PUNJAB TECHNICAL UNIVERSITY

JALANDHAR

Max. Marks: 90 **Time: 90 Mins.**

Entrance Test for Enrollment in Ph.D. Programme

Important Instructions

- ***Fill all the information in various columns, in capital letters, with blue/black ball point pen.***
- ***Use of calculators is not allowed. Use Blue/Black ball point pen for attempting the questions.***
- ***All questions are compulsory. No negative marking for wrong answers.***
- ***To attempt a question, make a tick mark (√) at the right option/answer.***
- ***Each question has only one right answer.***
- ***Questions attempted with two or more options/answers will not be evaluated.***

Subject *(Engg./Arch./Pharm./Mgmt./Sciences)* **ENGINEERING / APP. SCI.**

Discipline / Branch **BIO-TECHNOLOGY**

Name .....

Father's Name .....

Roll No. ..... Date : **10-07-2010**

Signature of Candidate .....

Signature of Invigilator .....

1 A mRNA molecule is 666 nucleotides long including the initiator and termination codons. The number of amino acids in the protein translated from this mRNA will be:

(A) 666 (B) 220
(C) 221 (D) 222

2. How many base pairs are present extra in Z-DNA as compared to A -DNA?

(A) 1 (B) 2
(C) 3 (D) 4

3. In a trinucleotide ATC denotes the,

(A) 5'P-ATC-3'OH (B) 3'P-ATC-5'OH
(C) 5'OH-ATC-3'P (D) 3'0H-ATC-5'P

4. A solution of double stranded DNA has a value of A_{260} =1.00 , after denaturation to single stranded DNA at the same concentartion it has a value of A_{260}= 1.37. This relationship is described by stating that double stranded DNA has become _____ when heated.

(A) Hypochromic (B) Hyperchromic
(C) Chromosensitive (D) Isochromic

5. Each Exonuclease exhibit specificity for removing nucleotides only from

(A) 5'end of the strand (B) 3' end of the strand
(C) 5'as well as 3' end of the same strand (D) Either 5' or 3' end of the strand

6. Ribozymes act upon phosphodiester bonds of nucleic acids to
   (A) Cleave them (B) Join them
   (C) Both cleave as well as form them (D) can act on bonds other than phoshpodiester bonds as well

7. For the DNA fragment TACGATCATAT' the complementary sequence would be :
   (A) TACGAT CATAT' (B) ATATGATCGTA
   (C) AUGC U AGUAUA (D) ATGCT AGTATA

8. Which of the following is not part of the normal process of cloning recombinant DNA in bacteria?
   (A restriction endonuclease digestion of cellular and plasmid DNAs.
   (B) production of recombinant DNA using DNA ligase and a mixture of digested cellular and plasmid DNAs.
   (C) separation of recombinant DNAs by electrophoresis using the Southern technique to determine where the desired recombinant migrates.
   (D) transformation of bacteria by the recombinant DNA plasmids and selection using ampicillin .

9. One of the most significant discoveries that allowed the development of recombinant DNA technology was:
   (A) the discovery of antibiotics used for selecting transformed bacteria.
   (B) the identification and isolation of restriction endonucleases permitting specific DNA cutting.
   (C) the discovery of DNA and RNA polymerase allowing workers to synthesize any DNA sequence.
   (D) the development of the polymerase chain reaction.

10. In discontinous synthesis of DNA
   (A) Leading and Lagging strand are synthesized discontinously
   (B) Leading strand is synthesized discontinously
   (C) Lagging strand is synthesized continously
   (D) Leading strand is synthesized continuously and lagging strand is synthesized discontinously.

11. Which of the following statements is true for Okazaki Fragments?
   (A) These are precursor fragments created on lagging strand
   (B) These are precursor fragments created on leading strand
   (C) These are naturally fragmentated DNA molecules
   (D) These DNA fragments are generated by restriction enzymatic action.

12. How many times more ATP is produced when glucose is converted to CO_2 and H_2O than when it is converted to lactic acid ?
   (A) 4 (B) 19
   (C) 15 (D) 30

13. The major category of proteins to which antibodies belong is :
   (A) Albumins (B) Gamma globulins
   (C) Beta globulins (D) Glycoproteins

14. The proteins get separated on the basis of their molecular weight by :
   (A) Ion-exchange chromatography (B) Gel chromatography
   (C) Affinity chromatography (D) Adsorption chromatography

15. Which one of the following hormones is a peptide of less than ten amino acids?
(A) insulin (B) growth hormone
(C) oxytocin (D) parathyroid hormone

16. Which of the following tests is the most sensitive quantitation of antigen- antibody reaction?
(A) Agglutination (B) Precipitation
(C) Radio-immunoassay (RIA) (D) Radial immunodiffusion

17. The antibody diversity generating gene segment 'D' is present in :
(A) Heavy chain genes (B) Light chain genes
(C) Lambda domain DNA (D) Delta domain DNA

18. DNA sequences that direct tissue and stage specific expression of genes and function in orientation and position-independent fashion are :
(A) TATA elements (B) enhancer elements
(C) Shine-Dalgarno sequence (D) nuclear-localization sequences

19. Which one among the following is not a nucleoside ?
(A) Adenosine (B) Guanosine
(C) Cytosine (D) Uridine

20. UV-mutagenesis results in:
(A) C-C dimer formation (B) Methyl group addition to nitrogen base
(C) T-T dimer formation (D) Excision of a base from DNA strand

21. Which of the following steps is not true in protein synthesis in prokaryotes?
(A) Binding of tRNA to a 30S particle (B) Binding of t RNA to a 70S ribosome
(C) Coupling of an amino acid to ribosome by an aminoacyl synthetase
(D) Separation of the 70S ribosome to form 30S and 50S particles.

22. Which of the following is the normal cause of chain termination?
(A) The t RNA corresponding to a chain – termination triplet cannot bind an aminoacid.
(B) There is no t RNA with an anticodon corresponding to a chain termination triplet.
(C) Messenger RNA synthesis stops at a chain termination triplet.
(D) The t RNA corresponding to a chain – termination triplet can bind an aminoacid that peptide bond is later cleaved by special proteases.

23. Which of the following statements is false about tRNA molecules?
(A) They are needed because amino acids cannot stick to mRNA.
(B) They are much smaller than mRNA molecules.
(C) They are synthesized without the need for intermediary m RNA.
(D) They bind amino acids without the need for any enzyme.

24. Could a supercoiled DNA molecule be formed by
(A) Joining the ends of a linear DNA molecule and twising the resulting circle.
(B) Twising the ends of a linear DNA molecule and then linking the ends together.
(C) Linking together the ends of a linear molecule.
(D) Twising the ends of a linear DNA molecule.

25. What would happen if double stranded DNA were placed in distilled water.

(A) It would denature
(B) It would stay as such
(C) It would twist up to make supercoiled structure
(D) Water molecules will attach to DNA covalently

26. Match the correct combination:

(a)	Protein structure	(1)	Northern blot
(b)	DNA transfer	(2)	Maxam Gilbert
(c)	DNA sequencing	(3)	Ramachandran plot
(d)	RNA transfer	(4)	Southern Blot

(A) a-2, b-4, c-3, d-l
(B) a-3, b-l, c-2, d-4
(C) a-3, b-4, c-2, d-l
(D) a-2, b-l, c-3, d-4

27. Mitochondria is involved in all of the following cellular processes, except

(A) ATP-production
(B) Apoptosis
(C) Tricarboxylic acid cycle
(D) Fatty acid biosynthesis

28. What should be the avreage weight of a decapaptide if the average weight of an amino acid is 110.

(A) 1100
(B) 1200
(C) 1000
(D) 990

29. Who can function as energy sensor and regulator of lipid metabolism?

(A) AMP
(B) ATP
(C) GMP
(D) GTP

30. Cellulose is a polymer of

(A) -Glu-α 1, 4 Glu-
(B) -Glu-β 1, 4 Glu-
(C) -Glu-α l, 4 Gal-
(D) -Glu-β 1, 4 Gal

31 You use the affinity column that you have designed to purify protein Q. Electrophoresis of the purified protein in the presence of sodium dodecyl sulfate (SDS) (following reduction of the protein) shows a single band of 60,000 daltons. In a gel filtration experiment, protein Q elutes between alcohol dehydrogenase (MW = 160,000) and B-amylase (MW=190,000). How many subunits are in intact protein Q?

(A) 3
(B) 2
(C) 1
(D) 4

32. An Allele can be cosidered Dominant if it

(A) determines the phenotype in a homozygous condition
(B) determines the phenotype in a heterozygous condition
(C) determines the genotype in a homozygous condition
(D) determines the genotype in a heterozygous condition

33. Rous Sarcoma virus uses the following enzyme for its replication:

(A) DNA dependent DNA Polymerase
(B) RNA dependent RNA Polymerase
(C) DNA dependent RNA Polymerase
(D) RNA dependent DNA Polymerase

34. The term pronucleus describes

(A) only the maternal nuclei in a newly fertilized embryo
(B) only the paternal nuclei in a newly fertilized embryo
(C) one of the two haploid nuclei either maternal or paternal in a newly fertilized embryo
(D) cell nuclei from a transfected cell

35. ‘Flavr Savr ’ tomatoes were obtained by targetting the enzyme
(A) ACC deaminase (B) ACC synthase
(C) Sucrose phosphate synthase (D) Isopentenyl transferase

36. In the commercial production of cheese from milk, the____enzme biocatalyses the reaction.
(A) Renin (B) Papain
(C) Bromelain (D) Glucose isomerase

37. All of the following can be used immobilization technique except
(A) Adsorption (B) Entrapping
(C) Microencapsulation (D) Absorption

38. Drug discovery can be made more efficient using
(A) Affinity fingerprinting (B) Antibody fingerprinting
(C) Affinity chromatography (D) Antibody based detection methods

39. Match the micro organism with correct antibiotics

(a)	Penicillium	(1)	Erythromycin
(b)	Streptomyces griseous	(2)	Streptomycin
(c)	Streptomyces erthreus	(3)	Nocardins
(d)	Nocordia uniformis	(4)	Penicillin

(A) a-4, b-2, c-1, d-3 (B) a-3, b-2, c-1, d-4
(C) a-3, b-4, c-1, d-2 (D) a-4, b-2, c-3, d-1

40. The term Biohydrometallurgy describes
(A) Metal extraction from ores using bacterial activity
(B) Increasing bacterial activity using metals
(C) Extracting bacteria from soil using metals
(D) Increasing metal concentration in soil using bacterial activity

41. Transcriptomics can be defined as the study of :
(A) a particular gene product (B) all the mRNAs in the cell
(C) all RNAs in the cell (D) diffeential gene expression

42. Which of the following is the live attenuated vaccine?
(A) Diphtheria (B) Oral polio
(C) Tetanus Toxoid (D) Pertusis

43. What unit of measure is used for the molecular weight of proteins ?
(A) kDa (B) ug
(C) kb (D) bp

44. Kinase types of reactions can
(A) inhibit ATP breakdown
(B) involve the transfer of a phosphate group
(C) involve the transfer of a ketone group
(D) involve the addition or removal of an amino acid to a polypeptide chain

45. The half life of ^{32}P is :
(A) 14 days (B) 6 hrs
(C) 1.4 hrs (D) 6 days

46. All of these are restriction endonucleases except
(A) Eco RI (B) ColE 1
(C) Hind II (D) Hae III

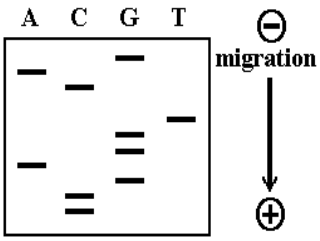
47. The glass bead column bioreactors can be used for
(A) suspension cultures (B) anchorage dependent cultures
(C) primary cultures (D) secondary cultures

48. HEPA in HEPA filters stands for
(A) High efficiency Particulate air (B) High Eluting Particulate air
(C) High efficiency purified air (D) High efficiency performing air.

49. In a devastating viral disease of Cattle and swine (Foot and mouth disease), the major antigenic determinant used for generating vaccine is
(A) VP1 (B) HSV1
(C) MS2 (D) HSV glycoprotein D

50. All of these are features of Humoral immunity EXCEPT :
(A) can be stimulated by free antigens in circulation
(B) the production of cytotoxic T cells
(C) antigen-antibody interaction
(D) the synthesis of immunoglobulins

51. A short DNA molecule is subjected to Sanger's enzymatic method for DNA sequencing using dideoxynucleoside triphosphates as chain-terminators and a ^{32}P-labeled primer. The autoradiogram of the sequencing gel is shown. The nucleotide sequence read from the gel is



(A) 5' CCGAGGTCAG 3' (B) 5' GACTGGAGCC 3'
(C) 5' AACCCGGGGT 3' (D) 5' TGGGGCCCAA3'

52. Function of MHC molecules is to
(A) to kill the microorganisms
(B) to assist B-lymphocytes in generating antibodies
(C) to present foreign antigens to cytotoxic T-cells
(D) to generate cytotoxic T-cells

53. Which of the following hormones can execute biological actions by crossing the plasma membrane followed by receptor activation.
(A) Glucagon (B) Estradiol
(C) Insulin (D) Norepinephrine

54. The first protein structure to be deciphered for its primary structure was
(A) insulin (B) urease
(C) myoglobin (D) ribonuclease

55. Zymogens are
(A) enzymes (B) inactive enzyme precursors
(C) enzyme precursors (D) lipids

56. Which amongst the following is the choicest method for transport of a solute against its concentration

(A) active transport (B) passive transport
(C) diffusion (D) osmosis

57. In glycolysis, ATP synthesis is catalyzed by :

(A) hexokinase (B) 6-phosphofructo kinase
(C) phosphoglycerate kinase (D) glyceraldehyde 3-phosphate dehydrogenase

58. The term hybridoma refers to fusion of

(A) an antibody producing cell with a single myeloma cell
(B) any cell with a single myeloma cell
(C) an antibody producing cell with any cell
(D) a myeloma cell with another myeloma cell

59. All of these are key reulatory enzymes of TCA (tricarboxylic cycle), except

(A) malate dehydrogenase (B) Isocitrate dehydrogenase
(C) α -oxoglutarate dehydrogenase (D) glutamate dehydrogenase

60. All the following are proteolytic enzymes present in intestine are except

(A) Enteropeptidase (B) Aminopeptidases
(C) Prolidases (D) lipases

61. Measurement of radioactivity can be done in any of these units except

(A) Curie (B) Roentgen
(C) Radiation absorbed dose (D) Radioactive decay

62. The entry of HIV virus in the target host cell takes palce when viral envelope fuses with the plasma membrane of the cell by a process mediated by viral

(A) enveolpe glycoprotein (B) enveolpe lipoprotein
(C) internal glycoprotein (D) structural proteins

63. The gag gene of HIV genome codes for

(A) major capsid protein p24 (B) major capsid protein p42
(C) major capsid protein p56 (D) major capsid protein p65

64. An E. coli strain has a mutation in the RNA Pol core enzyme $\alpha_2\beta\beta'$ that prevents association with sigma factor. This is expected to cause an inability of the enzyme to catalyze

(A) elongation of RNA. (B) recognize operators.
(C) recognize terminators. (D) recognize promoters.

65. cDNA can be defined as

(A) complementary DNA strand made against DNA
(B) a conformation of DNA
(C) complementary DNA made against mRNA
(D) complementary DNA made against t RNA

66. Identify the nutritionally essential amino acid out of the following
(A) Alanine (B) Tyrosine
(C) Tryptophan (D) Glycine

67. In TCA cycle, substrate level phosphorylation occurs at the level of
(A) Citrate synthase (B) Succinate thiokinase
(C) Succinate dehydrogenase (D) Malate dehydrogenase

68. Which amongst the following lipids has a signal transducing function?
(A) Phosphatidyl choline (B) Phosphatidyl serine
(C) Phosphatidyl ethanolamine (D) Phosphatidyl inosital-4, 5-bisphosphate

69. During Sodium Dodecyl Sulfate – Polyacrylamide Gel Electrophoresis (SDSPAGE) one SDS molecule binds how many amino acids on average :
(A) one (B) two
(C) three (D) four

70. Enzymes catalyse reactions by
(A) lowering activation energy (B) enhancing Keq
(C) increasing free energy (D) decreasing free energy

71. Shine dalgarno sequences are present in
(A) 5´ end of eucaryotic mRNA (B) 5´ end of eucaryotic Rrna
(C) 3´ end of eucaryotic mRNA (D) 3´ end of eucaryotic rRNA

72. The HAT selection in hybridoma technology helps
(A) cells grow in the presence of antibiotic
(B) cells grow in the absence of antibiotics but in presence of vitamins
(C) growth of hybrid cells that can utilize both pathways for nucleotide biosynthesis
(D) growth of hybrid cells that can use salvage pathway of nucleotide biosynthesis

73. The cells that have potential to develop into entire organism are known as
(A) Totipotent cell (B) Multipotent cells
(C) Pleuripotent cells (D) Unipotent cells

74. Ubiquitination process in the eukarotic cell is required for
(A) Protein remodeling (B) Protein degradation
(C) Ubiquitous protein processing (D) Uniform distribution of cytosolic Proteins

75. The basic principle involved in CsCl gradient centrifugation that helps in separation of DNA fragments.
(A) DNA fragments can move and accumulate at a position where the density of the DNA and CsCl is same
(B) Circular DNA will pellet while linear DNA will form a band
(C) Linear DNA will pellet while circular DNA will form a band
(D) Circular DNA will not penetrate the gradient being smaller in size

76. Apoptosis can be defined as
(A) a process of programmed cell death (B) a process of phagocytosis
(C) a process of necrotic cell death (D) a process of traumatic cell death

77. Epitope of a macromlecule is the
(A) antigenic determinant
(B) extremely hydrophobic part of the molecule
(C) autocrine signalling molecule
(D) exposed part of molecule

78. Which statement amongst the following is not true for shot gun approach of genome sequencing
(A) the chromosomes are initially mapped using physical mapping strategy
(B) the approach generates a large number of sequenced DNA fragments
(C) genome has to be redundantly sequenced so that overall length of the fragments covers the entire genome multiple times
(D) a robust computer assembly program is required to join the pieces of random fragments into a single whole genome sequence

79. Identify the compound with the highest standard free energy of Hydrolysis ?
(A) ATP (B) Phosphoenol pyruvate
(C) Phosphocreatine (D) Glucose –6-phosphate

80. Which material amongst the following cannot be used as matrix in type of liquid chromatography techniques
(A) cellulose (B) chitin
(C) polystyrene (D) agarose

81 Proteomics is the study of
(A) all proteins in an organism (B) genes coding proteins
(C) only structural proteins of a cell (D) only regulatory proteins of a cell

82. The functionally active form of vitamin D is
(A) cholecalciferol (B) ergocalciferol
(C) dehydrocholesterol (D) calcitriol

83. In the β oxidation of odd chain fatty acids, two products are formed acetyl CoA and propionyl CoA . To divert propionyl to TCA cycle it is converted into
(A) succinyl CoA (B) fumaryl CoA
(C) oxaloacetate (D) oxalosuccinate

84. The meaning of E-value in BLAST is
(A) the probability that the query sequence and the subject sequence come from same organism
(B) the probability that the query sequence and the subject sequence are homologous
(C) the expected number of generated sequences that would have the observed alignment
(D) the inverse of the similarity between the query sequence and the subject sequence.

85. The first genome sequence submitted to EMBL is
(A) *H.influenzae* (B) *D.melaogaster*
(C) *S.cerevisiae* (D) *A.thaliana*

86. The stop codons UAA,UAG and UGA are named respectively

(A) ochre ,amber and opal (B) amber, ochre and opal
(C) ochre ,opal and amber (D) opal ,amber and ochre

87. A cosmid can be used as a cloning vector because it has

(A) a plasmid origin of replication (ori) (B) a λ *cos* site
(C) a unique restriction site (D) all of these characters.

88. George Gey established HeLa cell line in 1952 from _____tissue

(A) cervical (B) Hepatic
(C) Pancreatic (D) Kidney

89. In the insect resistant transgenic crops *Cry* genes is derived from

(A) *Bacillus thuringiensis* (B) *Bacillus subtilis*
(C) *Clavibacter xyli* (D) *Pseudomonas fluorescens*

90. Crop varities are subjected to intellectual property rights in the form of PBR. PBR is an abbreviation of

(A) plant Breeder's Rights (B) plant buyers rights
(C) permanent breeding rights (D) pesticide resistant breeder's research consortium