2017

BIOTECHNOLOGY

[Honours]

PAPER – VI

Full Marks : 90

Time : 4 hours

The figures in the right hand margin indicate marks

Candidates are required to give their answers in their own words as far as practicable

Illustrate the answers wherever necessary

[NEW SYLLABUS]

GROUP – A

Answer any **two** questions from the following : 15×2

1. (*a*) Give a brief description of the process of obtaining DNA sequences from microbes. 3

   (*b*) What is next-generation sequencing ? 2

(*c*) Mention the major biological databases available for protein structure and function. Describe any one of such databases briefly. 1+2

(*d*) Describe the main features of NCBI format for nucleotide sequence data. 3

(*e*) Give an outline of the technique of the following task : 4

Downloading and saving of nucleotide sequence of a particular gene in FASTA format from NCBI database.

2. (*a*) Define data. 1

(*b*) What are primary and secondary data ? Describe the differences between these two types of data. 2+2

(*c*) What are the importance of classification of raw data ? 2

(*d*) What is class boundary ? How can you calculate class boundaries ? Describe with examples. 1+3

(e) Describe the *different methods* of collection of data. 4

3. (a) Define orthologs and paralogs. 4

(b) Certain genes are present in high copy numbers in a genome. What are the importance and implication of such a phenomenon? 2

(c) Describe the technique of obtaining DNA fingerprints. What are its major applications? 4 + 2

(d) What are the differences between DNA barcoding and DNA fingerprinting? 2

(e) Give two examples of restriction endo-nucleases. 1

4. (a) Give a brief account of different levels of protein structure. 5

(b) What is ab-initio protein structure prediction? 3

(c) What is boxplot? 2

(*d*) Describe the structure of an amino acid. Discuss about the different classes of amino acids based on polarity. 2+3

5. (*a*) Define generation time and growth rate constant. Do you consider generation time to be a constant value for a given bacterial species ? Discuss. 3+2

(*b*) What are the primary and secondary metabolites ? 3

(*c*) Why slow addition of glucose is preferred for industrial production of penicillin ? 2

(*d*) Describe the process of obtaining patents when an invention is considered novel. 3

(*e*) Mention any two organisms which produce useful biopigments. 2

6. (*a*) Describe the process of industrial production of vitamin B12. 5

(*b*) Discuss the functionality and prospects of obtaining bacterial exopolysaccharides. 3

(c) What is mycorrhiza ? Describe different types of mycorrhiza found in nature. 2+4

(d) Define vermicompost. 1

GROUP – B

Answer any five questions from the following : 8×5

7. (a) Define Diotransformation. 2

(b) Give examples of steroids produced through microbial biotransformation. Describe the advantages and disadvantages of such steroids compared to natural products. 2+4

8. (a) What are the advantages of asymbiotic nitrogen fixer based biofertilizers over rhizobial preparations ? 2

(b) Describe the process of following GMP norms in food processing industry. 4

(c) What is HACCP ? 2

9. (a) Describe the SSF method of citric acid production. 4

(*b*) What are the major tests conducted to ensure quality of beverages in the industries ? 4

10. (*a*) Discuss the prospects of Biotechnology Industry in India. 3

(*b*) Do you think the policies implemented in India have been successful in protecting indigenous plant varieties ? 3

(*c*) What is WIPO ? 2

11. (*a*) Define median and mode. $1\frac{1}{2}+1\frac{1}{2}$

(*b*) There are two samples of *Bacillus* sp. If the two groups are mixed together, find the mean length of *Bacillus* sp. in the mixed group. 3

GROUP	No. of Observations	Mean length (μm)
GROUP-A	30	2·8
GROUP-B	50	2·2

(*c*) What is correlation coefficient ? 2

(*Continued*)

12. (*a*) Describe the process and application of restriction mapping. 5

(*b*) Write short notes : "Introns early" hypothesis. 3

13. (*a*) What is horizontal gene transfer ? What are its implications ? 2+3

(*b*) Describe the factors that influence the evolution of genomes. 3

14. (*a*) What are variables and attributes ? Describe with examples. 4

(*b*) Describe the major outcomes of Human Genome Project. 4

GROUP – C

Answer any five questions from the following : 4×5

15. Define Poisson Distribution. What are its applications in Biology ? 2+2

16. Describe the methods of modelling point mutations in protein structure. 4

17. Write short notes on BLAST. 4

18. Describe the process of application of substitution matrices in sequence alignment. 4

19. Calculate Standard Deviation of the following distribution : 4

Height (KGs)	Number of Students
50 - 52	17
52 - 54	35
54 - 56	28
56 - 58	15
58 - 60	5

20. (*a*) What is a curated biological database ? 2

(*b*) Give brief account of PIR. 2

21. Describe the process of ethanol production through yeast. 4

22. Discuss the biosafety guidelines for a microbiological laboratory involving pathogenic bacteria. 4