Question Paper 2010 Delhi set 1
CBSE Class 12 Biotechnology

General Instruction:

- 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.Why is humulin considered better than pig insulin for the treatment of diabetes?

Ans. Humulin acts faster/Incidence of allergic reaction is reduced.

2. If a researcher began with a sample that contained 5 copies of double stranded DNA, how many copies would he be able to get after 20 cycles of PCR ?

Ans. $(5 \times 2)^{20} = 10^{20}$

3. What are interferons?

Ans. Interferons are proteins secreted by virally infected cells and interfere with viral propagation

4. In isolating recombinant insulin from a culture of *E.coli*, the cells were filtered and the filterate was subjected to a purification protocol. However no insulin was

obtained. Why?

Ans. Recombinant insulin is expressed intracellularily, hence no insulin is in the culture filtrate.

5. Why is erythropoietin (EPO) included in the list of banned substances for sportsmen?

Ans. EPO enhances performance of athletes because it stimulates RBC production, which increases oxygen carrying capacity, aerobic metabolism; hence it is banned.

SECTION – B

6. In a batch culture of *E.coli*, specific growth rates of the microbial cells will be maximum at which phase of growth and why?

Ans. Specific growth rate is maximum during exponential/ log phase. Availability of nutrients allows cells to divide rapidly till stationary phase.

7. Compared to a conventional plasmid, what additional sequences are required in a YAC vector so that it can behave as an artificial chromosome?

Ans. YACs contain teleomeric and centromeric sequences which enable it to behave as an artificial chromosome.

8. Why is it useful to search a database to identify newly determined DNA sequence? Give two reasons.

Ans. To identify genes, their functions, regulatory sequences and to infer phylogenetic relationships (any two)

9. Why is foaming caused during fermentation process? How can this be harmful to the process?

Ans. Foaming is caused by proteins/components of media/metabolites produced by microbes (any one).
Foaming can denature proteins/cut oxygen supply/microbes trapped infoam cannot grow (anyone)

10. What is a transgenic plant? Enlist two examples of transgenic plants with beneficial traits.

Ans. A transgenic plant has DNA/genes from another organism introduced through recombinant DNA technology.
Any two examples- Bt cotton, Flavr Savr tomatoes, Golden rice, edible vaccines.

11. Patients who are administered monoclonal antibodies against CD3 can accept renal allograft, why?

Ans. T cells playa major role in graft rejection.
OKT-3 targets CD3 surface marker on T cells removing them from circulation and hence graft is not rejected.

12. Listed below are four different single strands of DNA. Which of these in their double stranded form, would you expect to be cleaved by a restriction endo-nuclease, and why?
(a) GCCTCATTCGAAGCCTGA
(b) ACTCCAAGCTTCACTCCG
(c) CTCGCCAGACTCGTCGCA
(d) ACTCCACTCCCGACTCCA

Ans. Options (a) GCCTCATTCGAAGCCTGA
and (b)ACTCCAAGCTTCACTCCG
Restriction enzymes recognise palindromic sequences.

13. (a) Expand 'BLAST'.
(b) When aligning two or more genetic sequences, it is sometimes necessary to insert gaps, why?

Ans. BLAST: Basic Local Alignment Search Tool.
Gaps are inserted to align sequences of unequal length but sequence similarities.

14. How are novel genes introduced into plants using Ti plasmid of Agrobacterium? Enlist major steps.

Ans. Use leaf discs/embryonic callus; Infect with recombinant disarmed Ti plasmid;

cocultivation to facilitate transfer; selection and regeneration medium; induce rooting; hardening and transfer to soil.

15. A soil microorganism produces a novel metabolite in nanomolar (nM) concentration. Suggest any two ways to increase its production.

Ans. Strain improvement techniques; classical genetic techniques/mutant selection; genetic engineering

SECTION - C

16. What is 'Molecular Pharming'? Why is it more advantageous compared to production in a bacterial system? Give any four reasons.

Ans. To create transgenic animals by direct microinjection of DNA into ova or stem cells and produce insulin and other proteins in milk on a commercial scale.
Any four advantages over using bacteria-large amounts of source,functionally active proteins being produced in mammals, ease of collecting milk, ease of production, moderate capital investment.

17. DNA microarray permits an investigator to monitor simultaneously, the level of mRNA production from every gene in an eukaryotic organism.
(i) Why might such an analysis not give an accurate estimate of the level of protein expressed in an organism?
(ii) Which alternative technique will be better suited for the above mentioned analysis?

Ans. (i) Levels of mRNA are not necessarily correlated with protein production.
(ii) 2-D gel electrophoresis/proteomics can assess the total proteins actually expressed.

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

Ans.

Batch culture	Continuous culture
1. Closed culture system	open culture system
2. Has limited amount of nutrients	nutrients are replenished248

3. Organism shows normal growth kinetics	cells are grown for extended time
4. Organisms are exposed to con tinually changing environment.	chemical environment is constant

19. What are the potential risks (any three) and benefits (any three) of GM crops?

Ans.

20. Why is it difficult to culture animal cells as compared to plant or microbial cells?

Why is it essential to supplement animal cell culture media with serum?

OR

Why are animal cells grown in CO2 incubators and not in regular incubators? Give three reasons.

Ans.

21. (i) What are essential amino acids?
(ii) Athletes are recommended to consume Branched Chain Amino Acids (BCAA) before and after exercise. How does this practice benefit them?

Ans. . (i) Essential amino acids cannot be synthesised in the body and have to be obtained from the diet. 1
(ii) BCAA are important for muscle growth. Their intake prevents the breakdown of muscle proteins during exercise. They can be processed to yield energy.

22. What is a recombinant vector? How is it constructed?

Ams. Vector containing an insert is a recombinant vector.
Vector and fragment containing gene are isolatedand cut with samerestriction enzyme; joined with DNA ligase to make recombinant vector/

23. How can you obtain virus-free sugarcane plants from virus-infected plants? Are these plants virus-resistant? Why or Why not?

Ans. Micropropagation using meristems.
No, these are not virus resistant.
Because meristems are virus-free but do not have resistance genes.

24. Embryonic stem (ES) cells could potentially be used to treat a variety of diseases associated with cell and tissue damage. Defend this statement by giving three examples of ES therapeutics.

Ans. ES cells have self renewal capacity and differentiating capability and therefore can be used to treat burn victims; repair of joints damaged by injury or arthritis; repair or replacement of liver etc.

25. Study the following purification table and answer the questions that follow:
Steps Procedure Total protein (mg) Activity (units)
Step 1 Crude extract 15,000 150,000
Step 2 Salt fractionation 4,000 138,000
Step 3 Ion exchange chromatography 1,500 115,500
Step 4 Size exclusion chromatography 68.8 75,000
Step 5 Affinity chromatography 1.75 52,000

(i) Which step in the purification is most effective, and why?

(ii) Which of the procedure is least effective and why?

Ans. Step 5 most effective because of maximum increase in specific activity.
Step 3 least effective because specific activity decreases from previous step.

SECTION - D

26. (a) What do you understand by 'SNPs'? Suggest any two applications.
(b) Name any two databases important in bioinformatics. Mention the type of information which may be obtained form these databases.

Ans. SNPs are single nucleotide polymorphisms. Applications- disease predictions and population genetics etc. on pg. 80-81 (any two) 1 + 2 =3
Any two databases listed on pg.94- EMBL/SWISS-PROT /PDB/Ribosomal RNA database/PALI database and their use

27. (i) What is meant by proteomics ?
(ii) Name three important types of proteomics.
(iii) Why is the proteome of a given species larger than its genome? Give two reasons.

OR

Name the technique developed by O'Farrel. Schematically depict the key steps in the separation of proteins using this technique. Highlight the basis of separation at each step

Ans. (i) The entire protein complement of a cell/tissue/organism.
(ii) Structural proteomics; functional proteomics; expression proteomics
(iii) Proteins are more than genes due to alternate splicing/overlapping genes/post transcriptional and post translational modifications.

OR

2-D gel electrophoresis. First dimension by isoelectric focussing and include principle and second dimension by SDS-PAGE with principle.

28. (i) Schematically illustrate the technique of 'site-directed mutagenesis'.
(ii) What physical and chemical properties of naturally occurring enzymes might be useful to change by site directed mutagenesis?

OR

Explain the principle and steps involved in the Sanger's method of DNA sequencing.