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ENTRANCE EXAMINATION FOR ADMISSION, MAY 2010.

M.Sc. (BIOCHEMISTRY AND MOLECULAR BIOLOGY)

COURSE CODE : 368

Register Number :



Signature of the Invigilator
(with date)

COURSE CODE : 368

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. Spider webs are made of the strong and pliable protein called

(A) Fibroin	(B) Keratin
(C) Chitin	(D) Flagellin

2. The proton-sugar transporter in bacteria is

(A) Uniport	(B) Symport	(C) Antiport	(D) Diport
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3. The major plant hormone auxin causes

(A) Shoot growth and shoot initiation	(B) Splitting of the internode
(C) Cell expansion	(D) Internodal elongation

4. Colchicine is one of the most effective

(A) Spindle fiber promoter	(B) DNA synthesis inhibitor
(C) Spindle fiber inhibitor	(D) Cell suspension media

5. Ti plasmids belong to a

(A) Natural bacterium	(B) Virus
(C) Yeast	(D) Lambda phage

6. When ΔG of a reaction is negative, the reaction is

(A) At equilibrium
(B) Endergonic and tends to go towards forward reaction
(C) Endergonic and tends to go toward completion
(D) Exergonic and tends to go toward completion

7. The pollutants released by the jet planes are

(A) Fogs	(B) Smogs	(C) Colloids	(D) Aerosols
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8. Analogous structures are those whose similarity comes from

(A) their performing a similar function, rather than their arising from a common ancestor
(B) their being derived from a common ancestral structure
(C) the wing of a bird and the forelimb of a human
(D) their performing a dissimilar function, rather than their arising from a common ancestor

9. Species of bacteria, belonging principally to the genera *Bacillus* and *Clostridium*, produce extremely heat-resistant structures called
 (A) Endospores (B) Ascospores (C) Exospores (D) Pilus
10. The total capacity of lungs for accommodation is called
 (A) Tidal volume (B) Complementary volume
 (C) Supplementary volume (D) Vital capacity
11. The enzyme that accomplishes the unwinding of the original double stranded DNA molecule, once supercoiling has been eliminated, by breaking the hydrogen bonds that hold the two strands together is:
 (A) Helicase (B) Topoisomerase
 (C) DNA Polymerase II (D) Primase
12. A repeating DNA sequence at the end of chromosomes that prevents them from losing base pair sequences at their ends and from fusing together is called:
 (A) Telomere (B) Epimer (C) A replicon (D) Centromere
13. In DNA, mutations at G-C sequences occur quite frequently since 5-methyl cytosine easily deaminates to form:
 (A) Thymine (B) Adenine (C) Guanine (D) Cytosine
14. The sequence of different amino acids in the polypeptide chain of a protein is called :
 (A) Secondary structure (B) Tertiary structure
 (C) Primary structure (D) Quaternary structure
15. Infectious self-reproducing agents, consisting only of protein, with no nucleic acids (hypothesized in 1982 by Nobel Laureate Stanley B. Prusiner) are called :
 (A) ribozymes (B) proteomes
 (C) prions (D) proteinoids
16. Factor VIII - an accessory protein that participates in the intrinsic pathway of coagulation is called as
 (A) Antihemophilic factor (B) Hemophilic protein
 (C) Christmas factor (D) Stuart-Prower factor
17. Epinephrine and glucagon stimulate
 (A) Glycogen degradation in liver (B) Glycogen formation in liver
 (C) Protein degradation in liver (D) Prostaglandins

18. Chlorophyll is a porphyrin in which
- (A) Nitrogen atoms are coordinated to a magnesium ion
 - (B) Nitrogen atoms are coordinated to a copper ion
 - (C) Oxygen atoms are coordinated to a magnesium ion
 - (D) Carbon atoms are coordinated to a copper ion
19. Calvin cycle takes place only in
- (A) Stroma
 - (B) Inner membrane
 - (C) Outer membrane
 - (D) Matrix
20. Host-encoded proteins that provide the first line of defense against viral infections are
- (A) Interferons
 - (B) Transposons
 - (C) T cell encoded proteins
 - (D) Tubulins
21. Many animal retroviruses have acquired transforming genes called
- (A) Oncogenes
 - (B) Pseudogenes
 - (C) Methylated genes
 - (D) Nonmethylated genes
22. Antigenic determinants are known as
- (A) Paratope
 - (B) Carriers
 - (C) Epitopes
 - (D) Markers
23. The use and disuse principle of evolution was proposed by
- (A) Hugo De Vries
 - (B) Darwin
 - (C) Weismann
 - (D) Lamarck
24. Which of the following compounds is an inhibitor of Na-dependent glucose transport across the plasma membrane?
- (A) Ouabain
 - (B) Sodium azide
 - (C) Dicumarol
 - (D) Phlorhizin
25. Which one of the following enzymes catalyzes high-energy phosphorylation of substrates during glycolysis?
- (A) Pyruvate kinase
 - (B) Phosphoglycerate kinase
 - (C) Triose phosphate isomerase
 - (D) Glyceraldehyde-3-phosphate dehydrogenase

26. Which of the following tissues is capable of contributing to blood glucose?
- (A) Skeletal muscle (B) Adipose tissues
(C) Cardiac muscle (D) Duodenal epithelium
27. Proteins may be separated according to size
- (A) Isoelectric focussing
(B) SDS-PAGE
(C) Ion exchange chromatography
(D) Molecular exclusion chromatography
28. DNA replication is
- (A) Continuous and conservative
(B) Discontinuous and semiconservative
(C) Semidiscontinuous and semiconservative
(D) Conservative and semidiscontinuous
29. Ammonium sulphate is capable of precipitating protein because
- (A) protein is denatured (B) proteins aggregate
(C) proteins are dehydrated (D) proteins complex with salts
30. Diffusion pressure deficit (DPD) equals to
- (A) Osmotic pressure + Turgor pressure
(B) Osmotic pressure – Turgor pressure
(C) Osmotic pressure \times Turgor pressure
(D) Turgor pressure – Osmotic pressure
31. The tear secretion contains an antibacterial enzyme known as
- (A) bacitracin (B) lysosome
(C) lysozyme (D) lipase
32. Enzyme catalyzed hydrolysis of proteins produces amino acid of the form
- (A) D (B) DL (C) L (D) Racemic
33. The biosynthesis of urea occurs mainly in the liver:
- (A) Cytosol (B) Mitochondria
(C) Microsomes (D) Nuclei

34. The immunoglobulins are differentiated and also named on the basis of
 (A) Electrophoretic mobility (B) Heat stability
 (C) Molecular weight (D) Sedimentation coefficient
35. Zn is present as prosthetic group in this enzyme:
 (A) Carbonic anhydrase (B) Carboxy peptidase
 (C) Lactate dehydrogenase (D) Pyruvate dehydrogenase
36. Haemoglobin formation needs both
 (A) Iron and Zinc (B) Iron and Calcium
 (C) Iron and Copper (D) Iron and Magnesium
37. Hormones
 (A) act as coenzymes (B) act as enzymes
 (C) influence synthesis of enzymes (D) belong to B-complex group
38. Ribozymes are
 (A) enzymes present in ribosomes
 (B) enzymes which combine the ribosomal subunits
 (C) enzymes which dissociate
 (D) enzymes made up of RNA
39. If a completely radioactive double-stranded DNA molecule undergoes two rounds of replication in a solution free of radioactive label, what is the radioactivity status of the resulting four double-stranded DNA molecules?
 (A) half should contain no radioactivity
 (B) all should contain radioactivity
 (C) half should contain radioactivity in both strands
 (D) one should contain radioactivity in both strands
40. A polymorphism is best defined as
 (A) co-segregation of alleles (B) one phenotype, multiple genotypes
 (C) nonrandom allele association (D) one locus, multiple normal alleles
41. Which one of the following is not protein?
 (A) Myosin (B) Actin
 (C) Albumin (D) Haematin

42. Chitin is a
- (A) Homopolysaccharide (B) Heteropolysaccharide
(C) Mucopolysacchride (D) Conjugated protein
43. Which of the following glands have both an endocrine and an exocrine functions?
- (A) mammary gland (B) pancreas
(C) pituitary gland (D) adrenal gland
44. How are impulses transmitted across synapses by?
- (A) electrical means (B) chemical means
(C) mechanical means (D) thermal means
45. Reticulocytes refer to:
- (A) white blood cells (B) blood platelets
(C) lymphocytes (D) immature erythrocytes
46. Which scientists first gave experimental evidence that DNA is the genetic material?
- (A) Beadle and Tatum, who used a mutational and biochemical analysis of the bread mold *Neurospora* to establish a direct link between genes and enzymes
(B) Meselson and Stahl who showed that DNA is replicated semi-conservatively
(C) Watson and Crick who gave a model for the structure of DNA
(D) Avery, MacLeod, and McCarty who repeated the transformation experiments of Griffith
47. Actin filaments are found in all of the following except the
- (A) Flagella of bacteria
(B) Sarcomeres of skeletal muscles cells
(C) Stress fibers of fibroblasts
(D) Microvilli of intestinal brush border
48. During fasting, mitochondria is active in
- (A) Protein synthesis (B) Glycolysis
(C) Oxidation of fatty acids (D) Synthesis of fatty acids

49. When a muscle is stimulated to contract aerobically, less lactic acid is formed than when it contracts anaerobically because:
- (A) glycolysis does not occur to significant extent under aerobic conditions.
 - (B) muscle is metabolically less active under aerobic than anaerobic conditions.
 - (C) the lactic acid generated is rapidly incorporated into lipids under aerobic conditions.
 - (D) under aerobic conditions most of the pyruvate generated as a result of glycolysis is oxidized by the citric acid cycle rather than reduced to lactate.
50. In mammalian cell, S phase of cell cycle is marked by all of the following except
- (A) Histone content per cell is double that of cells in G1
 - (B) In replicated DNA newly incorporated bases are paired with parental bases
 - (C) Each replicated chromosome has 4 telomeres
 - (D) Sister chromatids disjoin from one another
51. Which of the following hormones initiates biological action by crossing the plasma membrane and then binding to a receptor?
- (A) Adenocorticotrophic hormone
 - (B) Norepinephrine
 - (C) Insulin
 - (D) Estradiol
52. The standard deviation is:
- (A) a test of significance
 - (B) a measure of the scatter of observation about the mean
 - (C) calculated from means & the no. of observations alone
 - (D) the same as a centile
53. Choose the best order of permeability of the molecules through plasma membrane
- (A) $H_2O > CO_2 > Glucose > Glycerol$
 - (B) $CO_2 > Glycerol > H_2O > Glucose$
 - (C) $CO_2 > H_2O > Glycerol > Glucose$
 - (D) $CO_2 > H_2O > Glucose > Glycerol$
54. A rifle bullet weighing 7 g leaves the barrel of a rifle with a velocity of 300 m/s. If the rifle recoils with a velocity of 1 m/s, find the mass of the rifle.
- (A) 5.3 kg
 - (B) 2.1 kg
 - (C) 8.1 kg
 - (D) 10 kg
55. A body of mass 2 kg is hung on a spring balance mounted vertically in a lift. If the lift descends with an acceleration equal to the acceleration due to gravity 'g', the reading on the spring balance will be changed by
- (A) 2 kg
 - (B) 4 kg
 - (C) 10 kg
 - (D) zero

56. What happens when the light intensity incident on a photoelectric surface is doubled?
- (A) the frequency of emitted photons is doubled
 - (B) the number of photons is doubled
 - (C) the number of photons becomes four times
 - (D) there is no effect at all
57. The strength of an acid is:
- (A) directly proportional to the value of the pKa of the acid
 - (B) inversely proportional to pKa
 - (C) not related to pKa
 - (D) equal to $1/pKa$
58. In a buffer solution made up of a weak acid and its salt, if the salt concentration is 100 times the concentration of acid, the pH will be:
- (A) the same as the pK
 - (B) one unit below the pK
 - (C) two units below the pK
 - (D) two units above the pK
59. An endemic species is
- (A) A species found uniquely in one place
 - (B) A species carrying an epidemic disease
 - (C) A species at an early phase of its evolution
 - (D) A taxonomist's mistake
60. The physical similarity of body shape in dolphins, sharks, and penguins results from:
- (A) Parallel evolution
 - (B) Geographic isolation
 - (C) Convergent evolution
 - (D) A property of a common ancestor
61. Continental drift is caused by
- (A) The dispersal of seeds and spores from one continent to another
 - (B) The random loss of genes from populations isolated on a continent
 - (C) The upwelling and subsequent movement of marine sediments
 - (D) The movement of tectonic plates on the Earth's crust
62. A palm tree was 90 cm high, when it was planted. It grows by an equal number of cm each year and at the end of the seventh year it was one ninth taller than at the end of the twelfth year
- (A) 30
 - (B) 45
 - (C) 57
 - (D) 18

63. According to Darwin's theory of evolution, differences between species may be the result of
- (A) the disuse of body structures
 - (B) the transmission of acquired characteristics
 - (C) natural selection
 - (D) mutagenic agents
64. Which of these disease causing bacteria was discovered by Robert Koch?
- (A) *Bacillus anthrax*
 - (B) *Salmonella typhimurium*
 - (C) *Shigella dysenteriae*
 - (D) *Corynebacterium diphtheriae*
65. One CentiMorgan is
- (A) Recombination ratio of 1% over small distances in a chromosome
 - (B) Recombination fraction of 1% over small distances in a chromosome
 - (C) Recombination indexes of 1% over small distances in a chromosome
 - (D) Recombination rate of 1% over small distances in a chromosome
66. Individuals must be _____ in order to be informative for linkage analysis.
- (A) Double heterozygotes
 - (B) Double homozygotes
 - (C) Single heterozygotes
 - (D) Single homozygotes
67. Incubation of gram-negative bacteria with lysozyme in an isotonic medium causes rod-shaped bacteria to assume a spherical shape. This phenomenon is
- (A) Destruction of cell wall
 - (B) Destruction of cytoskeleton
 - (C) Damage to the cell membrane
 - (D) Change in gene expression
68. Virus-mediated transfer of cellular genetic material from one bacterial cell to another by means of virus particles is called
- (A) Transfection
 - (B) Transformation
 - (C) Transposition
 - (D) Transduction
69. In animals, ritualized contests with little risk of serious injury or death to participants within the species lead to
- (A) A stable dominance hierarchy
 - (B) Biological altruism
 - (C) Adaptive radiation
 - (D) Instinctive behavior

70. Which of the following correctly explains how a favorable genetic trait can increase in frequency in a population?
- (A) Lamarck's principle (B) Natural selection
(C) Adaptive radiation (D) Genetic recombination
71. Blood flows from the heart to the lungs in the pulmonary artery and returns from the lungs to the heart in the pulmonary vein. The blood in the pulmonary artery is:
- (A) Higher in O₂ and lower in CO₂ content than the blood in the pulmonary vein
(B) Higher in both O₂ and CO₂ content than the blood in the pulmonary vein
(C) Lower in O₂ and higher in CO₂ content than the blood in the pulmonary vein
(D) Lower in both O₂ and CO₂ content than the blood in the pulmonary vein
72. If a subcellular fraction from liver tissue exhibits a high level of acid phosphatase activity it most likely contains:
- (A) Nuclei (B) Lysosome
(C) Endoplasmic Reticulum (D) Coated Vesicle
73. The ribosome is involved in all of the following EXCEPT
- (A) Peptide bond formation
(B) Amino acylation of tRNA
(C) Binding of protein factors during acylation
(D) Binding of aminoacyl tRNA to mRNA
74. What does the process of photosynthesis produce?
- (A) Starch, which is metabolized into less complex molecules by dehydration synthesis
(B) Protein, which is metabolized into less complex molecules by dehydration synthesis
(C) Glycerol, which is metabolized into more complex carbohydrates by dehydration synthesis
(D) Glucose, which is metabolized into more complex carbohydrates by dehydration synthesis
75. Which of the following is the principal buffer in interstitial fluid?
- (A) hemoglobin (B) albumin
(C) carbonic acid (D) H₂PO₄

76. Among the following components of chloroplast membrane which one is the strongest reducing agent?
- (A) reduced cytochrome b6 (B) PQR2
(C) NADPH (D) reduced ferredoxin
77. The growth kinetic that result from metabolizing one sugar before another is referred to as
- (A) exponential growth (B) diphasic growth
(C) diauxic growth (D) chemotaxis
78. Glucose and mannose are epimers. This means that
- (A) they are mirror images of each other
(B) one is an aldose the other a ketose
(C) they rotate plane polarized light in opposite direction
(D) they differ only in the configuration of one carbon atom
79. Which of the following polysaccharide is not a polymer of glucose?
- (A) Amylose (B) Glycogen
(C) Inulin (D) Cellulose
80. Resistance to antibiotics in bacteria is carried in the
- (A) Exons (B) Introns
(C) Plasmids (D) Heteromeres
81. The oxygen dissociation curve of normal adult hemoglobin is most effectively shifted to the right by
- (A) Increased 1,3-bisphosphoglycerate (B) Increased 2,3-bisphosphoglycerate
(C) Cooperative binding of oxygen (D) Increased pH
82. Two organisms mate. One is heterozygous for tallness (Tt) and the other is homozygous recessive (tt). What are the possible phenotypic outcomes for this mating?
- (A) 4 tall offspring (B) 3 tall offspring, 1 dwarf
(C) 2 tall offspring, 2 dwarves (D) 4 dwarves

83. Kornberg isolated DNA polymerase from *E. coli*. DNA polymerase I has an essential function in DNA replication. Which of the following is that function?
- (A) filling gaps left by the removal of RNA primer
 (B) filling gaps where introns are removed
 (C) recognition of rho factor for the initiation of transcription
 (D) production of poly(A) tails on eukaryotic mRNAs
84. Watson & Crick published their first paper on the double helix model of DNA in
- (A) 1923 (B) 1937 (C) 1953 (D) 1958
85. Crossing over occurs during
- (A) Prophase II (B) Prophase I
 (C) Interphase (D) Interkinesis
86. The offspring of matings between two pure strains are called
- (A) hybrids (B) mutants
 (C) the P generation (D) the F-2 generation
87. An organism with two different alleles is called
- (A) homozygous for that trait (B) homologous for the allele
 (C) heterozygous for that trait (D) heterologous for the allele
88. A monoecious plant is
- (A) haploid (B) polyploid
 (C) either male or female (D) both male and female
89. A plant population that reproduces by self pollination is an extreme example of
- (A) the bottleneck effect (B) the founder effect
 (C) rapid gene flow (D) assortative mating
90. The Human genome is reported to be composed of
- (A) 5000 genes (B) 10,000 genes
 (C) 30,000 genes (D) 80,000 genes
91. Three dice are thrown simultaneously. What is the probability that all three dice would be different?
- (A) $5/9$ (B) $7/9$ (C) $20/216$ (D) $50/216$

92. If there are six nucleotide bases possible instead of four. What is the maximum number of different amino acids that can be encoded by the same three letter codon?
(A) 216 (B) 640 (C) 96 (D) 540
93. The antidiuretic hormone is produced by
(A) adrenal glands (B) anterior pituitary gland
(C) posterior pituitary gland (D) hypothalamus
94. Among the following which hormone can induce flowering in short day plants when grown under longer light duration?
(A) Gibberillic acid (B) Cytokinins
(C) Auxins (D) Cytokines
95. Father and mother, both are carriers of sickle cell anemia, have two children who does not suffer from sickle cell anemia. What is the chance that their child in third pregnancy will be suffering from sickle cell anemia?
(A) 25% (B) 33.3% (C) 50% (D) 100%
96. Which is the marker enzyme for lysosome?
(A) catalase (B) succinate dehydrogenase
(C) cathepsin C (D) alkaline phosphatase
97. Barbara McClintock discovered transposable elements in the late 1940s in which of the species
(A) Rice (B) Maize
(C) *C. elegans* (D) *E. coli*
98. The half life of ^{131}I is
(A) one year (B) eight days (C) eight months (D) eight years
99. Inulin is a
(A) fructosan (B) xylan (C) hormone (D) glucosan
100. Organic solvents denature proteins primarily by
(A) Increasing the free energy of hydrophilic residues
(B) Lowering the free energy of hydrophobic residues
(C) Aggregation of hydrophobic regions of the protein
(D) Dissociation of the disulphide bonds