

**ENTRANCE EXAMINATION FOR ADMISSION, MAY 2013.**

**Ph.D. (BIOTECHNOLOGY)**

**COURSE CODE : 103**

Register Number :

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*Signature of the Invigilator  
(with date)*

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**COURSE CODE : 103**

Time : 2 Hours

Max : 400 Marks

*Instructions to Candidates :*

1. Write your Register Number within the box provided on the top of this page and fill in the page 1 of the answer sheet using pen.
2. Do not write your name anywhere in this booklet or answer sheet. Violation of this entails disqualification.
3. Read each of the question carefully and shade the relevant answer (A) or (B) or (C) or (D) in the relevant box of the ANSWER SHEET using HB pencil.
4. Avoid blind guessing. A wrong answer will fetch you -1 mark and the correct answer will fetch 4 marks.
5. Do not write anything in the question paper. Use the white sheets attached at the end for rough works.
6. Do not open the question paper until the start signal is given.
7. Do not attempt to answer after stop signal is given. Any such attempt will disqualify your candidature.
8. On stop signal, keep the question paper and the answer sheet on your table and wait for the invigilator to collect them.
9. Use of Calculators, Tables, etc. are prohibited.

1. Diphtheria toxin inhibits protein synthesis by
  - (A) causing formation of ADP-EF2 complex
  - (B) release of peptidyl-tRNA from the P-site
  - (C) binding to factor eEf-2
  - (D) inhibiting peptide bond formation
  
2. Nucleotide excision repair of DNA in *E. coli*
  - (A) replaces both strands of DNA in the damaged region
  - (B) uses high energy phosphate bonds
  - (C) utilizes RNA polymerase to make a primer
  - (D) requires uvr ABC exonuclease
  
3. A recessive mutation is one which
  - (A) is not expressed
  - (B) is expressed only when heterozygous
  - (C) is expressed only when homozygous or hemizygous
  - (D) is eliminated by natural selection
  
4. Which of the following processes require energy?
 

(A) ligation	(B) transformation
(C) restriction digestion	(D) hybridization
  
5. T4 polynucleotide kinase is used for
 

(A) labelling 3' ends of DNA	(B) labelling 5' ends of DNA
(C) creating blunt ends of DNA	(D) dephosphorylation of DNA
  
6. Mung bean nuclease could be used for
  - (A) DNA synthesis
  - (B) Nucleotide hydrolysis
  - (C) Trimming single stranded regions in DNA
  - (D) Removal of phosphate groups from the end of the DNA
  
7. DNA of a bacterium is not cleaved by its own restriction enzyme because the recognition DNA sequences are
  - (A) methylated
  - (B) deleted
  - (C) bound by inhibitory proteins
  - (D) not accessible to restriction enzymes

8. Which of the following sequences is most likely to be a restriction enzyme recognition site
- (A) CGGCTT (B) CGCCGC  
(C) GTAATG (D) GTCGAC
9. A highly aerobic and metabolically versatile organism used in oil-spill-clearing is
- (A) *Mycobacterium smegmatis* (B) *Azetobacter vinelandii*  
(C) *Pseudomonas cepacia* (D) *Leuconostoc mesenteroides*
10. Clostridia are anerobes and they form ATP by 'stickland' reaction. For this they use
- (A) palmitic acid (B) pyruvic acid  
(C) ethanol (D) aminoacids
11. The enzyme where catalysis involves transfer of electrons are named as
- (A) isomerases (B) transferases  
(C) oxidoreductases (D) lyases
12. Enzyme glutathione peroxide, catalyzes destruction of H<sub>2</sub>O<sub>2</sub>, contain
- (A) Zn (B) Fe  
(C) Se (D) Mo
13. Which of the following is a cofactor and not a coenzyme
- (A) biotin (B) tetrahydrofolic acid  
(C) copper (D) methylcobalamin
14. The  $K_m$  of an enzyme
- (A) one half of the  $V_{max}$   
(B) a dissociation constant  
(C) the substrate concentration that gives maximal velocity  
(D) the substrate concentration that gives half maximal velocity
15. Lower value of Michaelis constant shows
- (A) greater affinity of the enzyme for the substrate  
(B) less affinity of the enzyme for the substrate  
(C) enzyme is allosteric  
(D) question is incomplete

16. Which of the following statement is true about non-competitive inhibition
- (A) The  $V_{\max}$  decreases and  $k_m$  remain unchanged
  - (B) The  $V_{\max}$  remain unchanged and  $k_m$  increases
  - (C)  $V_{\max}$  and  $k_m$  both decreases
  - (D)  $V_{\max}$  decreases and  $k_m$  increases
17. At what  $[S]$  is the velocity ( $V_0$ ) of an enzyme-catalyzed reaction is 25% of the  $V_{\max}$
- (A)  $3/4 k_m$
  - (B)  $4 k_m$
  - (C)  $1/3 k_m$
  - (D)  $1/4 k_m$
18. Which of the following regulatory actions involves a reversible covalent modification of an enzyme
- (A) allosteric modulation
  - (B) competitive inhibition
  - (C) conversion of zymogen to active enzyme
  - (D) phosphorylation of a serine hydroxyl on the enzyme
19. Vitamin-D is derived from which of the following precursors by the action of UV-light
- (A) 7-dehydrocholesterol
  - (B) lanosterol
  - (C) glycocholate
  - (D) squalene epoxide
20. Which of the following coenzymes acts as electron sink to promote catalysis
- (A) biotin
  - (B) lipoamide
  - (C) CoA
  - (D) pyridoxal phosphate
21. Which of the following vitamins does not act as a precursor for co-enzymes
- (A) biotin
  - (B) thiamine
  - (C) folic acid
  - (D) ascorbic acid
22. Which of the following statements is true regarding enzyme catalysis of a chemical reaction
- (A) increases the forward and reverse reaction rates
  - (B) decrease  $\Delta G^\circ$  so that the reaction can proceed spontaneously
  - (C) increases the energy of a transition state
  - (D) decreases the entropy of reaction

23. Which of the following arrangement of the metal ions  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{++}$  and  $\text{Ca}^{++}$  in the order of decreasing concentrations is correct with respect to a quiescent mammalian cell?
- (A)  $\text{K}^+$ ,  $\text{Na}^+$ ,  $\text{Mg}^{++}$ ,  $\text{Ca}^{++}$  (B)  $\text{Na}^+$ ,  $\text{K}^+$ ,  $\text{Mg}^{++}$ ,  $\text{Ca}^{++}$   
 (C)  $\text{Mg}^{++}$ ,  $\text{K}^+$ ,  $\text{Na}^+$ ,  $\text{Ca}^{++}$  (D)  $\text{Ca}^{++}$ ,  $\text{Mg}^{++}$ ,  $\text{K}^+$ ,  $\text{Na}^+$
24. Which one of the following lipids is commonly found in biological membranes?
- (A) monoglycerides (B) diglycerides  
 (C) triglycerides (D) none of these
25. Most abundant lipid in plasma membrane is
- (A) cholesterol (B) sterol  
 (C) glycolipid (D) phospholipids
26. Which of the following is a function of plasma membrane
- (A) structural barrier and cell communication  
 (B) metabolic activities and cell adhesion  
 (C) mass flow regulation, active transport, diffusion, endocytosis and exocytosis  
 (D) all of the above
27. When an ion or solute is moved against a concentration gradient using energy, the process is called
- (A) diffusion (B) active transport  
 (C) transport (D) regulated diffusion
28. Receptor mediated endocytosis from plasma membrane requires which one of the following coat proteins
- (A) Clathrin (B) SNARE  
 (C) Arrestin (D) Glycophorin
29. A patch-clamp device is used to
- (A) measure the strength of a electrochemical gradient  
 (B) study the properties of individual transmitters  
 (C) infuse different kinds of ions into an axon  
 (D) study the properties of individual membrane channel
30. If a subcellular fraction from liver tissue exhibits high level of acid phosphatase activity, it is enriched in
- (A) nuclei (B) lysosomes  
 (C) micosome (D) golgi bodies

31. Which of the following amino acids can exist as diastereomers?
- (A) isoleucine and leucine (B) isoleucine and valine  
(C) isoleucine and threonine (D) serine and threonine
32. An essential building block of phosphatidic acid and phosphatidylcholine
- (A) glycerol (B) lysine  
(C) cholesterol (D) glucose
33. The concentration of sphingomyelins are increased in
- (A) Gaucher's disease (B) Fabry's disease  
(C) Febrile disease (D) Niemann-Pick disease
34. Alkaline hydrolysis of a triglyceride is
- (A) saponification (B) esterification  
(C) hydrogenation (D) dehydration
35. Which of the following co-factor is essential for the activity of acetyl coA carboxylase
- (A) NAD<sup>+</sup> (B) biotin  
(C) TPP (D) Vit B6
36. Refsum's disease arises due to defective
- (A)  $\beta$  - oxidation pathway  
(B)  $\alpha$  - oxidation pathway  
(C)  $\omega$  - oxidation pathway  
(D) TCA cycle
37. A common step involved in the biosynthesis of all steroid hormone
- (A) conversion of cortisol to corticosterone  
(B) cholesterol side chain cleavage  
(C) aromatization  
(D) dehydrogenation
38. Which of the following does not belong to glycosphingolipids
- (A) cerebrosides (B) gangliosides  
(C) globosides (D) sphingomyelin
39. Cellulase is indigestible by humans because we lack the enzyme that hydrolyzes
- (A)  $\alpha$  -1,4 glycosidic bonds (B)  $\alpha$  -1,6 glycosidic bonds  
(C)  $\beta$  -1,4 glycosidic bonds (D) long chain polysachharides



40. Which of the following compounds is not amphiphatic
- (A) cholesterol (B) oleic acid  
(C) succinate (D) phosphatidyl choline
41. Which of the following methods for studying loss of gene function does not involve any modification of the genome?
- (A) gene knockout by homologous recombination  
(B) RNA interference by injection of double stranded DNA  
(C) expression of an integrated antisense transgene  
(D) all the above
42. Restriction fragment length polymorphism (RFLP) is
- (A) the technique used to fingerprint of inheritance  
(B) the difference in the restriction maps between two individuals of one species  
(C) the difference in the restriction maps between two individuals of two species  
(D) the difference in the restriction maps between the two alleles in a diploid cell
43. A reporter gene
- (A) acts as repressor  
(B) allows gene expression to be readily measured  
(C) enhances mRNA stability  
(D) interacts with RNA polymerase
44. Transduction has been used extensively for genome mapping of bacteria. which of the following process is useful for gene mapping?
- (A) bacterial lysis (B) generalized transduction  
(C) specialized transduction (D) site specific recombination
45. Two double stranded DNA samples that are identical with respect to the number of base pairs, but differ significantly in their GC content, can be separated by
- (A) dialysis (B) agarose gel electrophoresis  
(C) density gradient centrifugation (D) oligo-dT column chromatography
46. Pyrosequencing derives its name from the fact that
- (A) the bases are detected by pyrolysis  
(B) it detects pyrophosphate released during base incorporation  
(C) it generates pyrograms as output  
(D) it uses enzyme apyrase to detect the bases

47. Aroma in rice is due to
- (A) 2-acetyl-1-pyrroline (B) Acetyl choline  
(C) 4-benzyl pyrroline (D) 2-ethyl pyrroline
48. For glycoproteins, most commonly used probe is
- (A) antibody (B) antigens  
(C) interferons (D) lectin
49. Phage M13 vectors are widely used for
- (A) obtaining fragments of cloned DNA suitable for DNA sequencing  
(B) obtaining single stranded copies of cloned DNA suitable for DNA sequencing  
(C) obtaining double stranded copies of cloned DNA suitable for electrophoresis  
(D) obtaining double stranded copies of cloned DNA suitable for DNA sequencing
50. Vectors designed to replicate in cells of two different species are called
- (A) plasmids (B) phagemids  
(C) transfer vectors (D) shuttle vectors
51. Parkinson's disease is associated with
- (A) an underproduction of  $\gamma$ -aminobutyrate  
(B) an underproduction of dopamine  
(C) an overproduction of histamine  
(D) an overproduction of  $\gamma$ -aminobutyrate
52. The inducer:
- (A) combines with a repressor and prevents it from binding to the promoter  
(B) combines with a repressor and prevents it from binding to the operator.  
(C) binds to the promoter and prevents the repressor from binding to the operator  
(D) binds to the operator and prevents the repressor from binding at this site
53. Identify the following point mutation in mRNA UAU to UAU AAC CUA and UUG CUA to UUG CUG AUA
- (A) transition and frame shift respectively  
(B) frame shift and transition respectively  
(C) transversion frame shift respectively  
(D) frame shift and transition respectively



54. Integral membrane proteins are helped to locate across the lipid bilayer by  
 (A) formation of disulfide bonds  
 (B) using an  $\alpha$  helix made up of amino acids with hydrophilic side chains  
 (C) using an  $\alpha$  helix made up of amino acids with hydrophobic side chains  
 (D) glycosylation
55. The enzyme following Michelis-Menten kinetics show a characteristic graph when substrate concentration is plotted against velocity, the nature of the graph will be  
 (A) sigmoidal (B) parabolic  
 (C) hyperbolic (D) straight line
56. The T $\psi$ C arm in the tRNA molecule possesses the sequence  
 (A) T, pseudouridine and C (B) T, uridine and C  
 (C) T, dihydrouridine and C (D) T, adenine and C
57. A synthetic nucleotide analogue, used in the chemotherapy of cancer and viral infections is  
 (A) arabinosyl cytosine (B) 4-hydroxypyrazolopyrimidine  
 (C) 6-mercaptopurine (D) 6-thioguanine
58. The most likely lethal mutation is  
 (A) substitution of adenine for cytosine (B) insertion of one nucleotide  
 (C) deletion of three nucleotides (D) substitution of cytosine for guanine
59. The blood sugar raising action of the hormone of suprarenal cortex is due to  
 (A) glyconeogenesis  
 (B) glycogenolysis  
 (C) glucagon like activity  
 (D) due to inhibition of glomerular filtration of glucose
60. Suppressor mutations occur in  
 (A) structural genes (B) promoter regions  
 (C) silencer elements (D) anticodons of tRNA
61. Trials for gene therapy in human beings were first carried out, with considerable success, in a genetic disease called  
 (A) cystic fibrosis (B) thalassemia  
 (C) adenosine deaminase deficiency (D) Lesch-Nyhan syndrome

62. If DNA of a cancer cell is introduced into a normal cell, the recipient cell
- (A) destroys the DNA (B) loses its ability to divide  
(C) dies (D) changes into a cancer cell
63. Amplification of dihydrofolate reductase gene in a cancer cell makes the cell
- (A) susceptible to folic acid deficiency  
(B) less malignant  
(C) resistant to amethopterin therapy  
(D) responsive to amethopterin therapy
64. Orcinol method is employed in the quantitation of
- (A) nucleic acid (B) DNA  
(C) RNA (D) proteins
65. Which one of the following statements is not characteristic of allosteric enzymes?
- (A) they frequently catalyze a committed step early in a metabolic pathway  
(B) they are often composed of subunits  
(C) they follow Michaelis-Menten kinetics  
(D) they frequently show co-operativity for substrate binding
66. 'Clearing factor' is
- (A) lipoprotein lipase (B) rotonase  
(C) 7-dehydro cholesterol (D)  $\beta$ -sitosterol
67. Rapoport-Luebering cycle is located in
- (A) liver (B) muscles  
(C) brain (D) erythrocytes
68. In Lineweaver-Burk plot, the y-intercept represents
- (A)  $V_{max}$  (B)  $K_m$   
(C)  $1/K_m$  (D) None of the above
69. Genetically engineered male sterile crop plants may be produced by inserting
- (A) lectin gene (B) chitinase gene  
(C) barnase gene (D) BT toxin gene

70. Choose the correct statement(s) about thermostable DNA polymerase used in PCR
- P. *Tli* pol has no 3' → 5' exonuclease activity  
 Q. *Pfu* pol has 3' → 5' exonuclease activity  
 R. *Taq* pol has 3' → 5' exonuclease activity  
 S. *Taq* pol has no proof reading ability
- (A) P, Q and R (B) Q, R and S  
 (C) P, R and S (D) P, Q and S
71. Which of the following would not be possible to address using a Northern blot?
- (A) mRNA size  
 (B) location of restriction sites in a particular gene  
 (C) spatial expression of a particular gene  
 (D) temporal expression of a particular gene
72. In  $lacO^c lacZ^- lacO^+ lacZ^+$  partial diploid, of the two *lacZ* enzymes, only the mutant enzyme (*lacZ*<sup>-</sup>) is synthesized constitutively. This observation show that *lac O*<sup>c</sup> mutation is
- (A) cis- dominant (B) cis recessive  
 (C) trans- dominant (D) trans- recessive
73. Chromosome walking is best described as
- (A) sequencing a genome at a time to ensure that no gaps are present at the end of the project  
 (B) identifying clones whose inserts overlap to generate a library of clones that cover a given segment of DNA  
 (C) generating a map along a chromosome in a step-by-step manner  
 (D) aligning DNA sequences by computer to generate contigs
74. A mixture containing two proteins having similar molecular mass but different oligomeric properties can be separated by
- (A) SDS PAGE analysis (B) native PAGE analysis  
 (C) isoelectric focusing (D) both B and C
75. Which one of the following antibiotics attaches to 50S ribosome and inhibits peptidyl-transferase activity?
- (A) penicillin (B) trimethoprim  
 (C) amphotericin (D) chloramphenicol

76. The molecular formulae of deoxyribose sugar and ribose sugar respectively are  
 (A)  $C_5H_{10}O_4$  and  $C_5H_{10}O_6$  (B)  $C_5H_{10}O_4$  and  $C_5H_{10}O_5$   
 (C)  $C_5H_{10}O_5$  and  $C_5H_{10}O_4$  (D)  $C_5H_{10}O_5$  and  $C_6H_{10}O_4$
77. Haploid plant cultures are got from  
 (A) leaves (B) root tip  
 (C) pollengrain (D) buds
78. Gene is segment of  
 (A) RNA (B) DNA  
 (C) RNA or DNA (D) Both DNA and RNA
79. DNA sequence is ATG. What would be the sequence of bases in anticodon of tRNA  
 (A) ATG (B) AUG  
 (C) UAC (D) TAC
80. VNTRs represents-  
 (A) new terminal regions in DNA  
 (B) functional genes in the DNA  
 (C) split genes in the sample DNA  
 (D) specific non-coding sequences with unique tandem repeats
81. Temperature dependent sex determination is observed in  
 (A) drosophila (B) amphibians  
 (C) reptiles (D) sea urchins
82. HDL is synthesized and secreted from  
 (A) liver (B) kidney  
 (C) pancreas (D) muscle
83. Least concentration of urea present in  
 (A) renal artery (B) renal vein  
 (C) post caval (D) dorsal aorta
84. Manifestation of masculin pattern in females due to hormonal effects is known as  
 (A) muscularity (B) virilism  
 (C) castration (D) epitaxis

85. Ontogenically origin of liver and pancreas is  
 (A) ectodermal (B) mesodermal  
 (C) endodermal (D) none
86. Lymph differs from blood in having  
 (A) blood with more RBC and less WBC (B) blood without plasma  
 (C) plasma without protein (D) blood with no RBC and more WBC
87. Blind spots does not contain  
 (A) rods (B) cones  
 (C) both rods and cones (D) tympanum
88. Which of the following belongs to the class of pepsin and trypsin  
 (A) rennin (B) amylase  
 (C) thyroxin (D) secretin
89. The respiration rate is lowest during  
 (A) playing tennis (B) running  
 (C) snoring when sleeping (D) eating food
90. Meeting point of all metabolic pathway is  
 (A) lactic acid (B) citric acid  
 (C) ornithine cycle (D) acetyl co-A
91. All of the following statements about monomeric G proteins are true EXCEPT:  
 (A) they are regulated by GTP-GDP exchange proteins  
 (B) they are regulated by GTPase activating proteins  
 (C) they regulate enzymes that synthesize cGMP  
 (D) they regulate vesicle formation
92. Which of the following is largest in size  
 (A) amacrine cells (B) purkinje cells  
 (C) renshaw cells (D) baket cells
93. Retroviral oncogenes are probably aberrant forms of normal cellular genes that regulate cell proliferation. Which of the following gene products are LEAST likely to be encoded by an oncogene?  
 (A) GTP-binding proteins (B) DNA-binding proteins  
 (C) transmembrane proteins (D) capsid proteins



94. All of the following are known to be part of a signal transduction cascade EXCEPT
- (A) phosphorylation of fibronectin
  - (B) dissociation of the components of a heterotrimeric G-protein
  - (C) enzymatic breakdown of phosphatidyl inositol bisphosphate (PIP<sub>2</sub>)
  - (D) elevation of intracellular [Ca<sup>2+</sup>]
95. Which of the following is NOT a consequence of increased cellular levels of cAMP?
- (A) activation of a kinase cascade
  - (B) activation of the transducin G-protein
  - (C) increased phosphorylation of glycogen phosphorylase
  - (D) inhibition of glycogen synthesis
96. SNARE proteins are found in the membranes of all of the following compartments EXCEPT
- (A) mitochondria
  - (B) golgi complex
  - (C) early endosome
  - (D) endoplasmic reticulum
97. Treatment of root tip meristem cells with the microtubule inhibitor colchicine results in all of the following EXCEPT
- (A) induction of polyploidy
  - (B) prevention of cytokinesis
  - (C) inhibition of mitotic spindle assembly
  - (D) cessation of DNA replication
98. Proline disrupts  $\alpha$ -helical structure in proteins because it is
- (A) an acidic amino acid
  - (B) an aromatic amino acid
  - (C) an imino acid
  - (D) a basic amino acid
99. Acetyl CoA, the cytoplasmic substrate for fatty acid synthesis, is formed in mitochondria. The inner mitochondrial membrane is impermeable to acetyl CoA. Which of the following compounds is the form in which the carbon of acetyl CoA is transported to the cytoplasm?
- (A) malate
  - (B) acetate
  - (C) citrate
  - (D) pyruvate
100. The GAL4 protein activates transcription from the GAL1 promoter in yeast. To bind to DNA, the protein utilizes a
- (A) heme group
  - (B) transcriptional-activating domain
  - (C) zinc-finger domain
  - (D) transmembrane segment