

# Question Paper

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



## MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. SYSTEMS BIOLOGY DEGREE EXAMINATION - AUGUST 2023  
SUBJECT: MSB 504 - PROTEOMICS AND METABOLOMICS  
(OBE - 2021 REGULATION - REPEATERS)

Marks: 70

Duration: 180 mins.

**Answer all the questions.**

**Illustrate where necessary.**

- 1) Explain the glycolytic pathway in detail with structures of the metabolites and enzymes involved in the process. (14)
- 2) Discuss principle and procedure of HPLC with a neat diagram. Add a note on (i) ion-exchange chromatography (ii) affinity chromatography and (iii) size exclusion chromatography. (14)

**Explain the following briefly:**

- 3A) Describe mass spectrometry based proteomics work flow. (7)
- 3B) Write a note on metabolomics biomarkers for diseases and clinical relevance. (7)
- 4A) How does metabolomics aid in understanding plant-pathogen interactions? (7)
- 4B) With the help of a neat flowchart describe an overview of the metabolomics analysis workflow. (7)

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

- 5A) Briefly highlight the differences & similarities between proteomics & metabolomics. (3.5)
- 5B) Explain two dimensional differential gel electrophoresis. (3.5)
- 5C) Write short notes on problems and challenges in metabolomics. (3.5)
- 5D) Write short notes on protein-protein interaction databases. (3.5)

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# Question Paper

Exam Date & Time: 14-Aug-2023 (02:00 PM - 05:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. (BIOINFORMATICS/SYSTEMS BIOLOGY) DEGREE EXAMINATION - AUGUST 2023  
SUBJECT: MBI 504 - BIOINFORMATICS ALGORITHM AND APPLICATIONS  
MSB 506 - SYSTEMS BIOLOGY ALGORITHMS  
(OBE - 2021 REGULATION - REPEATERS)

Marks: 70

Duration: 180 mins.

Answer all the questions.

Illustrate where necessary.

- 1) Explain the Needleman-Wunsch algorithm for sequence alignment with an example. (14)
- 2) What is a phylogenetic tree? Explain with an example the character-based method for tree building. (14)

Explain the following briefly:

- 3A) What is multiple sequence alignment (MSA)? Write a short note on applications of MSA. (7)
- 3B) Describe in detail the parameters considered for the interpretation of BLAST results. (7)
- 4A) Write a note on gene prediction methods in eukaryotes. (7)
- 4B) Classify machine learning techniques. Explain in detail the working of Hidden Markov Model. (7)

5. Write short notes on the following:

- 5A) Write a note on types BLAST. (3.5)
- 5B) Write a note MEME suite. (3.5)
- 5C) Write a short note on PAM and BLOSUM matrices. (3.5)
- 5D) Write a note on gap penalties. (3.5)

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# Question Paper

Exam Date & Time: 16-Aug-2023 (02:00 PM - 05:00 PM)



## MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. SYSTEMS BIOLOGY DEGREE EXAMINATION - AUGUST 2023  
SUBJECT: MSB 510 - CANCER BIOLOGY  
(OBE - 2021 REGULATION - REPEATERS)

Marks: 70

Duration: 180 mins.

**Answer all the questions.**

**Illustrate where necessary.**

- 1) Write an essay on the role of DNA methylation in controlling the gene expression. Add a note on epigenetic therapy. (14)
- 2) Explain the mechanism of activation of protooncogenes to oncogenes. (14)

**Explain the following briefly:**

- 3A) Briefly describe cancer metabolism and its effect on the epigenome with example. (7)
- 3B) Discuss the Hallmarks of cancer with appropriate examples. What are enabling characteristics of tumor? (7)
- 4A) WNT signalling. (7)
- 4B) MAPK signalling. (7)

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

- 5A) Immune checkpoint inhibitors. (3.5)
- 5B) BRCA1 (3.5)
- 5C) APC (3.5)
- 5D) Warburg effect and cancer. (3.5)

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