

# BIOTECHNOLOGY

## PAPER 1

### (THEORY)

(Three hours)

(Candidates are allowed additional 15 minutes for **only** reading the paper.  
They must **NOT** start writing during this time.)

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Answer **Question 1** (compulsory) from **Part I** and **five** questions from **Part II**.  
The intended marks for questions or parts of questions are given in brackets [ ].

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### PART I

Answer **all** questions.

#### Question 1

- (a) Mention any *one significant difference* between each of the following: [5]
- (i) Western blotting and southern blotting.
  - (ii) Pyranoses and furanoses
  - (iii) RNA polymerase and DNA polymerase.
  - (iv) Primary and secondary culture.
  - (v) Codon and anticodon.
- (b) Answer the following questions: [5]
- (i) What is optical isomerism?
  - (ii) What are termination codons?
  - (iii) What is meant by central dogma?
  - (iv) Who discovered enzyme restriction endonucleases?
  - (v) Why is *Agrobacterium tumifaciens* called as the natural genetic engineer of plants?
- (c) Write the full form of the following: [5]
- (i) MCS
  - (ii) NBPGR
  - (iii) AFLP
  - (iv) SCP
  - (v) EST

- (d) Explain briefly: [5]
- (i) Prosthetic group
  - (ii) Synthetic seeds
  - (iii) Palindromic sequences
  - (iv) Restriction sites
  - (v) Single strand binding proteins

## PART II

*Answer any five questions.*

### Question 2

- (a) What are carbohydrates? Classify them giving examples. [4]
- (b) Explain the steps involved in the post translational modification of proteins. [4]
- (c) Enlist *four* characteristics of a genetic code. [2]

### Question 3

- (a) Explain the following biochemical techniques: [4]
  - (i) Electrophoresis
  - (ii) Centrifugation.
- (b) Explain the different methods of freeze preservation of germplasm. [4]
- (c) What is meant by the term insertional inactivation? [2]

### Question 4

- (a) Explain how cell culture technology is useful in crop improvement. [4]
- (b) Explain a method used for DNA sequencing using *ddNTPs*. [4]
- (c) Why are *cDNA libraries* preferred over *geneomic libraries*? [2]

### Question 5

- (a) Explain semiconservative mode of DNA replication. [4]
- (b) Mention the ways by which the apparatus and instruments used in a tissue culture laboratory can be sterilized. [4]
- (c) What are coenzymes? Name *any two* of them. [2]

**Question 6**

- (a) Mention the chief characteristics of embryonic stem cells. [4]
- (b) Explain *any four* chemical properties of lipids. [4]
- (c) Differentiate between: [2]
  - (i) Blunt ends and sticky ends.
  - (ii) RAM and ROM

**Question 7**

- (a) What do you understand by gene regulation? [4]
- (b) Write the different roles that proteins accomplish in a cell. [4]
- (c) What are liposomes? [2]

**Question 8**

- (a) Write short notes on: [4]
  - (i) Virus mediated gene transfer.
  - (ii) Microinjection.
- (b) Discuss the principle and the procedure of the PCR technique. [4]
- (c) What are start and stop codons? [2]

**Question 9**

- (a) Explain the role of computer in new drug development research. [4]
- (b) Write a note on different types of sequence analysis programs. [4]
- (c) Name *any four* institutes in India, which deal with biotechnology. [2]

# BIOTECHNOLOGY

## PAPER 2

### (PRACTICAL)

(Three hours)

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Answer **all** questions.

The intended marks for questions or parts of questions are given in brackets [ ].

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#### Question 1

- (a) You are provided with a culture of bacteria isolated from curd. Proceed as follows:

Pick up a bacterial colony with a tooth pick or an inoculation loop and spread it on to a glass slide. Add two drops of crystal violet solution (1%) and gently warm it on a hot plate at 40°C until it becomes dry. Wash the smear with water to remove excess stain. Next, stain the slide with about 2 ml of iodine solution for 1 minute. Wash the smear with acetone. Now, counterstain the smear with saffranin solution (0.5%) for 1 minute. Again wash the smear with water and observe the slide under microscope.

**Answer the following questions:**

- (i) Write your observation when the slide is placed under the microscope. [1]
- (ii) Identify the technique used above and mention its use in the laboratory. [1]
- (iii) Explain the principle on which this technique is based. [1]
- (iv) Name the bacteria present in the curd. [1]
- (b) Perform the experiment described below and answer the questions that follow:

Take a ripe mashed banana (about 2" piece) into a beaker and add 30 ml of extraction fluid (E.F.) provided to you. Incubate the beaker at 60°C for 15 minutes. Stir gently with a glass rod. Filter 5 ml of the cooled content into a test tube and add 5 ml of cold 90% alcohol to it. Allow the test tube to stand for 10 minutes.

**Answer the following questions:**

- (i) What do you observe in the test tube after 10 minutes? [1]
- (ii) Give two uses of genomic DNA in molecular biology experiments. [1]
- (iii) Name a major contaminant found in the above sample. [1]
- (iv) Name two equipments used for quantitative estimation of DNA. [1]

**Question 2**

A milk sample for the isolation of proteins has been provided to you. Take 25 ml of the sample in a 50 ml flask and proceed as follows:

- (i) Warm the sample in a water-bath set at 35°C. Note the pH of the milk sample using a pH meter or a pH paper.
- (ii) Next, add 0.4 N HCl drop-wise until the protein starts coagulating. Note the pH at which maximum separation of protein takes place. Filter the solution through a thin muslin cloth to separate out the protein. **Show the protein isolated by you to the Visiting Examiner.**

**Answer the following questions:**

- (a) (i) Report the initial pH of the milk sample. [1]
- (ii) Report the pH at which the protein gets coagulated. [1]
- (b) Name the protein and carbohydrate present in the above sample. [1]
- (c) Explain the basic principle involved in the above isolation. [2]
- (d) Mention *two* precautions to be taken while conducting the above experiment. [1]

**Question 3**

Identify the instruments/photographs of the instruments (1 – 4) commonly used in a biotechnology laboratory. For each instrument write:

- (a) The names. [2]
- (b) One important structural feature. [2]
- (c) Specific use. [2]

**Question 4**

**Show the following to the Visiting Examiner for assessment.**

- (a) Project. [7]
- (b) **Biotechnology Practical File.** [3]