

ENTRANCE EXAMINATION FOR ADMISSION, MAY 2011.

Ph.D. (BIOTECHNOLOGY)

COURSE CODE : 103

Register Number :

Signature of the Invigilator
(with date)

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 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. Alpha amanitin is the potent inhibitor of
 - (A) Bacterial RNA polymerase
 - (B) RNA polymerase III
 - (C) RNA polymerase II
 - (D) RNA polymerase I
2. Acyclovir inhibits
 - (A) Viral Transcription
 - (B) Viral DNA replication
 - (C) Viral Translation
 - (D) None of the above
3. Particular RNAs that are important for development are located in distinct regions of the *Drosophila* embryo. This is most directly demonstrated by using
 - (A) western blotting
 - (B) *in situ* hybridization
 - (C) northern blotting
 - (D) *in vitro* translation
4. A mutation deleting an upstream activating sequence for a single gene would be expected to be
 - (A) polar
 - (B) *cis*-dominant
 - (C) *trans*-dominant
 - (D) silent
5. An RNA-dependent RNA polymerase is likely to be present in the virion of a
 - (A) DNA virus that multiplies in the cytoplasm
 - (B) DNA virus that multiplies in the nucleus
 - (C) minus-strand RNA virus
 - (D) plus-strand RNA virus
6. Dinitrophenol (DNP) uncouples mitochondrial electron transport from oxidative phosphorylation by
 - (A) inhibiting cytochrome oxidase
 - (B) dissociating the F₀ and F₁ units of the ATP synthase complex
 - (C) binding irreversibly to ubiquinone
 - (D) dissipating the proton gradient
7. Which of the following hormones initiates biological actions by crossing the plasma membrane and then binding to a receptor?
 - (A) Estradiol
 - (B) Glucagons
 - (C) Insulin
 - (D) Norepinephrine

8. In vertebrate genes, transcription regulatory regions that contain CpG islands are inactivated by which CpG modification?
(A) Myristylation (B) Phosphorylation
(C) Acetylation (D) Methylation
9. Proline disrupts α -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
10. Drugs that either stabilize or depolymerize microtubules can be used in cancer chemotherapy. Which of the following is correct concerning such drugs?
(A) They interfere with mitosis
(B) They prevent chromatin condensation
(C) They prevent movement of tumor cells into other tissues
(D) They interfere with endocytosis
11. Parkinson's disease is associated with
(A) an underproduction of γ - aminobutyrate
(B) an underproduction of dopamine
(C) an overproduction of histamine
(D) an overproduction of γ - aminobutyrate (GABA)
12. The yeast two hybrid system is used to detect
(A) Protein-DNA interactions (B) Protein-RNA interactions
(C) Protein-protein interactions (D) DNA-RNA interactions
13. A restriction endonuclease that recognizes the base pair sequence GATC (where N can be any nucleotide) will cleave random DNA on average every
(A) 256 bp (B) 625 bp
(C) 1024 bp (D) 4096 bp
14. Signal sequences are not required on proteins destined to
(A) for the cytosol (B) for the nucleus
(C) for the lysosome (D) for secretion

15. Which one of the following binding constants represents the highest affinity?
 - (A) $K_a = 1 \times 10^7 \text{M}^{-1}$
 - (B) $K_d = 1 \times 10^{-9} \text{M}$
 - (C) $K_a = 2 \times 10^8 \text{M}^{-1}$
 - (D) $K_d = 1.5 \times 10^{-9} \text{M}$
16. The bacterium *Treponema pallidum* is difficult to culture because
 - (A) It is unable to use carbohydrates as an energy source
 - (B) It requires lot of water to reproduce
 - (C) It lacks the genes needed for TCA cycle and Oxidative Phosphorylation
 - (D) All of the above
17. 2-amino, 6-Oxy purine is
 - (A) Hypoxanthine
 - (B) Xanthine
 - (C) Guanine
 - (D) Adenine
18. Ciprofloxacin (Fluoroquinolone derivative) is a potent inhibitor of
 - (A) Bacterial RNA Polymerase
 - (B) Bacterial DNA gyrase
 - (C) Bacterial DNA Polymerase III
 - (D) Bacterial Protein Synthesis
19. In human genome SNT's occur once in _____ nucleotide
 - (A) 100
 - (B) 1000
 - (C) 10,000
 - (D) None of the above
20. A_{260} value of which of the following is maximum?
 - (A) Free base
 - (B) Double stranded DNA
 - (C) Single stranded DNA
 - (D) None of the above
21. All of the following contribute to promoter binding by RNA polymerase in *E. coli* EXCEPT the
 - (A) rho factor
 - (B) -10 consensus sequence
 - (C) -35 consensus sequence
 - (D) Beta subunit of RNA polymerase
22. The rate limiting step of fatty acid synthesis is catalyzed by
 - (A) Acetyl CoA carboxylase
 - (B) ATP citrate lyase
 - (C) Malic enzyme
 - (D) Pyruvate dehydrogenase

23. mRNA will form hybrids only with the coding strand of DNA because
- (A) DNA will not reanneal at high temperatures
 - (B) The salt concentration will affect DNA reannealing
 - (C) DNA will not reanneal at low temperatures
 - (D) RNA: DNA hybridization follows the base-pairing rules
24. Which of the following is NOT involved in regulating the synthesis of RNA in the eukaryotic nucleus?
- (A) active genes in euchromatin, and inactive genes in heterochromatin
 - (B) amplification of some genes such as rRNA genes
 - (C) use of different RNA polymerases to transcribe different classes of RNA
 - (D) spliceosomes that stimulate synthesis of intron-containing hnRNAs
25. Which of the following primers would allow copying of the single-stranded DNA sequence 5' ATGCCTAGGTC?
- (A) 5' ATGCC
 - (B) 5' TACGG
 - (C) 5' CTGGA
 - (D) 5' GACCT
26. 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
27. *Escherichia coli* cell is grown in the presence of high amounts of glucose. Which of the following is true?
- (A) The cell will utilize lactose as a carbon source exclusively
 - (B) The level of cyclic AMP in the cell will be low
 - (C) The level of cyclic AMP in the cell will be high
 - (D) Transcription of mRNA from the lac operon will be high
28. Esterases belong to the category of
- (A) Ligases
 - (B) Lyases
 - (C) Transferases
 - (D) Hydrolases
29. Nickel and chromium compounds can cause cancer of
- (A) Skin
 - (B) Lungs
 - (C) Heart
 - (D) Liver

30. A mutant of an *E. coli* designated as $\text{arg}^+ \text{try}^-$ lacks the ability to synthesize tryptophan. Another mutant $\text{arg}^- \text{try}^+$ lacks the ability to synthesize arginine. Mixture of both these bacteria were grown in a medium containing only glucose and essential salts. Cells that could grow in the media have a genotype:
- (A) $\text{arg}^+ \text{try}^+$ (B) $\text{arg}^+ \text{try}^-$
 (C) $\text{arg}^- \text{try}^+$ (D) $\text{arg}^- \text{try}^-$
31. Which is not true about Opsonization?
- (A) is mediated by complement components and enhances phagocytosis
 (B) involves mainly the Fc portion of the immunoglobulins
 (C) fibroblast play a role in this process
 (D) is not restricted by the MHC (Major Histocompatibility Complex)
32. The metal which is used in Bioluminescence technique
- (A) Gold (B) Tungsten
 (C) Nickel (D) Cadmium
33. OKT3 antibody is used in
- (A) Immune suppressant (B) Cancer therapy
 (C) Immunotoxin (D) Mouth diseases
34. Mutation in genes that cause progressive memory loss are present in the chromosome numbers
- (A) 1, 14, 19, 21 (B) 3, 9, 11, 15
 (C) 4, 6, 8, 12 (D) 7, 14, 21, 15
35. Which bacteria is used as biocontrol agent?
- (A) *Escherichia coli* (B) *Pseudomonas fluorescens*
 (C) *Xanthomonas oryzae* (D) *Pseudomonas solanacearum*
36. Which bacteria is used for plant transformation
- (A) *Erwinia* (B) *Agrobacterium*
 (C) *Pseudomonas* (D) *Xanthomonas*
37. Which of the following hormone is modified amino acid
- (A) Prostaglandin (B) Progesterone
 (C) Estrogen (D) Epinephrine

38. When a dividing cell is treated with hydrogen peroxide, the spindle fibres precipitate due to formation of disulphide bridges. This reaction indicates that the spindle fibres and the microtubules are
- (A) glycosyl structures (B) proteinaceous structures
(C) non-polar organic structures (D) none of the above
39. Native DNA sample if first boiled for a few minutes and then cooled in a high salt concentration will show
- (A) constant UV absorbance
(B) initial rise and then fall in UV absorbance
(C) initial drop and then rise in UV absorbance
(D) steady drop in UV absorbance
40. What is the main target of natural selection?
- (A) the species (B) individual phenotype
(C) individual genotype (D) the population
41. The fastest enzyme is
- (A) Carbonic anhydrase (B) Trypsin
(C) Pepsin (D) Urease
42. Gibberellins are known as to break dormancy in cereal seeds. This dominantly is due to the secretion of
- (A) alpha amylase (B) protease
(C) lipase (D) cellulase
43. The description of 'gate type' of amino acids is appropriate in the case of
- (A) valine and alanine (B) serine and methionine
(C) methionine and citruline (D) glutamic acid and aspartic acid
44. The function of nitrogen fixation in *Anabaena* (*Cyanobacterium*) is performed by
- (A) thylakoid (B) heterocyst
(C) phycocyanin (D) phycoerythrin
45. Following are given chemical elements found in the human body in decreasing concentration. Mark the correct option:
- (A) C<H<O<N (B) C<O<H<N
(C) H<O<C<N (D) O<C<N<H

46. In a charged transfer RNA, the nucleotide bound to the amino acid is adenosine (A), and the next two nucleotides are cytosines (C). What can you tell about the DNA codon to which this transfer RNA corresponds?
- (A) the first position is A, but you can't tell about the others from the information given
 - (B) the codon is TGG
 - (C) the codon is ACC
 - (D) you can't tell anything about the codon from the information given
47. Goucher disease where glucocerebrosides are not degraded is related to
- (A) Lysosomes
 - (B) Mitochondria
 - (C) Peroxisomes
 - (D) Golgi
48. Major cause of evolution of genes and protein is
- (A) Point mutation
 - (B) Chromosomal aberrations
 - (C) Gene duplication and divergence
 - (D) Sexual reproduction
49. Consider the following DNA sequence 5'-ATGGGCATAGACGATATGGTAG-3' if due to frame shift mutation there is insertion of G between 3rd and 4th position. Consider a reverse mutation occur in same mutated sequence. Which reverse mutation will have minimum effect in protein change
- (A) Insertion of nucleotide between 5th and 6th position
 - (B) Deletion of nucleotide between 5th and 6th position
 - (C) Insertion of three nucleotide between 5th and 6th position
 - (D) Deletion of nucleotide between 11th and 12th position
50. The point where crossing over of chromatids takes place is
- (A) Kinetochore
 - (B) Ciasma
 - (C) Centromere
 - (D) Chromomere
51. Which of the following which is not intrinsic fluor?
- (A) Tryptophan
 - (B) Histidine
 - (C) Phenyl alanine
 - (D) Tyrosine
52. Effect of release of IP₃ during signal transduction pathway is
- (A) Closure of Ca⁺² channel in ER
 - (B) Inactivation of calmodulin proteins
 - (C) Increase in intracellular Ca⁺² level
 - (D) Increase of extracellular Ca⁺² level

53. Among the following which is not a cell adhesion protein
- (A) Cadherin (B) Immunoglobulin
(C) Integrin (D) Selectin
54. Among closely lying cells signal are communicated by
- (A) Neurotransmitters (B) Hormones
(C) Gap junctions (D) Cell membrane proteins
55. In many countries, DDT is banned as an insecticide because
- (A) it can be broken down by insects
(B) it is less effective in killing insect pests
(C) it is poisonous to plants
(D) it is not readily biodegradable
56. An increase in thyroxine will have which of the following effects?
- (A) decreased rate of glucose metabolism (B) increased glycogen production
(C) decreased rate of ATP production (D) increased CO_2 production
57. Globular protein when treated with organic solvent get denature (D). The main interaction which is affected on treatment with organic solvent is
- (A) hydrogen bonds (B) covalent bonds
(C) hydrophobic interactions (D) ionic interactions
58. The major role of 2,3 BPG formed during glycolysis in RBC is for hemoglobin in
- (A) decreasing affinity for oxygen (B) increasing affinity for oxygen
(C) decreasing affinity for CO_2 (D) increasing affinity for CO_2
59. Location of glutamate synthetase, an important enzyme in nitrogen assimilation is
- (A) in endoplasmic reticulum (B) only cytoplasm
(C) only chloroplast (D) both cytoplasm and chloroplast
60. In a hybridization experiment a plant shows phenotypic ratio of 15:1. How many genes control the trait for observed phenotypic ratio?
- (A) one (B) two
(C) three (D) polygene

61. The principle of formation of image in phase contrast microscopy
- (A) Interference of light waves
 - (B) Negative staining of object
 - (C) Use of fluorescent probes
 - (D) Enhancing contrast by differentiating the change in phase of light passed through specimen coming from $\frac{1}{2}$ angle of cone of light entering through objective lens
62. Human genome contains how many billion base pairs?
- (A) 1
 - (B) 2
 - (C) 3
 - (D) 5
63. Which are the persistent pesticide out of the following?
- (A) Herbicides
 - (B) Organomercuriales
 - (C) Organophosphorous
 - (D) Organochlorines
64. Excess nitrogen in human leads to which of the following disease?
- (A) Blue baby syndrome
 - (B) Syphilis
 - (C) Carcinoma
 - (D) Hemophilia
65. C : N ratio ideal for nutrient cycling is
- (A) 10-20 : 1
 - (B) 20-30 : 1
 - (C) 30-40 : 1
 - (D) 40-50 : 1
66. Creation of Dolly is a phenomenon of
- (A) Monopotency
 - (B) Multipotency
 - (C) Pleuropotency
 - (D) All of these
67. Neurocysticercosis is caused by
- (A) *Taenia Solium*
 - (B) *Taenia saginata*
 - (C) *Ascaris sp*
 - (D) *Trichomonas sp.*
68. Barnase is
- (A) DNase
 - (B) RNase
 - (C) Protease
 - (D) Polymerase
69. Barstar is known as
- (A) Promoter
 - (B) Inhibitor
 - (C) Transformer
 - (D) All of these

70. Most suppressor mutation are associated with genes concerned with the formation of
(A) DNA polymerase (B) RNA polymerase
(C) Small RNA (D) Transfer RNA
71. With regard to HLA class 1 antigen which is one of the below is FALSE
(A) they are made up of a heavy chain and a light chain
(B) they are expressed on all nucleated cells
(C) they are essential for viral antigen recognition by cytotoxic cells
(D) the genes for HLA class 1 molecules are located on chromosome 6 and 15
72. Which one is FALSE in the complement system?
(A) C1 is the first enzyme complex in the classical pathway
(B) Alternative pathway does not rely on antibody
(C) Classical pathway is best activated by bacterial endotoxin
(D) Both the alternative and classical pathway converge at C3
73. Antibiotic that is not inhibiting cell wall synthesis includes
(A) cefuroxime (B) erythromycin
(C) vancomycin (D) benzylpenicillin
74. Micro-organism that cannot cause latent infection
(A) Hepatitis A (B) Mycobacterium tuberculosis
(C) Varicella-Zoster virus (D) Cytomegalo virus (CMV)
75. Double membrane is absent in
(A) Chloroplast (B) Nucleus
(C) Mitochondria (D) Lysosomes
76. The organism that is an exception to the cell theory is
(A) Bacteria (B) Virus
(C) Amoeba (D) Paramecium
77. A cell has 4 chromosomes. After mitotic cell division the number of chromosomes in the daughter cell would be
(A) 4 (B) 8 (C) 16 (D) 32

78. Down's syndrome is due to
(A) extra chromosome 9 (B) extra chromosome 16
(C) extra chromosome 21 (D) extra chromosome 6
79. Which of the following block cytochrome electron transport system most effectively?
(A) sodium hydroxide (B) sodium chloride
(C) sodium azide (D) sodium nitrate
80. Reversal UV effect is called
(A) tautomeric shift (B) thymine dimer
(C) photo oxidation (D) photo reactivation
81. If a cell has one chromosome in excess of the normal number of chromosomes present in the nucleus, it is referred to as
(A) aneuploid (B) polyploid
(C) tetraploid (D) haploid
82. Bence-Jones proteins are
(A) Only constant region of light chain
(B) Only Light chains of antibody
(C) Only Heavy chains of antibody
(D) One heavy chain and one light chain antibody
83. Gene rearrangement in antibody production was first discovered by
(A) Baruj Benacerraf (B) Daniel Bovet
(C) George Snell (D) Susumu Tonegawa
84. Which of the following enzymes are not monomeric enzymes?
(A) Lactose synthase (B) Trypsin
(C) Chymotrypsin (D) Pepsin
85. According to Darwin's theory of evolution
(A) species are immutable
(B) tortoises are the modern descendents of glyptodonts
(C) all individuals have an equal chance of surviving and reproducing
(D) all of the above

86. In humans, a sperm differs from an ovum in that
- (A) it has a smaller nucleus
 - (B) it contains less cytoplasm
 - (C) it has no sex chromosome
 - (D) it contains a smaller number of chromosome
87. A shiny, sticky colony of *Streptococcus pneumoniae* is likely to be
- (A) nonencapsulated and nonpathogenic
 - (B) nonencapsulated and pathogenic
 - (C) encapsulated and pathogenic
 - (D) encapsulated and non-pathogenic
88. The minimum distance at which a microscope is capable of distinguishing two points as separate is its
- (A) magnification
 - (B) resolving power
 - (C) focal distance
 - (D) illumination
89. Which of the following contains polysaccharide?
- (A) pili
 - (B) cell wall
 - (C) flagella
 - (D) plasmids
90. In aerobic respiration, the final electron acceptor in the electron transport chain is
- (A) NAD^+
 - (B) NADP^+
 - (C) H_2O
 - (D) O_2
91. A researcher performs a cross between 2 mice, both having black fur. Black fur is dominant over white fur. 75% of the offspring have black coats and 25% have white coats. The researcher can assume that the parent genotypes were most likely:
- (A) $\text{BB} \times \text{BB}$
 - (B) $\text{BB} \times \text{Bb}$
 - (C) $\text{Bb} \times \text{Bb}$
 - (D) $\text{BB} \times \text{bb}$
92. A feature of amino acids not found in carbohydrates is the presence of
- (A) phosphorous
 - (B) oxygen
 - (C) carbon
 - (D) nitrogen
93. Which of the following is not a trait of an anabolism in the metabolism process?
- (A) The process of breaking down complex molecules to release energy
 - (B) Nutrients and molecules form complex molecules
 - (C) Uses simple sugars as building blocks for more complex molecules
 - (D) Uses amino acids as building blocks for more complex molecules

94. Density is defined as
- (A) the mass of a substance divided by the weight of a substance
 - (B) the volume of a substance divided by the mass of a substance
 - (C) the mass of a substance divided by the volume of a substance
 - (D) the volume of a substance divided by the weight of a substance
95. 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) none of the above
96. Vancomycin
- (A) is produced by a fungus
 - (B) is bacteriostatic in action
 - (C) is a glycopeptide
 - (D) should not be given intravitreally due to the risk of retinal necrosis
97. Which one of the following is not a cytokine?
- (A) arachidonic acid
 - (B) interleukins
 - (C) interferon
 - (D) tumour necrosis factor
98. The following species is not found as commensal in the conjunctiva
- (A) *Corynebacterium*
 - (B) *Chlamydia trachomatis*
 - (C) *Micrococcus*
 - (D) *Staphylococci*
99. If an element has an atomic number of 6 and a mass number of 14, how many neutrons does it have?
- (A) 8
 - (B) 6
 - (C) 14
 - (D) 7
100. Biogenic nanoparticles are synthesized using
- (A) chemicals
 - (B) plants
 - (C) plants and microbes
 - (D) UV rays
-