Roll No:.....

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**B.Sc. Biochemistry, Semester-V Examination-2023**
**Paper Title: GENETIC ENGINEERING AND BIOTECHNOLOGY**
**Paper Code: BBC CC 14**

**Time: 3-hour** **Max Marks: 75**

***Note:*** *This paper has 3 sections A, B, and C, Attempt all the three sections*
*Section A: Answer all the questions; Section B: Answer any 2 out of 4; Section C: Answer all the questions, each question has an internal choice*

**Course Learning Outcomes:**
CLO-1: Understand concepts in recombinant DNA technology
CLO-2: Learn the principles of gene cloning and expression vectors.
CLO-3: Learn the principles of creation of genomic and cDNA libraries, their applications and use.
CLO-4: Understanding the methods for protein production and their application in industrial production systems.
CLO-5: Apply the knowledge of recombinant DNA technology in gene cloning through hands on training

**Section A (Attempt all questions)** **(1x10=10 Marks)**

| Q. No | Questions | BTL | CLO | PLO |
|---|---|---|---|---|
| a | Selection marker for yeast cloning vector is ..... | 1 | 2 | 3 |
| b | Divalent cation required for polymerase action is..... | 1 | 2 | 3 |
| c | Elution buffer for Ni-NTA includes ..... salt | 3 | 2 | 2 |
| d | Plants which carry additional, stably integrated and expressed, foreign gene(s) from trans-species are known as..... | 2 | 3 | 3 |
| e | Direct uptake of DNA by protoplasts is stimulated by polyethylene glycol (True/False) | 1 | 3 | 2 |
| f | Herbicide-resistant crops are plants that have been genetically modified to be resistant to certain insects. (True/False) | 2 | 4 | 3 |
| g | Ribozymes have two domains and cleave target sequences at random positions. (True/False) | 2 | 4 | 3 |
| h | Klenow fragment, enzyme majorly used in DNA sequencing, has ..... activity but no ..... activity. | 3 | 1 | 3 |
| i | Terminal deoxynucleotidyl transferase (from calf thymus tissue), adds one or more deoxyribonucleotides onto the ..... terminus of a DNA molecule. | 3 | 1 | 3 |
| j | ..... restriction enzymes have the same recognition sequence but cleaves the DNA at a different site. | 4 | 1 | 3 |

**SECTION B: Long type Questions (Attempt any two out of four)** **(2x15=30 Marks)**

| Q. No | Questions | BTL | CLO | PLO |
|---|---|---|---|---|
| 1 | Discuss different approaches that can be used to identify a clone from gene library. | 4 | 3 | 3 |
| 2 | Discuss different techniques that can be used to perform site–directed mutagenesis. Is site directed mutagenesis different from protein engineering? Discuss. | 3 | 4 | 2 |

| | | | | |
|---|---|---|---|---|
| 3 | With the help of a diagram, discuss general features of *E. coli* plasmid vectors with examples. | 2 | 2 | |
| 4 | Explain the alkaline denaturation-based purification of plasmid DNA and PEG-based purification of bacteriophage DNA. | 1 | 1 | 2 |

**SECTION C: Short-type Questions. (Attempt all questions, each question has an internal choice) (5x7=35 Marks)**

| Q. No | Questions | BTL | CLO | PLO |
|---|---|---|---|---|
| 1 | Mention steps involved in the preparation of competent cells.<br>**OR**<br>What do you mean by insertional inactivation? | 1 | 3 | 3 |
| 2 | Discuss challenges in producing recombinant protein in *E. coli.*<br>**OR**<br>What are fusion tags? Discuss their role in purification of recombinant proteins. | 2 | 4 | 3 |
| 3 | Mention safety concerns related to genetically modified plants.<br>**OR**<br>Discuss the production of recombinant insulin. | 4 | 4 | 2 |
| 4 | Write a short note on Real-Time PCR.<br>**OR**<br>What is codon bias? How does it affect the expression of foreign gene. | 2 | 2 | 3 |
| 5 | Write a short note on the introduction of phage DNA into bacterial cells.<br>**OR**<br>Discuss the introduction of DNA into animal cells using electroporation. | 1 | 3 | 3 |
| 6 | Explain the process of synthetic oligonucleotide synthesis.<br>**OR**<br>Explain the role of linkers and adapters in converting blunt end to a sticky end. Address their limitations and its solution. | 3 | 1 | 3 |
| 7 | What are restriction endonucleases? Name the discoverers, the 3 types, and the mechanism of action of type II restriction endonuclease.<br>**OR**<br>Name and highlight the key features each of a plasmid, M13 bacteriophage and a Lambda phage cloning vector. | 4 | 1 | 3 |

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