Question Paper 2014 Comp. Outside Delhi set 1

CBSE Class 12 Biotechnology

General Instructions:

- All questions are compulsory.
- There is no overall choice. However, an internal choice has been provided in one question of three marks and two questions of five marks. You have
- to attempt only one of the choices in such questions. Question paper contains four sections ¾ A, B, C and D.
- Questions No. 1 to 5 are very short answer questions, carrying 1 mark each.
- Questions No. 6 to 15 are short answer questions, carrying 2 marks each.
- Questions No. 16 to 25 are also short answer questions, carrying 3 marks each.
- Questions No. 26 to 28 are long answer questions, carrying 5 marks each.
- Use of calculators is not permitted. However, you may use log tables, if necessary.

SECTION A

1. If the genes involved in fruit ripening are selectively mutated, what commercial importance can this serve?

2. Is it necessary to use a thermostable form of DNA polymerase in dideoxy DNA sequencing? Why or why not?

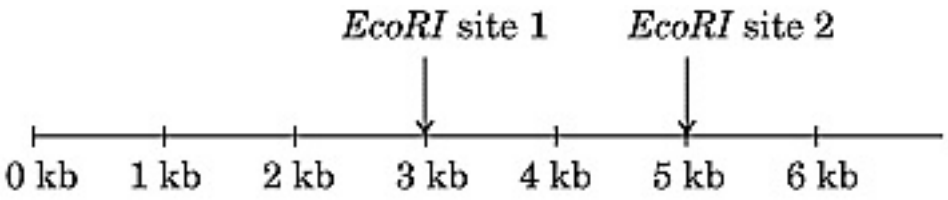
3. Environmentalists advocate the disuse of chemical insecticides. Suggest an alternative way to improve crop yields.

4. Why is strain preservation important in microbial cell culture?

5. Two laboratories have developed a procedure for downstream processing of an antibiotic. The major difference lies in the number of steps involved. Which one would you prefer and why?

SECTION B

6.Restriction mapping of a linear piece of DNA reveals the following EcoRI restriction sites :



(a) This piece of DNA is cut by EcoRI, the resulting fragments are separated by gel electrophoresis and the gel is stained. What is the size of the fragments obtained?
(b) If a 1000 bp of DNA were inserted between the two restriction sites, what will be the size of fragments when step (a) is repeated?

7. What is the effect of SDS on protein structure? How does it facilitate the determination of molecular mass?

8. Name two database retrieval tools. What is their purpose?

9. In a culture of E. coli, the cell population increases from 2.0×10^6 cells/ml

to 16×10^6 cells/ml in 30 minutes. What is the generation time of the given culture?

10. Why is the technique for the production of monoclonal antibodies called hybridoma technology? Give an example of a therapeutic monoclonal antibody for breast cancer patients.

11. If Sanger's dideoxy method shows that the template strand sequence is:
5' – TGCAATGCC – 3' sketch the gel pattern that would lead to this conclusion.

12. You have been provided with a mixture of proteins (A, B, C and D) in a buffer of pH 6.5. Protein A has a pI of 5.0 and all other proteins have a pI > 7.0. Based on this information, how will you separate protein A from the mixture ? Indicate the principle involved also.

13. A scientist determines the complete genome and proteome of a liver cell and a muscle cell from the same person. Would you expect bigger differences in the genome or proteome of

these two cell types? Explain.

14. A genetic engineer wants to isolate a gene from a scorpion that encodes a deadly toxin. The ultimate goal is to transfer this gene to a bacterium for commercial production of the toxin. Should he create a genomic library or a cDNA library? Explain

15. A technician in a tissue culture laboratory accidently removed the identification tag of a petri dish containing cells from a cancer biopsy. How can you identify this petri dish among other petri dishes containing normal cells?

SECTION C

16. Why do organophosphates act as selective inhibitors of serine proteases?

Why is the serine hydroxyl at the active site of serine proteases acidic as compared to other serine residues in the enzyme?

17. What are the essential features of a cloning vector? What is the role of 'cos sites' in phage lambda?

OR

What is the principle of blue-white selection for screening transformed E. coli cells?

18. What are DNA chips (or microarray) and how are they used in functional genomics?

19. List three differences between a batch culture and a continuous culture.

20. What are the potential risks and benefits of GM crops? Enlist three for each.

21. Indicate three applications of stem cell technology

22. What is molecular pharming? As compared to the production of desired proteins in bacteria, why might it be advantageous?

23. (a) Why is it useful to search a database to identify sequences that are homologous to a newly determined sequence?

(b) The X-chromosomes in female mammalian cells are homologous to each other. Do you agree?

24. What is metagenomics? Why is this approach gaining importance?

25. Why are animal cells grown in CO^2 incubators and not in regular incubators? Do we require similar incubators for culturing microbial cells?

SECTION D

26. (a) Why is sickle cell anemia called a molecular disease? What is the defect?
(b) Who developed the technique of protein fingerprinting ?
(c) Indicate two ways by which sickle cell anemia can be diagnosed.

27. (a) Enlist the various steps of plant tissue culture.
(b) Name a medium commonly used for culturing plant parts (explants). Which factors dictate the choice of media?

OR

(a) Describe vector-mediated and vector-less gene transfer in plants.
(b) Why is Agrobacterium tumefaciens regarded as nature's genetic engineer ?

28. (a) Schematically illustrate the technique of site directed mutagenesis.
(b) What physical and chemical properties of naturally occurring enzymes might be useful to change by site directed mutagenesis ? Give an example.

OR

(a) What are the three basic steps of a PCR cycle and at what temperatures are they performed ?
(b) How can we selectively amplify a DNA fragment ?
(c) Give the sequence of two primers (5 nucleotides long) required to amplify the following DNA sequence by PCR:
5' ATGCCTAGGATCATGC 3'