



WEST BENGAL STATE UNIVERSITY
B.Sc. Major 4th Semester Examination, 2026

MCBDSC407T-MICROBIOLOGY (MAJOR)

Time Allotted: 2 Hours

Full Marks: 50

*The figures in the margin indicate full marks.
Candidates should answer in their own words and adhere to the word limit as practicable.
All symbols are of usual significance.*

Answer Question Number 1 and any four from the rest

1. Answer any *five* questions:

2×5 = 10

- (a) Define LD₅₀.
- (b) What is a toxoid?
- ✓(c) What type of disease is caused by *Helicobacter pylori*?
- ✓(d) What is transport media? Give one example of transport media.
- ✓(e) How does Griseofulvin act on a fungal cell?
- (f) What is Sandwich ELISA?
- ✓(g) Mention the characteristic symptoms of malaria.
- ✓(h) Define antibiogram.
- ✓(i) Give an example of water borne viral disease and one vector borne protozoan disease.
- (j) What do you mean by H5N1 strain of influenza virus?

2. ✓(a) How ELISA and PCR can be used for detection of diseases?

(2+2)+2
+3+1

- ✓(b) Why is skin not a favourable microenvironment for bacterial colonization?
- ✓(c) State the principle of immunofluorescence technique.
- ✓(d) What are opportunistic pathogens?

3. ✓(a) Describe the symptoms of Kala-azar. Name the causative agent of the disease.

(3+1)+3
+2+1

- ✓(b) Why does HIV infection lead to immunodeficiency?
- ✓(c) How does Rabies virus transmission take place?
- ✓(d) Comment on the mortality rate of rabies infection.

4. ✓(a) Describe the mode of action of Amphotericin B. Why do you think it is selectively toxic?

(4+2)+4

- (b) Comment on the social impact of MDR and XDR organisms in the current world scenario.

5. (a) What is candidiasis? Which parts of human body are affected by candida infection? Name one antifungal agent effective against candida infection. (2+3+1)+4
- ✓ (b) Differentiate with example the cutaneous mycoses and systemic mycoses. 3+2+3+2
6. (a) Mention the mode of action of cholera toxin.
- (b) How does *Mycobacterium* survive inside macrophages?
- (c) Explain the pathogenicity of ETEC.
- (d) What do you mean by EHEC?
7. (a) What are the characteristics of *Vibrio cholerae* regarding the following aspects: (1+1+1+1)+2
- (i) Gram character
- (ii) Motility
- (iii) Morphology
- (iv) The disease it causes?
- (b) State the prophylaxis and control of enteric fever caused by *Salmonella* sp.
- (c) Describe the mode of action of ampicillin.
8. (a) Explain the mode of action of tetanus toxin. How can tetanus be prevented? (3+1)+2
- (b) What is HAART? +2+2
- (c) Define Nosocomial infection.
- (d) What do you mean by Chemotherapeutic index?
9. (a) Name two antiviral drugs used to treat influenza. 2+(2+2)
- (b) What do you mean by antigenic shift and antigenic drift? +2+2
- (c) What do you mean by inapparent polio virus infection?
- (d) What is the confirmatory test to diagnose AIDS patients and patient with typhoid fever?

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Answer Question Number 1 and any four from the rest

1. Answer any **five** questions from the following: 2×5 = 10
- (a) "Most of the food spoilage causing bacteria do not grow below 0.91 water activity." —Justify with reasons.
 - (b) What do you mean by 'Putrefaction'? Explain with example.
 - (c) Mention the extrinsic factors affecting microorganisms present in food.
 - (d) How redox potential affects microorganisms in food?
 - (e) How does benzoic acid act as a food preserving agent? Which food products use benzoic acid as preservatives?
 - (f) What is rennet? Mention its source for commercial cheese production.
 - (g) Name two microorganisms used as probiotics. Why are they considered as probiotics?
 - (h) What is ropy milk? Which organism is responsible for it?
 - (i) What is rancidity? Name a microorganism responsible for rancidity.
2. (a) What is Sauerkraut? Which microbes are associated with Sauerkraut preparation? 1+2+2
Name any two types of spoilage associated with this fermented food.
- (b) Why do sausage and other ground meat products provide a better environment for the growth of food spoilage organisms than solid cuts of meats? 2
- (c) "Use of sodium nitrite in meat preservation is not healthy."—Justify the statement. 2
- (d) How does sodium nitrite keep the meat red in colour? 1
3. (a) Write the shortcomings of HACCP analysis. 2
- (b) Which preservatives will you use for (i) canned fish (ii) ground beef (iii) garlic paste (iv) bread? $\frac{1}{2} \times 4 = 2$
- (c) How can you assess the VBNCs in spoiled food items? 2
- (d) Define D-value and thermal death time. 3
- (e) Mention the condition of UHT pasteurization. 1

4. (a) Define the terms:
 (i) Food poisoning (ii) Food borne intoxication (iii) Food borne infection. 2
- (b) What is the role of TTSS in causing bacterial diseases? Explain in the light of any food borne disease. 2
- (c) What do you mean by biopreservation of foods? 2
5. (a) Cite the difference between yoghurt and buttermilk. 2+2
- (b) What is the basis of chief aroma generation in yoghurt? Cite two properties of *L. delbrueckii bulgaricus* in yoghurt fermentation. 2
- (c) State two examples of non-nutritive sweeteners used in yoghurt. 2
- (d) Mention any two intrinsic properties of food that are responsible for food spoilage. 2
6. (a) Write a note on food preservation through use of radiation. 2
- (b) What is Appertization? 2
- (c) What do you mean by pathogenicity island? How are these important in causing bacterial diseases — Explain with suitable examples. 1+2
- (d) What is 12D concept? What is Freeze drying? 3
7. (a) How does staphylococcal enterotoxin become resistant to heat and low pH? 3
- (b) Food borne intoxication usually take lesser time to initiate disease symptoms than food borne infections— Justify with reason. 1+2
- (c) Discuss the roles of O_3 and H_2O_2 as food sanitizers. 2
- (d) Classify the cheese on the basis of curdling. 2
8. (a) What is stormy fermentation? 2
- (b) How can the efficiency of Pasteurization be checked? 2
- (c) What do you understand by shelf life of a food? 1
- (d) What do you mean by whiskers of meat? What type of microorganisms are responsible for that? 2+1
- (e) Why do you need to preserve pasteurized milk under refrigerator? 2
9. (a) Name two ways by which seafish spoilage can take place. Name two organisms associated with such spoilage. Give two examples of preservatives used to protect such type of food items. 2+2+2
- (b) Why pulses and grains are susceptible to mold attack during their storage? 2
- (c) Briefly describe a method by which mycotoxins can be detected in a spoiled food item. 2



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MCBDSC405T-MICROBIOLOGY (MAJOR)
ENVIRONMENTAL MICROBIOLOGY

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Answer Q. No. 1 and any four questions from the rest

1. Answer any **five** questions from the following:

2×5 = 10

- What is a bacteriophage?
- Define COD and its use in research.
- Define bioaerosols and their mode of transmission.
- What are the Green House Gases and how are they harmful?
- What is activated sludge?
- Give examples of two symbiotic luminescent bacteria.
- Describe commensalism and give an example.
- What are barophiles? Give an example.
- What do you understand by denitrification? Give one example.
- What are PGP's? Explain with an example.

Escherichia

- How will you determine the potability of water? 3
 - Give examples of faecal coliforms. 2
 - Briefly describe the selective media, which can be used to test wastewater and explain the mode of action of the media. 3
 - How is BOD related to wastewater? 2
- Describe N₂ cycle with a suitable diagram. 4
 - Briefly differentiate between biodegradation and bioremediation with examples. 4
 - What are extremophiles? Give one example. 2
- Briefly explain why will you consider a septic tank as a sewage treatment facility. 3
 - Explain the activated sludge method. 4
 - What is tertiary treatment of wastewater? 3
- Explain how thermophiles and psychrophiles maintain their membrane integrity for survival in their respective habitats. 4
 - What is ammonification? Name two organisms involved in it. 3
 - What are xenobiotics? Give two examples. 3

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| 6. (a) Define eutrophication and its causes. | 3 |
| (b) What do you understand by thermal stratification of a lake? Explain with a diagram. | 5 |
| (c) What is symbiosis? Give an example. | 2 |
| 7. (a) Explain AMB pathway in detail. | 5 |
| (b) What precautions will you take if there is a Covid 19 case in your neighbourhood? | 3 |
| (c) What is BSL and what is their importance? | 2 |
| 8. (a) What are nosocomial infections and how will you contain them? | 3 |
| (b) How will you treat a localised oil spill? Give an example of a representative microbe. | 3 |
| (c) Explain the principle of bioremediation of heavy metals with an example. | 4 |
| 9. (a) What is the anammox process? | 2 |
| (b) What do you understand by human microbiome? | 2 |
| (c) Differentiate between probiotics and prebiotics with examples. | 4 |
| (d) What are planktons and how are they important? | 2 |

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Answer Question Number 1 and any four from the rest

1. Answer any **five** questions from the following: 2×5 = 10
- (a) Name one inhibitor of the Glycolytic pathway.
 - ✓(b) What do you mean by anaplerotic reactions?
 - ✓(c) Define homolactic fermentation.
 - (d) What are ligand-gated ion channels?
 - ✓(e) Mention the names of two denitrifying bacteria.
 - ✓(f) What are siderophores?
 - ✓(g) What is Pasteur effect?
 - ✓(h) What is the function of leghemoglobin?
 - (i) What is the primary purpose of the pentose phosphate pathway?
 - (j) What are the unique characteristics of Photophosphorylation in bacteria?
2. (a) What is substrate level phosphorylation? 2
- (b) Define proton motive force and mention the significance of the structure of an ATP synthase. 3
- (c) Write down three regulatory steps of glycolysis. 3
- (d) Write down the steps of the ED pathway where ATPs are produced. 2
3. (a) Explain the homofermentative lactate fermentation. 2
- (b) Why are symport and antiport classified as coupled transport systems? 2
- (c) Explain phosphorylation system in bacteria with an example and a diagram. 2+2
- (d) What is the Pasteur effect? 2
4. (a) What is the importance of stereospecificity for enzymes of the TCA cycle? 2
- (b) What is the function of complex IV in the Electron transport chain? Define oxidative phosphorylation. 2+2
- (c) Describe the structure of Nitrogenase. Why is it very sensitive to oxygen? 2+1
- (d) What is infection thread? 1

- ✓ 5. (a) Name the pacemaker enzyme of glycolysis. Show the reaction involving this enzyme. 1+2
- (b) "Malonate is the inhibition of succinate dehydrogenase." — Explain. 2
- (c) Describe the oxidative phase of the pentose phosphate pathway. 3
- (d) What is the significance of phosphofructokinase? 2
- ✓ 6. (a) Distinguish between antiporter and symporter. 2
- (b) Explain secondary active transport with a suitable example. 3
- (c) Mention the names of two anoxygenic photosynthetic bacteria. 1+1
- (d) Differentiate between the photosystems I and II. $1\frac{1}{2} + 1\frac{1}{2}$
- ✓ 7. (a) State the role of the group translocation process in *E. coli*. Write down the difference between group translocation and facilitated diffusion. 3+1
- (b) Write short notes on any two of the following, mentioning at least four key points for each. $2 \times 2 = 4$
- (i) Methanogenesis
- (ii) Ammonia assimilation
- (iii) Photosynthesis in cyanobacteria.
- (iv) Bacterial ETC.
- (c) How many ATPs are produced each from NADH and FADH₂ in the ETC? 1+1
8. Show the reactions catalysed by the following enzymes. $2 \times 5 = 10$
- (a) Lactate dehydrogenase
- (b) α -ketoglutarate dehydrogenase.
- (c) Glycogen phosphorylase
- (d) Glycogen synthase
- (e) Phosphoglucomutase.
9. (a) What are phycobilisomes? 2
- (b) Why are cyanobacteria called oxygenic phototrophs? 2
- (c) What is phototrophic metabolism? Give two examples. 2+2
- (d) Write down the overall reaction of hydrogen oxidation. 2

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