

Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore
Pharmaceutical Microbiology & Biotechnology

II Year B Pharm (RS4)

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
1	INTRODUCTION	-	-	2	2

1. INTRODUCTION (2 marks)

1. Write contributions of Antony Van Leeuwenhoek.
2. Write contributions of Edward Jenner.
3. Write contributions of Robert Koch.
4. Write contributions of Louis Pasteur.
5. Write contributions of Alexander Fleming.
6. Write the concept of spontaneous generation.
7. Write four pharmaceutical uses of microorganisms.
8. State Koch's postulates.
9. What is germ theory of diseases?
10. Write significance of swan necked Flask.
11. What is biogenesis?

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
2	BACTERIOLOGY	10	-	2	12
		-	5	2+2+2	11

2.BACTERIOLOGY (10 marks)

1. Classify bacteria on the basis of nutritional requirements and add a note on raw materials used for preparation of culture media. (4+6)
2. Define and classify culture media. Mention salient feature of each media along with an example. (1+2+7)
3. Draw an ultra structure of typical bacteria. Write composition and functions of its organelles. (3+7)
4. Classify bacteria on the basis of morphological features. Add a note on composition and functions of cell wall. (6+4)
5. Write briefly on various techniques used for identification of bacteria with emphasis on colony characters.
6. Differentiate between gram positive and Gram negative cell wall. Add a note on principle and procedure of Gram's staining technique. (5+5)
7. Classify bacteria on the basis of oxygen, pH and temperature requirements. Add note on the effect of hyper and hypotonicity on bacteria. (2+2+2+4)
8. Describe bacterial growth curve. Add a note on physical factors affecting growth of bacteria. (5+5)
9. Enlist methods used for total and viability counting bacteria. Describe any two methods of total counting. (4+6)
10. Explain continuous and synchronous growth techniques. Add a note on filter membrane method of counting bacteria. (5+5)
11. Mention methods used for identification of bacteria. Explain any four biochemical tests used for identification of bacteria. (2+8)
12. Classify bacteria on the basis of oxygen requirement. Explain any four efficient methods of cultivation of anaerobic bacteria. (2+8)
13. Write in detail about agar plate methods of viability counting.

14. What is pure culture? Enlist methods for isolation of pure culture? Describe any two industrially important techniques of preserving bacteria. (2+3+5)
15. Write about importance of microbial preservation technique. Write procedure, merit and demerit of any four preservation techniques. (2+8).
16. What is pure culture? Write in detail about isolation of pure culture. (2+8)

Five Marks

1. Classify bacteria on the basis of nutritional requirements
2. Write a note on raw materials used for preparation of culture media.
3. Define and classify culture media with examples.
4. Write salient feature of differential & selective media along with examples.
5. Classify bacteria on the basis of morphological features.
6. Explain composition and functions of cell wall.
7. Differentiate between gram positive and Gram negative cell wall.
8. Write principle and procedure of Gram's staining technique.
9. Write principle and procedure of Acid-fast staining.
10. Describe bacterial growth curve.
11. Write a note on physical factors affecting growth of bacteria.
12. Describe any two methods of viability counting.
13. Describe any two methods of total counting.
14. Explain continuous and synchronous growth techniques.
15. Write a note on filter membrane method of counting bacteria.
16. Explain IMViC tests used for identification of bacteria.
17. Explain MR-VP tests used for identification of bacteria.
18. Write a note on cultivation of anaerobic bacteria.
19. Write different methods of motility testing
20. Enlist methods for isolation of pure culture?
21. Describe any two industrially important techniques of preserving bacteria.
22. Write about methods for maintenance of pure culture.
23. Write about importance of microbial preservation technique.
24. Write merit and demerit of any four preservation techniques.
25. Write a note on gelatin liquefaction and starch hydrolysis tests.

BACTERIOLOGY (2 marks)

Differentiate between

1. Differentiate between flagella and fimbriae.
2. Differentiate between enrichment and selective media.
3. Differentiate between mordant and decolourising agent.
4. Differentiate between log phase and decline phase.

5. Differentiate between chemostat and turbidostat.
6. Differentiate between acid fast and non acid fast bacteria.
7. What is mesosome ?
8. Differentiate between facultative anaerobes and obligatory anaerobes.
9. Differentiate between prokaryotes and Eukaryotes.
10. Differentiate between bacteria and virus.
11. Differentiate between phototroph and chemotrophs.
12. Differentiate between fungi and bacteria.
13. Differentiate between organotrophs and lithotrophs.
14. Differentiate between autotrophs and heterotrophs.
15. What is anaerobic media? Give examples.
16. Write functions of cytoplasmic membrane.
17. Mention uses of preservation techniques.
18. Mention chemicals used in gaspak system.
19. What are plasmids?
20. Write significance of plasmids.
21. What are micronutrients?
22. Write composition of Peptidoglycan.
23. What is micromanipulator? Mention its use.
24. Write principle and use of coulter counter instrument.
25. Mention reagents used for acid fast staining.
26. Mention role of each chemical used in gram's staining.
27. What is basal media? Give example.
28. What is synchronous growth?
29. What is transport media? Give one example.
30. What is enriched media? Give example.
31. What is differential media? Give example.
32. What is the role of agar in culture media.
33. What is pleomorphism? Give examples.
34. What are involution forms? .
35. What are mesophilic bacteria? Give examples.
36. What are Psychrophilic bacteria? Give examples.
37. What are Thermophilic bacteria? Give examples.
38. What are fastidious bacteria?
39. What is selective media? Give example.
40. What are Intra cytoplasmic inclusions? Give examples.
41. What is pour plate method, write its uses.
42. Mention functions of bacterial capsule.
43. What are cryoprotective agents? Give examples.
44. Mention arrangement based classification of cocci.

45. What is mean generation time?
46. What is lag phase of growth.
47. What is log phase of growth.
48. What is stationary phase of growth.
49. What is decline phase of growth.
50. List out the different phases of growth of bacteria
51. Write principle of starch hydrolysis test.
52. Mention Carbohydrate utilization tests.

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
3	INTRODUCTION	-	5	-	5

3. Fungi and virus (2 marks)

1. Mention media for cultivation of fungi.
2. Write merits of embryonic cultivation of virus.
3. Write merits of embryonic cultivation of virus.
4. What is capsid?
5. What is envelope in virus?
6. Classify fungi.
7. Mention pharmaceutical uses of fungi.
8. Write structure of typical virion.
9. What is mycelium?
10. Why are virus described as obligate parasites?

3. Fungi and virus (5 marks)

1. Describe methods of reproduction in fungi.
2. Write a note on cultivation of virus.
3. Discuss about merits and demerits of viral cultivation techniques.
4. Describe steps involved in replication of virus.
5. Write about classification of virus.

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
4	STERILIZATION	10	-	2	12
		-	5	2+2+2	11

4. STERILIZATION

I Long Essay

10 marks

1. Explain the principle, procedure, applications and demerits of sterilization using autoclave (3+3+2+2)
2. Explain the principle and operating procedure of Industrial autoclave along with a neat labeled diagram . (4 +6)
3. Explain the principle, procedure, applications and demerits of sterilization using hot air oven. (3+3+2+2)
3. Explain the mechanism of action, procedure, applications and factors affecting sterilization using ethylene oxide. (2+2+2+4)
4. Explain the source, mechanism of sterilisation, merit, demerits and applications of sterilization using Gamma radiations. (1+3+2+2+2)
5. Describe the steps involved in sterility testing; add a note on its interpretation. (6+4)
6. Explain principles involved in sterilisation by filtration. Add a note on its merits and demerits (5+1+4)
7. Classify different sterilization methods. Add a note on sterility test methods.
8. What are sterilisation indicators? Mention indicators used for various sterilisation methods.

5 marks questions

1. Write the procedure, merits and demerits of membrane filtration
2. Write the merits and demerits of different sterilizing filters.
3. Write the procedure, merits and demerits of ethylene oxide sterilisation.
4. Explain the principle involved in autoclaving.
5. Explain the mechanism of sterilisation and heat transfer by hot air oven.
6. Write the production, mechanism of action, demerits and applications of UV radiations.
7. Explain the factors affecting gaseous sterilisation.
8. Write a note on heating with bactericide
9. Write a note on sterilisation indicators.
10. Write about sampling technique of sterility testing.

11. Justify the importance of controls in sterility testing.

2 marks questions:

1. Define sterilisation
2. What is Pasteurisation? List out its applications
3. What is incineration?
4. Explain 'Heating to red hot' as a method of sterilisation.
5. Mention applications of UV radiations as a sterilant.
6. Explain the advantage of saturated steam over super heated steam.
7. Explain the advantages of autoclaving over hot air sterilization.
8. List out any four applications of gamma irradiation.
9. Mention any four applications of autoclave.
10. Mention any four applications of dry heat sterilization.
11. Mention any four applications of gaseous sterilization.
12. Mention any four applications of ethylene oxide sterilization
13. Mention any four applications of filtration sterilization
14. Mention any four gaseous sterilants.
15. Mention the ionizing and non-ionising radiations used for sterilization.
16. Write the mechanism of sterilisation by hot air oven.
17. Write the mechanism of sterilisation by autoclave.
18. Write mechanism sterilization by ethylene oxide.
19. Write the mechanism involved in membrane filtration sterilization.
20. Mention the demerits of moist heat sterilization
21. Mention the demerits of dry heat sterilization
22. Mention the demerits of ethylene oxide sterilization
23. Mention the demerits of gaseous sterilization
24. Mention the demerits of membrane filtration method of sterilization
25. Mention the demerits of UV radiation sterilization
26. Mention the demerits of gamma radiation as sterilant
27. Write bio-indicators for thermal sterilization.
28. Mention media used for sterility testing.
29. Why are positive controls used in sterility test
30. Why are negative controls used for sterility test
31. Write applications of membrane filtration
32. Write applications and limitations of formaldehyde as a sterilant.
33. What are HEPA filters?

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
5	DISINFECTANTS	-	5	2	7

5.DISINFECTANTS

5 marks questions

1. Explain any two methods for evaluation of bacteriostatic activity of a disinfectant.
2. Write the procedure of Redial Walker's co-efficient test.
3. Mention the merits and demerits of Redial Walker's co-efficient tests.
4. Explain a test for evaluation of bactericidal activity of a disinfectant.
5. What is MIC? Explain the method for its determination
6. Explain the antimicrobial sensitivity test.
7. List out the properties of an ideal disinfectant.
8. Classify disinfectants giving examples
9. Outline mechanism of action for each class of disinfectant.
10. Explain different factors affecting disinfection.
11. Write classification, mechanism of action and uses of phenolic disinfectants.
12. Explain the mechanism of action and uses of aldehyde disinfectants.
13. Write classification, mechanism of action and uses of halogens as disinfectants.
14. Write a note on evaluation of preservatives.
15. Explain evaluation of bacteriostatic activity of a disinfectant.

Short answer (02marks)

1. Write time and temperature of incubation for sterility testing.
2. Define disinfection.
3. Define antisepsis.
4. Differentiate between disinfection and antisepsis.
5. What is a preservative? Give examples
6. Give examples for disinfectants with virucidal activity
7. Give examples for disinfectants with antifungal activity
8. Give examples for disinfectants with sporicidal activity
9. Write the ideal properties of an antiseptic
10. Give examples for aerial disinfectants
11. Give two examples for alcoholic disinfectants. Mention its mechanism of action.
12. Give two examples for halide disinfectants. Mention its mechanism of action.
13. Give two examples for heavy metal compounds used as disinfectants. Mention its mechanism of action.
14. Name any two compounds used for disinfection of water, mention their mechanism of action
15. What is 'Zone of inhibition'?
16. What is MIC?

17. What is Disc diffusion method?
18. Write the equation for determination of Redial Walkers co-efficient
19. Difference between bacteriostatic and bactericidal agents.

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
6	Immunization	10	-	2	12
		-	5	2+2+2	11

6.IMMUNOLOGY (10marks)

01. Discuss in general the various types of antigen and antibody reactions. Add a note on their applications. (8+2)
02. Mention various antigen-antibody reactions. Discuss in detail the precipitation test. (2+8)
03. Explain types of antibodies. Explain antigen antibody reactions. (5+5)
04. Discuss in detail the Agglutination and complement fixation tests. (6+4)
05. What are different types of antigen? Write the chemical nature of the antigen and antibody. Add a note on antigenic determinants. (2+4+4)
06. Classify antibodies and write note on salient features of each antibody. (2+2+2+2+2)
07. Write about types of immunity and types of vaccines. (5+5)
08. What are vaccines? Classify them. Explain the production and storage of BCG vaccine. (2+2+6).
09. What are toxins & toxoids? Explain the production and storage of Tetanus toxoid. Add a note on booster dose. (3+5+2).
10. Write about production of oral polio vaccine. Add a note on immunization programme. (6+4)

Five Marks Questions

01. Write principle, procedure and applications of Western Blotting Technique.
02. Write principle, procedure and applications of ELISA test.
03. Write principle, procedure and applications of widal test.
04. Enlist different antibody antigen reactions and mention its diagnostic applications.
05. Write in detail the production of BCG vaccine.
06. Write in detail the production of Tetanus toxoid.
07. Write in detail the production of Polio vaccine.
08. Define immunity. Classify the types of immunity.
09. Write in detail the structure of different types of antibodies with neat labeled diagram.
10. Highlight on steps involved in production of antibodies.

IMMUNOLOGY (02marks)

01. What are haptens?
02. What are epitopes and paratopes?
03. Mention characters of antigen-antibody reactions.
04. What are mixed vaccines? Give examples.
05. Differentiate between killed and live vaccines.
06. Differentiate between active and passive immunity.
07. Differentiate between vaccine and antisera.
08. What are Toxoids?
09. Write the Principle involved in Widal test.
10. Write the Principle involved in Mantoux test.
11. Write the Principle involved in Western blot
12. Write the applications of ELISA test
13. Classify immunity
14. Write significance of H and O antigens
15. How do you convert toxin to toxoid
16. Mention diagnostic tests for Tuberculosis
17. Mention diagnostic tests for AIDS
18. Mention diagnostic tests for typhoid
19. Write two differences between agglutination and precipitation reactions.
20. Mention different types of immunoglobulins.
21. What is antitoxin?
22. Write general storage conditions for vaccines and sera.
23. Mention drugs used for treatment of Tuberculosis.
24. Mention drugs used for treatment of malaria.
25. Mention drugs used for treatment of typhoid.
26. Mention drugs used for treatment of AIDS.
27. Write signs and symptoms of dengue.
28. Define vaccine with examples.
29. Write about prevention of dengue.
30. Define immunity.
31. What are attenuated vaccine? Give examples.

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
7	FERMENTATION AND MICROBIOLOGICAL ASSAY	-	5	2	7

7. FERMENTATION AND MICROBIOLOGICAL ASSAY:

05 Marks

01. Explain principles involved in microbiological assay of streptomycin.
02. Write a note on principle involved in microbiological assay of vitamin B₁₂.
03. Describe production of vitamin B₁₂.
04. Outline the production of streptomycin.
05. Write neat labeled diagram of an industrial fermenter, add note on its accessories.
06. Explain microbiological assay of streptomycin by agar plate method.
07. Write procedure for titrimetric microbiological assay vitamin B₁₂.

II. Two Marks Questions

01. Properties of an ideal fermentor.
02. Mention parts of industrial fermenters along with their role.
03. What is the use sparger and impellor in a fermentor.
04. Mention organisms for production streptomycin & Vit B₁₂.
05. Mention organisms for microbiological assay of streptomycin.

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
8	GENETIC ENGINEERING	-	5	-	5

8. GENETIC ENGINEERING_(5marks)

- 1) Write briefly on various tools used in rDNA technology.
- 2) Write a note on vectors used in rDNA technology.
- 3) Write the production of recombinant insulin by genetic engineering.
- 4) Write the production of hepatitis B vaccine by r-DNA technology.
- 5) Write a note on restriction endonucleases.
- 6) Write a note on structure of plasmid vectors.
- 7) Explain methods used for isolation of desired gene.

- 8) Give schematic representation of steps involved in rDNA technology.
- 9) List the techniques used for identification of transgenic cells and explain any one.
- 10) Explain their practical application of endonuclease in molecular biology and biotechnology.
- 11) What are the essential characteristics needed for a vector?
- 12) What are the enzymes needed for the recombinant DNA technique?
- 13) Explain the principle and application of PCR.
- 14) What is a restriction site? Explain the important features of restriction sites.
- 15) Explain the method of production of Insulin by rDNA Technology
- 16) Explain the method of production of HBs Vaccine by rDNA Technology

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
9	Animal cell culture	-	-	2+2	4

09. Animal cell culture

01. Name two biological contaminants in animal cell culture.
02. What are the incubator conditions for animal cell culture?
03. Cell sources in animal cell culture.
04. Write the composition of HAT media
05. What are Monoclonal Antibodies
06. What is the difference between primary cell lines and secondary cell lines?
07. Significance of animal cell culture.
08. What are cell lines?
09. What is primary cell culture?
10. What is secondary cell culture?
11. What are monoclonal antibodies and polyclonal antibodies?
12. Write the applications of monoclonal antibodies.
13. Write any four applications of animal cell culture technology.
14. What are adherent and non adherent cell lines? Give examples.
15. Mention any four media used for animal cell culture.
16. Mention any four major requirements for cell culture laboratory.
17. How do you isolate cancer cell from normal cell?
18. How do you isolate fused hybrid cells from other cells?
19. How do you fuse myeloma cells with normal B- lymphocytes?
20. Differentiate between primary cell lines and immortal cell line.

Sl No	Chapter Name	Long Essay	Short Essay	Short Answer	Total Marks
10	DISEASES	-	5	-	5

10. DISEASES (5marks)

1. Write the causative organism, mode of transmission, prevention and treatment of malaria.
2. Write short notes on laboratory diagnosis and treatment of *Vibrio cholerae* and *Salmonella typhi*.
3. Write the causative organism, mode of transmission, sign and symptoms and prevention of AIDS.
4. What is dengue fever? Write the causative organism, mode of transmission, sign and symptoms.
5. Write about causative organism, mode of transmission, sign and symptoms and treatment of tuberculosis.

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