DEPARTMENT OF BIOCHEMISTRY

KURUKSHETRA UNIVERSITY, KURUKSHETRA

Time Allowed: 2 Hours **Maximum Marks: 200**

Note: Each questions carries 2 marks. There will be no negative marks for incorrect response. All questions are compulsory.

1. During photorespiration one molecule of CO_2 and one molecule of NH_3 are released in
(a) Peroxisome
(b) Mitochondria
(c) Chloroplast
(d) None of the above

2. Light harvesting complexes (LHCI and LHCII) in two photosystems consists of
(a) reaction centre I and II
(b) antenna pigments associated with proteins
(c) cytochrome b6-f complex
(d) None of the above

3. Which of the following does not occur in cyclic electron transport and photophosphorylation?
(a) Photolysis of water
(b) O_2 evolution
(c) formation of reduced NADPH
(d) All of the above

4. Which is main collagen of basal and external laminae?
(a) Type I collagen
(b) Type II collagen
(c) Type III collagen
(d) Type IV collagen

5. Which of following is not a component of electron transport chain in chloroplast?
(a) Plastoquinone
(b) Plastocyanin
(c) Ubiquinone
(d) cytochrome b6-f complex

6. The head piece of ATP-synthase (CF_1) in thylakoids consists of how many different polypeptides?
(a) 2
(b) 3
(c) 4
(d) 5

7. C_4 pathway requires more ATP for fixation of 1 CO_2 molecule than in C_3 cycle, even then C_4 plants are more efficient photosynthetically than C_3 plants. It is because C_4 plants have,
(a) low CO_2 compensation point
(b) very little or no photorespiration
(c) Kranz anatomy in their leaves
(d) All of the above

8. The difference between the proton motive force across the inner mitochondrial membrane and across the thylakoid membrane of chloroplasts is that
(a) the first is mainly due to voltage gradient, while the second is largely due to pH gradient
(b) the first is mainly due to pH gradient, while the second is largely due to voltage gradient
(c) it is due to an electron transport system in the first case, but not the second
(d) it drives the synthesis of ATP in the first case not in the second

9. On which of the following does aldosterone exert its greatest effect?
(a) glomerulus
(b) cortical collecting duct
(c) thin portion of the loop of Henle
(d) thick portion of the loop of Henle

10. Dehydration increases the plasma concentration of all the following hormones except
(a) vasopressin
(b) angiotensin II
(c) aldosterone
(d) atrial natriuretic peptide

11. Which of the following is responsible for the movement of O_2 from the alveoli into the blood in the pulmonary capillaries?
(a) Secondary active transport
(b) Facilitated diffusion
(c) Passive diffusion
(d) Filtration

12. Adult basal metabolic rate decreases with an increase in
(a) Muscle mass
(b) fever
(c) body fat
(d) body surface area

13.Which of the following has the greatest effect on the ability of blood to transport oxygen?
(a) Capacity of blood to dissolve oxygen
(b) amount of hemoglobin in the blood
(c) pH of plasma
(d) CO_2 content of red blood cells

14. Which of the following is the principal buffer in interstitial fluid?
(a) hemoglobin
(b) H_2PO_4
(c) carbonic acid
(d) compounds containing histidine

15. The leaving of neutrophils from the blood vessels to act on the site of injury is called as
(a) diapedesis
(b) histosis
(c) ameboidal movement
(d) flagellation

16. Tissue plasmin activator _____
(a) helps in wound healing
(b) causes allergic response
(c) boosts immunity
(d) dissolves clot in blood vessels

17. An increase in serum level of LDH_1 relative to LDH_2 is an indication of
(a) muscular dystrophy
(b) leukemia
(c) myocardial infarction
(d) hepatitis with jaundice

18. Highly poisonous cyanide after being combined with thiosulfate yielding less toxic compound categorized as:
(a) Cyanate
(b) Thiocyanate
(c) Thiosulfate cyanides
(d) Sodium thiosulfate

19. Which of the following statements about amino acid scoring for predicting protein quality in human nutrition is correct?
(a) The amino acid score is calculated by comparing the amino acid pattern of the protein to that of egg protein.
(b) The amino acid score is calculated by comparing the amino acid pattern of the protein to that of milk protein.
(c) A single reference pattern is used to calculate the amino acid score for all ages
(d) Different amino acid scoring patterns are used for different age groups.

20. The following anticoagulant binds with Ca^{2+} and prevents blood clotting
(a) Heparin
(b) fibrinogen
(c) Oxalate
(d) All of them

21. In isoelectric focusing, separation of proteins is based on:
(a) Relative content of positively charged groups
(b) Relative content of negatively charged groups
(c) Both (a) and (b)
(d) pH

22. Choose the correct statement for BAC vector system.
(a) BAC vector system stands for bacteria and chromosome
(b) It usually accepts insert of size approximately 1000kbp
(c) The repE and oriS sequences are required for controlling the copy number and par A-C sequences are required for replication
(d) A selectable marker is there for chloramphenicol resistance

23. Which of the following is a disadvantage of using YACs in gene therapy?
(a) They can cause immune reactions in patients
(b) They are difficult to deliver to specific target cells
(c) They can integrate into the host genome and disrupt gene function
(d) They can be rapidly degraded by the body's enzymes

24. Which of the following does not have high concentration of aspartate transaminase?
(a) Heart
(b) Liver
(c) Saliva
(d) Kidney

25. Many plasmids have ampicillin marker. This implies:

(a) the plasmids contain genes for ampicillin biosynthesis.
(b) ampicillin is required for bacterial growth after transformation.
(c) the plasmid contains the gene encoding β-lactamase.
(d) ampicillin is essential for cell survival.

26. Which of the following is not component of yeast artificial chromosome?
(a) centromere
(b) telomere
(c) origin of replication
(d) cos site

27. For cloning a DNA fragment larger than 100kb, which of the following vector system would be suitable?
(a) plasmid
(b) Cosmid
(c) Yeast artificial chromosome
(d) Lambda bacteriophage

28. Which statement correctly describes sequential steps in cDNA cloning?
(a) Reverse transcription of mRNA, second strand synthesis, cDNA end modification, ligation to vector
(b) mRNA preparation, cDNA synthesis using reverse transcription, second strand synthesis using terminal transferase, ligation to vector
(c) mRNA synthesis using RNA polymerase, reverse transcription of mRNA, second strand synthesis, ligation to vector
(d) double stranded cDNA synthesis, restriction enzyme digestion, addition of linkers, ligation to vector

29. A gene cannot be isolated from a human genomic DNA library by functional complementation of *E. coli* because of
(a) non-functional promoter
(b) the absence of splicing machinery
(c) coupled transcription and translation
(d) codon bias

30. Dideoxy DNA sequencing exclusively depends on one of the following:
(a) termination
(b) ATP
(c) plasmid vector
(d) vector primer

31. Which of the following could not possibly give rise to a restriction fragment length polymorphism (RFLP)?
(a) a missense mutation within the protein coding region of a gene
(b) a silent mutation within the protein coding region of a gene
(c) a single base change within the intron sequence of a gene
(d) an error in RNA splicing that mistakenly removes an exon

32. Which of the following is not a post-translational modification?
(a) Lipidation
(b) Protein phosphorylation
(c) Proteolytic processing
(d) DNA methylation

33. Which of the following methods is an example of forward genetics:

(a) Gene knock-out
(b) Gene knockdown
(c) Mutagenesis screen for dominant mutations
(d) RNA interference

34. If mixed oligonucleotides are used, it is regarded as _____
(a) mixed mutagenesis
(b) multiple mutagenesis
(c) cassette mutagenesis
(d) polymutagenesis

35. Process used in an expression vector to increase yield of recombinant protein synthesis?
(a) Translation initiation
(b) Promoter induction
(c) Transcription terminators
(d) Multiple cloning sites

36. Which of the following statements is false?
(a) Oxidation of cysteine residue with performic acid is done to break disulfide bond in proteins
(b) Reduction of cysteine residue with dithiothreitol is done to break disulfide bond in proteins
(c) Reduction of cysteine residue with performic acid is done to break disulfide bond in proteins
(d) Reduced cysteine is further acetylated by iodoacetate

37. Which technique is used to separate nucleic acids of size greater than 25 kb?
(a) SDS-PAGE
(b) Pulsed-field electrophoresis
(c) 2D- gel electrophoresis
(d) Isoelectric focusing

38. What is the starting point for selection of a suitable IEX matrix for purification of a recombinant protein?
(a) Prediction of isoelectric point (pI) from the amino acid sequence
(b) Test protein binding to an IEX matrix at a range of pHs and salt concentrations
(c) Test protein binding to a selection of anion and cation exchange matrices
(d) Pass your sample through a preparative column and elute with a salt gradient

39. Positional cloning is
a) cloning a gene portion by using primers from another species
b) selection procedure to clone cDNA
c) cloning a gene portion using PCR
d) mapping a gene to chromosomal region and identifying and cloning the genomic copy from that region

40. What is the basis of “binary vector” strategy?
(a) No physical attachment
(b) Big size
(c) Strain dependence
(d) Lysogenic/lytic cycle

41. Which of the following isotope is NOT radioactive
(a) ^{32}P
(b) ^{15}N
(c) ^{3}H
(d) ^{35}S

42. ……vitamin does not act as precursor for coenzymes
(a) Biotin
(b) Thiamine
(c) Ascorbic acid
(d) Folic Acid

43. Myeloma cells used in hybridoma technology
(a) lack HGPRT gene
(b) lack the ability to produce Ig
(c) lack both HGPRT and ability to produce Ig
(d) lack thymidine kinase

44. In competitive enzymatic inhibition
(a) Vmax decreases, Km decreases
(b) Vmax increases, Km unchanged
(c) Vmax and Km both decreases
(d) Vmax unchanged and Km increases

45. What is the closest estimate of number of amino acids residues in a protein having molecular mass of 90 kDa
(a) 8100
(b) 815
(c) 9000
(d) 90

46. Ramchandran plot describes the sterically permitted angles for which of the following
(a) Rotation about Cα-C bond and N-Cα bond
(b) Rotation about Cα-H and Cα-Cβ-bond
(c) Rotation about Cα-C and Cα-H bond
(d) Rotation about N-Cα and Cα-Cβ bond

47. Enormous diversity in protein is due to
(a) sequence of amino acids
(b) amino group of amino acids
(c) R-group of amino acids
(d) Peptide bond

48. Which of the following interaction is mainly responsible for aggregation of proteins in dilute solutions
(a) Peptide bonds
(b) Hydrogen bond
(c) Hydrophobic interactions
(d) Ionic interactions

49. Isoelectric point of amino acid 5.8. If this amino acid is solubilised in a buffer of pH 3.5 and then subjected to electrophoresis. It will
(a) not migrate in electrophoresis
(b) migrate to cathode
(c) migrate to anode
(d) some will migrate to cathode and some to anode

50. In two-dimensional electrophoresis, proteins are separated by
(a) First by their charge and then by their mass
(b) First by their mass and then by their charge
(c) Only on the basis of their mass

(d) Only on the basis of their charge

51. Changes of conformation of proteins can be detected by
(a) Fluorescence spectroscopy
(b) Circular dichroism
(c) Ultraviolet spectroscopy
(d) All of the above

52. Cleavage of the following peptide with trypsin will result in …. fragments
Gly-Ala-Arg-Ser-Tyr-Gly-Asn-Lys-Trp-Glu-Val
(a) No cleavage will occur
(b) All constituent amino acids will be produced
(c) Three fragments
(d) Four fragments

53. A double stranded DNA has 20% thymine. The percentage of guanine is
(a) 30%
(b) 20%
(c) 15%
(d) 80%

54. Which of the following statement correctly describes mammalian mRNAs
(a) They are normally double stranded
(b) They are transcribed from both strands
(c) Their ratio of ribose to purine bases equals to one
(d) They have overall negative charge at neutral pH

55. Glucose and galactose are two isomeric monosaccharides
(a) Anomers
(b) Epimers
(c) Conformers
(d) Enantiomers

56. Which glycerophospholipid is the major lipid of mitochondrial membrane
a) Phosphatidylcholine
b) Phosphatidylinositol
c) Cardiolipin
d) Lecithin

57. Most important source of reducing equivalents for synthesis of fatty acid in liver is
a) Oxidation of acetyl CoA
b) TCA cycle
c) Pentose phosphate pathway
d) Oxidation of fatty acids

58. Which enzyme transfers the phosphate group from ATP to another molecule
a) Phosphodiesterase
b) Esterase
c) Phosphatase
d) Kinase

59. Which of the following process is not allosteric regulation
a) Regulation of lac operon by allolactose in *E. coli*
b) Inactivation of nitrogenase by ADP-ribosylation
c) Catabolite repression by CAP in *E. coli*.

d) Regulation of phosphofructokinase activity by fructose 2,6-bisphosphate.

60. Histidine is present at active site of most enzymes because
a) It can easily make salt bridges
b) Its pKa is close to 7.0
c) It can better interact with the substrates
d) It is the only polar residue having 5-membered ring in side chain

61. Vacuoles of plant cells are analogous to
a) Spherosome
b) Lysosomes
c) Hydrogenosome
d) Golgi bodies

62. Diacylglycerol activates the following secondary messenger
a) Tyrosine kinase
b) MAP kinase
c) Protein kinase C
d) Protein kinase A

63. Which hormone passes through the cell membrane and binds to intracellular receptors
a) Estrogen
b) Glucagon
c) Acetylcholine
d) Nor-epinephrine

64. Radioactive iodine is incorporated into
a) Tyrosine
b) Serine
c) Threonine
d) Leucine

65. Following activity is not associated with DNA polymerase I
a) 5'-3' polymerase activity
b) 5'-3' endonuclease activity
c) 3'-5' exonuclease activity
d) 5'-3' exonuclease activity

66. Transposons
a) insert into DNA by homologous recombination
b) can insert into plasmids but not the bacterial chromosome
c) cannot transferred by phage mediated transduction
d) contain equivalent of insertion elements

67. If a segment of an mRNA molecule has sequence 5'-CGUCCGAUCGC-3'; which of following is a sequence of template DNA
a) 5'-GCGATCGGTAC-3'
b) 5'-GGUACCGAUCG-3'
c) 5'-CCATGGCTAGC-3'
d) 5'-GGUAGCCAUG-3'

68. DNA binding protein that initiates the transcription of bacterial genes is
a) Promoter
b) Repressor
c) Sigma factor

d) Operator

69. Promoter of a gene is the site where
a) Shine-Dalgarno sequence is present
b) RNA polymerase binds to DNA
c) DNA polymerase binds to DNA
d) The ribosome binds to mRNA

70. Enhancers are eukaryotic regulatory elements which may be located
a) Upstream of the promoter
b) Downstream of the promoter
c) Far from the promoter
d) All of the above

71. Footprinting technique can be used for
a) Mapping the ends of transcript
b) Mapping position of nucleosomes in chromatin
c) Determining the DNA binding site for a transcription factor
d) Determining level of expression of a specific transcript.

72. Products of _____ genes are constantly needed for cellular activity
(a) Structural genes
(b) housekeeping genes
(c) regulatory genes
(d) Smart genes

73. Which of the following is epigenetic factor for expression of the gene in eukaryotes
(a) DNA methylation
(b) DNA protein interaction
(c) Protein phosphorylation
(d) Recombination

74. _____amino acid has highest number of codons
(a) Proline
b) Aspartic acid
c) Leucine
d) Tryptophan

75. Wobble hypothesis explains how
a) different types of tRNAs are charged with single amino acid
b) how multiple stop codons can associate with same release factors
c) multiple tRNAs can associate with same codon
d) one tRNA can associate with multiple codons

76. Aminoacyl tRNA synthetase helps in
a) formation of peptide bond
b) joining of an amino acid to tRNA
c) attaching an amino group to organic acid
d) binding of mRNA to ribosomes

77. Shine-Dalgarno sequence of mRNA is helpful in
a) recognition of 5rRNA
b) recognition of 60S ribosomal subunit
c) recognition of 30S subunit of ribosome
d) recognition of 50S ribosomal subunit

78. Synthesis of peptide bond is catalysed by
a) P-site of ribosome
b) tRNA
c) A-site of ribose
d) 23S rRNA

79. Mutation in DNA that do not change the protein product is
a) Frameshift mutation
b) Silent mutation
c) Sense mutation
d) Nonsense mutation

80. Ames test is a mass screening approach for detecting
a) Phenylketonuria
b) Toxins
c) mutagenic carcinogens
d) Lactose intolerance

81. Restriction endonucleases hydrolyses polynucleotide from
a) only 5'-end
b) a phosphodiester bond within specific sequence
c) either terminal
d) at an internal phosphodiester bond.

82. pBR322 which is frequently used as vector for cloning genes in *E.coli* is
a) a modified bacterial plasmid
b) a transposon
c) a viral genome
d) an original bacterial plasmid

83. For cloning of a DNA fragment larger than 100 Kb, which of the following vector system is most suitable
a) Cosmid
b) Plasmid
c) lambda -bacteriophage
d) Yeast artificial chromosome.

84. For using a plasmid as cloning vector, minimum number of elements required are
a) origin of replication, multiple cloning site, promoter
b) origin of replication, multiple cloning site, selection marker
c) origin of replication, multiple cloning site, selection marker, promoter
d) origin of replication, multiple cloning site, selection marker, translation start site

85. A reporter gene
a) interacts with RNA polymerase
b) acts as repressor
c) allows gene expression to be readily measured
d) improves stability of mRNA

86. A gene can not be isolated from human genomic DNA library by functional complementation in *E.coli*. It is because of
a) Absence of splicing machinery
b) Codon bias
c) non-functional promoter

d) coupled transcription and translation

87. Transfection refers to
a) synthesis of mRNA from using DNA as template.
b) introduction of foreign DNA into cell.
c) synthesis of protein using mRNA as template.
d) Process of becoming of normal cell as malignant.

88. Choose the mismatch
a) Reporter molecule - acts as a shuttle vector
b) Maxam-Gilbert method – Chemical modification of bases
c) Biotin – Non radioactive label
d) Sanger's Method – Dideoxy terminator

89. Restriction Fragment Length Polymorphism (RFLP) is
a) used to fingerprint the inheritance patterns
b) difference between restriction maps between two individuals of two species
c) Difference in the restriction maps between two individuals of same species
d) Difference in restriction maps between the two alleles in diploid cell.

90. J-chain is found in
a) Ig M and Ig A
b) Ig E
c) Ig A
d) Ig M

91. Monoclonal antibodies differ from polyclonal antibodies in their property of reacting with
a) Specific epitope
b) Specific antigen
c specific clone of cells
d) All of the above

92. According to the clonal selection theory
a) an antibody changes its shape according to the antigen it interacts
b) Each B-cell produces diverse types of antibodies
c) an individual animal contains only one type of B-cell
d) animal contains many types of B-cells, each produces one kind of antibodies

93. A crossed precipitin line following double immune diffusion is due to
a) identity between antigens
b) shared epitopes between antigens
c) only few epitopes that are common between antigens
d) no common epitopes between antigens

94. IgE and mast cells are associated with
a) contact hypersensitivity
b) immediate hypersensitivity
c) autoimmunity
d) immunodeficiency

95. Which property is not related to water
a) Dipolar nature
b) High dielectric constant
c) Low heat of vaporization
d) bond angle of 104.5°

96. In alpha-helix, the hydrogen bonds are
a) perpendicular to the axis of helix
b) mainly between electronegative atom of R-group
c) mainly between electronegative atom of backbone
d) mainly between some of amino acids of alpha-helix

97. During reduction
a) two hydrogen-atoms are added to the isoalloxazine ring
b) flavin group is transferred
c) an equivalent of a hydride ion is transferred
d) two isoalloxazine becomes charged

98. Aspirin inhibits the synthesis of
a) arachidonic acid
b) histamine
c) prostaglandins
d) glucocorticoids

99. Which of the following pairs is inter-converted during mutarotation
a) D-glucose and L-glucose
b) alpha-D-glucose and beta-D-glucose
c) D-glucose and D-fructose
d) alpha-D-glucopyranose and beta-D-glucopyranose

100. In enzyme catalysed reaction that follows Michaelis-Menten kinetics, what will be the concentration of substrate when velocity of reaction is 90% of Vmax
a) 18 Km
b) 9 Km
c) 5 Km
d) 10 Km

Answer key:

1.b	11.c	21.c	31.d	41.b	51.b	61.b	71.c	81. b	91.d
2.b	12.c	22.d	32.d	42.c	52.c	62.c	72. b	82. a	92.d
3.d	13.b	23.c	33.c	43.c	53.a	63.a	73. a	83. d	93.d
4.d	14.c	24.c	34.c	44.d	54.d	64.a	74. c	84. b	94.b
5.c	15.a	25.c	35.b	45.b	55.b	65.b	75. d	85. c	95.c
6.d	16.d	26.d	36.c	46.a	56.c	66.d	76. b	86. a	96.b
7.b	17.c	27.c	37.b	47.a	57.c	67.a	77. c	87. b	97.a
8.a	18.b	28.a	38.a	48.c	58.d	68.c	78. d	88. a	98.c
9.b	19.d	29.b	39.a	49.b	59.b	69.b	79. b	89. c	99.b
10.d	20.c	30.a	40.a	50.a	60.b	70.d	80. c	90. a	100.b