DEPARTMENT OF BIOTECHNOLOGY

Question bank

BIOTECHNOLOGY

M.SC SEMESTER III

PAPER I :Genetic Engineering & Its Application

1. 1. In detail give the salient methods of transformation of bacterial cells. 16M
2. Describe the steps involved in polymerase chain reaction. Add a note on primer designing. 16M
3. Discuss the use of Ti and Ri plasmids as vectors. 10M
4. Discuss the role and importance of genetic markers in plant transformation. 16M
5. In detail discuss the expression of heterologous genes in insects. 16M
6. Discuss the salient features of expression vectors. 16M
7. Discuss gene therapy with herpes virus vectors. 16M
8. Gene replacement 8M
9. Gene silencing. 8M
10. Somatic cell fusion 4 M
11. Use of scaffold attachment regions 4 M
12. Refolding and stabilization 4 M
13. Retrovirus gene transfer system. 4 M
14. Explain the method for in-vitro amplification of target DNA. 16 M
15. Discuss in detail the steps involved in bacterial transformation with pBR 322. 10M

16. Describe the features of Ti and Ri Plasmids and explain the mechanism of DNA transfer using Ti plasmid. 16M
17. Discuss the role of reporter genes in Plant Transformation studies with example. 8 M
18. Describe physical methods employed in plant transformation. 8 M
19. Explain the precautions to be taken for proper expression of eukaryotic genes in bacteria. Explain with example. 16 M
20. Discuss salient features of expression vectors. 8M
21. Explain how can one ensure rapid purification of Recombinant Proteins after their expression. 8 M
22. Discuss the phage display technique for monoclonal antibody production. 8 M
23. Write a note on retrovirus gene transfer system. 8 M
24. Discuss the advantages and disadvantages of adeno-virus and adenoassociated viruses in Gene therapy. 16 M
25. Role of PEG in transfection. 4 M
26. Advantages of hairy root culture. 4 M
27. Insect Expression System. 4 M
28. Herpes virus vectors. 4M
29. Describe various chemical methods of Transfection. 16M
30. Describe steps involved in Polymerase chain reaction. Add a note on its applications. 16M
31. Discuss plant transformation by Ti plasmid. 10M
32. Methods of nuclear transformation. 8
33. Role of virulence genes in Plant transformation. 8
34. Discuss the expression of heterologous genes in insect cells. 16
35. Salient features of expression vectors. 8
36. Processing of recombinant proteins. 8

37. Discuss the advantages and disadvantages of adenovirus and adeno associated virus mediated gene delivery.16M
38. Phage display technique 8
39. In Vivo gene delivery. 8
40. Liposomes 4
41. 35S Promoter 4
42. Eukaryotic gene expression in bacteria 4
43. Gene augmentation. 4
44. Discuss in detail the use of restriction endonucleases in genetic engineering. 16M
45. Describe in detail shot gun method for producing gene library. 16M
46. Discuss the construction of cDNA library and compare it with genomic DNA library. 16M
47. Maxam Gilbert chemical cleavage method.8M
48. Western blotting. 8M
49. What are vectors ? Explain the use of plasmids as vectors.8M
50. Discuss the importance of physical and biological containment in biosafety regulation.16M

DEPARTMENT OF BIOTECHNOLOGY

Question bank

BIOTECHNOLOGY

M.SC SEMESTER III

Paper II :Plant Biotechnology

1. Give a detailed account of inorganic nutrient components of tissue-culture media and discuss their role. 16M
2. Single cell clone 8M
3. Methods of sterilization. 8M
4. Give an account of protoplast culture and its various applications. 16M
5. Test for viability of culture cells 8M
6. Embryo rescue 8M
7. Development of Bt genes 8M
8. Application of plant transformation for anti-fungal proteins 8M
9. Technology involved for enhancement of shelf life of fruits and flowers 8M
10. Describe role of various molecular markers in breeding program. 16M
11. Biodegradable plastic 8M
12. Therapeutic proteins. 8M
13. Gelling agents in culture media and their properties 4
14.) Application of haploids in plant breeding 4
15. Bar and barnase systems 4
16. Manipulation of Shikimate pathway and its products.8M
17. Discuss in detail plant tissue culture media preparation and composition. 16M

18.Write a note on organogenesis in plant tissue culture. 8M
19. Write a short notes on suspension cultures. 8
20. Write in detail protoplast isolation, culture and fusion technique. 16
21.
22. Embryo Rescue Technique. 8
23. DNA banking of Germplasm conservation. 8
24. What are transgenic plants ? How are Insect Resistant Plants developed. 16
25. Describe production of disease resistant plant by suing chitinase and 1,3-beta glucanase ?8
26. Discuss how post harvest losses can be managed ? 8
27. What are molecular makers ? Explain in detail, SCAR and SSCP Techniques ? 16
28. Biodegradable Plastic 8
29. Oleosin partition technology. 8
30. Somatic Embryogenesis 4
31. Symmetric and Asymmetric Hybrids 4
32. RFLP. 4
33.Explain in detail Somatic Embryogenesis and factors affecting Somatic Embryogenesis ? 16
34. Suspension culture technique. 8
35. Plant tissue culture media. 8
36. Explain in detail Shoot Tip culture technique. 16
37. Symmetric and Asymmetric Hybrid. 8
38. Protoplast culture technique. 8
39. Discuss in detail Insect Resistance in Plants. 16
40. Virus resistant plants. 8
41. Bar and Barnase System. 8

42. Give brief account on molecular marker aided breeding with reference to RAPD, STS, SSCP and SCAR. 16
43. Green House Technology. 8
44. Edible vaccines. 8
45. Callus culture. 4
46. Anther culture. 4
47. Male sterile lines. 4
48. Biodegradable Plastic. 4
49. How tissue culture technique is useful in producing novel plants ?16
50. Suspension culture. 8
51. Embryogenesis. 8
52. How shoot tip is used in clonal propagation and production of virus tree plants ? 16
53. Symmetric and asymmetric hybrids. 8
54.) Germplasm conservation. 8
55. Describe development of insect resistant transgenic plant. 16
56. Protease inhibitor. 8
57. ACC oxidase. 8
58. Describe Shikimate pathway in detail. 16
59. Therapeutic proteins. 8
60. Molecular marker assisted selection. 8
61. Write notes on :
62. Initiation and maintenance of callus. 4
63. Embryo culture. 4
64. Nematode resistance. 4
65. SCAR. 4

DEPARTMENT OF BIOTECHNOLOGY

Question bank

BIOTECHNOLOGY

M.SC SEMESTER III

PAPER III :Environmental Biotechnogy

1. Need for environmental education. 8
2. Air pollutants and their properties. 8
3. Gaseous pollutants. 8
4. Soil pollution. 8
5. Describe in detail the abiotic and biotic components of an ecosystem. 16
6. Ecological succession. 8
7. Importance of biogeochemical cycles. 8
8. Explain in detail the renewable sources of energy. 16
9. Biosensors and biochips. 8
10.) Biofuel cells. 8
11. Write notes on :
12. Integrated pest management. 8
13. Aquatic ferns as biofertilizers. 8
14. Fungi as biofertilizers. 8
15. Bacterial biofertilizers. 8
16. Thermal pollution. 4
17.) Ecads. 4
18. Biofilters. 4
19. Earthworm as biofertilizers. 4

20.Describe properties of various water pollutants. Add a note on their impact on aquatic ecosystem.16M

21. Noise pollution. 8

22. Soil pollution. 8

23. Write a detailed note on biotic components of any one of the ecosystems. 16

24.Explain biotechnological approaches for bioconversion and biodegradation of environmental pollutants.16

25. Explain with examples how energy is obtained from biomass. 16

26.What are Biosensors ? Explain its principle and applications. 16

27.4. What is integrated pest management ? Give a detailed account on Biopesticides. 16

28.Explain the following with examples :

29. Algal biofertilizers. 8

30. Fungi as biofertilizers. 8

31. Write brief notes on :

32. Causes of marine pollution. 4

33. Biomagnification. 4

34. Biofuel cells. 4

35. Aquatic ferns as biofertilizers. 4

36.Explain thermal pollution and marine pollution in detail. 16

37. Explain environmental ethics in detail. 8

38. Describe in detail need for environmental education. 8

39. Explain in detail various abiotic and biotic components of ecosystem in detail. 16

40. Explain Bioaccumulation and Biomagnification. 8

41. Explain Ecads and ecotypes. 8

42. Explain in detail about energy from biomass. 16

43. Biosensors. 8

44. Biofuel cells. 8

45. What are Biofertilizer and Biopesticides ? Explain bacterial biofertilizer in detail. 16

46. Explain earthworm as biofertilizer. 8

47. Explain integrated pest management in detail. 8

48. Noise pollution. 4

DEPARTMENT OF BIOTECHNOLOGY

Question bank

BIOTECHNOLOGY

M.SC SEMESTER III

PAPER IV :Diagnostic Medical Biotechnology

1. Discuss in detail disease pathology and clinical spectrum of any one Bacterial disease condition. 16
2. Give a detailed account of assays for diagnosis of inherited diseases. 16
3. Describe SNP detection by hybridization and Polymerization based assays. 16
4. With example explain what is 'disease' gene and what is 'susceptibility' gene ? 8
5. Describe briefly any one method utilized for clonal amplification of templates during High through
6. DNA sequencing. 8
7. What is clinical proteomics ? Describe proteomic methods for disease biomarker analysis. 16
8. Outline of a typical proteomics experiment 8
9. Mass spectrometry for protein biomarker identification. 8
10. Explain what are nanobiosensors and their applications in clinical diagnosis. 16
11. What is a nanobiochip ? Discuss the importance of different types of biochips in molecular diagnostics.
12. Host pathogen interaction in AIDS 4
13. Phenylketonuria 4
14. 2D protein analysis 4

15. Gold and Silver nanoparticles. 4
16. Discuss the disease pathology and clinical spectrum of tuberculosis. 16
17. Write a detailed note on clinical diagnosis of viral diseases with suitable examples. 16
18. Describe various techniques for SNP detection. 16
19. Discuss Next Generation DNA sequencing methods (any two). 16
20. Explain disease biomarker analysis outlining a typical proteomic experiment . 16
21. How is 2D protein analysis important in protein identification ? Explain the process in detail. 16
22. Explain what is Nanomolecular diagnostics. Add a note on Nanoarrays in diagnosis. 16
23. Write notes on :
24. Application of nanodiagnostics 8
25. Protein nanoarrays. 8
26. Bioinformatic tools for molecular diagnosis 4
27. Monogenic disorder 4
28. Ethics in Molecular Diagnosis 4
29. CNT biosensor 4
30. Write a detailed note on Assays for the Diagnosis of inherited diseases. 16
31. Discuss in detail disease pathology and clinical spectrum of Tuberculosis. 16
32. Explain in detail any two techniques employed for DNA polymorphism analysis. 16
33. Discuss the importance of High throughput DNA sequencing in disease diagnosis/susceptibility detailing
34. Describe any one Next Generation Sequencing technique. 16
35. Discuss in detail the approach for protein biomarker discovery through proteomics experiment. 16
36. Ethics in Molecular Diagnosis 8
37. Present methods for diagnosis of AIDS. 8
38. Write notes on :
39. DNA nanomachines 8
40. Nanobiosensors. 8
41. Self-assembled protein nanoarrays 8

42. Applications of nanodiagnostics. 8
43. Bioinformatic tools for molecular diagnosis 4
44. Polymorphism detection without sequence information 4
45. 2D analysis of protein biomarkers 4
46. DNA nanosensor. 4
47. Present methods for diagnosis of AIDS. 8
48. Gold and Silver nanoparticles. 4
49. With example explain what is 'disease' gene and what is 'susceptibility' gene ? 8
50. DNA sequencing. 8

DEPARTMENT OF BIOTECHNOLOGY

Question bank

BIOTECHNOLOGY

M.SC SEMESTER IV

PAPER I :Animal Biotechnology

1. Describe in detail the different types of media used for animal cell culture. 16
2. Describe the characteristics of cells in culture. 16
3. Describe primary culture technique in detail. 16
4. Write notes on Separation of cells based on their density and size. 8
5. Maintenance of established cell lines. 8
6. Write notes on Apoptosis in cell culture 8
7. Stem cell cultures 8
8. Scaling up of suspension culture 8
9. Immortalization of cells in culture. 8
10. Describe the process of harvesting, purification and assays of products of animal tissue culture with suitable examples. 16
11. Describe in detail the organ culture, histotypic culture and organotypic cell cultures. 16
12. Write notes on Role of carbon dioxide 4
13. Cell adaptation 4
14. Somatic cell genetics 4
15. Method for assay of cytotoxicity 4
16. Discuss the chemical, physical and metabolic functions of different constituents of culture medium. 16
17. Discuss the characteristics of cells in culture with reference to contact inhibition, anchorage dependence and cell-cell communication. 16

18. Describe the primary culture technique in detail.

19. Explain the role of flow cytometry in cell viability, toxicity and cell type separation. 16

20. What are embryonic stem cells ? Write the applications of stem cells in tissue homeostasis. 16

21. What is apoptosis ? Describe various mechanisms of apoptosis. 16

22. Describe the mass production purification and assay of vaccines. 16

23. Discuss various strategies of tissue engineering. 16

24. Write short notes on Cell senescence 4

25. Explant culture 4

26. Measurement of cell death 4

27. Vascular grafts and skin grafts. 4

28. Write in detail about various systems of animal tissue culture. 16

29. Discuss the characteristics of cells in culture. 16

30. Explain the principle and technique of primary cell culture. 16

31. Discuss various methods of separation of cell types, advantages and limitations. 16

32. Write a detailed note on scaling up of animal cell culture. 16

33. What are stem cells ? Explain embryonic stem cell culture technique in detail. 16

34. Discuss 'Tissue culture as a screening system'. 16

35. Discuss in detail mass production of vaccines. 16

36. Write short notes on Cell-cell communication 4

37. Cell cloning 4

38. Role of cytochrome C in apoptosis 4

39. Three dimensional cultures.

DEPARTMENT OF BIOTECHNOLOGY

Question bank

BIOTECHNOLOGY

M.SC SEMESTER IV

PAPER II :Biostatistics , Bioinformatics ,Ethics and Patenting

1. Explain the measures of central tendency. 8
2. Discuss the importance of Chi-square test in statistical analysis. 8
3. Discuss the various sampling methods used in statistics. 8
4. Describe the importance of tabulation in presentation of statistical data. 8
5. Discuss the various steps involved in designing a database. Add a note on metabolic pathways databases. 16
6. Discuss the importance of bioinformatics tools in drug designing. 16
7. Discuss Ethical, Legal and Social Issues (ELSI) involved in the field of Biotechnology. 16
8. Write a detailed note on ethics involved in Human Stem Cell Research. 16
9. What is a Patent ? Describe the various steps involved in a patenting process. 16
10. Write notes on Intellectual Property Rights 8
11. Biosafety and its implementation. 8
12. Write short notes on :Dendrogram 4
13. Operating Systems 4
14. Release of genetically modified organisms 4
15. Quality Control in Biotechnology. 4

16. **Write a detailed account on phylogeneteic clustering. 16**
17. **Give detailed account on research design and field layout. 16**
18. **Give a brief idea about types of data. Give detailed account on genomic and metabolic pathways databases. 16**
19. **Discuss the importance of proteomics in protein sequences, alignment and protein structure prediction. 16**
20. **Discuss various ethical constraints associated with genetic modifications and food consumption. 16**
21. **Give detailed account on ethical constraints related to human embryonic stem cell research. 16**
22. **Give detailed account on IPR. 16**
23. **With suitable examples explain the importance of patent and trademark in Biotechnology products and processes. 16**
24. **Write short notes onMeasures of central tendency 8**
25. **BLAST 8**
26. **Applications of human genetic rDNA research 8**
27. **Plant breeders right. 8**

DEPARTMENT OF BIOTECHNOLOGY

Question bank

BIOTECHNOLOGY

M.SC SEMESTER IV

PAPER III :Applied Environmental Biotechnology

1. Discuss different types of solid wastes and describe management of agricultural waste. 16
2. Write in detail on Phyto remediation. 16
3. Describe the process of bioleaching of mercury and Cadmium. 16
4. Describe biosorption of heavy metals with examples. 16
5. Discuss primary treatment of waste water and add a note on activated sludge process. 16
6. Describe in detail treatment scheme for Tannery industry waste water. 16
7. Define Xenobiotic compounds and discuss biodegradation of synthetic dyes. 16
8. Flavir dependent reactions. 8
9. Biodegradation of surfactants. 8
10. Bioreduction 4
11. Methylation of mercury. 4
12. Oxidation ponds 4
13. Cytochrome P450 monooxygenase system. 4
14. Discuss various methods of solid waste treatment and management. 16
15. Biofeasibility. 8
16. Bioreduction. 8
17. Discuss biomethylation of mercury and arsenic. 16
18. Metal microbial interaction. 8

19. Advantages and disadvantages of bioleaching. 8
20.Activated sludge treatment. 8
21. Waste water treatment by biofilms. 8
22.Discuss the treatment scheme of Dairy and Distillery waste. 16
23. Discuss biodegradation of lignin, tannin, surfactants and pesticides. 16
24.Discuss the role of alcohol and aldehyde dehydrogenases and carboxyl esterases in biotransformation.
25. Composting systems. 4
26. Metal binding targets. 4
27. Aerated ponds. 4
28. Cytochrome P450 monoxygenase system. 4
29.Solid waste, if allowed to accumulate, is a health hazard'. Justify the statement. 16
30. What is composting ? Briefly explain any one method by which it is accomplished. 8
31. Distinguish between Bioremediation and Phytoremediation. 8
32. What is Bioleaching ? Why is it needed ? Discuss the bioleaching of Mercury and
33.Cadmium. 16
34. Explain the factors that influence bioabsorption. 8
35. Discuss the Biomethylation of elements. 8
36. Discuss the various biological treatment systems for waste water treatment. 16
37. Describe the activated sludge process. What are its merits and limitations ? 8
38. Discuss the treatment scheme of chemical and antibiotic waste. 8
39. Describe any two microbial activities carried out on the Xenobiotice compounds. 16
40.Discuss biotransformation with respect to Oxidation and Reduction reactions. 16
41. Write short notes on :
42. Bioreduction. 4
43. Metal precipitation. 4
44. Role of Biofilms in Waste water treatment. 4
45. Hydrolysis Reactions. 4

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DEPARTMENT OF BIOTECHNOLOGY

Question bank

BIOTECHNOLOGY

M.SC SEMESTER IV

PAPER IV :Therapeutic Medical Biotechnology

1. **Explain in detail the process of Adenovirus mediated gene transfer. 16**
2. **Write a note on Gene silencing technology and describe its therapeutic application. 16**

3. **Describe the detail the high throughput screening methods for drug discovery. 16**
4. **Write notes on Concept of pharmacogenetics 8**
5. **Metagenomics and drug discovery. 8**
6. **Write a detailed note on nanoparticle based drug delivery. 16**
7. **Write short notes on Nanobiotechnology for drug discovery. 8**
8. **Physicochemical characteristics of nanomaterials. 8**
9. **Explain in detail the process of Drug development and phases of Clinical Trials. 16**
10. **Write notes on**
11. **Protocol designing. 8**
12. **Standard operating procedures. 8**
13. **Write short notes on**
14. **Liposome mediated gene delivery.**
15. **Concept of Pharmacogenomics. 4**
16. **Nano medicine and safety issues. 4**
17. **Role of CRC in clinical trials. 4**
18. **Describe the mechanism of SiRNA mediated gene silencing. 8**
19. **Explain what are transgenics and their use in drug discovery. 8**
20. **Describe the process of retrovirus mediated gene transfer. 16**
21. **Describe the Identification of drug targets using proteomics approach. 16**
22. **Write notes on Pharmacogenetics 8**
23. **Metagenomics. 8**
24. **Explain in detail the mechanism of nanoparticle based drug delivery. 16**
25. **Ethical and regulatory issues of nanomedicine. 8**
26. **Physicochemical characteristics of nanomaterials. 8**
27. **Explain the role of CRC and CRA in clinical trials. 16**
28. **Describe the phases of clinical trials. Add a note on protocol designing. 16**
29. **Write short notes on Liposome mediated gene delivery 4**
30. **Toxicogenomics 4**
31. **Neurotoxicology 4**
32. **Informed consent process. 4**