



ਪੰਜਾਬ ਟੈਕਨੀਕਲ ਯੂਨੀਵਰਸਿਟੀ ਜਲੰਧਰ

PUNJAB TECHNICAL UNIVERSITY JALANDHAR

Max. Marks: 90

Time: 90 Mins.

Entrance Test for Enrollment in Ph.D. Programme

Important Instructions

- Fill all the information in various columns, in capital letters, with blue/black ball point pen.
- Use of calculators is not allowed.
- All questions are compulsory. No negative marking for wrong answers.
- Each question has only one right answer.
- Questions attempted with two or more options/answers will not be evaluated.

Stream (Engg./Arch./Pharm./Mgmt./App.Sci./Life Sci.)

LIFE SCIENCES

Discipline / Branch

BIO-TECHNOLOGY

Name

Father's Name

Roll No.

Date: **19-11-2011**

Signature of Candidate

Signature of Invigilator

1. Glucose biosensor uses which analytical component
 - a) Glucohydrogenase
 - b) Glucose
 - c) Glucose peroxidase
 - d) Glucose oxidase
2. In NMR, the sensitivity is determined by the
 - a) Magnetogyric ratio of nuclei being measured
 - b) Magnetic field strength
 - c) Natural isotopic abundance of nuclei being measured
 - d) Electric spin
3. Highest count rates of radioactive sample(γ emitting isotope) is detected by
 - a) Geiger muller tube
 - b) Liquid Scintillation counting
 - c) Solid scintillation counting
 - d) End window ionization counters
4. Predict the elution order of following solutes in reverse phase HPLC
 - 1) Propyl alcohol 2) 1,2 ethanediol 3) chloro benzene 4) benzene
 - a) 2>1>3>4
 - b) 1>2>4>3
 - c) 2>1>4>3
 - d) 3>4>2>1
5. Mass spectrometers separate isotopes of different elements based on their _____
 - a) Mass
 - b) Electric charge
 - c) Mass divided by electric charge
 - d) Electric charge divided by mass
6. Which of the following is a Nucleic acid database?
 - a) Swiss-prot
 - b) Uniprot
 - c) PDB
 - d) EMBL
7. Which of the following is not a part of protein secondary structure?
 - a) α -Helix
 - b) β -Helix
 - c) β -Turns
 - d) α -sheets
8. Which of the following is not a type of BLAST?
 - a) BLASTp
 - b) BLASTz
 - c) BLASTn
 - d) BLASTx
9. Which of the following is not used for predicting 3D structure of protein?
 - a) Modeller
 - b) Phyre
 - c) PsiPred
 - d) ProtParam
10. ClustalW is used for
 - a) Secondary structure prediction
 - b) Tertiary structure prediction
 - c) Primary protein structure analysis
 - d) Multiple sequence alignment
11. Which of the following is not a dihedral angle of protein?
 - a) θ (theta) b) ϕ (Phi) c) ψ (Psi) d) ω (Omega)

12. Which of the following is not a primary database?
 a) PDB
 b) PROSITE
 c) GenBank
 d) DDBJ
13. Which of the following cannot be used as Vector for gene cloning purpose?
 a. Phage.
 b. Plasmid.
 c. Bacterium.
 d. M13
14. A DNA library is
 a. A general collection of all genes sequenced thus far.
 b. a collection of DNA fragments that make up the entire genome of a particular organism.
 c. a DNA fragment inserted into a vector.
 d. all DNA fragments identified with a probe.
15. When $[S] = K_M$, the velocity of an enzyme catalyzed reaction is about:
 a. $0.1V_{max}$.
 b. $0.2V_{max}$.
 c. $0.3 V_{max}$.
 d. $0.5 V_{max}$
16. Enzyme B requires Zn^{2+} in order to catalyze the conversion of substrate X. Zinc is best identified as a:
 a. Coenzyme.
 b. Cofactor.
 c. Zinozyme
 d. Zifactor.
17. What is indirect infringement?
 a) Person obtained license of patent and used it commercially
 b) Patent expired and used commercially
 c) Patentable thing claimed by person who supplies product to patentable person
 d) Not performing any infringing act in the territory covered by the patent
18. Which of the following is alternatively called Corporate venturing
 a) Intrapreneurship
 b) Entrepreneurship
 c) Act of starting a new venture
 d) Offering a new product by existing company
19. Which of the following is not part of RNA processing in eukaryotes?
 a) splicing of exons
 b) reverse transcription
 c) addition of a 5' cap
 d) addition of a poly A tail
20. An *E.coli* strain lacking DNA Polymerase I would be deficient in:
 a) Repair
 b) Splicing
 c) Methylation
 d) Degradation
21. The ribosome is involved in all the following EXCEPT:
 a) Peptide bond formation
 b) Aminoacylation of tRNA
 c) Binding of protein factors during elongation
 d. Binding of aminoacyl tRNA to mRNA
22. Three types of RNA involved in comprising the structural and functional core for protein synthesis, serving as a template for translation, and transporting amino acid, respectively, are:
 a) mRNA, tRNA, rRNA
 b) rRNA, tRNA, mRNA
 c) tRNA, mRNA, rRNA
 d) rRNA, mRNA ,tRNA
23. Common lesions found in DNA on exposure to UV light are
 a) Pyrimidine dimers
 b) Single stranded breaks
 c) base deletions
 d) Purine dimmers
24. All is true about Heterotrimeric G proteins EXCEPT:
 a) They bind either GDP or GTP
 b) They have GTPase activity
 c) They act as binary on-off switches
 d) They phosphorylate proteins
25. The terms Isoschizomer is used for
 a) DNA ligases
 b) DNA polymerases
 c) DNA helicases
 d) Restriction endonucleases
26. Yeast two hybrid system is used to study
 a) DNA-DNA interaction
 b) RNA-RNA interaction
 c) Protein-protein interaction
 d) DNA-RNA interaction
27. Increased genetic diversity following extended time in tissue culture is a problem called
 a) Gene alteration
 b) Temporal modification
 c) Somaclonal variation
 d) Culture stock
28. The roots of plants are converted into drug-producing structures in a process called
 a. Microcosam establishment
 b. Mibridisation
 c. Bioremediation
 d. Rhizosecretion
29. Antisense technology
 a. selectively blocks expression of a gene

- b. combines genetic material from different species
- c. combines organelles and cells
- d. alters or transfers cells
30. The most popular model plant *Arabidopsis thaliana* belongs to which family
- a) Labiatae
b) Ranunculaceae
c) Solanaceae
d) Cruciferae
31. Golden rice is created by transforming genes related to
- a. Hormone synthesis
b. Beta-carotene synthesis
c. Protein synthesis
d. Carbohydrate synthesis
32. The use of genetically engineered crops to produce compounds with therapeutic value is
- a. Hybridisation
b. Genetic engineering
c. Molecular farming
d. Bioaugmentation
33. The factors required for the maturation of Neutrophils are
- a) IL-4, GM-CSF, G-CSF
b) IL-3, GM-CSF, G-CSF
c) IL-4, GM-CSF, CFU-N
d) IL-3, GM-CSF, CFU-N
34. Which factor is associated with the binding of gp120 of HIV
- a) CD3
b) CD4
c) CD19
d) CD21
35. The MHC class I molecule is a cell surface glycoprotein consisting of
- a) Variable alpha chain and nonvariable beta microglobulin chain
b) Variable alpha chain and variable beta microglobulin chain
c) Nonvariable alpha chain and nonvariable beta microglobulin chain
d) Nonvariable alpha chain and variable beta microglobulin chain
36. The sequence of antigen processing in MHC class I pathway is
- a) Antigenic protein, peptide fragment released into cytosol, proteasome, ER
b) Antigenic protein, proteasome, peptide fragment released into cytosol, ER
c) Antigenic protein, peptide fragment released into cytosol, ER proteasome
d) Antigenic protein, ER, peptide fragment released into cytosol, proteasome, ER
37. In general the osmolality of animal cultured cells is in the range (mosm/kg) of
- a) 200-260
b) 260-320
c) 300-360
d) 360-420
38. Which of the amino acids are not present in Eagle's MEM medium
- a) L-Ala, L- L-Arg, L-Ser
b) L-Ala, L- L-Arg, L-Tyr
c) L-Val, L- L-Arg, L-Ser
d) L-Ala, L- L-Pro, L-Ser
39. The major reason for the rejection of pig organs by primates is due to the presence of a special group of disaccharides in pigs (and absent in humans). These disaccharides are synthesized by an enzyme
- a) Alpha 1,3 –glucosyltransferase
b) Alpha 1,3 –galactosyltransferase
c) Alpha 1,4 –glucosyltransferase
d) Alpha 1,4 –galactosyltransferase
40. How much of the biological carbon present on the Earth is accounted for by microbes
- a) 30%
b) 40%
c) 50%
d) 60%
41. Intestinal microbes are rich source of
- a) Vitamin C & K
b) Vitamin A & C
c) Vitamin A & B
d) Vitamin B & K
42. Which of the amino acid is not present in the cell wall of Bacteria
- a. L-Ala
b. L- Glu
c. D-Ala
d. D-Glu
43. The antibiotic streptomycin kills bacteria by inhibiting
- a. Cell wall biosynthesis
b. Disrupting cell membrane permeability
c. Inhibiting DNA replication
d. Inhibiting protein synthesis
44. Majority of microbes are
- a. Chemolithoautotrophs
b. Chemolithoheterotrophs
c. Chemoorganoautotrophs
d. Chemoorganoheterotrophs
45. Which of the following vitamin is involved in one-carbon metabolic process
- a. Folic acid
b. Biotin
c. Thiamine

- d. Riboflavin
46. Which of the following component is not a part of nutrient medium prepared for the growth of Cyanobacteria
- Sodium nitrite
 - Citric acid
 - Glucose
 - EDTA
47. Agar is a Sulfated polymer composed mainly of
- Galactose and Glucouronic acid
 - Glucose and Glucouronic acid
 - Galactose and Galactouronic acid
 - Glucose and Galactouronic acid
48. SARS stands for
- Sever Acute Respiratory Syndrome
 - Sever Acute Respiratory Symptom
 - S Sever Acute Retro Syndrome
 - ever Acute Respiratory Symptom
49. The antimicrobial activity of chlorine gas is due the generation of
- Oxidizing agent
 - Reducing agent
 - HCl
 - KCl
50. In the relationship between two organisms, if only one organism benefits, such association is called
- Mutualism
 - Neutralism
 - Commensalism
 - Opportunism
51. The most distinguishing parameter in differentiation between Bacteria and Archaea is
- Cell Wall composition
 - Extreme habitats
 - tRNA sequences
 - rRNA sequences
52. Which bacterium has two chromosomes?
- Duplobacterium
 - Vibrio
 - Rhizobium
 - Mycobacterium
53. The cell membranes of many bacteria contain
- Sterols
 - Cholesterols
 - Hopanoids
 - Haponoids
54. Which of the following is a virulence plasmid
- Ti
 - F
 - TOL
 - Dd VP
55. In Gram negatives, which *Protein Secretion Sysyems* require the involvement of chaperons
- Type I & II
 - Type II & III
 - Type III & V
 - Type II & IV
56. In chlorophyll-based photosynthesis amongst bacteria, which of the following is not an electron donor
- H₂O
 - H₂
 - H₂S
 - S
57. *Escherichia* can be distinguished from *Shigella* on the basis of
- Motility test
 - Voges-Proskeur test
 - H₂S production test
 - Urease test
58. A viral disease Chicken pox (Varicella) is caused by
- SS DNA Varioella-Zoster virus
 - DS DNA Varioella-Zoster virus
 - SS DNA Varicella-Zoster virus
 - DS DNA Varicella-Zoster virus
59. The bacterium, *Helicobacter pylori*, a resident of human stomach
- will grow in a nutrient medium having pH 2.0
 - will die in a nutrient medium having pH 2.0
 - will not die, but remain metabolically active in a nutrient medium having pH 2.0
 - will grow in nutrient medium having pH 2.0 but not in a medium with pH 7.0
60. In A=T base pair
- C-1 of sugar is attached to N-9 of adenine and N-1 of Thymine
 - C-1 of sugar is attached to N-1 of adenine and N-6 of Thymine
 - C-4 of sugar is attached to N-9 of adenine and N-1 of Thymine
 - C-4 of sugar is attached to N-1 of adenine and N-6 of Thymine
61. 3-D structures of proteins can be determined by
- X-ray crystallography and NMR
 - X-ray crystallography only
 - NMR only
 - HPLC
62. Which type of RNA is present maximally in Bacteria
- mRNA
 - rRNA
 - tRNA
 - Satellite RNA

63. The consensus sequence of Pribnow box is
 a) TATAAT
 b) TAATAT
 c) TATTAA
 d) TAATTA
64. A genomic library comprises of
 a) All the genes present in the chromosome of a cell
 b) All the genes present in the chromosome and plasmid of a cell
 c) All the Genetic material present in a cell
 d) All the genetic material present in the chromosome of a cell
65. Which antibiotic biosynthesis is associated with the production of Factor-A.
 a) Penicillin
 b) Tetracycline
 c) Streptomycin
 d) Chloramphenicol
66. The microbial biosynthesis of Polyhydroxybutyrate (PHB) involves the following enzymes
 a) 3-ketothiolase, acetoacetylCoA synthase, PHA Synthase
 b) 3-ketothiolase, acetoacetylCoA reductase, PHA Synthase
 c) 2-ketothiolase, acetoacetylCoA reductase, PHB Synthase
 d) 2-ketothiolase, acetoacetylCoA reductase, PHB Synthase
67. The aspect ratio of a STR is usually between
 a) 2-4
 b) 3-5
 c) 2-6
 d) 3-7
68. An enzyme requires Zn^{2+} in order to catalyze the conversion of substrate to product. Zinc is best identified as a:
 a. Coenzyme.
 b. Cofactor.
 c. Co-substrate.
 d. Zincozyme.
69. Which of the following toxin is not phage mediated
 a) Shiga-like toxin 1
 b) Cholera toxin
 c) Tetanus toxin
 d) Botulinum
70. Nitrogen fixing bacteria require how many ATP molecules for conversion of one molecule of Nitrogen
 a) 36
 b) 24
 c) 12
- d) 01
71. The bacterium *Escherichia coli* is
 a) Gram positive, sporulating, short rods and motile, lactose fermenter
 b) Gram negative, short rods and non-motile, non lactose fermenter
 c) Gram positive, non-sporulating, long rods and motile, lactose fermenter
 d) Gram negative, non-sporulating, short rods and motile, lactose fermenter
72. The enzyme Trypsin acts on the
 a) Carboxyl side of Lysine residues
 b) Aminoside of Lysine residues
 c) Carboxyl side of Tryptophan residues
 d) Aminoside of Tryptophan residues
73. The expression of cholera toxin is
 a) Higher at 37°C, lower at 30°C, higher at pH 6.0, lower at pH 8.0
 b) Lower at 37°C, higher at 30°C, higher at pH 6.0, lower at pH 8.0
 c) Higher at 37°C, lower at 30°C, lower at pH 6.0, higher at pH 8.0
 d) Lower at 37°C, higher at 30°C, lower at pH 6.0, higher at pH 8.0
74. The enzyme RNaseH digests
 a) RNA only
 b) RNA, DNA
 c) RNA + RNA-DNA heteroduplex
 d) dsRNA only
75. Which term is not associated with Ti plasmids
 a) Nopaline
 b) Octopine
 c) TC-T-DNA
 d) TL-T-DNA
76. Continuous feed during fermentation is normally used to maintain
 a) Substrate concentration
 b) Water level
 c) Product concentration
 d) Cell number
77. Which of the following is not used for predicting 3D structure of protein
 a) Modeller
 b) Phyre
 c) PsiPred
 d) ProtParam
78. Which of the following microbial enzyme is produced maximally by the industry
 a) Amylase b) Protease c) Cellulase d) Lipase
79. New-Delhi-beta-Lactamase-1 was first time detected in

- a) *Pseudomonas aeruginosa*
- b) *Acinetobacter baumannii*
- c) *Staphylococcus aerus*
- d) *Klebsiella pneumonia*
80. Which of the following interactions are involved in antigen-antibody binding?
- a) Hydrogen Bond
- b) Vander Waal's forces
- c) Covalent bond
- d) Electrostatic interactions
81. Spectrophotometer works on the principle of Beer-Lambert's law. According to Beer-Lambert's law intensity of transmitted light is
- a) Directly proportional to length of the tube
- b) Inversely proportional to the length of tube
- c) Inversely proportional to the square of length of tube
- d) Independent to the length of tube
82. A set of virulence genes (*vir* genes), located in the *Agrobacterium* Ti-plasmid, is activated by
- a) Octopine
- b) Nopaline
- c) Acetosyringone
- d) Auxin
83. Which of the following types of enzymes are usually subjected to direct feedback inhibition by an intracellular metabolite?
- a) Enzymes catalyzing the last step in a catabolic pathway
- b) Enzymes catalyzing the last step in a biosynthetic pathway
- c) Enzymes catalyzing the first step in a biosynthetic pathway
- d) Enzymes localized in the lysosomes
84. An X-linked recessive gene produces red-green colour blindness in humans. A woman with normal colour vision whose father was colour-blind marries a colour-blind man. What is the probability that their son will be color-blind?
- a) 0
- b) $\frac{1}{4}$
- c) $\frac{1}{2}$
- d) Insufficient data
85. In *Escherichia coli*, the synthesis of tryptophan is controlled by the tryptophan operon that is repressed in the presence of excessive tryptophan. When a mutant strain that has lost the regulatory gene of the tryptophan operon is placed in a medium that contains all nutrients the cells need to grow except tryptophan, which of the following will occur?
- a) The cells will continue to grow even though excess tryptophan is synthesized.
- b) The cells will grow until excessive tryptophan arrests the expression of the operon.
- c) The cells will not grow until enough tryptophan has been synthesized to activate the co-repressor.
- d) The cells will never grow unless tryptophan is added to the medium
86. Which of the following is not a DNA based characterization technique?
- a) 16s analysis
- b) BIOLOG
- c) Multiple locus sequence alignment
- d) FAME
87. Which of the following can most likely lead to loss of gene function?
- a) A change from a TAA codon to TAG codon in coding region
- b) A mis-sense mutation in open reading frame
- c) A frame shift mutation in the coding region
- d) A change from T to C in promoter region
88. Which of the following amino acid is most likely present in the kink region of an α -helical structure?
- a) Asparagine
- b) Proline
- c) Histidine
- d) Cystine
89. The chemical composition of biodiesel is
- a) Monoesters of long chain fatty acids
- b) Monoesters of short chain fatty acids
- c) Diesters of short chain fatty acids
- d) Diesters of short chain fatty acids
90. Which of the following is correct?
- a. Protease is an exotoxin
- b. LPS is a pyrogen
- c. Peptidoglycan is a monomer of glucosamine
- d. Dipicolinic acid is an amino acid