ENTRANCE EXAMINATION FOR ADMISSION, MAY 2012.

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 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. An example of α-amino acid not present in proteins but essential in mammalian metabolism is

   (A) 3-Amino 3-hydroxypropanoic acid

   (B) 2-Amino 3-hydroxybutanoic acid

   (C) 2-Amino 4-mercaptobutanoic acid

   (D) 2-Amino 3-mercaptopropanoic acid

2. pH (isoelectric pH) of alanine is

   (A) 6.02 (B) 6.6 (C) 6.8 (D) 7.2

3. In N-linked glycosylation, the oligosaccharide chain is attached to protein by

   (A) asparagine (B) arginine (C) serine (D) threonine

4. Substrate consumption in lag phase of microbial growth is primarily used for

   i. turnover of the cell material

   ii. maintenance of intracellular pH

   iii. motility

   iv. increase in cell number

   (A) i, ii and iv only (B) ii, iii and iv only

   (C) i, ii and iii only (D) iv only

5. Gas vacuoles are present in

   (A) Anabaena fios-aquae (B) Bacillus subtilis

   (C) Acanthurus nigrofuscus (D) Mycobacterium tuberculosis

6. When the linear form of glucose cyclizes, the product is a(n):

   (A) anhydride (B) glycoside

   (C) hemiacetal (D) lactone

7. By a mechanism called co-transport

   (A) sugar moves down its concentration gradient while sodium moves up its concentration gradient

   (B) sodium moves outward against is concentration gradient while sugar moves inward down its concentration gradient

   (C) sugar and sodium move inward down their concentration gradient

   (D) sodium moves inward down its concentration gradient while sugar moves inward up its concentration gradient

8. The smallest immunoglobulin is

   (A) IgG (B) IgE (C) IgD (D) IgA

9. The normal serum level of IgG is

(A) 1200 mg% (B) 500 mg% (C) 300 mg% (D) 200 mg%

10. The tyrosine residues per molecule of thyroglobulin is

(A) 85 (B) 95 (C) 115 (D) 135

11. Monochromatic (one color) light is sometimes used to increase the resolution of light microscopes. Light of which color below would give you the best resolution?

(A) Red (B) Orange (C) Green (D) Blue

12. Which of the following statements about Transmission Electron Microscopy is not true?

(A) The specimen must be stained with osmium or other heavy metal.

(B) The specimens are placed in a high vacuum for viewing.

(C) The specimens must be sliced very thin, 20-100 nm in thickness.

(D) The beam is focused by electromagnetic lenses.

13. "Parfocal" refers to microscopes with multiple objectives where

(A) objectives are used in pairs for stereoscopic effects.

(B) each objective has the same working distance above the specimen.

(C) each objective is positioned to be in focus at the same stage height.

(D) sequential objectives increase power by a factor of two.

14. What was the first bacterium shown to cause human disease?

(A) Anthrax (B) Mycobacterium

(C) Diphtheria (D) Streptococcus

15. Louis Pasteur's studies on the unwanted production of acid from beet sugar was the first demonstration that

(A) sugars are unstable and can breakdown into either ethanol or acid

(B) bacteria can cause specific chemical reactions

(C) ethanol is unstable and can convert to acid

(D) microorganisms can be found in air

16. The anterior V-spot in microfilaria of Wuchereria represents

(A) Nerve ring (B) Cervical papilla

(C) Excretory system (D) Reproductive

17. In Cushing's syndrome-a tumour associated disease of adrenal cortex, there is
(A) Decreased epinephrine production
(B) Excessive cortisol production
(C) Excessive epinephrine production
(D) Decreased cortsoil production

18. The circulating concentration of ACTH in plasma is
(A) 0.05 mμ / 100 ml (B) 0.1 – 2.0 mμ / 100 ml
(C) 2.5 – 3.5 mμ / 100 ml (D) 3.0 – 5.0 mμ / 100 ml

19. Tobacco and tea leaves are fermented to give flavour and taste. This type of fermentation is known as
(A) Alcohol fermentation (B) Curing
(C) Degradation (D) Lactic acid fermentation

20. Penicillin is commercially produced by
(A) *P.notatum* (B) *P.chrysogenum* (C) *P.citrinum* (D) *P.roquefortii*

21. A 0.22 M solution of lactic acid (pKa 3.9) was found to contain 0.20 M in the dissociated form and 0.02 M undissociated form, the pH of the solution is
(A) 2.9 (B) 3.3 (C) 4.9 (D) 5.4

22. What locks all transmembrane proteins in the bilayer?
(A) Chemical bonds that form between the phospholipids and the proteins
(B) Hydrophobic interactions between nonpolar amino acids of the proteins and the aqueous environments of the cell
(C) Attachment to the cytoskeleton
(D) The addition of sugar molecules to the protein surface facing the external environment

23. Which of the following processes requires membrane proteins?
(A) Exocytosis (B) Phagocytosis
(C) Receptor mediated endocytosis (D) Pinocytosis

24. One consequence of the sidedness of the plasma membrane is that
(A) molecules that begin on the inside face of the ER end up on the inside face of the plasma membrane
(B) the asymmetrical distribution for membrane proteins, lipids, and carbohydrate must be determined when the membrane is first constructed
(C) some proteins on the cytoplasmic side of the membrane are attached to the cytoskeleton
(D) the inside of an ER vesicle is topographical equivalent to the extra cellular surface of the plasma membrane

25. If a DNA molecule has a deaminated base, it will be repaired by:
(A) by excision repair pathways
(B) with the help of repair endonucleases
(C) by base excision repair
(D) with the help of DNA glycosylases

26. A negative varicella antibody titer in a young woman signifies
(A) Fifth disease
(B) Susceptibility to chickenpox
(C) Possible subacute sclerosing panencephalitis (SSPE)
(D) Possible hepatitis B infection

27. A secretory protein T chain (T protein) is present in
(A) Ig A (B) Ig M (C) Ig D (D) Ig E

28. The immunoglobulins are differentiated and also named on the basis of
(A) Electrophoretic mobility
(B) Heat stability
(C) Molecular weight
(D) Sedimentation coefficient like 7 S, 19 S etc.

29. Ovule integument gets transformed into
(A) seed (B) fruit wall (C) seed coat (D) cotyledons

30. Without DNA gyrase, bacterial chromosomes would
(A) become wound so tight they couldn't reproduce
(B) fracture
(C) mutate
(D) form chromosomes like those in eukaryotic cells

31. Chloroplasts probably originated as
(A) cyanobacteria (B) viruses
(C) *E. coli* bacteria (D) yeast cells

32. The most important innovation (new idea) in Pasteur's 'swan neck flask' experiments was:
(A) a glass barrier prevented contamination.
(B) heating media prevented microbial growth.
(C) fresh air could directly contact the medium.
(D) the experimenter could look for contamination without disturbing the experiment.

33. A specific cortisol binding protein, transcortinis a

(A) Albumin (B) α1-Globulin (C) α2-Globulin (D) β-Globulin

34. Mitochondrial evidence suggests

(A) Neanderthals are our direct ancestors

(B) Neanderthals are still alive

(C) Neanderthals never existed

(D) Neanderthals and humans last shared a common ancestor 500,000 years ago

35. An expression vector is

(A) expression of cloned genes by inserting a 'promoter sequence' and a 'terminal sequence'

(B) an insertion that signals for initiation of transcription and signal for termination of transcription

(C) expression of desired gene and production of high amount of proteins through additional DNA insert

(D) all the above

36. Biogenesis theory was proposed by which of the following philosopher/scientist?

(A) Oparin (B) Miller (C) Muller (D) Redi

37. Which among the following IS double membranous cell organelle?

(A) Peroxisome (B) Lysosome

(C) Glyoxysome (D) None of the these

38. Karyotype showing all morphological features of the chromosome is called

(A) Satellite (B) Polygram

(C) Histogram (D) Idiogram

39. A carbonated drink, pH 3 is ———— times more acid than distilled water.

(A) 4 (B) 100 (C) 1,000 (D) 10,000

40. The acetylation marks in the histone tails promote the

(A) formation of transcriptionally active chromatin

(B) formation of transcriptionally inactive chromatin

(C) formation of facultative heterochromatin

(D) all of the above

41. What is the reference linking number of a closed circular DNA with a length of 2100 bp?

(A) 210 (B) 200 (C) 110 (D) 100

42. Pfu DNA polymerase is better enzyme than Taq DNA polymerase because of its

(A) High speed
(B) Proofreading function
(C) High specificity
(D) All of the above

43. In *E.coli*, separation of catenated chromosomes are done by

(A) Topoisomerase I
(B) Topoisomerase II
(C) Topoisomerase III
(D) Topoisomerase IV

44. Telomerase is a(n)

(A) ribonucleoprotein
(B) enzyme needed for the completion of replication
(C) enzyme responsible for senescence
(D) all of the above

45. The Sigma factor of RNA polymerase is responsible for its

(A) higher processivity
(B) higher speed
(C) higher specificity
(D) higher activity

46. Lac repressor contains

(A) Leucine zipper
(B) Helix turn helix
(C) Zinc finger
(D) Rossman fold

47. Dnmtl is a

(A) Maintenance DNA methyltransferase
(B) De Nova DNA methyltransferase
(C) Bacterial DNA methyltransferase
(D) Yeast DNA methyltransferase

48. Xeroderma pigementosum is caused by mutations in genes involved in the

(A) Base excision repair
(B) Mismatch repair
(C) Nucleotide excision repair
(D) All of the above

49. A favorable charge-charge interaction between R groups in an alpha-helix is expected to occur when the interacting side chains are separated by:

(A) one-two residues
(B) three-four residues
(C) five-six residues
(D) seven-eight residues

50. The bacterium *Treponema pallidium* 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

51. Which of the following has been linked to cervical cancer?

(A) Epstein-Barr Virus

(B) Human Cytomegalo Virus

(C) Human Herpes Virus 8

(D) Human Papilloma Virus

52. In *E. coli*, the inability of the *lac* repressor to bind an inducer would result in

(A) constitutive synthesis of -galactosidase

(B) inducible synthesis of -galactosidase

(C) synthesis of inactive -galactosidase

(D) no substantial synthesis of -galactosidase

53. Which of the following statements about retrotransposons is correct?

(A) They contain genes for ribosomal proteins

(B) They possess a gene for RNA-dependent RNA polymerase

(C) They possess genes that encode proteins that integrate RNA into chromosomes

(D) They transpose via an RNA intermediate.

54. Receptors for signaling for steroid hormones are located at

(A) plasma membrane

(B) organelle membrane

(C) intracellular

(D) no receptor

55. In Drosophila XO are male and XXY are female while in humans XX are female and XY are male. On the basis of given information which statement is NOT true?

(A) Y chromosome do not play any role in sex determination of drosophila

(B) Y chromosome is sex determinant in humans

(C) In humans sex determination is based on number of X chromosomes to sets of autosomes

(D) In drosophila sex determination is based on number of X chromosomes to set of autosomes

56. Immunological diversity in antibody is generated by
(A) Rearrangement of immunoglobulin genes
(B) Alternative RNA processing
(C) Post transcriptional modification
(D) Post translational modification

57. The maximum BOD and minimum DO for pure drinking water should be
(A) 25, 5 (B) 2, 5 (C) 3, 9 (D) 0, 6

58. A bacterial population becomes half after one minute, the reduction in population depends on population at time 't', what would be remaining population after 2 min of original population?
(A) 1/4 (B) 1/2 (C) 1/8 (D) 1/16

59. Defective gene in Amyotrophic lateral sclerosis is
(A) Rb (B) p53 (C) bC12 (D) TGF

60. Electrical activity of brain during brain mapping can be recorded by
(A) FMRI (B) ECG (C) EEG (D) Polygraphy

61. Leukemia inhibiting factor has been utilized in animal cell culture for
(A) Stimulating growth of cell (B) Differentiation
(C) Morphogenesis (D) Arrest cells at mitosis

62. What would happen if lysosome membrane leaks its digestive enzyme in cytosol?
(A) Acid hydrolases will be inactivated
(B) Acid hydrolases will digest the cellular components
(C) pH of cell will increase
(D) It will cause I-cell disease

63. Genetic disorder xeroderma pigmentosum is due to error in
(A) Base excision repair mechanism
(B) Nucleotide excision repair mechanism
(C) Direct repair mechanism
(D) DNA replication mechanism

64. In a population with two alleles 'b' and 'B' having allele frequency 0.7 and 0.3 in Hardy-Weinberg equilibrium, how many individuals in a sample of 250 can be expected to be heterozygous?
(A) 52 (B) 105 (C) 21 (D) 42

65. An oligonucleotide DNA sequence tagged with fluorescent tag used to identify unknown gene by hybridization is termed as

(A) Probe
(B) Reporter gene
(C) Ligand
(D) C-DNA

66. 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

67. When oxygen-hemoglobin curve shift to left it represents

(A) decrease in pH
(B) decrease in CO_2 level
(C) rise in concentration of 2,3 BPG
(D) more affinity for oxygen

68. Globular protein when treated with organic solvent get denatured. The main interaction which is affected on treatment with organic solvent is

(A) hydrogen bonds
(B) covalent bonds
(C) ionic interactions
(D) hydrophobic interactions

69. ———— is referred as biological indicator of autoclave.

(A) *Bacillus stearothermophilus*
(B) *Bacillus subtilis*
(C) *Bacillus megatorium*
(D) *Bacillus cereus*

70. What is the goal of angiogenesis inhibitors?

(A) They inhibit the formation of small blood vessels that feed a tumor
(B) They prevent the activation of protein kinases in the cell
(C) They target the Ras protein, causing it to stop Promoting cell division
(D) They inhibit the synthesis of HER1 proteins on cancerous cells

71. Which one is FALSE in the complement system?

(A) Alternative pathway does not rely on antibody
(B) Classical pathway is best activated by bacterial endotoxin
(C) C1 is the first enzyme complex in the classical pathway
(D) Both the alternative and classical Pathway converge at C3

72. A researcher performs a cross between 2 mice, both having black fur. Black for is dominant over white for 75% of the offspring have black coats and 25% have white coats. The researcher can assume that the parents genotypes were most likely:

(A) BB × BB
(B) BB × Bb
(C) BB × bb
(D) Bb × Bb

73. Excess nitrogen in the blood causes

(A) Pernicious anemia
(B) Sickle cell anemia
(C) Nutritional anemia
(D) Methanoglobinaemia

74. Cot units are

(A) Rate of renaturation per sec
(B) Rate of denaturation per sec
(C) Rate of denaturation
(D) Rate of renaturation

75. 'Delay of senescence' due to cytokinin is also known as

(A) Melcher's effect
(B) Richmond Lang effect
(C) Braun and Wood effect
(D) Skoog effect

76. Which of the following hormone is modified amino acid?

(A) Prostaglandin
(B) Progesterone
(C) Epinephrine
(D) Estrogen

77. 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 three nucleotide between 5th and 6th position
(B) Insertion of a nucleotide between 5th and 6th position
(C) Deletion of a nucleotide between 5th and 6th position
(D) Deletion of a nucleotide between 11th and 12th position

78. Which of the following correctly ranks the amount of DNA present in each cell of particle, from least to most? Bacteria (B) DNA virus (V), human (H), wheat plant (P), yeast (Y).

(A) V-B-Y-H-P (B) V-Y-B-P-H (C) V-B-Y-P-H (D) V-Y-B-H-P

79. A molecular biologist analyzed a DNA sample and found that it contained the nucleotide bases in the following proportion: A : T : G : C is 1.0 : 1.33 : 0.98 : 0.65. This data indicates that:

(A) DNA sample is highly thermolabile
(B) DNA sample is from a eukaryotic cell
(C) DNA in the sample is single stranded
(D) more data is required for any deduction

80. Native DNA sample if first boiled for a few minutes and then cooled in a high salt concentration will show:

(A) initial rise and then fall in UV absorbance

(B) constant UV absorbance

(C) initial drop and then rise in UV absorbance

(D) steady drop in UV absorbance

81. The presence of a non competitive inhibitor:

(A) leads to both an increase in V_{max} of a reaction and increase in the K_m

(B) leads to decrease in the observed V_{max}

(C) leads to decrease in K_m and V_{max}

(D) leads to an increase in K_m without affecting V_{max}

82. Urea or EDTA treatment of membranes leads to dissociation of

(A) peripheral proteins (B) integral proteins

(C) cholesterol molecules (D) phospholipids

83. How many grams of $MgCl_2$ are required to prepare one liter of a 10-millimolar $MgCl_2$ solution? (Atomic weight of Mg = 24.3 g; atomic weight of Cl = 35.5 g.)

(A) 0.59 g (B) 59 g (C) 95 g (D) 0.95 g

84. What is the role of the caspases in apoptosis?

(A) Caspase is a term used to refer to the initial signal that causes apoptosis

(B) Caspases are enzymes that are inactivated during apoptosis and in their absence the cell dies

(C) Caspases are proteases that carry out the controlled destruction of the cell's components during apoptosis

(D) Caspases are inhibitors of apoptosis; the destruction of the caspases causes apoptosis to begin

85. 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

86. 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

87. 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

88. Which one of the following is semiessential amino acid for humans?

(A) Valine (B) Arginine (C) Lysine (D) Tyrosine

89. Which of the following *cry* gene codes for the protein which can control the corn borer effectively?

(A) *cry* I Ac (B) *cry* II Ab (C) *cry* I Ab (D) *cry* II Ac

90. Which of the following peptide chain is removed during maturation of pro-insulin into insulin?

(A) A peptide (B) B peptide

(C) C peptide (D) A and C peptide

91. Which of the following transgenic protein product has been used to treat emphysema?

(A) α-1-antitrypsin (B) α-Lactalbumin

(C) Cry protein (D) B-peptide

92. Which method of cellular defence is common in all eukaryotic organisms?

(A) RNA interference (B) Reverse transcription

(C) VNTR (D) Phagocytosis

93. Which biotechnology company is credited with the synthesis of genetically engineered human insulin of the first time?

(A) Celera genomics (B) Cipla

(C) Eli Lily (D) Ranbaxy

94. The normal E. coli cells carry resistance against which of the following antibiotics?

(A) Ampicillin (B) Chloramphenicol

(C) Tetracycline or kanamycin (D) None of these

95. Polyethylene glycol can help in the uptake of foreign DNA into the host cell, this type of gene transfer is called as

(A) Electroporation

(B) Chemical mediated genetic transformation

(C) Microinjection

(D) Particle gun

96. In the year 1963, two enzymes responsible for restricting the growth of bacteriophage in *Escherichia coli* were isolated. They were _____ and _____ respectively.

(A) Ligase, Restriction endonuclease

(B) Helicase, Restriction endonuclease

(C) Methylase, Restriction endonuclease

(D) DNA polymerase, Restriction endonuclease

97. Find the correct match:

	Column I		Column II
a.	House keeping genes	i.	Histone gene
b.	Luxury genes	ii.	sn RNA genes
c.	Repeated genes	iii.	ATPase gene
d.	Pseudogenes	iv.	Nitrate reductase gene

(A) a(i), b(ii), c(iii), d(iv) (B) a(iii), b(iv), c(ii), d(i)

(C) a(iii), b(iv), c(i), d(ii) (D) a(iii), b(ii), c(i), d(iv)

98. Which statement is correct for negative operan?

(A) Co-repressor binds with inducer

(B) Co-repressor binds with repressor

(C) Co-repressor does not bind with repressor

(D) cAMP shows negative effect

99. "Burkitt lymphoma" in humans is due to

(A) Deletion (B) Translocation

(C) Transition (D) Tautomeric shift

100. From a cross AABb × aaBb, the genotypes AaBB : AaBb : Aabb : aabb are obtained in ratio of

(A) 1 : 1 : 1 : 1 (B) 1 : 2 : 1 : 0 (C) 0 : 3 : 1 : 0 (D) 1 : 1: 1 : 0