



## WEST BENGAL STATE UNIVERSITY

B.Sc. Honours 4th Semester Examination, 2023

## MCBACOR08T-MICROBIOLOGY (CC8)

Time Allotted: 2 Hours

Full Marks: 40

*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.***Question No.1 is compulsory and answer any *four* questions from the rest**

1. Answer any *four* questions from the following: 2×4 = 8
  - (a) Why are *E. coli* RecA mutants UV sensitive?
  - (b) What is transformation efficiency?
  - (c) What is the significance of mutational hotspots?
  - (d) What do you mean by abortive transduction?
  - (e) Define 'copy number' of a plasmid.
  - (f) What is 'cold shock' in transformation? What is its significance?
  - (g) What is IS element? Why it is so important?
  - (h) What do you mean by linkage?
2. (a) Design an experiment to prove that single stranded DNA is taken up by the cell during natural transformation. 4
- (b) A transformation experiment is carried out using donor DNA that is  $A^+B^+C^+$  and a recipient  $A^-B^-C^-$ .  $A^+$  transformants are selected and tested further. Of these, 64% are  $B^+$  and none of them are  $C^+$ . Also,  $B^+$  are selected and 8% are also  $C^+$ . What is the gene order? 4
3. (a) What is homologous recombination? 2
- (b) Describe the mechanism of RecBCD complex action in homologous recombination in *E. coli* with suitable diagram. 2
- (c) What is 'chi intermediate'? 2
- (d) Mention the role of RecA protein in bacterial recombination. 2
4. (a) State with proper justification, whether Col plasmids are mobilizable in the following conditions: 2×3 = 6
  - (i)  $F^+ \text{ mob}^- \text{ bom}^+$  (ii)  $F^+ \text{ mob}^+ \text{ bom}^-$  (iii)  $F^+ \text{ mob}^+ \text{ bom}^+$
- (b) State some important molecular features of  $2\mu$  plasmid. 2

5. (a) Explain how 5- Bromouracil induces mutation. 2  
(b) How does an absolute defective mutation differ from a conditional mutant? 2  
(c) In Ames test, What is the utility of adding microsomal fraction in the growth medium of salmonella? 2  
(d) What is mutator gene? Give example. 2
6. (a) How is bacterial genetic material organized inside the cell? 3  
(b) What is centromere? Describe its function. 2  
(c) What are the structural components of nucleosome? 2  
(d) What are pseudogenes? 1
7. (a) Why is SOS repair called 'error prone repair'? Mention the advantage of having such error prone repair for the cell. 2+2  
(b) Describe briefly how low copy number plasmids are maintained in a bacterial cell. 4
8. (a) What are Mpf and Dtr components of F plasmid? State the functions of these two components in conjugation. 2+4  
(b) Why specialized transducing particles are not conducive for genetic mapping? 2



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**MCBACOR09T-MICROBIOLOGY (CC9)**

**VIROLOGY**

Time Allotted: 2 Hours

Full Marks: 40

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Candidates should answer in their own words and adhere to the word limit as practicable.  
All symbols are of usual significance.*

**Question No. 1 is compulsory and answer any four questions from the rest**

1. Answer any **four** questions from the following: 2×4 = 8
  - (a) Presence of maltose in media plays an important role in lambda infection, why?
  - (b) What are the disadvantages of live attenuated viral vaccine?
  - (c) Why retroviral oncogenes are more detrimental than DNA viral oncogenes?
  - (d) What will happen if a T4 phage fails to undergo proper headfull packaging?
  - (e) What is lysogenic conversion?
  - (f) What is the reason behind latent period in one step growth curve of virus?
  - (g) What are the advantages that retrovirus has for the LTR region in its genome?
  - (h) State the difference between viroids and viruses.
2. (a) What is cooperative binding? How does it help lambda repressor to establish lysogeny when MOI is greater than 1? (1+4)+2+1
  - (b) What is retroregulation?
  - (c) What is icosahedral capsid?
3. (a) Name one animal enveloped virus. 1+(1½+1½)+3+1
  - (b) What do you mean by antigenic shift and antigenic drift with reference to Influenza virus?
  - (c) How can you assay the titre value of a plant virus?
  - (d) Name the virus whose crystallized structure was described first.
4. (a) What is the special feature of the bacteriophage T4 genome that distinguish it from its *E. coli* DNA? 3+3+2
  - (b) How is that feature used by the phage for its own protection from digestion?
  - (c) What do you mean by headful packaging of T4 DNA?



5. (a) What is MoI number? State the formula of calculating MoI number. (1+1)+1+3+2  
 (b) How does MoI number relates with the selection of lytic and lysogenic cycle by a virus?  
 (c) How can you experimentally prove that a  $\lambda$  genome has been integrated within the genome of a given *E. coli* ?  
 (d) What is the role of antiterminator proteins in progression of lytic cycle in  $\lambda$ ?
6. (a) Show with a flowchart that how intracellular IFN signalling get induced in presence of a viral particle to counter the viral multiplication within the host. 3+2+(1×3)  
 (b) What are the factors that determine the host specificity of a virus?  
 (c) Give an example of animal virus lying to each of the following classes in Baltimores classification:  
 (i) Class III; (ii) Class VII; (iii) Class V
7. (a) What is LTR? 2×4 = 8  
 (b) What is the function of 'gag', 'pol', 'env' in retrovirus?  
 (c) How retrovirus can be classified according to the baltimores' classification system?  
 (d) Comment on the harmful aspects of DNA oncogenic viruses.
8. (a) Why Picornavirus genome can not be translated directly by host ribosome? How does then the issue get solved by the virus? (2+2)+(1+1)+2  
 (b) What do you mean by Null infection by virus? How can this be happened?  
 (c) Mention the degeneracy theory for origin of virus.
9. (a) What is the mechanism of action of Oseltamivir? 2+2+3+1  
 (b) Mention the criteria for virus classification as directed by ICTV.  
 (c) How does normal Src protein converts into an oncoprotein?  
 (d) Name the virus involved in Burkitt lymphoma.



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**MCBACOR10T- MICROBIOLOGY (CC10)**

**FOOD AND DAIRY MICROBIOLOGY**

Time Allotted: 2 Hours

Full Marks: 40

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All symbols are of usual significance.*

**Question No. 1 is compulsory and answer any four from the rest**

1. Answer any **four** questions from the following: 2×4 = 8
  - (a) What are Probiotics? Give example.
  - (b) What is cold sterilization? Where it is used?
  - (c) What is rancidity? Name a microorganism responsible for rancidity.
  - (d) What do you understand by cross contamination of food?
  - (e) What are 4D's in Botulism?
  - (f) Why should thawed food not to be frozen again?
  - (g) Name an antimicrobial substance present in milk and in an egg.
  - (h) Name one microorganism that is present in butter and in fish.
  
2. (a) What happens to bacteria in the food when the water activity is changed from 0.998 to 0.945? 2
  - (b) Why do some bacteria survive in low water activity and others die? 2
  - (c) What is the effect of gaseous atmosphere on food microorganisms? 3
  - (d) Mention the causative agent of sulfide stinker spoilage of canned food. 1
  
3. (a) What is the difference between food-borne intoxication and food-borne infection? Give example.  $1\frac{1}{2} + 1\frac{1}{2}$ 
  - (b) What is HACCP? Discuss its importance in food safety. 1+2
  - (c) How nitrite and nitrate help in food preservation? 2
  
4. (a) Which organism causes black rot of egg? Why egg white has antibacterial property? 1+2
  - (b) Comment on the role of thermotolerant bacteria on food spoilage. 2
  - (c) Discuss about the microbiological events take place in sauerkraut production. 3



5. (a) Does reducing the pH of food lower the chances of food spoiling? Justify your answer. 2
- (b) Name four antimicrobial barrier present in milk. 2
- (c) Why should milk cream be pasteurized for a longer time than milk itself? 2
- (d) What are the preservative factors in cheese? 2
  
6. (a) What are the various intrinsic factors affecting the microbial growth in food? 3
- (b) Describe the following with examples: 3
  - (i) Perishable foods (ii) Semi perishable foods (iii) Non-perishable foods
- (c) Explain the preservation technique using salt and sugar with example. 2
  
7. (a) Why milk is pasteurized but not sterilized? 2
- (b) What are the advantages of dehydrated milk over fluid milk? 2
- (c) Give the differences between refrigeration and freezing. 2
- (d) Mention four organic preservatives used in the food industry. 2
  
8. (a) What is the causative agent of Listeriosis and symptoms involved in it? 2
- (b) How bacteriocin help in food preservation? 2
- (c) What is the function of rennin in cheese making? 2
- (d) What is blanching? 2
  
9. (a) Mention the methods of preservation of fish. 3
- (b) What is ropiness of milk? How it can be prevented? 2+1
- (c) List the preservatives for each of the following: 1+1
  - (i) Bread (ii) Tomato Sauce

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