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**St Aloysius College (Autonomous)**  
**Mangaluru**  
**Semester IV- P.G Examination – M.Sc. Biochemistry**  
**May - 2024**  
**IMMUNOLOGY**

Time: 3 Hours

Max. Marks: 70

**I Answer any TEN sub-divisions of the following: (10x2=20)**

1. What is innate immunity, and how does it serve as the first line of defense against pathogens in the body?
2. Enlist the scope of immunology
3. Write the principle of immunofluorescence techniques
4. What role do monoclonal antibodies play in medical diagnostics?
5. Illustrate the TCR-peptide-MHC trimolecular complex
6. Which subset of T cells participates in the activation of B cells? What is the consequence of this activation?
7. Illustrate the distinction between organ-specific and systemic autoimmune diseases. Provide specific examples.
8. What are natural killer (NK) cells
9. What are thymus dependent antigens and give an example
10. Distinguish between primary and secondary immune response.
11. Which type of hypersensitivity reaction entails the release of antibodies mediated by immunoglobulin E (IgE), and what diagnostic methods are utilized for its identification?
12. Compare active and passive immunization. Provide specific examples

**II Answer any SIX of the following: (6x5=30)**

13. Explain humoral immunity
14. Describe immunoprecipitation techniques.
15. With the help of a labelled diagram describe the structure of class I and class II MHC molecules.
16. What is immune tolerance? Evaluate the significance of immune tolerance
17. Discuss the types of antigens
18. How are monoclonal antibodies produced, and what role does hybridoma technology play in their creation?
19. Illustrate the cytosolic pathway of antigen processing and presentation
20. How does the immune system recognize and eliminate cancer cells through immune surveillance

**III Answer any TWO of the following: (2x10=20)**

21. Explain Radioimmunoassay with applications
22. Evaluate the essential components and mechanisms involved in the immune response against viral and bacterial infections
23. Differentiate between adaptive and innate immunity
24. Explain about a) Immunogen b) Haptens c) Epitopes

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**St Aloysius College (Autonomous)**

**Mangaluru**

**Semester IV- PG Examination – M.Sc. Biochemistry**

**May - 2024**

**GENETICS**

**Time: 3 Hours**

**Max. Marks: 70**

**I Answer any TEN sub-divisions of the following:**

**10x2=20)**

1. Name the four evolutionary forces affecting allele frequencies.
2. Give some examples of extrachromosomal inheritance in different organisms.
3. Define polygenic inheritance
4. Define dosage compensation and X inactivation.
5. Describe the significance of genetic recombination in generating genetic diversity.
6. When is plaque formed in microbial culture? How is it identified?
7. Explain why silent mutations do not always result in changes to the phenotype?
8. Describe how chromosomes can be classified based on the position of the centromere
9. Explain why model organisms are crucial in genetic research.
10. Justify the statement-The p53 protein is sometimes called the "guardian of the genome"
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 Mendel's Law of Segregation. How does this law relate to the distribution of alleles during gamete formation?
14. Explain why codominance results in a different phenotypic expression compared to complete dominance.
15. How do retroposons differ from other transposons with respect to their structure and functions?
16. Explain the difference between genetic linkage mapping and physical mapping.
17. Discuss the mechanism of methyl directed mismatch repair
18. Explain the principle behind the Ames test. How it is used to assess the mutagenic potential of chemical substances?
19. Explain how the Warburg effect influences the metabolic behavior of cancer cells
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 the three main components of a typical gene.
22. Describe the role of telomerase in cancer development
23. Analyze the genetic and hormonal mechanisms underlying the expression of sex-limited and sex-influenced traits.
24. Discuss the consequences of trisomy in humans

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**St Aloysius College (Autonomous)  
Mangaluru**

**Semester IV- P.G Examination – M.Sc. Biochemistry  
May - 2024**

**GENETIC ENGINEERING AND BIOINFORMATICS**

**Max. Marks: 70**

**Time: 3 Hours**

**I Answer any TEN sub-divisions of the following: (10x2=20)**

1. What are inducible vectors? Give examples.
2. What are HeLa cells, and why are they commonly used in biotechnology?
3. Describe the fundamental principle of mass spectrometry in protein analysis
4. Recall the principle underlying plaque hybridization
5. Distinguish between identity and similarity in the context of biological sequences
6. Analyze how bioinformatics techniques played a pivotal role in dealing with COVID-19
7. Describe the role of INSDC
8. What is the function of DNA polymerase in recombinant DNA technology?
9. Describe the role of reversible terminator nucleotides in Illumina sequencing chemistry
10. Assess the impact of RasMol on protein structural biology research
11. Identify the types of topoisomerases commonly used in genetic engineering.
12. Distinguish between random and invitro mutagenesis

**II Answer any SIX of the following: (6x5=30)**

13. Explain the process by which kinases phosphorylate DNA molecules in genetic engineering.
14. Explain how RFLP analysis detects genetic variation
15. Describe BLASTP and BLASTN. Add a note on their uses.
16. Compare and contrast plasmid-based vectors and bacteriophage-based vectors used in prokaryotic systems.
17. Compare and contrast the advantages and disadvantages of using Arabidopsis thaliana versus Nicotiana benthamiana as host systems for protein expression.
18. Explain the role of calcium phosphate in facilitating the uptake of DNA by cells
19. Discuss the advantages and limitations of Phylip compared to other phylogenetic analysis software
20. Explain chromosome walking

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**III Answer any TWO of the following: (2x10=20)**

21. Illustrate the techniques used in transcript mapping
22. Explain the significance of i) Pfam ii) Signal peptide databases
23. Analyze the implications of using restriction endonucleases in genetic engineering and biotechnology applications.
24. Compare and contrast the underlying principles of SYBR Green and TaqMan probe chemistries in quantitative PCR (qPCR)

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**St Aloysius College (Autonomous)  
Mangaluru**

**Semester IV- PG Examination – M.Sc. Biochemistry**

**May - 2024**

**CLINICAL TOXICOLOGY**

**Time: 3 Hours**

**Max. Marks: 70**

**Answer any TEN sub-divisions of the following:**

**(10x2=20)**

1. Define the terms placebo and double blind in the context of clinical trials
2. Assess the role of blood brain barrier in drug distribution
3. Explain the concept of absolute bioavailability in pharmacokinetics
4. Name one mechanism of neurotoxicity and provide a brief description of its impact on the nervous system.
5. Briefly describe the role of glomerular filtration and tubular reabsorption in renal elimination of toxicants.
6. Name two metals known for causing nephrotoxicity and briefly outline their sources.
7. What is the difference between specific and non-specific binding agents used in antidotes? Give an example of each.
8. What is the function of glutathione-S-transferases (GSTs) in detoxification?
9. Explain the term bioactivation in the metabolism of toxicants.
10. Write a note on Opioids.
11. Write a note on potential adverse effects associated with the long-term use of metoclopramide.
12. Write on adverse effects of both salbutamol and montelukast.

**II Answer any SIX of the following:**

**(6x5=30)**

13. Discuss the key factors you would consider when selecting the most appropriate organism(s) for preclinical studies
14. Explain the advantages and disadvantages of parenteral routes of drug administration
15. Describe the mechanisms of drug action
16. Compare and contrast the effects of endocrine toxicants during organizational periods versus activational periods.
17. Discuss the mechanisms underlying cell necrosis as a toxic response in the respiratory system.
18. Explain the process of nicotine addiction, including the role of dopamine and its impact.
19. Discuss the mechanism of action of Isoniazid and its specificity for mycobacteria.
20. Describe the mechanism of action of alcohol in the brain.

**III Answer any TWO of the following:**

**(2x10=20)**

21. Discuss the applications of nanotechnology in drug delivery systems
22. Discuss what type of drugs are obtained from non- natural sources
23. Analyze the role of antidotal therapy in the management of specific poisoning cases. Choose two different toxins, describe their toxic effects, and outline the recommended antidotal interventions.
24. Compare and contrast the mechanisms of action of digoxin and nitroglycerin in treating heart conditions.

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