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Printed Page:-4 **Subject Code:- BBT0405**

Roll. No:

NOIDA INSTITUTE OF ENGINEERING AND TECHNOLOGY, GREATER NOIDA
(An Autonomous Institute Affiliated to AKTU, Lucknow)
B.Tech
SEM: IV - THEORY EXAMINATION (2025 - 2026)
Subject: r-DNA Technology

Time: 3 Hours **Max. Marks: 100**

General Instructions:

IMP: *Verify that you have received the question paper with the correct course, code, branch etc.*
1. *This Question paper comprises of* ***three Sections -A, B, & C.*** *It consists of Multiple Choice Questions (MCQ's) & Subjective type questions.*
2. *Maximum marks for each question are indicated on right -hand side of each question.*
3. *Illustrate your answers with neat sketches wherever necessary.*
4. *Assume suitable data if necessary.*
5. *Preferably, write the answers in sequential order.*
6. *No sheet should be left blank. Any written material after a blank sheet will not be evaluated/checked.*

SECTION-A 20

1. Attempt all parts:-

(1.1) Which of the following statements is correct with respect to a unit of an enzyme? (CO1, K1) 1

(a) One unit of enzyme is defined as the amount of enzyme required to digest 1miligram of standard DNA in a specific time of 1hr and under given temperature conditions

(b) The amount of enzyme required doesn't vary with the number of sites present in the DNA

(c) If more number of sites is there in the DNA more units of enzyme are required in comparison to same amount of DNA with fewer sites

(d) The amount of enzyme required for digestion of DNA with less number of sites is more than that of more number of sites in the same amount of DNA

(1.2) The ligation reaction is more efficient in which case? (CO1, K1) 1

(a) Blunt end ligation
(b) Sticky end ligation
(c) Both have the same efficiency
(d) Depends on the reaction conditions

(1.3) Plasmids are used as cloning vectors for which of the following reasons: (CO2, K1) 1

(a) Can be multiplied in culture
(b) Self- replication in bacterial cells
(c) Can be multiplied in laboratories with the help of enzymes
(d) Replicate freely outside bacterial cells

(1.4) Bacteria protect themselves from viruses by fragmenting viral DNA with: (CO2, K1) 1

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(a) Ligase
(b) Endonuclease
(c) Exonuclease
(d) Gyrase

(1.5) Denaturation in PCR generally occurs at: (CO3, K1) 1

1. 37°C
2. 55°C
3. 72°C
4. 94–95°C

(1.6) PCR can be used to amplify a specific fragment of DNA from which of the following? (CO3, K1) 1

(a) A drop of blood
(b) A hair follicle
(c) A fragment of skin
(d) All of these

(1.7) The hybridomas are made by: (CO4, K1) 1

(a) fusing T cells with myeloma cells
(b) fusing B cells with myeloma cells
(c) fusing T helper cells with myeloma cells
(d) fusing B memory cells with myeloma cells

(1.8) Which of the following technique is most suitable for detecting the presence of a gene product: (CO4, K1) 1

(a) Dot blotting
(b) Southern blotting
(c) plaque blotting
(d) Western blotting

(1.9) Automated DNA sequencing is an improvement of Sanger's method where: (CO5, K1) 1

(a) ddNTPS are used for chain termination
(b) PCR is used for making sequencing templates
(c) Fluorescently labelled dNTPs are used for chain termination
(d) Fluorescently labelled ddNTPs are used for chain termination

(1.10) Which of the following is a chemical nucleotide sequencing method? (CO5, K1) 1

(a) Sanger method
(b) Maxam-Gilbert method
(c) Edmans method
(d) Automated sequencing

2. Attempt all parts:-

(2.1)	What are the uses of synthetic linkers? (CO1, K1)	2
(2.2)	Name different type of vectors that are used in recombinant DNA technology. (CO2, K1)	2
(2.3)	Write any two applications of PCR. (CO3, K1)	2
(2.4)	What are the limitations of cDNA library? (CO4, K1)	2
(2.5)	Mention one advantage and disadvantage of Sanger Sequencing. (CO5, K1)	2

SECTION-B 30

Answer any one of the following:-

(3.1)	Does Taq polymerase denature DNA? Give reasons to support your answer. (CO1, K1)	6
(3.2)	What is the main principle and significance behind rDNA technology ? (CO1, K1)	6

Answer any one of the following:-

(3.3)	Write the differences between plasmid and phagemid vector? (CO2, K2)	6
(3.4)	What are the plant based vectors. Explain with the help of examples? (CO2, K2)	6

Answer any one of the following:-

(3.5)	Discuss various forms of PCR in detail. (CO3, K2)	6
(3.6)	Illustrate the process of RT-PCR. (CO3, K3)	6

Answer any one of the following:-

(3.7)	With the help of labelled diagram explain in detail about plaque hybridization. (CO4, K2)	6
(3.8)	Write a short note on HART and HRT methods for analysis of cloned genes. (CO4, K2)	6

Answer any one of the following:-

(3.9)	Discuss the process of DNA microarray in detail. (CO5, K2)	6
(3.10)	Compare and contrast the benefits and drawbacks of the Sanger and Maxam-Gilbert DNA sequencing methods. (CO5, K3)	6

SECTION-C 50

4. Answer any one of the following:-

(4.1)	Describe the properties of an ideal vector molecule. Also describe different types of vectors with examples. (CO1, K1)	10
(4.2)	Is it possible to isolate a His -tagged protein which has high prevalence of non-polar residues. Discuss (CO1, K1)	10

5. Answer any one of the following:-

(5.1)	Describe the progress and prospects of human artificial chromosomes. (CO2, K2)	10
(5.2)	Explain in detail about the human genome project. (CO2, K2)	10

6. Answer any one of the following:-

(6.1)	Explain the working principle of PCR. Illustrate the process of inverse PCR. (CO3, K3)	10
(6.2)	Explain in detail about different types of DNA Polymerases and its fidelity as thermostable enzymes. (CO3, K2)	10

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7. Answer any <u>one</u> of the following:-

(7.1)	Explain various genetic selection strategies that may be used for various applications in rDNA Technology? (CO4, K2)	10
(7.2)	Draw a flowchart that compares the general stages required in building genomic and complementary DNA (cDNA) libraries. (CO4, K1)	10

8. Answer any <u>one</u> of the following:-

(8.1)	Discuss various methods that are utilized for recombinant protein extraction and purification? (CO5, K2)	10
(8.2)	Discuss the working mechanism of high-throughput sequencing technique in detail. (CO5, K2)	10