1 Mark Questions

1. The scientists who discovered restriction endonucleases are
   (a) Temin and Baltimore
   (b) Arber and Smith
   (c) Gilbert and Sanger
   (d) Lederberg and Tatum

2. The virus responsible for the Severe Acute Respiratory Syndrome (SARS) is a
   (a) picornavirus (b) coronavirus
   (c) adenovirus (d) influenza virus

3. Denitrification process carried out by a few groups of bacteria reduces nitrate (NO_3^-) to nitrogen (N_2) gas. How many electrons per nitrogen atom are transferred to nitrate in the process?
   (a) 2 (b) 3
   (c) 4 (d) 5

4. Metabolic yield of a product being produced by an industrially important microorganisms defined as
   (a) gram product formed / gram substrate consumed
   (b) gram product formed / gram cells formed
   (c) gram product formed / litre of culture broth
   (d) gram product formed / (litre/hour)

5. Which of the following features can distinguish bacteria and archea?
   (a) Absence of the membrane enclosed nucleus
   (b) Absence of internal membranous organelles
   (c) The type of glycosidic bonds present in the peptidoglycan layer (or its equivalent) of the cell wall
   (d) Presence of N-acetyglucosamine in the petidoglycan layer (or its equivalent) of the cells wall

6. Which of the following feature is not exhibited by green sulphur photosynthetic bacteria?
   (a) Presence of bacteriochlorophylls
   (b) Sulphur deposition outside the cell wall
   (c) Oxygenic mode of photosynthesis
   (d) Non-motile nature of cells

7. The microorganisms which obtain energy from the oxidation of inorganic compounds are known as
   (a) photoautotrophs
   (b) chemolithotrophs
   (c) photoheterotrophs
   (d) chemoorganotrophs

8. Neutrophiles exchange potassium for proton using
   (a) antiport transport system
   (b) symport transport system
   (c) ABC transport system
   (d) group translocation

9. Amphotericin B selectively disrupts the cells membrane of fungi because of its high affinity for a compound present in fungal membrane. The name of this compound is
   (a) ergosterol (b) mannitol
   (c) miconazole (d) clotrimazole

10. Which of the following 'hepatitis virus' has DNA genome?
    (a) Hepatitis A (b) Hepatitis B
    (c) Hepatitis C (d) Hepatitis E

2 Marks Questions

11. Which of the following groups of microorganisms contain both superoxide dismutase and catalase enzymes for growth?
    (a) Obligate aerobes only
    (b) Facultative anaerobes only
    (c) Strict anaerobes only
    (d) Both (a) and (b)

12. Which of the following is not responsible for making bacteria resistant to penicillin action?
(a) Change of the penicillin binding proteins
(b) Inability of penicillin to reach its site of action
(c) Inability to bid to 30 S ribosomal subunit
(d) Presence of plasmid coding for pencillinase

13. Match the correct combination of the antibiotic and the microorganism producing it.

Antibiotic	Microorganism
A. Vancomycin	1. *Bacillus subtilis*
B. Bacitracin	2. *Cephalosporium acremonium*
C. Chloramphenicol	3. *Streptomyces orientalis*
D. Streptomycin	4. *Penicillium chrysogenum*
	5. *Streptomyces venezuelae*
	6. *Streptomyces griseus*

	A	B	C	D
(a)	3	1	5	6
(b)	1	4	6	3
(c)	5	3	6	4
(d)	6	3	5	2

14. The pathogenesis associated with *Vibrio cholerae* infection depends on the colonization of the small intestine by the organism and secretion of an enterotoxin. Which of the following statement related to pathogenicity of cholera is incorrect?
(a) *Vibrio cholerae* secretes the enterotoxin choleragen
(b) Choleragen consists of A (active) and B (binding) subunits
(c) Choleragen toxin alone cannot reproduce the symptoms of cholera in the absence of *Vibrio cholerae*
(d) CTX bacteriophage carries the genes of cholera toxin and other virulence factors

15. Prior infection of *Mycobacterium tuberculosis* can be detected by positive tuberculin skin test result. The basis of this test is
(a) anaphylactic hypersensitivity (Type I)
(b) antibody dependent cytotoxic hypersensitivity (Type II)
(c) immune complex mediated hypersensitivity (Type III)
(d) cell mediated or delayed hypersensitivity (Type IV)

16. A bacterial culture on being transferred from anaerobic to aerobic condition of growth drastically reduce the rate of glucose catabolism. This regulatory phenomenon is known is
(a) Tyndollization
(b) Pasteurization
(c) Crabtree effect
(d) Pasteur effect

17. Which of the following statements related to 'High frequency recombination' (Hfr) cells is incorrect?
(a) Single strand of DNA that enters into recipient F^- cell contains a piece of the *F* factor at the leading end followed by the bacterial chromosomes and then by the remainder the *F* factor
(b) Most mating results in the transfer of only a portion of donor chromosome because the attachment between the two cells can break
(c) The bacterial genes adjacent to the leading piece of the *F* factor are least frequently transferred
(d) The donor cell genes that are transferred vary, since the *F* plasmid can integrate at several different sites in a bacterial DNA

18. Replication of the positive strand genome of poliovirus requires
(a) reverse transcriptase
(b) virus encoded RNA dependent RNA polymerase
(c) DNA dependent RNA polymerase
(d) DNA polymerase

19. Which of the following statement about bacteriophage λ is incorrect?
(a) It initially produces two proteins; one acts as an inhibitor of λ repressor synthesis and the other acts as a terminator for transcription
(b) It maintains its lysogenic state in the absence of an inducer
(c) In switching from the lysogenic to the lytic phase, it turns off the synthesis of λ repressor because cro protein binds to λ operator O_R3
(d) If forms N and Q gene products which act as positive regulatory proteins leading to the sequential production of λ encoded proteins

20. While evaluating the effectiveness of a disinfectant (X) against *Salmonella typhi* by the 'Phenol-Coefficient Method' the following data were obtained.

	Dilution	Sub-culture Tubes: 5 min	10 min	15 min
Disinfectant (X)	1 : 50	0	0	0
	1 : 100	+	0	0
	1 : 150	+	0	0
	1 : 175	+	+	0
Phenol	1 : 200	+	+	+
	1 : 90	+	0	0
	1 : 100	+	+	+

0 = No growth, + = Growth
The Phenol-Coefficient of the disinfectant (X) would be
(a) 1.66
(b) 3.32
(c) 0.50
(d) 1.00

21. Lactic acid bacteria ferment glucose to produce two moles of lactic acid. What is the net yield of ATP and NADH per mole of glucose?
(a) 2 ATP and 2 NADH (b) 2 ATP and 0 NADH
(c) 4 ATP and 2 NADH (d) 4 ATP and 0 NADH

Common Data for Questions 22 to 24
Analysis of the electron transport in a newly isolated aerobic Gram positive bacterium showed the existence of five electron transport molecules. Their redox potentials are as follows :

Oxidant	Reductant	Electron Transferred	E_0 (Volts)
P	PH_2	2	−0.13
NAD^+	NADH	2	−0.32
R	RH_2	2	−0.02
Cyto-chrome-c (+3)	Cyto-chrome-c (+2)	1	+ 0.22
S	SH_2	2	+ 0.63

Faraday constant (F) = 23 kcal/(volt mole)

22. Which of the following sequence of the electron transport carries would be involved in the transport of electrons for energy generation?
(a) $P \rightarrow NAD^+ \rightarrow R$ Cytochrome-$c \rightarrow S$
(b) $NAD^+ \rightarrow P \rightarrow R \rightarrow$ Cytochrome-$c \rightarrow S$
(c) $NAD^+ \rightarrow P \rightarrow$ Cytochrome-$c \rightarrow R \rightarrow S$
(d) $NAD^+ \rightarrow$ Cytochrome-$c \rightarrow P \rightarrow R \rightarrow S$

23. If the electrons are transferred from NADH to S, the difference in redox potential would be
(a) +0.95 (b) +0.76
(c) −0.95 (d) −0.76

24. What would be the value of standard free energy change for the transfer of electrons from PH_2 to S?
(a) −17.5 kcal/mol (b) −35.0 kcal/mol
(c) +17.5 kcal/mol (d) +35.0 kcal/mol

Common Data for Questions 25 and 26
E. coli can metabolise both glucose and lactose sugar as sole source of carbon and energy. While glucose catabolising enzymes are constitutive lactose catabolising enzymes are induced in the presence of compounds such as lactose IPTG, etc. Lactose catabolising enzymes are also regulated by catabolite repression.

5. Assume that *E. coli* has been grown in a nutrient medium containing lactose only. When the culture has reached the logarithmic phase of growth, the cells are harvested and transferred to a medium containing glucose only. Would you expect the culture to
(a) continue to grow in its logarithmic phase
(b) exhibit a lag phase first and then grow again in its logarithmic phase
(c) stop growth
(d) undergo lysis

26. If the *E. coli* cells are grown in a medium containing both glucose and lactose, what is likely to happen?
(a) Both the sugars would be utilised simultaneously
(b) The culture will exhibit synchronous growth
(c) Lactose will be utilised first followed by glucose
(d) Glucose will be utilised first followed by lactose

Statement for Linked Answer Questions 27 and 28
Consider a nutrient medium containing 2×10^4 cells. The culture is incubated at 25°C under aerobic conditions for growing the cells. The generation time of the cells is 40 minutes.

27. If the culture is allowed to grow for 8 hours, how many generations would have taken place?
(a) 8 (b) 12
(c) 16 (d) 24

28. What will be the cells population after 8 hours?
(a) 4.1×10^5 (b) 8.2×10^6
(c) 4.1×10^7 (d) 8.2×10^7

Statement for Linked Answer Questions 29 and 30
A mutant of *E. coli* was found which did not synthesise β–galactosidase in the presence as well as in the absence of the inducer, IPTG. The investigation revealed that the structural genes of the *lac* operon were unaltered in the mutant, but one of the controlling genes (I or O) was mutated. The different allelic forms of the regulator gene and operator gene are as follows :
I^+ = Wild type regulator gene
I^c = Constitutive regulator
I^s = Repression from which is insensitive to inducer
O^+ = Wild type operator gene
O^c = Constitutive operator

29. Which of the following mutation in the controlling genes was responsible for the above mentioned behaviour of the *E. coli* mutant?
(a) I^+O^+ (b) I^CO^+
(c) I^SO^+ (d) I^+O^C

30. On further mutation, the *E. coli* mutant synthesized β-galactosidase in the presence of the inducer only. Which of the following mutant form would explain this observation?
(a) I^+O^+ (b) I^+O^C
(c) I^SO^+ (d) I^SO^C