

72

QUESTION PAPER
SERIES CODE

A

Registration No. :

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Centre of Exam. : _____

Name of Candidate : _____

Signature of Invigilator

ENTRANCE EXAMINATION, 2013
Pre-Ph.D./Ph.D. in MOLECULAR MEDICINE
[Field of Study Code : CMMP (169)]

Time Allowed : 3 hours

Maximum Marks : 70

INSTRUCTIONS FOR CANDIDATES

Candidates must read carefully the following instructions before attempting the Question Paper :

- (i) Write your Name and Registration Number in the space provided for the purpose on the top of this Question Paper and in the Answer Sheet.
- (ii) **Please darken the appropriate Circle of Question Paper Series Code on the Answer Sheet.**
- (iii) The Question Paper is divided into two Parts : Part—A and Part—B. Both Parts have multiple-choice questions. All answers are to be entered in the Answer Sheet provided with the Question Paper for the purpose by darkening the correct choice, i.e., (a) or (b) or (c) or (d) with BALLPOINT PEN only against each question in the corresponding Circle.
- (iv) Part—A consists of 30 questions and **all** are compulsory.
- (v) Part—B contains 60 questions. **Answer any 40 questions.**
In case any candidate answers more than the required 40 questions, the first 40 questions attempted will be evaluated.
- (vi) Each correct answer carries 1 mark. **There will be negative marking and ½ mark will be deducted for each wrong answer.**
- (vii) Answer written by the candidates inside the Question Paper will not be evaluated.
- (viii) Calculators and Log Tables may be used.
- (ix) Pages at the end have been provided for Rough Work.
- (x) Return the Question Paper and Answer Sheet to the Invigilator at the end of the Entrance Examination. **DO NOT FOLD THE ANSWER SHEET.**

INSTRUCTIONS FOR MARKING ANSWERS

1. Use only Blue/Black Ballpoint Pen (do not use pencil) to darken the appropriate Circle.
2. Please darken the whole Circle.
3. Darken ONLY ONE CIRCLE for each question as shown in example below :

Wrong	Wrong	Wrong	Wrong	Correct
● (b) (c) ●	⊗ (b) (c) (d)	⊗ (b) (c) ⊗	● (b) (c) ●	(a) (b) (c) ●

4. Once marked, no change in the answer is allowed.
5. Please do not make any stray marks on the Answer Sheet.
6. Please do not do any rough work on the Answer Sheet.
7. Mark your answer only in the appropriate space against the number corresponding to the question.
8. **Ensure that you have darkened the appropriate Circle of Question Paper Series Code on the Answer Sheet.**

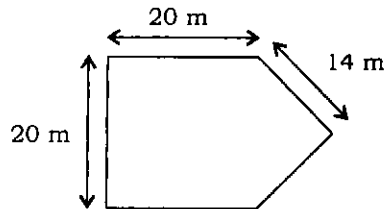
PART—A

Answer **all** questions

1. Which of the following numbers comes next in the series 4-6-9-6-14-6-?
(a) 6
(b) 17
(c) 19
(d) 21

2. Which of the following letters comes next in the sequence 7G, 10J, 13M, 16P, 19S, 22—?
(a) T
(b) U
(c) V
(d) W

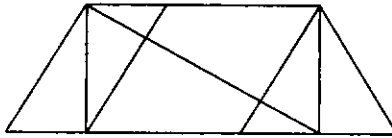
3. A gardener earns ₹ 2 per square metre of grass that he cuts in a garden. How much does he earn from cutting the grass in the garden with dimensions given below?



- (a) ₹ 500
 - (b) ₹ 508
 - (c) ₹ 1000
 - (d) ₹ 1080
-
4. On a hot summer day, a glass of cold coffee quickly becomes warm. This is because
(a) entropy increases in the glass
(b) entropy decreases in the glass
(c) entropy increases outside the glass
(d) there is no change in entropy either in the glass or outside it

5. Three children are sitting on a seesaw in a playground. Ram weighs 25 kg and is sitting 4 m to the left of the fulcrum of the seesaw. Shyam weighs 35 kg and is sitting 2 m to the right of the fulcrum. If Ashok must sit halfway between Shyam and the fulcrum on the right side to balance the seesaw, how much does Ashok weigh?
- (a) 20 kg
(b) 25 kg
(c) 30 kg
(d) 35 kg
6. A 3 g cube of sugar (sucrose : $C_{12}H_{22}O_{11}$) is added to a cup containing 250 ml of water at 80 °C. If the density of water at 80 °C is 0.975 g/ml, what is the molality of the sugar solution?
- (a) 0.019 mol/kg
(b) 0.037 mol/kg
(c) 0.049 mol/kg
(d) 0.051 mol/kg
7. A student dissolves 20 g of NaOH in water to obtain a 300 cm³ solution. What is the molarity of the solution?
- (a) 1.0 M
(b) 1.55 M
(c) 1.67 M
(d) 1.73 M
8. In an experiment, bacteria are first incubated in culture medium containing only ¹⁵N and then transferred to medium containing only ¹⁴N and grown for 3 generations. The bacterial DNA is then analyzed. What proportions of heavy DNA, hybrid DNA and light DNA will be present?
- (a) 50% hybrid, 50% light
(b) 75% hybrid, 25% light
(c) 25% hybrid, 75% light
(d) 100% hybrid, 0% light

9. How many triangles are present in the figure given below?



- (a) 8
- (b) 10
- (c) 12
- (d) 14

10. A 0.9% solution of NaCl is isotonic to red blood cells (RBCs). What will happen if the RBCs are placed in a 9% solution of NaCl?

- (a) They will expand
- (b) They will shrink
- (c) They will burst
- (d) Nothing will happen

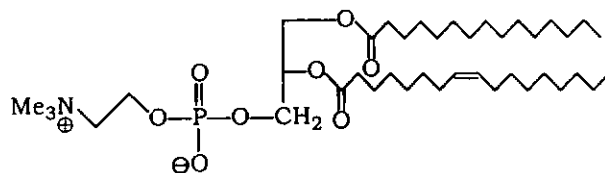
11. In a family, there are 4 children. Each was born after a gap of 3 years from the previous child. If the sum of their ages is 38, what is the age of the youngest child?

- (a) 5 years
- (b) 9 years
- (c) 12 years
- (d) 16 years

12. You need to make 100 ml of Luria broth containing $50 \mu\text{g/ml}$ ampicillin. The stock solution of ampicillin is 100 mg/ml . How much volume from the stock solution should you use?

- (a) $50 \mu\text{l}$
- (b) $100 \mu\text{l}$
- (c) $150 \mu\text{l}$
- (d) $200 \mu\text{l}$

13. The father of a woman is colour-blind but she has normal colour vision. She marries a man who is colour-blind. If the gene that causes colour blindness is an X-linked recessive gene, what is the probability that their son will be colour-blind?
- (a) 0
 (b) 1/4
 (c) 1/2
 (d) 3/4
14. After running an agarose gel, an ethidium bromide stained band of a 2 kb DNA fragment was isolated and the ethidium bromide intercalated with the band was estimated to be 20 picogram. From the same gel, a research fellow isolated a 0.5 kb DNA fragment and estimated ethidium bromide as
- (a) 5 picogram
 (b) 10 picogram
 (c) 80 picogram
 (d) 40 picogram
15. If visible light stimulus from all wavelengths in equal ratio falls on the human eye, it will perceive it as
- (a) black colour
 (b) a rainbow of colours
 (c) white colour
 (d) a fuzzy set of alternating black and white bars
16. Identify the nature of the molecule from the following structure :



- (a) A phosphoprotein
 (b) A nucleic acid
 (c) A carbohydrate
 (d) A phospholipid

17. A rectangle-shaped cell having 20 angstrom (\AA) length and 13 \AA breadth changed into circular shape with an equal perimeter under a magnetic force. What will be the radius of the circular-shaped cell?

(a) 16.5 \AA

(b) 10.5 \AA

(c) 3.5 \AA

(d) 1.54 \AA

18. A faulty thermometer shows its fixed point marked as 5° and 95° . Somebody measured his body temperature as 59° . What will be the correct temperature of the body on Celsius scale?

(a) 60 $^\circ\text{C}$

(b) 30 $^\circ\text{C}$

(c) 37.8 $^\circ\text{C}$

(d) 42 $^\circ\text{C}$

19. An AT-rich DNA fragment with a melting temperature (T_m) of 60 $^\circ\text{C}$ will contain approximately

(a) 16 GC pairs and 6 AT pairs

(b) 6 GC pairs and 21 AT pairs

(c) 8 GC pairs and 19 AT pairs

(d) 15 GC pairs and 15 AT pairs

- 20.** In order to clone a gene, you have mixed a linear piece of DNA having EcoRI and XhoI sites with a linear vector DNA digested at similar sites in a buffer consisting of 50 mM Tris-HCl, 1 mM EDTA, 1 mM DTT, 0.1 mM Mg²⁺, 2 mM ATP, 50 mM NaCl and 5% glycerol and 1 unit of T4 DNA ligase was added to it. Following incubation at 16 °C overnight, what result you would expect?
- (a) Covalently closed circular DNA
 - (b) Nicked DNA
 - (c) DNAs will remain linear
 - (d) A long linear piece of DNA will form
- 21.** To prepare 0.5 M Tris buffer of pH 7.5, which one of the following available acids will you prefer to use to adjust its pH?
- (a) H₂SO₄
 - (b) HCOOH
 - (c) HNO₃
 - (d) CH₃COOH
- 22.** A partially purified repressor protein in 100 mM Tris-HCl, 150 mM NaCl, 1 mM DTT, 1 mM PMSF and 10% glycerol at pH 8.0 and having a pI of 7.2 was given to you for further purification. SDS-PAGE of the preparation revealed presence of multiple protein bands. As a first step, which one of the following materials will you use for the process?
- (a) Hydroxyapatite
 - (b) Q-sepharose
 - (c) S-sepharose
 - (d) Butyl-sepharose
- 23.** A given gene A has two alleles. One of the alleles has multiple SNPs (both synonymous and non-synonymous) and you have amplified the gene by PCR using properly designed primers and tested the product in 1% agarose gel. How many DNA bands will you visualize in the stained gel?
- (a) Single band
 - (b) Two bands
 - (c) A smear
 - (d) No band

24. The rate of evaporation of water on the moon compared to the earth should be
- (a) quicker
 - (b) slower
 - (c) same
 - (d) dependent on the amount of water
25. A refrigerator is driven by a 1000 W electric motor having an efficiency of 60%. The refrigerator is considered as a reversible heat engine operating between 273 K and 303 K. Calculate the time required to freeze 32.5 kg water at 0 °C. [Heat losses may be neglected. Latent heat of fusion of ice is $336 \times 10^3 \text{ J}\cdot\text{kg}^{-1}$.]
- (a) 30 min 20 sec
 - (b) 3 min 20 sec
 - (c) 33 min 20 sec
 - (d) 36 min 20 sec
26. In a PCR reaction, you have used a buffer containing 1.5 mM Mg-acetate instead of vendor suggested 1.0 mM MgCl_2 by mistake. You have added all other components as required. What will be the most expected result?
- (a) Amplification of template DNA
 - (b) Multiple DNA bands
 - (c) A smear
 - (d) No product
27. One important forensic DNA sample was found to be too diluted for further processing. As a last resort, which one of the following reagents can you use to concentrate the same?
- (a) Sucrose crystals
 - (b) Butanol
 - (c) Fused CaCO_3
 - (d) 4.1 M $(\text{NH}_4)_2\text{SO}_4$ solution

28. In an siRNA experiment, a double-stranded 21-mer oligo against the 3' UTR of a gene leads to complete loss of function of the gene in cell culture. For the gain of function, one should transfect the cells with plasmid containing
- 3' UTR of the gene
 - 5' UTR of the gene
 - coding region of the gene
 - gene with the introns
29. An organism with ~1 Mbp genome size replicates its DNA completely in thirty minutes. If it has replicated at one-fourth of its schedule time, it should
- increase origin frequency
 - allow reinitiation
 - increase DNA polymerase synthesis rate
 - All of the above
30. The picture given below shows the different topoisomers of the same DNA following agarose gel electrophoresis :



Lanes A, B and C correspond to

- relaxed circular DNA, linear DNA and supercoiled DNA respectively
- linear DNA, relaxed circular DNA and supercoiled DNA respectively
- linear DNA, nicked circular DNA and supercoiled DNA respectively
- nicked circular DNA, supercoiled DNA and linear DNA respectively

PART—B

Answer *any forty* questions

- 31.** Which of the following amino acids are non-polar and hydrophobic in nature?
- (a) Phe Tyr Trp His
 - (b) Ala Val Leu Met
 - (c) Ser Thr Cys Asn
 - (d) Lys His Arg Asp
- 32.** Which of the following statements is correct for a diploid organism?
- (a) Cells in G1 and G2 phase will have $4n$ and $2n$ chromosome respectively
 - (b) Cells in G0 and G1 phase will have n and $2n$ chromosome respectively
 - (c) Cells in G1 and G2/M phase will have $2n$ and $4n$ chromosome respectively
 - (d) Cells in G1 and G2 phase will have $2n$ chromosome and $4n$ chromosome in M phase
- 33.** Two human mitochondrial proteins X and Y interact with each other. To verify the interaction experimentally, an immune-precipitation (IP) reaction was carried out in mitochondrial extract by using anti- X antibody raised in rabbit and protein A-sepharose. Precipitated proteins were separated and transferred to PVDF membrane and probed with anti- Y antibody raised in donkey and HRP conjugated anti-rabbit secondary antibody raised in donkey. The blot was developed using ECL reagent. Which one of the following will you expect to detect on the blot?
- (a) Signals for both X and Y
 - (b) Signal for neither X nor Y
 - (c) Signal for Y but not for X
 - (d) Signal for X
- 34.** Every eye has a 'blind spot' in the visual field of retina. The presence of this 'blind spot' is due to
- (a) the inability of the eye lens to focus on a small part of the retina
 - (b) several blood vessels that merge together and enter the eye at the 'blind spot'
 - (c) the absence of photoreceptors (rods and cones) in the retina where the axons exit the eye
 - (d) the rods in the 'blind spot' which are less sensitive to light than the cones
- 35.** In forensic science applications, PCR can be used to amplify the region containing
- (a) long tandem repeats (LTR)
 - (b) short tandem repeats (STR)
 - (c) transposon elements (Tn)
 - (d) Both (a) and (b)

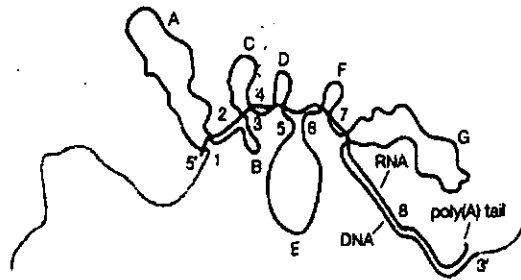
36. An object when weighed by using a physical balance
- (a) should weigh more at pole than at equator
 - (b) should weigh same at pole and at equator
 - (c) should weigh less at pole than at equator
 - (d) All of the above are incorrect
37. The figure given below shows the X-ray diffraction pattern of right-handed helical DNA where the helix makes a turn every 3.4 nm with ~10 bases per turn :



It shows which of the following forms of DNA?

- (a) Z form
 - (b) A form
 - (c) B form
 - (d) X form
38. In proteomics, 'peptide mass fingerprinting' generates
- (a) complete peptide sequence information
 - (b) only partial peptide sequence information
 - (c) peptide molecular weight determination
 - (d) None of the above
39. Which of the following represents the largest epithelial surface in the human system?
- (a) The respiratory system
 - (b) The reproductive system
 - (c) The gastrointestinal system
 - (d) The urinary tract
40. The minimum distance at which a microscope is capable of distinguishing two points as separate is called its
- (a) magnification
 - (b) illumination
 - (c) resolving power
 - (d) focal length

41. The picture given below shows the hybridization of genomic DNA with corresponding RNA :



The loops A, B and C indicate

- (a) exons
 - (b) introns
 - (c) junk DNA
 - (d) open reading frames
42. The RNA editing phenomenon (first described in lower eukaryotes) that helps to modify/mutate sequence information at the mRNA level rather than in the DNA level takes place in
- (a) Trypanosome cox II mRNA
 - (b) human apolipoprotein B mRNA
 - (c) human cox II mRNA
 - (d) Both (a) and (b)
43. While digesting pUC19 plasmid DNA with EcoRI restriction enzyme in 1X reaction buffer you have added 10 mM Triton-X-100 detergent by mistake. What effect of the detergent would you expect to see on the digestion process?
- (a) 0% digestion
 - (b) 50% digestion
 - (c) 75% digestion
 - (d) 100% digestion
44. Electromagnetic wave consists of
- (a) magnetic waves only
 - (b) electric charge waves only
 - (c) both electric and magnetic waves
 - (d) None of the above

45. In native PAGE
- (a) lower molecular weight proteins may run faster
 - (b) higher molecular weight proteins may run faster
 - (c) proteins may run on the basis of their charge and mass
 - (d) All of the above
46. The logic behind the use of alkali to isolate plasmid is to
- (a) denature proteins
 - (b) dissolve lipids
 - (c) lyse the bacterial membranes
 - (d) denature the DNA
47. What will be the copy number of the chromosome of *E. coli* when grown in rich medium like LB?
- (a) 1
 - (b) 10
 - (c) 4
 - (d) 2
48. Glutathione is a tripeptide antioxidant of which of the following amino acids?
- (a) Glycine, Methionine and Glutamic acid
 - (b) Glycine, Cysteine and Glutamic acid
 - (c) Glycine, Methionine and Cysteine
 - (d) Methionine, Cysteine and Glutamic acid
49. The average length of siRNAs is usually
- (a) between 25 to 29 nucleotides
 - (b) between 19 to 23 nucleotides
 - (c) between 14 to 18 nucleotides
 - (d) any number of nucleotides
50. Some plants and bacteria can convert lipids into carbohydrates but animals fail to do so because of the presence of which one of the following pathways?
- (a) Pentose phosphate
 - (b) Gluconeogenesis
 - (c) Glyoxylate
 - (d) Beta-oxidation

51. In infectious microbiology, the term 'NDM-1' stands for
- (a) Naturally Defective Mutant
 - (b) New Delhi Metallo-beta-lactamase-1
 - (c) National Directory of Microbial Strains-Collection 1
 - (d) None of the above
52. Macular degeneration is connected with
- (a) maniac depression
 - (b) age-related damage to the retina
 - (c) degeneration of microfold cells in the intestine
 - (d) None of the above
53. For the year 2012, the Nobel Prize in Chemistry was jointly awarded to Robert Lefkowitz and Brian Kobilka for
- (a) functional mapping of G protein-coupled receptors (GPCRs)
 - (b) studies of nuclear receptors
 - (c) generating 3-D models to show how different antibiotics bind to ribosomes
 - (d) development of *in vitro* fertilization
54. The shortest phase in mammalian cell cycle is
- (a) M phase
 - (b) G1 phase
 - (c) G2 phase
 - (d) S phase

55. The molarity of a solution that has 2.3 moles dissolved in 4.6 liters will be
- (a) 0.5 M
 - (b) 1 M
 - (c) 0.25 M
 - (d) 1.25 M
56. Oligodendrocytes, astrocytes and Schwann cells are different types of
- (a) glial cells
 - (b) neurons
 - (c) endothelial cells
 - (d) cells found in blood-brain barrier
57. RNA polymerases that transcribe mitochondrial DNA and chloroplast DNA found in higher eukaryotes are similar to polymerases from
- (a) eubacteria and bacteriophages
 - (b) eukaryotes
 - (c) archaea
 - (d) mycoplasma
58. Which one of the following proteins initiates DNA strand separation during the replication of *E. coli* chromosome?
- (a) DnaA
 - (b) DnaJ
 - (c) DNA helicase
 - (d) DNA gyrase

59. Holography involves the use of
- (a) interference
 - (b) polarization
 - (c) 2-D images
 - (d) infrared light
60. Exclusive presence of mitochondrial protein is confirmed by detecting
- (a) lamin
 - (b) porin
 - (c) beta-actin
 - (d) alpha-actin
61. A malfunction in lymph nodes will result in
- (a) deposition of uric acid
 - (b) abnormal glucose metabolism
 - (c) abnormal blood flow
 - (d) increase in infections
62. Which of the following was the first reported crystal structure of a protein?
- (a) Insulin
 - (b) Hemoglobin
 - (c) Myoglobin
 - (d) Collagen
63. Which of the following statements is the most accurate description of the phospholipid bilayer in a cell membrane?
- (a) It is composed of two layers of phospholipid molecules with their tails pointing away from each other
 - (b) It is composed of two layers of phospholipid molecules with their tails interacting with each other
 - (c) It is composed of two layers of phospholipid polymers
 - (d) It is composed of two layers of phospholipid molecules with their tails lying parallel to each other
64. Which of the following hormones is not an amino acid derivative?
- (a) Thyroxine (T4)
 - (b) TSH
 - (c) Epinephrine
 - (d) Melatonin

65. A decrease or absence of insulin hormone receptors on cells will result in the development of
- (a) type I diabetes mellitus
 - (b) diabetes insipidus
 - (c) type II diabetes mellitus
 - (d) All of the above
66. Retinoblastoma (Rb) protein is involved in retinoblastoma, a childhood cancer of retina, which is caused due to
- (a) mutation in only one copy of Rb gene
 - (b) abnormal regulation of Rb phosphorylation
 - (c) inhibition of E2F transcription factor
 - (d) recruitment of chromatin modifying enzymes promoting histone deacetylation and methylation
67. Both budding and fission yeasts offer powerful genetic systems, because
- (a) they contain relatively small genome size
 - (b) they can exist in the haploid state carrying only one copy of the chromosome
 - (c) it is easy to generate mutations that inactivate genes in haploid genome
 - (d) All of the above
68. Which of the following pairs of cyclin dependent kinase (CDK) and cyclin is incorrect?
- (a) CDK1/Cyclin B
 - (b) CDK2/Cyclin E
 - (c) CDK4/Cyclin A
 - (d) CDK6/Cyclin D
69. Histone H3 lysine 9 methylation leads to the binding of
- (a) heterochromatin protein 1 (HP1) leading to transcriptional repression
 - (b) histone acetyl transferase (HAT) leading to transcriptional upregulation
 - (c) silent information protein (SIR) leading to transcriptional repression
 - (d) both transcriptional repression and upregulation depending on chromatin organization

70. The multidrug resistance (MDR) transport protein that exports a large variety of drugs from the cytosol to the extracellular medium uses the energy derived from
- hydrolysis of ATP
 - hydrolysis of GTP
 - Na^+/K^+ ATPase
 - vacuolar ATPase
71. Oxidation of fatty acids takes place both in the mitochondria and peroxisomes. The main end products are
- acetyl-CoA and ATP in both the cases
 - acetyl-CoA and ATP in the mitochondria and acetyl-CoA in the peroxisome
 - acetyl-CoA in the mitochondria and acetyl-CoA as well as ATP in the peroxisome
 - acetyl-CoA and NADH in both the cases
72. Prostaglandins are a group of compounds that function via a sub-family of cell surface seven-transmembrane receptors and G protein-coupled receptors. Their target cells are present in the immediate vicinity of the site of their secretion. Prostaglandins are synthesized from
- cholesterol
 - amino acids
 - carbohydrates
 - fatty acids
73. Which of the following is the precursor for the synthesis of all the other molecules?
- Testosterone
 - Cholesterol
 - Estrogen
 - Vitamin D
74. Which of the following is the most likely interaction of a drug molecule with the drug binding site?
- van der Waals interactions
 - Hydrogen bond
 - Ionic bond
 - All of the above

75. From the following molecules, which one is not a typical messenger for a tyrosine kinase linked receptor?
- (a) Insulin
 - (b) Acetylcholine
 - (c) Growth factors
 - (d) Cytokines
76. Which of the following terms describes a drug molecule that has the same effect on a receptor as the endogenous signaling molecule?
- (a) Agonist
 - (b) Antagonist
 - (c) Partial agonist
 - (d) Inverse agonist
77. Aquaporins are large family of highly conserved proteins that transport which of the following molecules across the biomembrane?
- (a) Water
 - (b) Glycerol
 - (c) Hydrophilic molecules
 - (d) All of the above
78. The most successful anti-atherosclerosis medication is the statin that binds and inhibits
- (a) HMG-CoA reductase
 - (b) phospholipase
 - (c) phosphatidylcholine esterase
 - (d) acyl transferase
79. A receptor 'ligand' represents
- (a) a drug molecule
 - (b) an intra- or extra-cellular signaling molecule
 - (c) an exogenous chemical that mimics an endogenous signaling molecule
 - (d) All of the above
80. Exercise is to gymnasium as eating is to
- (a) fitness
 - (b) restaurant
 - (c) food
 - (d) dieting

81. Which of the following statements is true about calmodulin?
- (a) It is a protein which binds calcium ions and binds to DNA to activate transcription
 - (b) It is a protein which modifies calcium ion concentration within the cell
 - (c) It is a protein which binds calcium ions and activates protein kinases
 - (d) It is a protein which transports calcium ions across the cell membrane
82. Which of the following receptors is not a G protein-coupled receptor?
- (a) The muscarinic receptor
 - (b) The glycine receptor
 - (c) The adrenergic receptor
 - (d) The glutamate receptor
83. A polypeptide contains six glutamine, five aspartic acid, four arginine, two glutamic acid, three histidine and three lysine residues. The overall charge would be
- (a) five (-)
 - (b) two (+)
 - (c) three (+)
 - (d) four (-)
84. Etoposide, an FDA approved drug that is used in chemotherapy against cancer, works against
- (a) topoisomerase II
 - (b) topoisomerase I
 - (c) DNA polymerase
 - (d) RNA polymerase
85. From the following molecules, which one exerts the greatest influence on the body's metabolism?
- (a) Estradiol
 - (b) Thyroxine
 - (c) Glucagon
 - (d) Leptin

- 86.** Flagella is made of
- (a) lipids
 - (b) carbohydrates
 - (c) proteins
 - (d) All of the above
- 87.** The gauge pressure due to blood circulation for a standing person should be maximum at
- (a) brain
 - (b) heart
 - (c) feet
 - (d) Same everywhere
- 88.** Optical fibers used in telecommunication work on the basis of internal
- (a) diffraction
 - (b) emission
 - (c) reflection
 - (d) radiation
- 89.** Xeroderma pigmentosum is a human genetic disease that renders affected individuals highly sensitive to sunlight resulting in skin lesions and cancer. The genes involved (XPA, XPC, ...) are of
- (a) nucleotide excision repair pathway
 - (b) double-strand break repair pathway
 - (c) non-homologous end joining repair pathway
 - (d) transcription-coupled repair pathway
- 90.** One of the differences between MALDI and ESI ionizations in mass spectrometry is that
- (a) MALDI generates multiple-charged peaks but not ESI
 - (b) MALDI generates monoisotopic peaks but not ESI
 - (c) Both (a) and (b)
 - (d) None of the above

★ ★ ★