This question paper contains 2 printed pages. **Your Roll No. .....**

Sl. No. of Ques. Paper : **2094** **GC-3**

Unique Paper Code : **32583904**

Name of Paper : **Tools in Modern Biology**

Name of Course : **B.Sc. (Hons) Biomedical Sciences (CBCS)**
Skill Enhancement Course

Semester : **III**

Duration : **3 hours**

Maximum Marks : **50**

(Write your Roll No. on the top immediately on receipt of this question paper.)

*Attempt **five** questions in all. Question No. 1 is compulsory. Give illustrations and examples wherever required. (Subparts of the questions should be attempted together)*

1. (a) Name the scientists who first discovered/invented the following. Give short description of their discovery mentioning salient features. (any *four*)
   (i) Genetic Engineering
   (ii) Genetic material is DNA
   (iii) Penicillin
   (iv) Alkaline lysis method of plasmid isolation
   (v) Use of green fluorescent protein
   (vi) Polymerase Chain Reaction. $4\times1=4$

   (b) Define the following: (any *five*)
   (i) SDS-PAGE
   (ii) Primer
   (iii) Cloning vector
   (iv) Gel matrix
   (v) Immunoaffinity chromatography
   (vi) Therapeutic protein. $5\times1=5$

   (c) State true or false and justify the statement:
   (i) A process in which cells are maintained in culture in the stationary growth phase by the continuous addition of fresh medium that is exactly balanced by the removal of the cell suspension is known as continuous fermentation.
   (ii) pGEX is an expression vector.
   (iii) RE type I are routinely employed in gene cloning.
   (iv) Cell lysis during plasmid isolation is done under hypotonic conditions.
   (v) Ethidium Bromide is used in agarose gel electrophoresis for the separation of DNA fragments as a staining dye. $5\times1=5$

P.T.O.

(d) Expand the following acronyms (any *four*):

(i) ORF (ii) PEG

(iii) SAGE (iv) pUC

(v) YAC $4\times1=4$

2. (a) What steps would you take to reduce the spurious PCR products? Compare and contrast multiplex and nested PCR. 4

(b) Ten nanograms of mouse genomic DNA are needed for a PCR reaction. The template stock has a concentration of 0.4 mg/ml. How many microliters of the stock solution should be used? 3

(c) Draw the structure of the end of linear DNA fragment that was produced by a *Hin*FI restriction digest? 1

3. Differentiate between the following:

(i) Cohesive and sticky ends

(ii) Insert and cassette

(iii) *Taq* and *Pfu* DNAP

(iv) Adaptors and Linkers. $4\times2=8$

4. Mapping a linear DNA molecule: A 10 kb linear DNA is digested with two restriction enzymes in single and combination digests. Draw the possible maps with each digest and complete the table.

Digestions	Name of the Enzyme	Fragments produced (kb)	Possible maps
1	EcoRI	9 and 1	
2	*Hin*d III	6 and 4	
3	*Eco*RI+ *Hin*d III	6, 3 and 1	

Determine map based on the above three digestions. 8

5. (a) Explain how you would design primers for cloning a gene using PCR based cloning method. 3

(b) Role of following chemicals or reagents in plasmid isolation:

(i) EDTA

(ii) Sodium dodecyl sulfate

(iii) Potassium acetate

(iv) Phenol

(v) Tris-Cl 5

6. Write short notes on: (any *four*)

(i) Features of fluorescence microscope

(ii) Eukaryotic expression vector

(iii) Colony PCR

(iv) Optimization of PCR conditions for Mg^{2+} concentration

(v) Dideoxynucleotide procedure for sequencing DNA. $4\times2=8$