technique, and discuss the advantages and limitations of the method.

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NOVEMBER/DECEMBER 2024

23PBT33 — BIOPROCESS TECHNOLOGY

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define fermentation.

2. What is batch culture?

3. Define fermenter.

4. What are the uses of antibiotics?

5. Give examples for physiological method of cell disruption.

6. Define flocculation.

7. What is downstream processing?

8. Define crystallization.

9. Define aerobic fermentation.

10. What is primary metabolite?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Explain solid substrate for fermentation.

Or

(b) Infer the application of immobilized enzyme.

12. (a) Differentiate mechanically agitated reactors with non-agitated reactors.

Or

(b) Illustrate the importance of sterilization process.

13. (a) Explain the filtration process in fermentation process.

Or

(b) Infer about the sedimentation on fermentation.

14. (a) Explain the principles of sedimentation.

Or

(b) Infer about filtration technique.

15. (a) Illustrate about the role anaerobic fermentation in biotechnology.

Or

(b) Elaborate about effluent treatment.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Elaborate about microbial cell culture and its applications.

17. Discuss the production of citric acid by fermentation process.

18. Explain the extraction principle involved in fermentation process.

19. Describe the chromatographic technique involved in fermentation.

20. Illustrate the commercially important secondary metabolites.

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NOVEMBER/DECEMBER 2024

23PEBT34A — NANO BIOTECHNOLOGY (Elective V)

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define nanotechnology.
2. What is size-dependent variation in the properties of nanomaterials?
3. What is bottom-up approach in nanomaterial synthesis?
4. Define magnetic nanoparticles.
5. What is the role of nanotechnology in dentistry?
6. What is a biosensor?
7. How do nanoparticles help in cancer therapy?
8. Define the term "drug release mechanism."
9. What are the bio-toxicity of nanoparticles?
10. What is the cellular interaction of scaffolds used in implants?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Describe the key aspects of Feynman's vision of nanotechnology.

Or

(b) Classify nanobiomaterials with examples.

12. (a) Compare and contrast top-down and bottom-up approaches in nanomaterial synthesis.

Or

(b) Explain the biosynthesis of nanomaterials with an example.

13. (a) Explain the role of nanotechnology in the textile industry and highlighting its advantages.

Or

(b) How are nanomaterials utilized in food packaging and preservation?

14. (a) Discuss the role of nanomaterials in modern diagnostic techniques.

Or

(b) Describe the mechanism of targeted drug delivery using nanocarriers.

15. (a) Explain the biological responses to implant materials and scaffolds used in medical applications.

Or

(b) Discuss the bio-toxicity of nanoparticles and its implications on human health.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the different types of nanomaterials and their properties in detail.

17. Discuss the quantum dots and magnetic nanoparticles with their applications.

18. Discuss about the applications of nanomaterials in bone substitutes and their role in enhancing bone regeneration in detail.

19. Explain the implications of drug delivery using nanomaterials, focusing on their advantages.

20. Describe about the risk assessment and safety regulation of nanoparticles in detail.

NOVEMBER/DECEMBER 2024

23PSBT35 — GENE MANIPULATION TECHNOLOGY (SET II)

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Mention the role of agarose in gel electrophoresis.

2. What are the types of vectors?

3. Define cDNA library.

4. Give the applications of genomic libraries.

5. Define genome.

6. Give the applications of whole genome shotgun sequencing.

7. What are therapeutic proteins?

8. Mention the role of machine learning in protein engineering.

9. What are reporter genes?

10. Give examples for transgenic plants.

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Explain autoradiography with its applications.

Or

(b) Explain how agarose gel electrophoresis is used to select recombinant DNA molecules.

12. (a) Compare between BAC and YAC vectors.

Or

(b) How chromosome walking is used to identify and isolate specific genes?

13. (a) Explain the DNA microarray technique and give its applications.

Or

(b) Differentiate between whole genome shotgun sequencing and sanger sequencing.

14. (a) Give the applications of protein engineering.

Or

(b) Illustrate the significance of monoclonal antibodies.

15. (a) What are the applications of gene cloning in biotechnology and medicine?

Or

(b) Explain the process of animal cloning.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the process and significance of gene manipulation technology in modern biotechnology.

17. Elaborate the construction and screening of YAC library. Give its advantages.

18. Describe transcriptome analysis with its applications.

19. Elaborate the site directed mutagenesis in detail.

20. Discuss the process of creating transgenic animals.

APRIL/MAY 2025

DBT32/GBT32 — PLANT BIOTECHNOLOGY

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Write the significance of restriction enzymes in genetic engineering.

2. State the concept of germplasm in agriculture.

3. Define totipotency.

4. What is somatic embryo?

5. What is mean by biotic stress?

6. Define nitrogen fixation.

7. Define a protoplast.

8. Describe somatic hybrids.

9. What is Ti plasmid?

10. Which one is called as natural genetic engineer?

SECTION B — (5 × 5 = 25 marks)

Answer ALL questions.

11. (a) Investigate the genetic engineering approach used to delay fruit ripening in plants.

Or

(b) Explore the importance of valuable germplasm collections in preserving genetic diversity.

12. (a) Discuss the process of cytodifferentiation in plant tissue culture, outlining the cellular changes and specialization that occur during differentiation.

Or

(b) How organogenesis is utilized in tissue culture systems to regenerate specific plant organs?

13. (a) Examine the genetic pathways and regulatory mechanisms underlying stress tolerance in plants.

Or

(b) Assess the ecological impact of transgenic plants.

14. (a) Explain how somatic hybrids are identified and characterized for assessing genetic compatibility.

Or

(b) Examine the challenges associated with haploid plants production for plant breeding.

15. (a) Discover particle bombardment gene transfer method.

Or

(b) Discuss the principles behind the northern blotting technique, for analyzing transgene expression.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Elaborate production of genetic engineered plants and application.

17. Explain the steps involved in micropropagation for rapid multiplication rare plant.

18. Discuss the process of nitrogen fixation in leguminous plants.

19. Explain the different approaches used to induce haploidy in plants.

20. Discuss about agrobacterium-mediated gene transfer method.

APRIL/MAY 2025

23PBT41–RESEARCH METHODOLOGY

Time : Three hours | Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL Questions.

1. What are the main objectives of research?
2. Define sampling.
3. What is the significance of an abstract?
4. Define a research report.
5. Define standard deviation.
6. What is meant by variance component estimation?
7. What is a spreadsheet application?
8. What is the purpose of a presentation tool?
9. Define the World Wide Web.
10. What does "Boolean search" mean in web searching?

SECTION B — (5 × 5 = 25 marks)

Answer ALL Questions.

11. (a) Describe the general steps involved in the research process.

Or

(b) Explain any two types of research with examples.

12. (a) Write the essential qualities of a good research report.

Or

(b) Compare the results and discussion sections in a research paper.

13. (a) Compare and contrast paired and unpaired T-tests.

Or

(b) Explain the degrees of freedom in statistical analysis.

14. (a) Describe the process of storing and organizing data in a spreadsheet.

Or

(b) Explain the process of creating a basic presentation using Microsoft PowerPoint.

15. (a) Describe the basic functions of a search engine.

Or

(b) Discuss the advantages and limitations of PubMed.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Discuss the various techniques used for processing and analyzing data in research.

17. Describe in detail the various components of a research report with examples.

18. Explain the principles and applications of a two-factor factorial design with an example.

19. Describe tin detail the various customization options available in a presentation tool.

20. Discuss the importance of databases like Scopus, PubMed, and Science Direct for scientific research.

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APRIL/MAY 2025

23PBT42 — BIOSTATISTICS

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. What are the main methods of collecting statistical data?

2. Define confidence limits in statistical analysis.

3. What is the coefficient of correlation?

4. What are Markov chains?

5. What is a sampling distribution?

6. Name some measures of dispersion.

7. When is an r X c table used?

8. What is a Z-test?

9. How does one-way classification ANOVA differ from two-way classification?

10. What does LSD stand for in experimental design?

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) Explain the methods of data collection and outline the process of classifying data.

Or

(b) Explain the concept of random sampling and the role of standard errors in statistical analysis.

12. (a) Discuss the Poisson distribution and its significance in modeling rare events.

Or

(b) Illustrate the Z transformation and its application in normalizing data for comparison.

13. (a) Explain the coefficient of variation and infer its role in comparing relative variability.

Or

(b) Interpret the methods of computation.

14. (a) Explain how to construct a 2×2 table, calculate the chi-square test statistic, and test for heterogeneity.

Or

(b) Discuss Emerson's method and its use in partitioning the chi-square statistic for better interpretation.

15. (a) List the role of spreadsheets in data entry, mathematical and statistical functions, and their use as a database.

Or

(b) Examine the use of graphics/presentation packages for creating visual aids and presenting research results.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions.

16. Explain the importance of diagrammatic representation and different types of statistical graphs in data analysis.

17. Compare and contrast the binomial (Gaussian) and negative binomial distributions, including their characteristics, probability functions, and applications.

18. Discuss the basis of statistical inference and the concept of sampling distribution.

19. Discuss the use of normal, t, and z distributions in hypothesis testing for large and small samples concerning mean, variance, proportions, and correlation coefficient.

20. Discuss the importance of understanding main effects and interaction effects in two-way ANOVA.

APRIL/MAY 2025

23PEBT43B — BIOFERTILIZERS AND ORGANIC FARMING (Elective VI)

Time : Three hours | Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define nitrogen fixation.

2. Illustrate two advantages of biofertilizers with examples.

3. What are cyanobacterial biofertilizers?

4. Define mass production in the context of biofertilizers.

5. What are VAM fungi?

6. Explain how *Azolla* functions as a biofertilizer.

7. Define organic farming.

8. Describe the role of beneficial insects in organic farming.

9. Define organic fertilizers.

10. Mention two benefits of municipal waste recycling.

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL questions.

11. (a) How do biofertilizers contribute to sustainable farming?

Or

(b) Write a short note on the history of biofertilizer production.

12. (a) How do cyanobacterial biofertilizers improve soil fertility?

Or

(b) Explain the role of *Rhizobium* in nitrogen fixation.

13. (a) Describe the benefits of phosphate-solubilizing microbes in soil fertility.

Or

(b) Explain the symbiotic relationship between mycorrhizal fungi and plant roots.

14. (a) What are the common natural pesticides used in organic farming?

Or

(b) What are the environmental benefits of organic farming?

15. (a) What is green manuring? Mention two examples of green manure crops.

Or

(b) Describe the types of vermicomposting methods.

SECTION C — (3 × 10 = 30 marks)

Answer any THREE questions.

16. Discuss the role of biofertilizers in enhancing soil fertility and crop productivity.

17. Explain the role of blue-green algae (Nostoc) as biofertilizers and their applications in agriculture.

18. Explain the advantages of using plant-based (neem) and animal-based (fish) biofertilizers in agriculture.

19. Discuss the role of biogas production in sustainable agriculture, including its applications.

20. Describe the process of recycling biodegradable municipal and agricultural waste and its applications in organic farming.

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APRIL/MAY 2025

23PSBT44A — STEM CELL BIOLOGY (SEC III)

Time : Three hours Maximum : 75 marks

SECTION A — (10 × 2 = 20 marks)

Answer ALL questions.

1. Define differentiation.

2. What is totipotency?

3. What is meant by stem cell niche?

4. Define germ line.

5. What is cell sorting?

6. What is induced pluripotent stem cells?

7. Mention the four phases of cell cycle progression.

8. Give the role of JAK- STAT pathway.

9. Define embryonic stem cells?

10. What are doomed embryos?

SECTION B — ($5 \times 5 = 25$ marks)

Answer ALL the questions.

11. (a) Describe the embryonic stem cells.

Or

(b) Describe adult stem cells.

12. (a) Explain the general characteristics of hematopoietic stem cells.

Or

(b) Discuss the specifications of stem cell niche.

13. (a) Interpret the role of feeder cell layers.

Or

(b) Compare and contrast the cell line sterility, authencity and stability.

14. (a) Discuss the role of Ras- Raf in cell cycle control.

Or

(b) Discuss the role of the P13K pathway in cell cycle control.

15. (a) Outline the ethical considerations in the research of human stem cells.

Or

(b) Show the applications of bone marrow stem cells.

SECTION C — ($3 \times 10 = 30$ marks)

Answer any THREE questions

16. Discuss the mesenchymal and adipose stem cells.

17. Summarize the various functions and importance of stem cell receptors.

18. Describe the various techniques to isolate stem cells.

19. Discuss the role of LIF in cell cycle control.

20. Explain the applications of adipose – derived stem cells.

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