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SARDAR PATEL UNIVERSITY  
M.Sc. (III SEMESTER) EXAMINATIONS.  
2<sup>ND</sup> January, 2021 (Saturday). Time: 02.00 – 04.00 p.m.

## PAPER: PS03CBIT22 – GENETIC ENGINEERING

TOTAL MARKS: 70

## I. Choose the most appropriate answer:

(8 x 1 = 8 marks)

- In a spectrophotometric (260 nm) experiment, optical density of a 1.0 ml of a nucleic acid sample was found to be 1.0; it corresponds to
  - 50µg/ml of ds DNA
  - 40µg/ml of ss DNA or RNA
  - 33µg/ml of oligonucleotides
  - All of the above
- Biolistics method of gene transfer is more suitable to transform \_\_\_\_\_ cells
  - Plant
  - bacterial
  - animal
  - Yeast
- How many dsDNA molecules are obtained from one dsDNA template after 4 cycles of PCR?
  - 4
  - 8
  - 16
  - 32
- Most common reporter gene whose product can be directly visualized in transformed cells is
  - NPTIL (Neomycin phosphotransferase)
  - CAT (chloramphenicol acetyl transferase)
  - β-galactosidase
  - GFP (green fluorescent protein)
- Stringency in Southern blotting is essential to
  - allow the DNA to get cross linked to the membrane
  - denature the dsDNA
  - allow specific binding of the probe to the target DNA
  - avoid specific interaction between probe and target DNA
- In conventional PCR, quantification of the initial DNA used is NOT possible since
  - Ethidium Bromide does not bind quantitatively to DNA
  - the reaction is not optimized in the first few cycles
  - the amplification of DNA is not exponential
  - All of the above
- The cI repressor gene is responsible for maintenance of \_\_\_\_\_ cycle in Lambda phage
  - Lytic
  - replicative
  - lysogenic
  - both lytic and lysogenic
- Which of the following virus is not used in gene therapy?
  - Papillomavirus
  - Retrovirus
  - Adenovirus
  - SV 40 virus

[1]

[P.T.O.]

**II. Match/True-False/ answer in One sentence/Fill in the blanks**

**(16 x 1 = 16 marks)**

1. Match the following

- |                     |   |
|---------------------|---|
| i. pUC8             | a. Insertion vector                         |
| ii. Probe           | b. Gene transfer in plants                  |
| iii. $\lambda$ gt10 | c. Small DNA segment used for hybridization |
| iv. Ti plasmid      | d. Lac selection plasmid                    |

- |                  |                          |
|------------------|--------------------------|
| 2. i. SyBR green | a. Restriction digestion |
| ii. RFLP         | b. DNA sequencing        |
| iii. Ion Torrent | c. Microprojectiles      |
| iv. Biolistics   | d. Real Time PCR         |

**Write whether True-False**

3. Cosmid is the most sophisticated type of  $\lambda$  vector having maximum carrying capacity of 40-45 kb DNA.
4. BAC vectors have less insert capacity but greater stability than YAC vectors
5. SYBR Green binds to DNA in a sequence specific manner.
6. Tungsten microprojectiles used for Biolistics have better DNA holding capacity and no toxicity
7. Luciferase reporter system is a sensitive, stand alone system.
8. Maxam-Gilbert's method of DNA sequencing could not be automated since toxic chemicals are used.
9. RAPD is an expensive as well as difficult method of DNA finger printing
10. Novel plant varieties could be protected under patents law.

**Fill in the blanks**

11. The cycle at which the fluorescence of DNA exceeds the background fluorescence in real time PCR is known as \_\_\_\_\_.
12. The rice variety in which the metabolic pathway for beta carotene biosynthesis has been introduced is known as \_\_\_\_\_.
13. Roundup is a herbicide containing \_\_\_\_\_ as an active principle
14. \_\_\_\_\_ is a DNA fingerprinting method based on restriction digestion
15. Ion Torrent sequencing is based on a change in \_\_\_\_\_ during dNTP incorporation
16. The farmers and plant breeders rights act was enacted by India in \_\_\_\_\_

**III. Answer any seven in brief:**

(7 x 2 = 14 marks)

1. Explain restriction modification system.
2. Differentiate between iso-schizomers and neo-schizomers
3. The absorbance measurement at 260nm with 2  $\mu$ l of a 10 times diluted DNA sample reveals an OD of 0.8. Calculate the concentration of DNA (in  $\mu$ g) in a 100  $\mu$ l DNA preparation.
4. Application of dideoxynucleotides
5. Use of alkaline phosphatase in rDNA technology
6. Differentiate between *E. coli* and T4 DNA ligase
7. Taqman probes
8. VNTRs
9. BT brinjal

**IV. Answer in detail:**

(4 x 8 = 32 marks)

1. Discuss different steps in DNA isolation and differentiate how plant genomic DNA isolation is different from the bacterial DNA isolation?

**OR**

1. List different methods used for introduction of rDNA into host cells. Describe any one method in detail with its advantages and disadvantages.

2. What are the basic properties of good cloning vectors? Explain construction of Cosmids and discuss the strategy for selection.

**OR**

2. What are the salient features of expression vectors? Discuss the method for recombinant protein production using expression vectors.

3. Describe the principle, applications advantages and disadvantages of any one next generation DNA sequencing in detail.

**OR**

3. Explain the principle and uses of
  - a) RFLP
  - b) PCR based Site Directed Mutagenesis

4. Define metagenomics. Explain the strategies followed for metagenome analysis in detail.

**OR**

4. Discuss the principle and advantages of CRISPR/Cas 9 system. Explain how it is useful in gene editing?

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