ENTRANCE EXAMINATION FOR ADMISSION, MAY 2013.

M.Sc. (BIOTECHNOLOGY)

COURSE CODE : 303

Register Number : [ ]

Signature of the Invigilator
(with date)

COURSE CODE : 303

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. Which of the following methods for studying loss of gene function does not involve any modification of the genome?
   (A) gene knockout by homologous recombination
   (B) RNA interference by injection of double stranded DNA
   (C) expression of an integrated antisense transgene
   (D) all the above

2. Restriction fragment length polymorphism (RFLP) is
   (A) the technique used to fingerprint of inheritance
   (B) the difference in the restriction maps between two individuals of one species
   (C) the difference in the restriction maps between two individuals of two species
   (D) the difference in the restriction maps between the two alleles in a diploid cell

3. A reporter gene
   (A) acts as repressor
   (B) allows gene expression to be readily measured
   (C) enhances mRNA stability
   (D) interacts with RNA polymerase

4. Transduction has been used extensively for genome mapping of bacteria. which of the following process is useful for gene mapping?
   (A) bacterial lysis
   (B) generalized transduction
   (C) specialized transduction
   (D) site specific recombination

5. Two double stranded DNA samples that are identical with respect to the number of base pairs, but differ significantly in their GC content, can be separated by
   (A) dialysis
   (B) agarose gel electrophoresis
   (C) density gradient centrifugation
   (D) oligo-dT column chromatography

6. Pyrosequencing derives its name from the fact that
   (A) the bases are detected by pyrolysis
   (B) it detects pyrophosphate released during base incorporation
   (C) it generates pyrograms as output
   (D) it uses enzyme apyrase to detect the bases

7. Aroma in rice is due to
   (A) 2-acetyl-1-pyrroline
   (B) Acetyl choline
   (C) 4-benzyl pyrroline
   (D) 2-ethyl pyrroline

8. For glycoproteins, most commonly used probe is

(A) antibody (B) antigens

(C) interferons (D) lectin

9. Phage M13 vectors are widely used for

(A) obtaining fragments of cloned DNA suitable for DNA sequencing

(B) obtaining single stranded copies of cloned DNA suitable for DNA sequencing

(C) obtaining double stranded copies of cloned DNA suitable for electrophoresis

(D) obtaining double stranded copies of cloned DNA suitable for DNA sequencing

10. Vectors designed to replicate in cells of two different species are called

(A) phasmids (B) phagemids

(C) transfer vectors (D) shuttle vectors

11. The injection of DNA into developing inflorescence using a hypodermic syringe is called

(A) microinjection

(B) microfection

(C) micromanipulator mediated DNA delivery

(D) macroinjection

12. Protein binding regions of DNA are identified by one of the following techniques

(A) Finger printing (B) Foot printing

(C) Southern blotting (D) Western blotting

13. A major advantage of monoclonal antibodies compared to polyclonal antibodies is that monoclonal antibodies

(A) have higher-affinity binding to antigens

(B) have identical binding sites that recognize a specific epitope

(C) cross-link molecules that share antigenic sites

(D) are more easily coupled with probes such as fluorescent dyes

14. In which of the following organism mRNA has introns ?

(A) Nostoc (B) Rhizobium

(C) Chlamydomonas (D) Mycoplasma

15. Colchicine is an alkaloid used to double the number of chromosomes. It is obtained from

(A) rhizome of *Cochicum automnale* (B) corms of C. *autumnale*

(C) bulbs of C. *autumnale* (D) root tubers of C. *autmnale*

16. Jacob and Monad contribution related to
(A) transposons (B) DNA sequencing
(C) regulation of gene expression (D) all the above

17. OKT3 antibody is used in
(A) cancer therapy (B) immune suppressant
(C) Immunotoxin (D) mouth diseases

18. 'Zinc fingers' are important in cellular recognition because they are
(A) at the catalytic site of many kinases
(B) characteristic of palindrome structures of unique-sequence DNA
(C) a structural motif in many DNA-binding proteins
(D) structures with high redox potential

19. Which one of the following genera fix nitrogen nonsymbiotically?
(A) Rhizobium (B) Nitrosomonas
(C) Nitrobacter (D) Azotobacter

20. Methionine and ———— are having single codon
(A) threonine (B) tryptophan
(C) tyrosine (D) arginine

21. Alpha D-Glucose and Beta D-Glucose may be referred to as
(A) isomers (B) epimers
(C) anomers (D) aldoses

22. The main rate limiting enzyme in heme synthesis is
(A) uroporphyrinogen I synthase (B) delta ALA synthetase
(C) uroporphyrinogen decarboxylase (D) heme synthase

23. Which drug is referred as "Wonder Drug"
(A) streptomycin (B) penicillin
(C) insulin (D) chloramphenicol

24. 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

25. 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

26. Creation of Dolly is a phenomenon of

(A) monopotency (B) multipotency

(C) pleuropotency (D) all of these

27. 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) frame shift and transition respectively

28. Integral membrane proteins are helped to locate across the lipid bilayer by

(A) formation of disulfide bonds

(B) using an α helix made up of amino acids with hydrophilic side chains

(C) using an α helix made up of amino acids with hydrophobic side chains

(D) glycosylation

29. Somatic gene therapy attempts to correct a gene defect by introducing the normal gene into

(A) the fertilized egg

(B) the sperm

(C) cultured embryonic stem (ES) cells

(D) cells in the patient's body other than eggs or sperm

30. The enzyme following Michelis-Menten kinetics show a characteristic graph when substrate concentration is plotted against velocity, the nature of the graph will be

(A) sigmoidal (B) parabolic

(C) hyperbolic (D) straight line

31. What is the major protein responsible for 75-80% of the osmotic pressure of the human plasma?

(A) alpha Globulin (B) beta Globulin

(C) albumin (D) fibrinogen

32. Which anti cancerous drug is obtained from Catharanthus roseus

(A) vincristine
(B) resveratrol
(C) serpentine
(D) colchicine

33. Rhodopisin is a trans membrane protein belonging to the large family of G-protein coupled receptor. It is found in the disc of rod cell of human retina. Activation of rhodopisin is due to

(A) phosphorylation of its extracellluar tyrosine residue
(B) binding of external ligand to its extra cellular loops
(C) photoisomerisation of its prosthetic group
(D) binding of calcium ions to its trans membrane aspartic groups

34. The mushroom poison amanitin is an inhibitor of the synthesis of

(A) mRNA
(B) glycoprotein
(C) DNA
(D) protein

35. He La cells were obtained from

(A) Henrietta Lowe
(B) Henrietta Lacks
(C) Henry Lowe
(D) Henry Lacks

36. All of the following cell types contains the enzyme telomerase which protects the length of telomeres at the end of chromosomes except

(A) haemopoetic
(B) tumor
(C) germinal
(D) somatic

37. What is the function of initiation factor IF-3?

(A) if bound to the 40S subunit, it facilitates the association of the 40S and 60S subunit
(B) if bound to the 30S subunit ,it prevents the association of the 30S and 50S subunit
(C) if bound to the 30S subunit, it allows the 16S rRNA of the 30S subunit to interact with the Shine-Dalgarno sequence of the mRNA
(D) it directs the initiator tRNA to enter the partial P-site on the 30S subunit bound to mRNA

38. Short (200 to 500 base pairs) DNA sequence that has a single occurrence in the human genome and whose location and base sequence are known

(A) sequence tagged sites (STS)
(B) expressed sequence tags (EST)
(C) motif
(D) none of the above

39. This vitamin is the major lipid-soluble anti-oxidant in cell membranes and plasma lipoproteins

(A) vitamin K
(B) vitamin A
(C) vitamin D
(D) vitamin E

40. Amphibian metamorphosis is controlled by

(A) thyroid hormone
(B) ecdysone
(C) parathyroid hormone
(D) oxytocin

41. Which of the following drives directional transport through nuclear pore complexes?

(A) ABC transporter
(B) GTPase
(C) ATPase
(D) Ran GTPase

42. Positional cloning refers to

(A) isolating a gene by PCR using primers from another species
(B) cloning a portion of a gene using a PCR
(C) using a selection procedure to clone a cDNA
(D) mapping a gene to a chromosomal region and then identifying and cloning the genomic copy of the gene from the region

43. The mitochondria serve as a marker for cytochrome oxidase and the lysosome serve for

(A) catalase
(B) acid phosphatase
(C) galactosidase
(D) succinic dehydrogenase

44. Lysosomes are abundant in-

(A) WBC and osteoblasts
(B) RBC and Spleen
(C) liver and Spleen
(D) WBC and Spleen

45. 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.

46. Calcium absorption is inferred by

(A) fatty acids
(B) amino acids
(C) vitamin D
(D) vitamin B12

47. Bohr effect is

(A) shifting of oxyhemoglobin dissociation curve to the right

(B) shifting of oxyhemoglobin dissociation curve to the left

(C) ability of hemoglobin to combine with O2

(D) exchange of chloride with carbonate

48. The mechanism of synthesis of DNA and RNA are similar to all the following ways except

(A) they involve release of pyrophosphate from each nucleotide added

(B) they require activated nucleotide precursor and Mg^{2+}

(C) the direction of synthesis is

(D) they require a primer

49. Albinism is due to deficiency of the enzyme:

(A) phenylalanine hydroxylase

(B) tyrosinase

(C) p-Hydroxyphenylpyruvic acid oxidase

(D) tyrosine dehydrogenase

50. Molecular weight of heterogenous nuclear RNA (hnRNA) is

(A) More than 10^7 (B) 10^5 to 10^6

(C) 10^4 to 10^5 (D) Less than 10^4

51. The T ψ C arm in the tRNA molecule possesses the sequence

(A) T, pseudouridine and C (B) T, uridine and C

(C) T, dihydrouridine and C (D) T, adenine and C

52. A synthetic nucleotide analogue, used in the chemotherapy of cancer and viral infections is

(A) arabinosyl cytosine (B) 4-hydroxypyrazolopyrimidine

(C) 6-mercaptopurine (D) 6-thioguanine

53. The most likely lethal mutation is

(A) substitution of adenine for cytosine

(B) insertion of one nucleotide

(C) deletion of three nucleotides

(D) substitution of cytosine for guanine

54. Regulation of haem synthesis occurs by

(A) covalent modification (B) repression - derepression

(C) induction (D) allosteric regulation

55. An inherited or acquired renal tubular defect in the reabsorption of phosphate (Vit D resistant ricket) is characterized with

(A) Normal serum Phosphate

(B) High serum phosphate

(C) A low blood phosphorous with elevated alkaline Phosphate

(D) A high blood phosphorous with decreased alkaline phosphatase

56. The immunoglobulin which provides highest antiviral activity is

(A) Ig D (B) Ig E (C) Ig A (D) Ig G

57. Human growth hormone has

(A) one polypeptide chain and one intra-chain disulphide bond

(B) one polypeptide chain and two intra-chain disulphide bond

(C) two polypeptide chains joined by one disulphide bond

(D) two polypeptide chains joined by two disulphide bond

58. Acromegaly results in all the following except

(A) overgrowth of the bones of face, hands and feet

(B) increased stature

(C) enlargements of viscera

(D) impaired glucose tolerance

59. The blood sugar raising action of the hormone of suprarenal cortex is due to

(A) glyconeogenesis

(B) glycogenolysis

(C) glucagon like activity

(D) due to inhibition of glomerular filtration of glucose

60. Suppressor mutations occur in

(A) structural genes (B) promoter regions

(C) silencer elements (D) anticodons of tRNA

61. Trials for gene therapy in human beings were first carried out, with considerable success, in a genetic disease called

(A) cystic fibrosis (B) thalassemia

(C) adenosine deaminase deficiency (D) Lesch-Nyhan syndrome

62. If DNA of a cancer cell is introduced into a normal cell, the recipient cell
(A) destroys the DNA
(B) loses its ability to divide
(C) dies
(D) changes into a cancer cell

63. Amplification of dihydrofolate reductase gene in a cancer cell makes the cell
(A) susceptible to folic acid deficiency
(B) less malignant
(C) resistant to amethopterin therapy
(D) responsive to amethopterin therapy

64. Orcinol method is employed in the quantitation of
(A) nucleic acid (B) DNA (C) RNA (D) proteins

65. Which one of the following statements is not characteristic of allosteric enzymes?
(A) they frequently catalyze a committed step early in a metabolic pathway
(B) they are often composed of subunits
(C) they follow Michaelis-Menten kinetics
(D) they frequently show co-operativity for substrate binding

66. 'Clearing factor' is
(A) lipoprotein lipase
(B) crotonase
(C) 7-dehydro cholesterol
(D) β-sitosterol

67. Rapoport-Luebering cycle is located in
(A) liver (B) muscles (C) brain (D) erythrocytes

68. In Lineweaver-Burk plot, the y-intercept represents
(A) V_{max} (B) K_m (C) $-K_m$ (D) $1/K_m$

69. Genetically engineered male sterile crop plants may be produced by inserting
(A) lectin gene
(B) chitinase gene
(C) barnase gene
(D) BT toxin gene

70. Choose the correct statement(s) about thermostable DNA polymerase used in PCR
P. *Tli* pol has no 3′→5′ exonuclease activity
Q. *Pfu* pol has 3′→5′ exonuclease activity
R. *Taq* pol has 3′→5′ exonuclease activity
S. *Taq* pol has no proof reading ability
(A) P, Q and R
(B) Q, R and S
(C) P, R and S
(D) P, Q and S

71. Which of the following would not be possible to address using a Northern blot?

(A) mRNA size

(B) location of restriction sites in a particular gene

(C) spatial expression of a particular gene

(D) temporal expression of a particular gene

72. In $lacO^c\ lacZ^-/lacO^+\ lacZ^+$ partial diploid, of the two lacZ enzymes, only the mutant enzyme (lacZ-) is synthesized constitutively. This observation show that $lacO^c$ mutation is

(A) cis- dominant

(B) cis recessive

(C) trans- dominant

(D) trans- recessive

73. Chromosome walking is best described as

(A) sequencing a genome at a time to ensure that no gaps are present at the end of the project

(B) identifying clones whose inserts overlap to generate a library of clones that cover a given segment of DNA

(C) generating a map along a chromosome in a step-by-step manner

(D) aligning DNA sequences by computer to generate contigs

74. A mixture containing two proteins having similar molecular mass but different oligomeric properties can be separated by

(A) SDS PAGE analysis

(B) native PAGE analysis

(C) isoelectric focusing

(D) both (B) and (C)

75. Which one of the following antibiotics attaches to 50S ribosome and inhibits peptidyl-transferase activity?

(A) penicillin

(B) trimethoprim

(C) amphotericin

(D) chloramphenicol

76. The technique used to identify specific DNA sequence in bacterial colonies is

(A) in situ hybridization

(B) colony hybridization

(C) dot blot technique

(D) western blotting

77. RFLP involves

(A) used to identify a specific DNA

(B) used to identify a specific RNA

(C) used to identify a specific protein

(D) used to identify both DNA and RNA

78. Which of the following are vectors for animals

(A) CMV vectors and Gemini vectors

(B) lambda phage and M13 phage vectors

(C) SV 40 vectors and Bovine papillomavirus vectors

(D) all of the above

79. Which of the following chemical enhances vir gene expression

(A) acetosyringone (B) cyanidin

(C) dextran (D) glutennin

80. RNA is very much susceptible to hydrolysis in alkali because

(A) it contains Uracil residues in its structure

(B) its 2' OH groove participate in intramolecular cleavage of phosphodiester backbone

(C) cleavage occurs in the glycosilic bonds of purine bases

(D) cleavage occurs in the glycosilic bonds of pyrimidine bases

81. Which of the following fluorescent probes is used to monitor the progress of amplification of Real Time PCR?

(A) SYBR Green (B) FITC

(C) cyan Blue (D) rhodamine

82. 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

83. 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

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

(A) Melcher's effect (B) Richmond lang effect

(C) Braun & Wood effect (D) Skoog effect

85. A biochemical indication of vitamin B_{12} deficiency can be obtained by measuring the urinary excretion of

(A) pyruvic acid (B) malic acid

(C) methyl malonic acid (D) urocanic acid

86. Fully activated pyruvate carboxylase depends upon the presence of

(A) malate and Niacin

(B) acetyl CoA and biotin

(C) acetyl CoA and thiamine pyrophosphate

(D) oxaloacetate and biotin

87. Stain which is not useful in identifying fungus

(A) giemsa (B) haematoxylin and eosin

(C) gomori methanamine silver (D) PAS (periodic acid-Schiff)

88. Cot units are

(A) rate of renaturation per sec (B) rate of denaturation per sec

(C) rate of denaturation (D) rate of renaturation

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

(A) BB × BB (B) BB × Bb

(C) BB × bb (D) Bb × Bb

90. When bacteria produce mammalian proteins, cDNA is used rather than genomic DNA. Which of the following is the best explanation?

(A) it is not possible to clone the entire coding region of the gene.

(B) it is easier to clone cDNA than genomic DNA of comparable size.

(C) most eukaryotic gene promoters do not function in bacteria.

(D) most eukaryotic genes have introns that cannot be removed in bacteria

91. Which cyclin protein involves at late G1 phase of cell cycle

(A) D (B) E

(C) A (D) C

92. In mammalian cells, rRNA is produced mainly in

(A) nucleus (B) ribosomes

(C) nucleolous (D) cytoplasm

93. Caffeine promotes lipolysis by increasing cyclic AMP levels through its effect on the activity of the enzyme

(A) adenylate cyclase (B) protein kinase

(C) phosphodiestrase (D) calmodulin phosphorylase

94. Rice bacterial blight resistant gene

(A) *Xa21* (B) *hrp*

(C) *Phz* (D) Phl

95. 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 5^{th} and 6^{th} position

(B) deletion of nucleotide between 5^{th} and 6^{th} position

(C) insertion of three nucleotide between 5^{th} and 6^{th} position

(D) deletion of nucleotide between 11^{th} and 12^{th} position

96. The isoelectric point of alanine is 6.0. If alanine is dissolved in a buffer of pH 3.0 and subjected to electrophoresis

(A) it will migrate to either anode or cathode

(B) it will migrate to the cathode

(C) some will migrate to the anode and some to cathode

(D) it will migrate to the anode

97. Mucous which covers the epithelial lining of stomach and protects it from protease activity is secreted by

(A) goblet cells (B) parietal cells

(C) microvilli (D) acinar cells

98. The largest protein in the body is

(A) desmin (B) nebulin

(C) titin (D) calcineurin

99. Which of the following types of DNA replication or repair systems is dysfunctional in individuals with Xeroderma pigmentosum

(A) base excision repair (B) mismatch repair

(C) nucleotide excision repair (D) DNA helicase

100. On a Ramachandran plot the entries for haemoglobin would be clustered around

(A) All four corners (B) The left-handed alpha helix

(C) The right handed alpha helix (D) The extended chain conformation