

SCHOOL OF CHEMICAL & LIFE SCIENCES
PH.D. COURSE WORK EXAMINATION (OCTOBER 2023)
PHBT104-Elective Paper: BIOTECHNOLOGY
BIOTECHNOLOGY AND HUMAN HEALTH

Time: Three Hours**Maximum Marks: 75**

(Write your Roll No. at the top immediately on receipt of this question paper)

Answer ALL questions. All parts of a question must be answered in continuation. Start answering each question on a new page. Cite examples and draw labeled diagrams wherever applicable.

Q1. Short Answer Type; Attempt any 10 (not more than half a page) [10 X 1.5 = 15]

- i. Define the immune system. What are three lines of defense of the immune system?
- ii. What is an antigen? How it is different from an antibody? List 5 major types of immunoglobulins.
- iii. What is phagocytosis?
- iv. What is hypersensitivity and its types?
- v. What are myeloma cells? Name two essential enzymes required for the salvage pathway.
- vi. Explain Induced Pluripotent Stem Cells.
- vii. What are Biosensors? Give two examples.
- viii. Explain the Air Lift Fermenter
- ix. Name three enzymes used in enzyme immobilization.
- x. Define autocatalytic reaction in cell growth kinetics.
- xi. What is gene therapy? Name one technology recently being used in genome editing.
- xii. Name any four products manufactured using fermentation technology.
- xiii. Name two genetic disorders caused by mutations in the non-nuclear mitochondrial DNA.
- xiv. What is the difference between primers and DNA probes?
- xv. Define stringency in hybridization.

Q.2. Short note type; Attempt any 04 (not more than two pages) [4x5 = 20]

- a. Briefly describe the major elements of the innate and adaptive immune system that provides defense against the infection.
- b. Briefly describe IgE-mediated hypersensitivity. What cells and receptors are involved in allergen capture and what co-stimulatory proteins and cytokines lead to its activation?
- c. Briefly explain the steps in Polymerase Chain Reaction. How it is different from qRT-PCR.
- d. Briefly discuss the industrial applications of immobilized enzymes.
- e. Briefly explain HAT medium selection in hybridoma.
- f. Differentiate between defined media and complex media.

Q.3. Long note type (no limit of pages). Attempt any 02 [2 x 20 = 40]

1. Discuss the following with suitable diagrams.
 - a. Compare and contrast the structure, expression, and functions of MHC class I and class II molecules. [1 x 10 = 10]
 - b. Describe autoimmunity in humans with three examples of autoimmune disorders. [1 x 10 = 10]
2. Describe in detail the principles and steps of monoclonal antibody production using Hybridoma technology. Give suitable examples. List out the advantages and disadvantages of monoclonal antibodies and the practical significance of Hybridoma technology.

3. Describe various techniques for isolation and preservation of culture. What are the advantages and disadvantages of various methods for the preservation of pure culture?
4. Discuss in detail the various steps involved in downstream processing. How products are purified? Give one example.
5. What are stem cells? Discuss its types, applications, and sources. Explain the difference between monozygotic and dizygotic twins. Give one example of stem cell disorder.

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