

Ph.D. Entrance Test
Science
Microbiology

1 : 1st half.12-AM(u)

Con. 3162-12.

KK-2597

(3 Hours)

[Total Marks : 100

28th April, 2012

Section I [Marks : 40]

N.B. : (1) All questions are compulsory.

(2) Select the most appropriate alternative and rewrite the statement.

1. A potent inhibitor of protein synthesis that acts as an analogue of aminoacyl t-RNA is-
 - a. Streptomycin
 - b. Nalidixic acid
 - c. Rifampicin
 - d. Puromycin
2. Topoisomerases are involved in -
 - a. producing RNA primers
 - b. producing nick in DNA
 - c. joining the DNA fragments
 - d. separation of DNA strands
3. Electron microscope is useful in studying bacteria because-
 - a. e^- can penetrate through bacteria
 - b. bacterial structures are very small
 - c. bacteria move quickly and hence difficult to photograph
 - d. to identify organisms on the basis of organelles
4. What do chloroplasts and mitochondria have in common?
 - a. Both are present in the animal cells
 - b. Both contain their genetic material
 - c. Both are present in all eukaryotic cells
 - d. Neither is present in plant cells
5. Addition of groups to double bonds or formation of double bonds by removal of groups is catalyzed by -
 - a. Ligases
 - b. Lyases
 - c. Hydrolases
 - d. Oxidoreductases
6. A plot of $[S] / V_o$ against $[S]$ giving a straight line of slope $1 / V_{max}$ is called-
 - a. Hanes plot
 - b. Eadie-Hofstee plot
 - c. Lineweaver-Burk plot
 - d. Michaelis- Menten plot

7. Type of nitrogenase that is synthesized when *Azotobacter* cells are grown in media lacking molybdenum but containing vanadium is-
- Nitrogenase I
 - Nitrogenase II
 - Nitrogenase III
 - None of these
8. Which of these following enzymes are required to reverse the citric acid cycle in Reductive TCA pathway?
- Fumarate Reductase
 - α - Ketoglutarate synthase
 - ATP: Citrate Lyase
 - All of these
9. The combined activity of Rubisco oxygenase and the glycolate salvage pathway that consumes O_2 and produces CO_2 is called-
- Photosynthesis
 - Photorespiration
 - Photophosphorylation
 - None of these
10. The region of Trp operon that is involved in transcription attenuation regulatory mechanism is-
- trp A
 - trp B
 - trp C
 - trp L
11. Analytical ultracentrifuges are capable of operating at speeds approaching-
- 70,000 rpm (500,000 g)
 - 6,000 rpm (7,000 g)
 - 25,000 rpm (60,000 g)
 - None of these
12. Soils with medium to light-colored A horizons with significant clay accumulation in their B horizons are called-
- Spodosols
 - Histosols
 - Aridisols
 - Alfisols
13. Fertilizers which supply only one primary plant nutrient, namely N/P/K, are called-
- straight fertilizers
 - complex fertilizer
 - mixed fertilizer
 - All of these

14. In symbiotic nitrogen fixation, the form of nitrogen which is transported to the plant from the bacteroid is-
- L- glutamate
 - L- glutamine
 - L- alanine
 - L- aspartate
15. Which of the following genes is not involved in the nodulation process-
- nod D
 - nol K
 - noe J
 - nif B
16. Which of the following regulons / operons is not involved in the regulation of oxidative stress response-
- Oxy R
 - Sox RS
 - nar XL
 - Env Z / Omp R
17. For the conversion of $\text{NH}_3 \rightarrow \text{NO}_2 \rightarrow \text{NO}_3$, name the two reactions in the correct order-
- Nitrification, Ammonification
 - Ammonification, Nitrosification
 - Nitrosification, Ammonification
 - Nitrosification, Nitrification
18. To which phase of the growth curve do the mathematical analysis of growth is possible?
- Lag phase
 - Log phase
 - Stationary phase
 - Death phase
19. Genes that promote cell growth and mitosis are called-
- Proto-oncogenes
 - Suppressor genes
 - ras genes
 - None of these
20. In MALDI mass spectrometry ionization of biomolecules is achieved by which laser?
- Oxygen
 - Nitrogen
 - Argon
 - Neon

21. A precursor obtained by r-DNA technology used for commercial ascorbic acid production is-
- 2- keto-L-gluconic acid
 - 2- keto-L-gluconic acid methyl ester
 - Diacetone-L-Sorbose
 - None of the above
22. In Gaussian distribution , Mean \pm 3SD limits corresponds to -----% observations.
- 95
 - 99
 - 99.73
 - 95.45
23. Viruses and bacteria in body fluids are attacked by-
- Antibodies from B cells
 - Complement proteins
 - Exotoxin
 - Helper T cells
24. LLO is a Virulence factor associated with
- Listeria monocytogenes,
 - Campylobacter jejuni
 - Salmonella enteritidis
 - Yersinia enterocolitica
25. Who won the Nobel prize in 1997 for the discovery of prions?
- S.B. Prussiner
 - E.Lewis
 - E. Ruska
 - M. Smith
26. Quartz Cuvettes are employed below this wavelength
- 600 nm
 - 400 nm
 - 800 nm
 - 360 nm
27. A piece of DNA of length 10 KB obtained using EcoRI digestion is being inserted in a pBR322 plasmid (approximately 4 KB) vector which was first digested by the restriction enzyme Eco RI. The optimum vector : insert ratio ($\mu\text{g}/\mu\text{g}$) should be approximately,
- 0.1
 - 0.5
 - 1
 - 5

28. A group of researchers have tested many chemicals and found several that have potential for use in modifying the action of the immune system. Which of the following would seem to have the most promise as a drug for inhibiting transplant rejection,
- Compound A13 : acts like histamine
 - Compound Q6 : suppresses cytotoxic T cells
 - Compound N 98 : a potent allergen
 - Compound M 31 : stimulates helper T cells
29. Flux control analysis is used to study-
- Movement of molecules across the pathway
 - Turnover of raw materials
 - Yield of recombinant protein
 - Synthesis of mRNAs
30. Strains of organisms produced by inter breeding so that they have essentially the same genotype are called
- Isogenic
 - Isotrophic
 - Auxotrophic
 - Prototrophic
31. Which one of the following statements is Incorrect about bacterial endospore ?
- Core pH is about 5.5 to 6.0
 - Resistant to lysozyme
 - Dipicolinic acid is present
 - Small acid soluble protein is absent
32. Which of the following statements is not correct for an oncogene?
- They cause cellular transformation
 - They are readily transduced by retroviruses
 - Generally they are growth regulatory proteins
 - They are always localized in the nucleus
33. Shotgun approach is used for
- cDNA library
 - genomic library
 - both a. & b.
 - None of these
34. Mycobacterial cell wall is the immune system booster present in
- Alum
 - Freund's incomplete adjuvant
 - Freund's complete adjuvant
 - All of the above

35. Which of the following statement about HIV is incorrect?
- HIV is an enveloped Retrovirus
 - HIV infects T cells that carry the CD4 antigen on their surface
 - HIV contains two copies of plus single stranded RNA genome
 - HIV - 1 contains only three genes namely gag, pol and env
36. Which reducing agent is not naturally present in the cell?
- Ascorbic acid
 - Glutathione
 - Cysteine
 - Dithiothreitol
37. 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.
- What is the multiplicity of infection (MOI)?
- 10^3
 - 10^2
 - 10^1
 - 10^4
38. Phage typing is frequently used in diagnosis for the identification of certain strains of pathogens, such as,
- Staphylococci
 - Enteroviruses
 - Plasmodium falciparum
 - Leshmania donovani
39. Abzymes are -
- Enzymes that are highly specific like antibodies
 - Antibodies that have catalytic activities
 - Also referred as Zymogens
 - Enzymes that hydrolyze antibodies
40. These are considered as key starvation – stress response regulators-
- cyclic-AMP
 - Guanosine tetraphosphate
 - σ^S and σ^E factors
 - All of these

Section II

[30 marks]

N.B.-

1. Attempt any three questions
2. All questions carry equal marks

Que. 1 - Give a brief account of the following- (10)

1. Ethical aspects in clinical research.
2. Methods of research data analysis.
3. Benefits of biofertilizers in context to harms of chemical fertilizers.
4. Morphogenesis in *Arthrobacter*.

Que. 2 - Describe the following- (10)

1. Strategy followed to clone Restriction endonucleases.
2. Method used to increase permeability of cell membrane.
3. HACCP principles.
4. Techniques used for detecting viruses.

Que. 3 - Discuss the following- (10)

1. Applications of nanotechnology in medical and environmental science.
2. Biodegradation of halogenated aliphatics
3. Diagnosis of genetic disorders
4. Data mining

Que. 4 – Write a note on the following- (10)

1. Cell lines and their maintenance
2. Principle and working of Transmission Electron Microscope
3. IPR and IPP
4. Fungal infections

Que. 5 – Answer the following- (10)

1. What is “Golden Rice”? In what way it is different from the normal rice?
2. How would you determine ribosomal RNA sequences?
3. Comment on – Survival strategies of microorganisms.
4. Explain the role of radioisotopes in pharmaceuticals.

Section III

[30 marks]

Que. 1 – Give detailed account of any two of the following- (30)

1. Recent advances in Microbial Taxonomy.
2. Microbial growth on one carbon compounds.
3. Methods for studying soil organisms
4. Standard methods of analysis in food industry.
