BIOTECHNOLOGY-045

Marking Scheme/99

Q1. Cell growth inhibited when in contact with other cells/wall of the container. (1)

Q2 Van der Waals forces are important in macromolecules such as proteins because the large surface areas involved can result in reasonably large total forces/Several Van der Waals forces together give rise to stronger force. (1)

Q3. Bacterial cells scatter light in proportion to their concentration giving rise to high turbidity/absorbance/optical density. (1)

Q4. Reverse transcriptase is required to convert unstable m RNA to stable c DNA. (1)

Q5. Growth retardant. (1)

Q6. Microarray using DNA chip. (1)

Q.7.
- Create transgenic plants by introducing genes which over express stress related osmolytes/osmoprotectants
- Examples such as sugars (trehalose), sugar alcohol (mannitol), amino acids (proline), betaines (glycine betaine), etc.

(2)

Q.8. PCR produces double stranded DNA and M-13 produces single stranded DNA. (2)

Q.9. Finite cell line - Limited life span, slow growth rate, show contact inhibition, monolayer form etc.. (Any two) (1)
Continuous cell line - No contact inhibition, no anchorage dependence, monolayer or suspension form, rapid growth rate etc. (Any 2) as on pg. 140. (1)

Q.10. Several proteins can be obtained from a single m-RNA; processes such as polyadenylation; alternative splicing ; m-RNA editing can cause this/post translational modifications.(Any two) (1X2)

Q.11. Several additional steps are required which may use enzymes and hence add on to the cost. (1)

Difficulty arises due to various post-transcriptional and post-translational modifications. (Any two) (1)

Q.12. Insertional inactivation of Lac Z gene present in vector. (1)
Transformed host cells appear white and non- transformed host cells appear blue on X-Gal substrate (1)

Q 13. Primary metabolites are required for basic metabolic processes e.g. amino acids, nucleic acids. (1)
Secondary metabolites are additional products which may be required e.g. in defense mechanisms. Any example from page 119 -120. (1)

Q 14. Animal cell culture requires periodic replenishment of media / only limited generations are possible /scale up is challenging.(Any two from page 137-139) (2)

Q 15. a) Specific domains of macromolecules(antigens) / specific sequences of amino acids that invoke immune response. (1)

b) (2)

Monoclonal antibodies	Polyclonal antibodies
Binds to a specific epitope on an antigen	Binds to multiple epitopes on an antigen
It is produced by single clone of B-cells	It is produced by multiple clones of B-cells (Any one)

Q16. Transgenic animals are created by direct microinjection of DNA into Ova/stem cells to produce proteins. 1
Advantages : ½ X4
a)High production capacity.
b)Ease of source material collection
c)Moderate capital instrument requirements
d) Low operational cost
e)Ease of production including purification and scale-up. (Any four)

Q.17
- DNA ase I makes random nicks in ds DNA 3
- Chain extension by DNA Polymerase I from 3' OH
- in the presence of dNTPs including fluorescently labeled d UTPs

Or

Fig.3 on Pg.65

Q.18. Any three on page no 106 3

Q.19. Protein fingerprinting page no 37/Mass spectrometry page no 45-46 2 ½
Example Normal Hb and Sc Hb ½

Q.20 10^6 mg to be produced 3
100 mg is produced in 0.5 l
10^6 mg will be produced in 5000l
Hence total volume of culture medium required is 5000 l
Total capacity of 2 fermentors / week = 2 x100 l
Number of weeks = 5000l/2x100
Time required = 25 weeks.

Q.21. Figure 10; page no 20; 2 ½
Detection of specific DNA sequence/DNA fingerprinting ½

Q.22. a) Different insert size / Different types of host cells. 1
b)YAC will not replicate 1
c)Expression vectors ; ½
Special features like signals for transcription and translation are incorporated along with foreign genes. ½

Q 23 Any two database along with information available from page no 80. 2
Any one database retrieval tool and its application from page no 78/79 1

Q24. 3

Fed –Batch culture	Continuous culture
i) Subsequently fed with fresh medium	Nutrients are added before it gets exhausted
ii) Volume of culture increases	Volume remains constant
iii) Graph as on Fig 6. page no 92 /Any point included in the graph.	Graph as on Fig 7. page no 92/Any point included in the graph.

Or

a) Proper mixing of nutrients and providing O_2 for better microbial growth. 1
b)Use of Baffle flask and shakers to increase turbulence. 2

25. Deficiency of essential amino acids /vitamins 1
Two approaches :
a) Transgene for amino acids /vitamins introduced in plants under control of seed specific promoter 1
b) Endogenous genes are modified to increase essential amino acids /vitamins 1

26. a)Gene Knock out is to selectively remove a gene in order to study its function in an organism 1

b)Fig. 13, Page no 155 2
c)Any two on page no 155 2

Or

(a)Need only soil, water, minerals, CO_2 and sunlight to produce thousands of sophisticated chemical molecules. 1
b) Meristem culture technique(Apical meristem), as these are generally free of viruses 2
c) i) Embryo rescue –Excise embryo at proper stage , grow on suitable nutrient medium/Somatic hybridization 1
ii)Use of Barnase gene(with specific TA -29 promoter). 1

27. NCBI –National Centre for Biotechnology Information. 1
Any two advantages on page 60. 2
Any two analysis on page 80. 2

28. a) pH at which net charge on amino acids is zero. 1
b)Proteins are separated on the basis of Iso-electric point in one dimension and on the basis of mass /size in other dimension. 2
c)Crude homogenate is added to biphasic mixture of Dextran and PEG .Cellular debris partitions to dextran and soluble constituents partitions to PEG 2

Or

Self explanatory fig.8 , page no 42
