L. MICROBIOLOGY

Q.1 – 10 carry one mark each

Q1.   The Scientist who developed aseptic methods using phenol to prevent infections was

   (A)   Robert Koch
   (B)   John Tyndall
   (C)   Paul Ehrlich
   (D)   Joseph Lister

Q2.   The organism Robert Koch used first to propose Koch's postulates was

   (A)   Mycobacterium tuberculosis
   (B)   Salmonella typhimurium
   (C)   Bacillus anthracis
   (D)   Klebsiella pneumoniae

Q3.   The primary strain used for staining endospore is

   (A)   Crystal violet
   (B)   Malachite green
   (C)   Safranin
   (D)   Carbol fuchsin

Q4.   The engulfment of disease causing bacteria by macrophages was discovered by

   (A)   Emil von Behring
   (B)   Elie Metchnikoff
   (C)   Shibasaburo Kitasato
   (D)   J. Bordet

Q5.   The two key enzymes of glyoxylate cycle are

   (A)   Isocitrate dehydrogenase, α-Ketoglutarate dehydrogenase
   (B)   Isocitrate lyase, α-Ketoglutarate dehydrogenase
   (C)   Isocitrate lyase, Malate synthase
   (D)   Malate synthase, Isocitrate dehydrogenase

Q6. *Nitrosomonas europaea* is a chemolithotroph in which electron donor and electron acceptor, respectively are

(A) NH_4^+, O_2
(B) H_2, O_2
(C) NO_2^-, O_2
(D) H_2S, NO_3^-

Q7. In Gram negative bacteria, the flagellum is attached to the cytoplasmic membrane by the rings

(A) S ring only
(B) S and M rings
(C) P ring
(D) P and L rings

Q8. In *Rhizobium*-legume symbiotic nitrogen fixation, oxygen-sensitive nitrogenase is protected by leghemoglobin. The ratio of leghemoglobin-bound O_2 to free O_2 is

(A) 10 : 1
(B) 100 : 1
(C) 1,000 : 1
(D) 10,000 : 1

Q9. Nonphosphorylated Entner Doudoroff pathway (EDP) is operative in species of

(A) *Pyrococcus*
(B) *Streptococcus*
(C) *Micrococcus*
(D) *Staphylococcus*

Q10. A 'regulon' is defined as

(A) A set of operons that are functionally co-ordinated
(B) A master gene regulating the function of a set of genes
(C) All the regulatory genes of the genome
(D) The genes present in the control region of an operon

Q11. In TCA cycle, both carbons of acetyl CoA are oxidized to CO_2 at two steps which are

(A)   Cis-aconitate $\rightarrow$ Isocitrate $\rightarrow$ α-Ketoglutarate

(B)   α-Ketoglutarate $\rightarrow$ Succinate $\rightarrow$ Fumarate

(C)   Isocitrate $\rightarrow$ α-Ketoglutarate $\rightarrow$ Succinate

(D)   Citrate $\rightarrow$ Cis-aconitate $\rightarrow$ Isocitrate

Q12. Cells of *Escherichia coli* grown on mineral salts medium with glycerol as carbon source, are harvested and exposed to three different inducers of *lac* operon. Their inducing efficiencies are

(A)   TMG < IPTG < Lactose

(B)   Lactose < TMG < IPTG

(C)   IPTG < Lactose < TMG

(D)   TMG < Lactose < IPTG

Q13. A bacterial suspension when counted in Petroff-Hausser bacteria counting chamber showed on average 20 bacteria in one large square (each large square = $1/25$ mm^2). The number of bacteria/ml of the suspension is

(A) 25×10^6

(B) 50×10^6

(C) 10×10^7

(D) 25×10^7

Q14. *Pseudomonas* species metabolize a wide range of organic compounds through β-ketoadipate whose structure is

(A) $CH_3.CH_2.CO.CH_2.COOH$

(B) $HOOC.CH_2.CH_2.CO.COOH$

(C) $HOOC.CH_2.CH_2.CH_2.CO.COOH$

(D) $HOOC.CH_2.CH_2.CO.CH_2.COOH$

Q15. In a different planet codons have four bases instead of three and there are four termination codons as against three found in our planet. Which of the following statements will NOT hold true in 4 base codon planet assuming there is no evolutionary selection?

(A)   The number of codons will be too few to code for all twenty amino acids

(B)   There will be greater codon degeneracy than in earth

(C)   The number of t-RNA genes will be more compared to earth

(D)   The sizes of proteins will be generally longer

Q16. In most phototrophic and autotrophic organisms, CO_2 is fixed by RuBisCo via Calvin cycle. The sugar into which CO_2 gets fixed is

(A) Ribulose-5-phosphate
(B) Glyceraldehyde-3-phosphate
(C) 1,3-Bisphosphoglycerate
(D) Ribulose-1,5-bisphosphate

Q17. The genome size of the following organisms are in the order

(A) Haemophilus influenzae > Saccharomyces cerevisiae > Escherichia coli > φx174
(B) Escherichia coli > Saccharomyces cerevisiae > Haemophilus influenzae > φx174
(C) Saccharomyces cerevisiae > Escherichia coli > Haemophilus influenzae > φx174
(D) Saccharomyces cerevisiae > Haemophilus influenzae > φx174 > Escherichia coli

Q18. The following are the number of germ line genes for heavy and light chains in an individual. Calculate the approximate number of diverse IgG (Kappa) molecules that the individual can generate not taking into account somatic mutation

Germline genes	Heavy chain	K chain
V	50	40
D	30	0
J	6	5

(A) 131
(B) 9,200
(C) 18,00,000
(D) 36,00,000

Q19. A strain of *Mycobacterium tuberculosis* was found to be resistant to INH, streptomycin and rifamycin at 10^{-5}, 10^{-6}, 10^{-7} frequencies, respectively. The frequency of appearance of a strain resistance to all three compounds is

(A) 10^{-5}
(B) 10^{-6}
(C) 10^{-11}
(D) 10^{-18}

Q20. In *Escherichia coli* the number of molecules per cell occur in the following order

(A) tRNA < mRNA < rRNA < DNA
(B) DNA < mRNA < rRNA < tRNA
(C) rRNA < mRNA < tRNA < DNA
(D) DNA < tRNA < mRNA < rRNA

Q21. Switch recombination does not take place among the immunoglobulin genes

    (A)   IgM $\longrightarrow$ IgD

    (B)   IgM $\longrightarrow$ IgG1

    (C)   IgM $\longrightarrow$ IgE

    (D)   IgM $\longrightarrow$ IgA

Q22. EMB (eosin-methylene blue) agar is used to differentiate *Escherichia coli* from *Enterobacter aerogenes*. The green metallic sheen of the colonies is due to

    (A)   Eosin and methylene blue combine to produce a precipitate under neutral conditions (*E. aerogenes*)

    (B)   Eosin and methylene blue combine to produce a precipitate under acidic conditions (*E. coli*)

    (C)   Methylene blue gets precipitated under acid conditions (*E. coli*)

    (D)   Eosin gets precipitated under neutral conditions (*E. aerogenes*)

Q23. UV spectroscopy is **not** used to quantitate the compounds based on absorbance

    (A)   Nucleic acids have absorbance peak at 260 nm

    (B)   NAD(P)H have absorbance peak at 340 nm

    (C)   Aromatic aminoacids have absorption maxima about 280 nm

    (D)   Sulfur containing aminoacids absorbance at 270 nm

Q24. Luminous bacterium (*Vibrio fischeri*) and flashlight fish (*Photoblepheron palpebratus*) provide an interesting symbiotic association. In the luciferase reaction the products are

    (A) $FMN + RCOOH + H_2O$

    (B) $RCOOH + H_2O + light$

    (C) $FMN + RCOOH + H_2O + light$

    (D) $FMNH_2 + RCOOH + H_2O + light$

Q25. The flagellate *Monas stigmatica* (6 µm long) swims at the speed of 50 cell lengths per second. The distance it covers in 1 hour is

    (A)   1.08 cm

    (B)   10.80 cm

    (C)   10.8 m

    (D)   1.08 m

Q26. The serotypes of *Salmonella* sp. are due to

    (A)   Lipid A structure

    (B)   Core polysaccharide containing KDO and heptose

    (C)   Unusual sugars in O-side chain

    (D)   Both Lipid A structure and core polysaccharide

Q27. The property not possessed by Archaebacteria is

(A) They have pseudomurein in their cell walls
(B) Their lipids have ether linkage
(C) They have N-acetylglucosamine and N-acetyltalosaminuronic acid as repeating alternating units in the backbone
(D) They have D and L amino acids in their short peptide chain

Q28. Which of the following properties of diphtheria toxin is not true

(A) The nicked toxin is biologically and immunologically identical to unnicked toxin
(B) On reduction with GSH, chains A and B are separable
(C) Diptheria toxin inhibits protein synthesis by ADP-ribosylating EF2
(D) Chain A alone is toxic to animals and whole cells

Q29. The following statements are made regarding incorporation of 5-bromodeoxyuridine into DNA
a. 5-bromodeoxyuridine substitutes thymidine in DNA
b. The minimum number of DNA replication cycles required to observe mutation is two
c. 5-bromodeoxyuridine produces GC $\longrightarrow$ AT transition
d. 5-bromodeoxyuridine generates deletion mutants

Which of the above statements are true

(A) (a) and (c)
(B) (a) and (b)
(C) (c) and (d)
(D) (b) and (c)

Q30. In a bacterial cell culture the initial cell population (N_0) was 10^3 cells/ml. In 6 hours and 40 minutes, it has gone through 20 generations. The final cell population (N_t) and growth rate constant (K), respectively are

	N_t		K
(A)	10^9 cells/ml	and	3
(B)	10^4 cells/ml	and	4
(C)	10^7 cells/ml	and	5
(D)	10^9 cells/ml	and	6