

PH 511.4

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St Aloysius College (Autonomous)

Mangaluru

Semester IV - P.G. Examination- M.Sc. Biochemistry

ST. ALOYSIUS COLLEGE

April - 2025

MANGALURU

MANGALURU-575 002

IMMUNOLOGY

Time: 3 Hours

Max Marks: 70

(10x2=20)

I. Answer any TEN of the following:

1. How do B cells contribute to adaptive immunity, and what is the significance of antibody production in the immune system?
2. Define complement protein and give example.
3. Enlist the principle and applications of agglutination reactions.
4. Explain the principle and applications of ELISA.
5. Differentiate between thymus-independent and thymus-dependent antigens.
6. Evaluate the key role of MAC in the complement system.
7. How do you classify autoimmune diseases? Provide examples.
8. Write the contribution of Louis Pasteur in the field of immunology.
9. What are immunogens and give example.
10. Comment on two differences between cytotoxic T cells and Helper T cells.
11. What are co-stimulatory molecules? Give examples.
12. What are tumor antigens? How can they be classified?

II. Answer any SIX of the following:

(6x5=30)

13. How does the bone marrow function as a primary lymphoid organ, and what is its role in the production of immune cells?
14. Discuss the various applications of monoclonal antibodies.
15. Analyze the key differences between cell mediated and Humoral immune response?
16. Discuss the mechanism of central tolerance in context of T-cells.
17. How do phagocytes, such as neutrophils and macrophages, recognize and engulf pathogens during the innate immune response?
18. Explain the principle and applications of immuno precipitation techniques.
19. The MHC genes are highly polymorphic. Justify the statement.
20. Discuss Type I hypersensitivity reactions. Add a note on different indications of Type I hypersensitivity reactions.

III. Answer any TWO of the following:

(2x10=20)

21. Explain the structure and function of Ig G, Ig M and Ig E.
22. What are the various categories of vaccines? Compare the mechanisms of action of different types of vaccines.
23. Explain the mechanism by which exogenous antigens are processed and presented.
24. Explain Radio-immuno-assay with applications.

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Semester IV – PG Examination – M.Sc. Biochemistry

ST. ALOYSIUS COLLEGE PG LIBRARY

April - 2025

MANGALORE-575 003 GENETICS

Time: 3 Hours

Max. Marks: 70

(10x2=20)

I. Answer any TEN of the following:

1. What are the characteristics of Mendelian inheritance?
2. What is speciation?
3. List some characteristics of polygenic inheritance.
4. What is the average genome size of humans? Define c-value paradox.
5. What is map unit? How is it measured?
6. Define the term for the region of a chromosome where the nucleosomes are tightly packed together.
7. Chromosomal analysis of a newborn reveals a deletion on the short arm of chromosome 5. Identify the genetic disorder associated with this karyotype change, and discuss the common medical complications.
8. Define reciprocal translocation and Robertsonian translocation.
9. Explain why model organisms are crucial in genetic research.
10. Analyse how cancer cells differ from normal cells in their requirements for growth factors.
11. Discuss the common risk factors associated with the development of cancer.
12. Define the term "retroviral oncogene" and provide two examples.

II. Answer any SIX of the following:

(6x5=30)

13. Explain why codominance results in a different phenotypic expression compared to complete dominance.
14. What is maternal inheritance? Explain in detail with example.
15. Explain the mechanism of conjugation in microbial gene transfer.
16. How do transposons contribute to genetic variation within a population?
17. Define the terms: Spontaneous, induced, conditional, missense, and nonsense mutations.
18. Recall the steps involved in the repair of an alkylation-induced DNA modification.
19. Explain the concept of targeted therapy and its advantages over conventional chemotherapy.
20. Describe the role of GTP hydrolysis in the normal function of H-Ras and how its alteration can be oncogenic.

III. Answer any TWO of the following:

(2x10=20)

21. Describe how nondisjunction of chromosomes during meiosis leads to different types of chromosomal disorders with examples.
22. Describe how mutations in the p53 gene can contribute to cancer development.
23. Analyse the importance of coevolution in driving speciation and generating biodiversity.
24. Categorise chemical mutagens and describe their mode of action on DNA.

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Semester IV - P.G. Examination- M.Sc. Biochemistry

April - 2025

GENETIC ENGINEERING AND BIOINFORMATICS

Time: 3 Hours

ST.ALOYSIUS COLLEGE Max Marks: 70

PG Library

(10x2=20)

MANGALORE-575 003

I. Answer any TEN of the following:

1. List the key components required for performing TOPO cloning.
2. Enlist the examples of prokaryotic and eukaryotic vectors used in genetic engineering.
3. Describe the fundamental principle of mass spectrometry in protein analysis.
4. Recall two major findings of the Human Genome Project.
5. Distinguish between identity and similarity in the context of biological sequences.
6. Define BLAST and briefly explain its primary function.
7. Distinguish between a rooted and an unrooted tree.
8. What are HeLa cells, and why are they commonly used in biotechnology?
9. Describe the role of reversible terminator nucleotides in Illumina sequencing chemistry.
10. Expand (a) EMBL (b) DDBJ.
11. If you have a DNA sequence with the recognition site for EcoRI (GAATTC), where would you expect the enzyme to cleave?
12. Distinguish between one-step and two step RT-PCR.

II. Answer any SIX of the following:

(6x5=30)

13. How would you use DNA ligase to construct a recombinant plasmid for gene cloning?
14. List the applications of PCR.
15. Describe the gel mobility shift assay.
16. Describe the features and applications of hybrid vectors with examples.
17. Compare and contrast the advantages and disadvantages of using *Arabidopsis thaliana* versus *Nicotiana benthamiana* as host systems for protein expression.
18. Explain how RFLP analysis detects genetic variation.
19. A researcher wants to identify potential drug targets for a specific disease. How could bioinformatics databases and tools assist in this process?
20. Describe the steps involved in constructing a Genomic Library.

III. Answer any TWO of the following:

(2x10=20)

21. Explain the principle behind the microinjection, electroporation and biolistic methods for gene transfer. What are the main advantages and limitations of these methods?
22. Discuss the major features of Protein Data Bank and its data format
23. Describe the use of various enzymes used in recombinant DNA technology.
24. Explain the concept of Chromatin immunoprecipitation. Add a note on its applications.
