Sample Question Paper
2015 - 16
Class – XII
Biotechnology (045)

Time: 3 Hrs. **M.M.:70**

General Instructions:

(i) All questions are compulsory.
(ii) There is no overall choice. However, an internal choice has been provided in one question of two marks, one question of three marks and all three questions of five marks. You have to attempt only one of the choices in such questions.
(iii) Question paper contains four sections -A, B, C and D.
(iv) Question numbers 1 to 6 are very short answer questions, carrying 1 mark each.
(v) Question numbers 7 to 14 are short answer questions - I, carrying 2 marks each.
(vi) Question numbers 15 to 25 are also short answer questions - II, carrying 3 marks each.
(vii) Question numbers 26 to 28 are long answer questions, carrying 5 marks each.
(viii) Use of calculators is not permitted. However, you may use log tables, if necessary.

SECTION-A

Q1. A scientist wants to protect a part of a DNA from attack by restriction enzymes. Design first step of his experiment? (1)

Q2. Presence of selectable marker is an essential feature of an ideal cloning vehicle. Give reason. (1)

Q3. Expand and define PER. (1)

Q4. Given below is a list of the first 8 residues of the β-helix in myoglobin from different organisms. Based on this information, identify the amino acids which are most
(a) conserved
(b) variable (1)

Population → / Organism ↓	1	2	3	4	5	6	7	8
Rabbit	A	L	R	L	M	G	P	E
Dog	A	L	D	L	M	E	F	E
Sea Anemone	K	I	D	L	H	C	H	E
Crab	A	I	D	L	H	C	Q	E
Rohu	A	R	R	L	M	C	Q	E
Whale	A	F	E	L	T	G	G	E

Q5. In assessing the effect of growth factors on animal cell cultures, a particular phase of growth is more suitable. Name this phase giving reason for the same. (1)

Q6. CHO animal cell line is used to express r-HuEPO. Give reason. (1)

SECTION-B

Q7. pUC19 and a linear DNA (both of same size) have two sites for the same restriction endonuclease. When cleaved and separated on agarose gel electrophoresis, how many bands will be visualized in each case and why? (1+1)

Q8. Chymotrypsin catalyses the hydrolysis of proteins containing bulky, aromatic, hydrophobic amino acids.Comment. (2)

Q9. Interpret possible use of nick translation in detecting chromosomal translocations. Draw a suitable diagram. (½ x4)

Q10. *C.elegans* is a eukaryotic organism with a genome of 97 Mb and about 20,000 genes. Why organizational features of this genome are unusual when compared to the genomes of other eukaryotes, such as yeast and *Drosophila*?

OR

BLAST helps in finding the homology in biological sequence alignment. Give any two reasons for this homology. (1+1)

Q11. Highlight graphically the differences between culturing microbes in the school laboratory and a bioreactor which allow cells to grow in a continuous culture system. (1+1)

Q12. State any two advantages of using *Pichia pastoris* as a eukaryotic expression host. (1+1)

Q13. Execute the engineered biosynthetic pathway which leads to the production of valuable secondary metabolites for their over-production. (2)

Q14. Enlist the advantages and limitations of animal cell culture (two each). (½ x4)

SECTION-C

Q15. Parth has identified luciferase gene from firefly. Construct a flowchart of the steps that you would follow to transfer the gene to a plant. (½x6)

Q16. One of the major uses of genome sequencing is to develop tools for future experimentation. Given the sequence of a ribonuclease gene from the model plant

Brassica, how would you design a tool for isolating the ribonuclease gene from an *Oryza sativa* plant. (½x6)

Q17. Linus Pauling predicted that ScHb differed in charge from normal hemoglobin protein. Explain the technique which was used to confirm this with the help of diagram. (½x6)

Q18. If a given protein with a molecular weight of 20,000 daltons containing 5,4,3,2, and 1 charges, is subjected to mass spectrometry, find the sequence of protein ions detected by the mass spectrometer. (½x6)

Q19. A patient suffering with blood cancer has been put on radio and chemotherapy for the past 5 months. How can FISH technique be used to monitor the effect of the same? (1+1+1)

Q20. Annotation of human genome sequence reveals that our genome contains 30000-33000 genes. Proteomic analysis indicates that human cells are capable of synthesizing more than 30,000 different proteins. How can this discrepancy be reconciled? (2+1)

Q21. If a culture of *Haemophilus* contains 10^5 cells/ml at 4:00 a.m. and 10^{11} cells/ml at 4:00 p.m., calculate its specific growth rate and doubling time. Which growth phase in this bacterial culture will show maximum specific growth rate? (1+1+1)

Q22. Rohan cultured *streptococcus* bacteria in his lab to check whether it is gram positive or negative and then he threw the culture directly in dustbin. Is this method of disposal ethically and ecologically safe? (1+1+1)

Q23. Somatic hybrids and cybrids are produced by a technique of plant biotechnology. Identify this technique and explain by citing two examples of plants. (1+1+1)

OR

Though a genetically engineered crop is herbicide and pesticide resistant, it still requires use of agro chemicals. Mention atleast three facts to justify the statement. (1+1+1)

Q24. Outline the process of creation of chimeric mouse by embryonic stem cell culture. (½x6)

Q25. Monoclonal antibodies are preferred over polyclonal antibodies for diagnostics and antibody based therapy? Justify giving two reasons for the same by taking Herceptin as an example. (1+1+1)

SECTION-D

Q26. PCR allows for rapid and highly specific diagnosis of infectious diseases. Enumerate the basic steps of polymerase chain reaction (PCR)? How can we selectively amplify

a DNA fragment? Mention any two applications of PCR.

(3x½+1+½+1+1)

OR

Distinguish between:

(i) dNTP & ddNTP
(ii) pBR322 & pUC19
(iii) M-13 & lambda phage
(iv) Cosmid & plasmid
(v) Transformation and transfection (½ x10)

Q27. We often find catchy slogans in laundry detergents like, with biologically active enzymes.

(i) Identify this enzyme.
(ii) Name the residues which contributed to its enzymatic activity.
(iii) Native form of this enzyme is inactivated by bleach. Give reason.
(iv) Is there any way to retain the activity even in the presence of bleach?

(½ +1½+1+2)

OR

Give reasons for the following:

(i) OKT-3 is used to prevent graft rejection following kidney transplantation.
(ii) Kappa casein is involved in micelle stabilization of milk proteins.
(iii)Whey protein detoxifies xenobiotics.
(iv) Curd is used as pro-biotic.
(v) BCAA enriched food is taken before and after exercise.

(1x5)

Q28. Depict the induction of crown gall on a stem of a plant by *Agrobacterium tumefaciens* with the help of a schematic diagram.

(1x5)

OR

Outline various steps involved in the regeneration of whole plants using culture techniques.

(1x5)