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St Aloysius College (Autonomous)

Mangaluru

Semester II – P.G. Examination - M.Sc. Biotechnology

May - 2024

GENETIC ENGINEERING

Time: 3 Hours

Max. Marks: 70

Note: Draw neat labeled diagrams/schematic sketches/structures wherever necessary.

I. Write short notes on any FIVE of the following: (5x3=15)

1. Differentiate between blunt ends and sticky ends with an example.
2. What are DNA manipulative enzymes?
3. What is the function of the polylinker region in pUC19?
4. What do you understand by binary vectors? What is their utility?
5. Explain marker free strategies.
6. Explain radioactive method of labelling gene probes.
7. Explain the potential sources of errors in PCR amplification and how they can be minimized.
8. Explain siRNA and its applications.

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II. Write explanatory notes on any FIVE of the following: (5x5=25)

9. Explain the purpose of using adaptors in the construction of recombinant DNA molecules.
10. Compare the differences between genomic and cDNA libraries.
11. Compare and contrast electroporation and sonoporation methods of gene transfer.
12. Explain the applications of PCR in diagnosing viral infections. Illustrate it with an example.
13. Discuss on identification of recombinants by colony hybridization technique.
14. Discuss the workflow involved in PacBio RNA sequencing, including sample preparation, sequencing chemistry, and data analysis steps.
15. Give an account of Liposome mediated transformation.
16. Explain the development of M13 phage vectors and their applications.

III. Answer any THREE of the following: (3x10=30)

17. Explain the methods involved in putting sticky ends to blunt end DNA.
18. Discuss on the various vectors designed for protein purification.
19. Describe the various selectable markers used in gene cloning.
20. Discuss the advantages of real-time PCR over conventional PCR techniques in molecular diagnostics.
21. Give an account of the different types of artificial chromosomes. Add a note on their applications.

St Aloysius College (Autonomous)**Mangaluru****Semester II – P.G. Examination - M.Sc. Biotechnology****May – 2024****ENZYMOLOGY**

Time: 3 Hours

Max. Marks: 70

Note: Draw neat labeled diagrams/schematic sketches/structures wherever necessary.**I. Write short notes on any FIVE of the following:****(5×3=15)**

1. What is enzyme engineering?
2. Explain Eddie-Hofstee plot.
3. Describe the concerted model of ATCase.
4. Explain Random Sequential Mechanism.
5. What is Creatine Kinase enzyme? How it is being employed in clinical diagnosis?
6. What is active site? Why is it important?
7. Draw a schematic representation of blood clotting cascade.
8. Write a note on the factors to be considered while selecting the enzyme extraction methods.

II. Write explanatory notes on any FIVE of the following:**(5×5=25)**

9. Explain nucleophilic and electrophilic reactions of enzymes with suitable examples
10. Explain coupled assay methods with suitable examples
11. Elaborate on any two types of vitamin and non-vitamin derived coenzymes.
12. Provide an overview of Lineweaver-Burk plot and compare it with Hanes plot.
13. How the enzymes are used for the therapeutic applications? Explain with examples.
14. Explain Penicillin as suicide inhibitor.
15. Describe the structure and basic mechanism of action of lysozymes.
16. Describe the structure of PDC.

III. Answer any THREE of the following:**(3×10=30)**

17. What is enzyme assay? Explain its types with suitable examples.
18. Derive the Michaelis-Menten equation for enzyme kinetics starting from the basic reaction scheme of substrate (S) binding to an enzyme (E) to form an enzyme-substrate complex (ES) and subsequent product (P) release.
19. Illustrate the step-by-step process of activation of digestive enzymes with a note on the conformational changes occurring in chymotrypsinogen during this activation.

20. Compare and contrast irreversible inhibition with reversible inhibition, focusing on key differences in terms of binding kinetics, reversibility, and mechanisms of action.
21. Elaborate on the enzyme immobilization technique and its applications in different fields.

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RESEARCH METHODOLOGY, ETHICS AND SCIENTIFIC COMMUNICATION

Time: 3 Hours

Max. Marks: 70

Note: Draw neat labeled diagrams/schematic sketches/structures wherever necessary.

I. Write short notes on any FIVE of the following: (5x3=15)

1. Describe the role of a lab notebook in documenting experimental procedures and results.
2. What are the different types of sample design based on representation basis and element selection?
3. Identify two features commonly found in plagiarism detection software tools.
4. What is h-index?
5. Distinguish between SNIP and SJR.
6. Distinguish between thesis and research article.
7. Define publication ethics in academic and scientific research.
8. Distinguish between direct personal and direct oral interview.

II. Write explanatory notes on any FIVE of the following: (5x5=25)

9. Reflect on the responsibilities of researchers in maintaining research integrity and the consequences of breaching it.
10. Compare sample survey Vs census survey.
11. How will you Identify predatory publishers and journals?
12. Distinguish between systematic and stratified sampling with an example.
13. How can researchers demonstrate their qualifications and expertise to carry out the proposed research in a grant proposal?
14. Describe the various parts of research design.
15. Distinguish between dense and sparse indexing of databases.
16. Analyze the limitations of correlational research in establishing causality.

III. Answer any THREE of the following: (3x10=30)

17. Evaluate mixed methods research, analyzing its benefits and potential challenges in integrating qualitative and quantitative approaches effectively.
18. Discuss on collection of primary data and data presentation.
19. Elaborate on the various modes of scientific presentations.
20. Explore the transformative potential of research in uncovering new insights and addressing ongoing problems.
21. Explain the principle and important experimental designs.

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**Semester II – P.G. Examination - M.Sc. Biotechnology
May – 2024**

ANALYTICAL TECHNIQUES IN BIOTECHNOLOGY

Time: 3 Hours

Max. Marks: 70

Note: Draw neat labeled diagrams/schematic sketches/structures wherever necessary.

- I. Write short notes on any FIVE of the following: (5x3=15)**
1. Name two advantages of using HPTLC over conventional TLC.
 2. Mention the commonly used matrix in affinity chromatography.
 3. Explain the principle behind gradient electrophoresis and how it differs from traditional electrophoresis techniques.
 4. Mention the limitations of beer lamberts law.
 5. What are isotope? Give examples.
 6. Mention the clinical application of isotopes.
 7. Write a note on different types of buffers used in electrophoresis.
 8. Discuss the advantages and limitations of cellulose acetate electrophoresis compared to other electrophoretic techniques.
- II. Write explanatory notes on any FIVE of the following: (5x5=25)**
9. Explain the various types of gels used in gel filtration chromatography.
 10. Explain autoradiography.
 11. Discuss the potential challenges and pitfalls associated with differential centrifugation and density gradient centrifugation and how they can be addressed.
 12. Evaluate the advantages and limitations of NMR spectroscopy.
 13. Explain the principles and methodologies of two-dimensional electrophoresis.
 14. Explain measurement radioactivity by gas ionization chamber.
 15. Explain the steps involved in the preparation of ion exchange resin.
 16. Discuss in detail the theory and mathematics of centrifugation.
- III. Answer any THREE of the following: (3x10=30)**
17. Briefly explain the instrumentation of x-ray diffraction.
 18. Compare and contrast polyacrylamide gel electrophoresis (PAGE) and agarose gel electrophoresis.
 19. Explain Scintillation counters.
 20. Discuss in detail the principle, types and applications of Paper chromatography.
 21. Explain the applications of radioisotopes in biology.
