# Question Paper

Exam Date & Time: 28-Jun-2023 (02:00 PM - 05:00 PM)

## MANIPAL ACADEMY OF HIGHER EDUCATION

**SECOND SEMESTER M.Sc. (MEDICAL BIOTECHNOLOGY/TISSUE ENGINEERING/GENOME ENGINEERING/MOLECULAR BIOLOGY AND HUMAN GENETICS) DEGREE EXAMINATION - JUNE/JULY 2023**
**SUBJECT: MBT/MTE/MGE/MBH 502 - IMMUNOLOGY AND IMMUNOGENETICS**
**(OBE - 2021 REGULATION)**

**Marks: 70** **Duration: 180 mins.**

**Answer all the questions.**

**Illustrate where necessary.**

**Answer the following questions in an essay format.**

| | | |
|---|---|---|
| 1) | Describe various strategies employed by innate immune system to eliminate pathogens. | (14) |
| 2) | Explain historical and biochemical evidence for immunoglobulin structure. Discuss antibody diversity. | (14) |

**Answer the following questions in the form of a brief essay.**

| | | |
|---|---|---|
| 3A) | Describe role of neutrophils in combating pathogens. | (7) |
| 3B) | Describe IL-6 mediated JAK/STAT Pathway during inflammation. | (7) |
| 4A) | What is haplotype? Describe inheritance of HLA haplotypes. | (7) |
| 4B) | Describe classification and functions of major subsets of T cells. | (7) |

5. **Answer the following with a brief note:**

| | | |
|---|---|---|
| 5A) | MALT. | (3.5) |
| 5B) | Resident macrophages. | (3.5) |
| 5C) | Clonal ignorance. | (3.5) |
| 5D) | Haptens and their role in immune system. | (3.5) |

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# Question Paper

Exam Date & Time: 30-Jun-2023 (02:00 PM - 05:00 PM)

## MANIPAL ACADEMY OF HIGHER EDUCATION

**SECOND SEMESTER M. Sc. (MEDICAL BIOTECHNOLOGY/MOLECULAR BIOLOGY AND HUMAN GENETICS) DEGREE EXAMINATION - JUNE/JULY 2023**
**SUBJECT: MBT 504/MBH 504 - MOLECULAR MEDICINE**
**(OBE - 2021 REGULATION)**

**Marks: 70** **Duration: 180 mins.**

**Answer all the questions.**

**Illustrate where necessary.**

**Answering the following essay type.**

| | | |
|---|---|---|
| 1) | What are induced pluripotent stem cells? Discuss Yamanaka factors and how they induce mouse fibroblasts to become induced pluripotent stem cells. | (14) |
| 2) | What type of stem cells are found in bone marrow? Discuss mesenchymal stem cells and their differentiation. | (14) |

**Answer the following short essay type.**

| | | |
|---|---|---|
| 3A) | What is an mRNA vaccine? Explain how mRNA vaccines enter our cells to produce proteins using COVID-19 as an example. | (7) |
| 3B) | Briefly describe the process of gene therapy. Give a specific and detailed example of how gene therapy may be used to solve associated with genetic disorders. | (7) |
| 4A) | Make a note about how to find biomarkers using a multi-omics approach. | (7) |
| 4B) | What are the endodermal lineages? Add a note on stem cells and Diabetes. | (7) |

5. **Answer the following short note.**

| | | |
|---|---|---|
| 5A) | How does Alzheimer's disease affect cognition? | (3.5) |
| 5B) | What is translational research? | (3.5) |
| 5C) | What roles do stem cells play in regenerative medicine? | (3.5) |
| 5D) | Why the heart does not get cancer? Justify your comments. | (3.5) |

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# Question Paper

Exam Date & Time: 11-Aug-2023 (02:00 PM - 05:00 PM)

## MANIPAL ACADEMY OF HIGHER EDUCATION

**SECOND SEMESTER M.Sc. (MEDICAL BIOTECHNOLOGY/MOLECULAR BIOLOGY AND HUMAN GENETICS) DEGREE EXAMINATION - AUGUST 2023**
**SUBJECT: MBT 506/MBH 506 - MOLECULAR BIOLOGY II**
**(OBE - 2021 REGULATION - REPEATERS)**

**Marks: 70** **Duration: 180 mins.**

**Answer all the questions.**

**Illustrate where necessary.**

| | | |
|---|---|---|
| 1) | Describe in detail the transposition mechanism in corn. Add a note on the importance of transposons. | (14) |
| 2) | Describe the physical organization and characteristics of eukaryotic genome. | (14) |

**Explain the following briefly:**

| | | |
|---|---|---|
| 3A) | Methods to study proteins. | (7) |
| 3B) | Sporulation in Bacillus. | (7) |
| 4A) | Different types of prokaryotic polymerases and their function. | (7) |
| 4B) | Mating-type switching in yeast. | (7) |

5. **Write short notes on the following:**

| | | |
|---|---|---|
| 5A) | Hallmarks of cancer. | (3.5) |
| 5B) | Gleevec | (3.5) |
| 5C) | DNA microarrays. | (3.5) |
| 5D) | Ribozymes | (3.5) |

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# Question Paper

Exam Date & Time: 05-Jul-2023 (02:00 PM - 05:00 PM)

## MANIPAL ACADEMY OF HIGHER EDUCATION

**SECOND SEMESTER M. Sc. GENOME ENGINEERING/ M. Sc. SYSTEMS BIOLOGY/ M. Sc. MOLECULAR BIOLOGY AND HUMAN GENETICS/ M. Sc. TISSUE ENGINEERING DEGREE EXAMINATION - JUNE/JULY 2023**
**SUBJECT: MGE 510/ MSB 510/ MBH 508/ MTE 508 - CANCER BIOLOGY**
**(OBE - 2021 REGULATION)**

**Answer ALL questions.**
**Illustrate where necessary**

**Marks: 70** **Duration: 180 mins.**

| | | |
|---|---|---|
| 1) | Write an essay on immune cell-based cancer therapy | (14) |
| 2) | Explain the multistep processes of metastasis. | (14) |

3) **Explain the following briefly:**

| | | |
|---|---|---|
| 3A) | Write an essay on the molecular aetiology of breast cancer. | (7) |
| 3B) | Elaborate on apoptosis pathway | (7) |
| 4A) | Discuss the properties of cancer cell. | (7) |
| 4B) | Write a note on molecular diagnosis of various cancers. | (7) |

5) **Write short notes on the following:**

| | | |
|---|---|---|
| 5A) | Cancer vaccines | (3.5) |
| 5B) | Suicide gene therapy | (3.5) |
| 5C) | Hereditary cancer syndromes. | (3.5) |
| 5D) | APC gene | (3.5) |

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# Question Paper

Exam Date & Time: 05-Jul-2023 (02:00 PM - 05:00 PM)

## MANIPAL ACADEMY OF HIGHER EDUCATION

**SECOND SEMESTER M. Sc. BIOINFORMATICS / M. Sc. TISSUE ENGINEERING / M. Sc. MOLECULAR BIOLOGY AND HUMAN GENETICS / M. Sc. GENOME ENGINEERING DEGREE EXAMINATION - JUNE/JULY 2023**
**SUBJECT: MBI 508/ MTE 510 / MBH 510/ MGE 512 - MATHEMATICS AND R PROGRAMMING**
**(OBE - 2021 REGULATION)**

**Answer ALL questions.**
**Illustrate where necessary**

**Marks: 70** **Duration: 180 mins.**

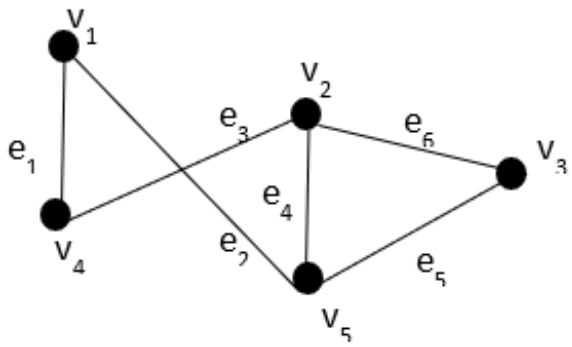
| | | |
|---|---|---|
| 1) | With an example, explain various types of plots and graphs in R | (14) |
| 2) | With an example, add a note on R data structures. | (14) |

**Explain the following briefly:**

| | | |
|---|---|---|
| 3A) | What is the need of bioconductor packages? Explain the features of bioconductor packages | (7) |
| 3B) | Let U={1, 2, 3, 4, 5, 6, 7, 8, 9}, A={ 1, 2, 3, 4}, B={ 2, 4, 6, 8. Draw Venn diagrams. Verify De Morgan's laws. | (4) |
| i) | | |
| ii) | How many words, with or without meaning can be made from the letters of the word WEDNESDAY, assuming that no letter is repeated if<br>a) 4 letters are used at a time<br>b) all letters are used at a time<br>c) are letters are used with first letter is a vowel. | (3) |
| 4A) | Solve the equations using Cramer's rule.<br>x - y - 2z = 3; 2x + y + z = 5; 4x - y - 2z = 1. | (7) |
| 4B) | Show that the following sequence is graphical. Also find a graph corresponding to the sequence 5, 1, 2, 5, 2, 4, 3, 2. | (7) |

5) **Write short notes on the following:**

| | | |
|---|---|---|
| 5A) | Using Logic Gates discuss AND and OR operations. | (3.5) |
| 5B) | Solve the following equations by matrix method:<br>7x + 6y - 5z = 30; 3x - 4y + z = 0; x + 2y - 3z = 10. | (3.5) |
| 5C) | "R is called dynamically typed language". Why? Explain the features of R statistical program. | (3.5) |
| 5D) | Represent the graph shown below, with an incidence matrix. | (3.5) |

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