

## N : MICROBIOLOGY

### Q. 1 – Q. 6 carry one mark each.

- Q.1 Which is the most modern method of classification of organisms?  
 (A) Morphology (B) Gram staining  
 (C) Biochemical characterization (D) 16S rRNA sequence
- Q.2 The mode of action of sulfonamides is by inhibition of  
 (A) Cell wall synthesis (B) Folic acid metabolism  
 (C) DNA replication (D) Sulphur metabolism
- Q.3 The Ziehl-Neelsen staining technique is used for the detection of  
 (A) Endospores (B) Capsule (C) Flagella (D) Cell wall
- Q.4 A solution of ampicillin is  
 (A) Sterilized by autoclaving (B) Sterilized by dry heat  
 (C) Sterilized by membrane filtration (D) Need not be sterilized
- Q.5 Fixation of molecular nitrogen is carried out by  
 (A) A multi-enzyme complex containing nitrogenase and nitrogenase reductase  
 (B) Nitrogenase  
 (C) Nitrogenase reductase  
 (D) Nitrate reductase
- Q.6 The complement fixation test for syphilis was introduced by  
 (A) Theobald Smith (B) Walter Reed  
 (C) Martinus Willem Beijerinck (D) August von Wassermann

### Q. 7 to Q.24 carry two marks each.

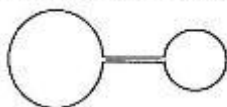
- Q.7 You have a culture of metabolically inactive *E. coli*. To make protoplasts you will use  
 (A) Penicillin (B) Lysozyme  
 (C) Hypertonic solution + penicillin (D) Hypertonic solution + lysozyme
- Q.8 The Ames test is carried out on 3 strains of *Salmonella typhimurium* having 3 different kinds of mutations in the *his* gene. Two mutagens, acridine orange and ethyl methane sulfonate (EMS), are used in this experiment and the following results are obtained.

Strain	Number of revertants/ $10^8$ cells		
	Acridine orange	EMS	No mutagen
P	10080	1	2
Q	2	101	3
R	2	3	2

Based on the chemical nature of the mutagens, the nature of the mutation in the *his* gene in the 3 strains is

- |                          |                      |                      |
|--------------------------|----------------------|----------------------|
| (A) P- silent            | Q- insertion         | R- base substitution |
| (B) P- insertion         | Q- silent            | R- frameshift        |
| (C) P- frameshift        | Q- base substitution | R- insertion         |
| (D) P- base substitution | Q- frameshift        | R- silent            |

- Q.9 You isolate a natural plasmid from a tetracycline resistant strain of *E.coli*. You heat denature the plasmid, allow it to self anneal and observe the DNA by electron microscopy. The predominant DNA structure observed is shown schematically below.



The plasmid is most likely to contain a

- (A) Phage DNA                      (B) Transposon                      (C) Transfer operon                      (D) T DNA
- Q.10 For which of the following diseases does the causative agent NOT strictly obey Koch's postulates?
- (A) Tuberculosis                      (B) Cholera  
(C) Bovine spongiform encephalopathy                      (D) Bird flu
- Q.11 An *E. coli* culture is mutagenized to obtain leucine auxotrophs. The auxotroph can be identified by plating on medium
- (A) Containing leucine  
(B) Lacking leucine  
(C) Containing leucine followed by replica plating onto (B)  
(D) Lacking leucine followed by replica plating onto (A)
- Q.12 An agent used in the cosmetic treatment of facial wrinkles is isolated from
- (A) *Shigella* sp.                      (B) *Bacillus anthracis*  
(C) *Clostridium botulinum*                      (D) *Aspergillus flavus*
- Q.13 Three restriction endonucleases P, Q and R recognize 4bp, 6bp and 8bp sequences respectively. The relative frequency of occurrence of these sequences on a bacterial genome is
- (A)  $P > Q > R$                       (B)  $P > R > Q$                       (C)  $R > Q > P$                       (D)  $Q > R > P$
- Q.14 The alternate pathway of complement-mediated cell lysis is triggered by
- (A) Bacterial polysaccharide  
(B) Bacterial polysaccharide + antibody to the polysaccharide  
(C) Antibody to the polysaccharide  
(D) All of the above
- Q.15 Anaphylaxis is initiated by
- (A) IgE bound to mast cells                      (B) Antigen bound to IgE on mast cells  
(C) Antigen bound to mast cells                      (D) All of the above
- Q.16 For which one of the following operations are dilution rate and limiting a specific nutrient the important parameters?
- (A) Batch fermentation                      (B) Fed batch fermentation  
(C) Chemostat                      (D) Turbidostat
- Q.17 By doubling the concentration of an enzyme the
- (A)  $K_m$  will remain constant and  $V_{max}$  will increase  
(B)  $K_m$  and  $V_{max}$  will increase  
(C)  $K_m$  and  $V_{max}$  will decrease  
(D)  $K_m$  will increase and  $V_{max}$  will remain constant

- Q.18 Glycosidic linkages between D-glucose residues in starch and cellulose respectively are  
 (A) ( $\alpha$  1 $\rightarrow$ 4) and ( $\beta$  1 $\rightarrow$ 4) (B) ( $\alpha$  1 $\rightarrow$ 4) and ( $\alpha$  1 $\rightarrow$ 4)  
 (C) ( $\beta$  1 $\rightarrow$ 4) and ( $\beta$  1 $\rightarrow$ 4) (D) ( $\beta$  1 $\rightarrow$ 4) and ( $\alpha$  1 $\rightarrow$ 4)
- Q.19 The enzymes responsible for generation of ATP in *E. coli* by substrate level phosphorylation and the electron transport system are located respectively in the  
 (A) Cytoplasm and plasma membrane  
 (B) Plasma membrane and cytoplasm  
 (C) Cytoplasm and outer membrane  
 (D) Outer membrane and cytoplasm
- Q.20 Which reducing agent is NOT naturally present in the cell?  
 (A) Ascorbic acid (B) Glutathione  
 (C) Cysteine (D) Dithiothreitol
- Q.21 The TCA cycle begins by the condensation of the two carbon compound (P) with the four carbon compound (Q) to form the six carbon compound (R). Here P, Q, R represent  
 (A) Oxaloacetate, Citrate, Acetyl-CoA (B) Acetyl-CoA, Oxaloacetate, Citrate  
 (C) Citrate, Oxaloacetate, Acetyl-CoA (D) Acetyl-CoA, Citrate, Oxaloacetate
- Q.22 In glycolysis the conversion of glucose to two pyruvate molecules gives a net yield of  
 (A) 2 ATP (B) 4 ATP + 2 NADH  
 (C) 2 ATP + 2 NADPH (D) 2 ATP + 2 NADH

### Common Data Questions

#### Common Data for Questions 23 and 24:

- A  
 (P) Retroviridae  
 (Q) Herpesviridae  
 (R) Rhabdoviridae  
 (S) Baculoviridae

- B  
 (1) Linear double stranded DNA  
 (2) Minus strand RNA  
 (3) Circular double stranded DNA  
 (4) Plus strand RNA

- Q.23 Match the columns.  
 (A) P-1, Q-2, R-3, S-4 (B) P-2, Q-3, R-4, S-1  
 (C) P-3, Q-4, R-1, S-2 (D) P-4, Q-1, R-2, S-3
- Q.24 Which one of the GENOMES listed above is NOT infectious when introduced into host cells by liposomes?  
 (A) Linear double stranded DNA (B) Minus strand RNA  
 (C) Circular double stranded DNA (D) Plus strand RNA

### Linked Answer Questions: Q.25 to Q.28 carry two marks each.

#### Statement for Linked Answer Questions 25 and 26:

A gene is negatively regulated by a repressor that binds to an operator with a dissociation constant ( $K_D$ ) of  $10^{-9}$ M. There are 100 molecules of repressor per cell and the cell volume is  $10^{-8}$  ml.

- Q.25 Assuming the Avogadro number (N) to be  $10^{23}$  molecules, what is the concentration of the repressor in the cell?  
 (A)  $10^{-8}$ M (B)  $10^{-9}$ M (C)  $10^{-10}$ M (D)  $10^{-11}$ M



- Q.26 At this concentration of the repressor, the gene is
- |                         |                           |
|-------------------------|---------------------------|
| (A) Repressed           | (B) Transiently repressed |
| (C) Partially expressed | (D) Expressed             |

**Statement for Linked Answer Questions 27 and 28:**

A suspension of temperate phage contains  $10^7$  particles/ml. Only 10% of these are capable of infecting bacteria. Hundred microlitres of the phage suspension is mixed with 1000 bacterial cells.

- Q.27 What is the multiplicity of infection (MOI)?
- |            |            |            |            |
|------------|------------|------------|------------|
| (A) $10^3$ | (B) $10^2$ | (C) $10^1$ | (D) $10^0$ |
|------------|------------|------------|------------|

- Q.28 At this MOI
- |  |
|--|
| (A) Lysogeny is favoured                               |
| (B) Lytic cycle is favoured                            |
| (C) Both lysogeny and lytic cycle are equally favoured |
| (D) The bacterial cells do not get infected            |

**END OF SECTION - N**