Question Paper

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

MANIPAL ACADEMY OF HIGHER EDUCATION

SECOND SEMESTER M. Sc. (MEDICAL BIOTECHNOLOGY/TISSUE ENGINEERING/GENOME ENGINEERING) DEGREE EXAMINATION - AUGUST 2023
SUBJECT: MBT/MTE/MGE 502 - IMMUNOLOGY AND IMMUNOGENETICS
(OBE - 2021 REGULATION - REPEATERS)

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

Answer all the questions.

Illustrate where necessary.

Answer the following questions in an essay format.

1)	Describe T cell mediated antigen recognition along with generation and diversity of T cell receptors.	(14)
2)	Describe classification and functions of pattern recognition receptors in identifying pathogens. Write a note of TLR signalling.	(14)

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

3A)	Describe evolution of immune system with examples.	(7)
3B)	Explain pleotropic nature of cytokines with an example.	(7)
4A)	Explain mechanisms regulating T cell dependent B cell activation.	(7)
4B)	What autoimmunity? Explore how autoimmunity and illnesses are caused.	(7)

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

5A)	Anaphylaxis	(3.5)
5B)	Mast cells	(3.5)
5C)	HLA polymorphism.	(3.5)
5D)	Biological function of anti-idiotypic antibodies.	(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. GENOME ENGINEERING DEGREE EXAMINATION - AUGUST 2023
SUBJECT: MGE 504 - SYNTHETIC BIOLOGY AND GENOME ENGINEERING: HEALTH AND DISEASE
(OBE - 2021 REGULATION - REPEATERS)

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

Answer all the questions.

Illustrate where necessary.

1)	Define humanized animal model and explain genome engineering strategies to develop mouse model for metabolic diseases.	(14)
2)	Write an essay on applications of programmable nucleases in genome editing.	(14)

Explain the following briefly:

3A)	Define ex-vivo genome editing based therapy and discuss ex-vivo genome editing therapeutic approach to treat haemophilia A.	(7)
3B)	Define opsins. Explain different types of opsins and their application in optogenetics.	(7)
4A)	Write a note on various tools employed in directed molecular evolution studies.	(7)
4B)	Define biodevices and discuss designing of suitable gene circuits using appropriate standard biological parts.	(7)

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

5A)	Designer baby.	(3.5)
5B)	Third generation biofuel and its advantages.	(3.5)
5C)	Application of dCas9.	(3.5)
5D)	Challenges associated with genome editing technologies.	(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. GENOME ENGINEERING DEGREE EXAMINATION - AUGUST 2023
SUBJECT: MGE 506 - TOOLS TECHNIQUES AND MODELS OF GENOME ENGINEERING
(OBE - 2021 REGULATION - REPEATERS)

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

Answer all the questions.

Illustrate where necessary.

Give descriptive answers:

1)	Explain cisgenesis and oligonucleotide directed mutagenesis. Add a note on zinc finger nucleases and their applications.	(14)
2)	Discuss DNA free genome editing with examples of plant genomes by CRISPR systems.	(14)

Explain the following briefly:

3A)	Discuss and justify the mice and *Drosophila* as experimental models.	(7)
3B)	Describe RNA sequencing methods with a note on single cell transcriptomics.	(7)
4A)	Discuss the adenoviral vectors and adeno associated viral vectors (AAV) and their characteristics. Comment on advantages and disadvantages of each.	(7)
4B)	What is ChIP sequencing and what are its different applications?	(7)

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

5A)	cDNA libraries.	(3.5)
5B)	Pentatricopeptide repeat protein.	(3.5)
5C)	Gene editing for beta thalassemia.	(3.5)
5D)	RNA interference.	(3.5)

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