P. P. SAVANI UNIVERSITY

Fifth Semester of B.Sc. Examination
December-2021
SSBT3130–Recombinant DNA Technology-I

11.12.2021, Saturday **Time: 12:30 p.m. to 03:00 p.m.** **Maximum Marks: 60**

Instructions:

1. The question paper comprises of two sections.
2. Section I and II must be attempted in separate answer sheets.
3. Make suitable assumptions and draw neat figures wherever required.
4. Use of scientific calculator is allowed.

Section-I (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a Alpha-complementation of β-galactosidase is a method for distinguishing

- **A** transformed colonies from non-transformed colonies
- **B** recombinant colonies from non-recombinant colonies
- **C** Protein expressing cells from non-protein expressing cells
- **D** All of the above

1.1b Enzymes which cut, shorten or degrade nucleic acid molecules comes under the group of_____

- **A** Nucleases
- **B** Ligases
- **C** Polymerases
- **D** Modifying enzymes

1.1c Which of the following is an example of exonuclease

- **A** EcoRV
- **B** XhoI
- **C** Bal31
- **D** Bgl2

1.1d DNase I cleaves_____

- **A** Only double stranded DNA
- **B** Both single and double stranded DNA
- **C** Only single stranded DNA
- **D** None of the above

1.1e The term 'Recombinant DNA' often referred to as

- **A** Chimeric DNA
- **B** Single stranded DNA
- **C** Plasmid
- **D** Non-recombinant DNA

1.1f Genetically engineered human insulin was first produced by

- **A** Genentech
- **B** Biocon
- **C** Agribiotech
- **D** Roche

1.1g Nucleases which remove nucleotides one at a time from the end of a DNA

molecules are known as

A Endonucleases
B Polymerases
C Exonuclease
D Excinuclease

1.1h **'AAGCTT'** is the recognition site for which of the following restriction enzymes

A Hind III
B EcoRI
C Bam HI
D Sma I

1.1i _____ are two important cofactors for ligase enzymes

A Mg^{+} and Mn^{+}
B ATP and NAD^{+}
C Ca^{+} and Zn^{+}
D None of the above

1.1j YCp vectors have ____

A ARS, CEN and TRP1 gene
B ARS, CEN and URA3 gene
C ARS, CEN and Leu2
D ARS and CEN region

1.2 **Answer the Following: (MCQ/Short Question/Fill in the Blanks)** **[05]**

1.2a A transgene has the potential to change the phenotype of an organism (True/False)

1.2b First transgenic organism was created by Annie Chang and _____

1.2c Presence of recombinant colonies can be checked by PCR or restriction digest (True/False)

1.2d Endonucleases remove nucleotides one at a time from the end of a DNA molecule (True/False)

1.2e S1 nuclease cleaves only single-stranded DNA, including single-stranded nicks in mainly double-stranded molecules (True/False)

Q.2 **Short Notes (Attempt any two)** **[06]**

A Ligase

B DNA modifying enzymes

C Difference between linkers and Adaptors

Q.3 **Explain in detail (Attempt any two)** **[14]**

A Discuss the strategies to modify a blunt ended DNA molecule into a sticky end molecule?

B What are various important steps in Gene Cloning? Discuss Bacterial transformation in detail.

C What is the major difference between exonucleases and endonucleases? Discuss restriction endonucleases in detail.

Section-II (Total Marks - 30)

Q.1 Short Questions **[10]**

1.1 Objectives **[05]**

1.1a The genes responsible for the replication of plasmid are located on

- **A** chromosomal DNA of bacteria
- **B** plasmid DNA
- **C** chromosomal DNA of yeast
- **D** both A and C

1.1b Plasmids of the RP4 type are transmitted by

- **A** Transformation
- **B** Conjugation
- **C** Transduction
- **D** both B and C

1.1c Episomes are a special type of plasmids, which

- **A** Cannot replicate by itself
- **B** Can replicate by the gene found on a separate plasmid
- **C** Can replicate independently of the host and also in association with a chromosome with which it becomes integrated
- **D** both A and B

1.1d Relaxed plasmids are

- **A** low-copy plasmids
- **B** high-copy plasmids
- **C** relaxed linear plasmids
- **D** specially large plasmids

1.1e Shuttle vectors

- **A** can shuttle between one bacterium to another
- **B** promote shuttling of genes from plasmid to chromosomal DNA
- **C** both A and B
- **D** can be propagated in two or more different host species

1.1f Telomere is a characteristic feature of

- **A** Phagemid
- **B** Cosmid
- **C** M13
- **D** YAC

1.1g Which of the following is NOT true for a cosmid

- **A** it is a plasmid
- **B** it has a cos site
- **C** it produces plaques on selective media
- **D** it produces colonies on selective media

1.1h One of the limitation for using λ bacteriophage DNA as a vector was:

- **A** Was difficult to ligate with the gene of interest
- **B** has more than one recognition sequence for many restriction endonuclease
- **C** is prone to degradation
- **D** all of the above

1.1i The transposons found in fly is known as

A T element
B P element
C C element
D P plasmid

1.1j Which of the following enzyme will produce a staggered end:

A AluI
B Hind III
C Sma I
D All of the above

1.2 Answer the Following: (MCQ/Short Question/Fill in the Blanks) **[05]**

1.2a Plasmids are chromosomal double-stranded DNA (True/False)

1.2b Integrative plasmids are also known as exosomes (True/False)

1.2c Cosmids are the hybrids between insertion and replacement vectors (True/False)

1.2d Infective phage particles are not formed, if the total size of the DNA molecule is more than 52 kb (True/False)

1.2e In YAC, _____is the selectable marker into which new DNA is inserted and also used for visual screening

Q.2 Short Notes (Attempt any two) **[06]**

A Shuttle vector

B Replacement vector

C BAC

Q.3 Explain in detail (Attempt any two) **[14]**

A What are E. coli-based cloning vectors? Explain at least two such vectors in detail?

B Explain Ti plasmid and their role in plant genetic engineering in detail. Describe binary vector and co-integration strategy using suitable diagrams.

C What are YACs? Explain it in detail.