72

QUESTION PAPER SERIES CODE
A

Registration No. : | | | | | |

Centre of Exam. : _____

Name of Candidate : _____

Signature of Invigilator

ENTRANCE EXAMINATION, 2014

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.

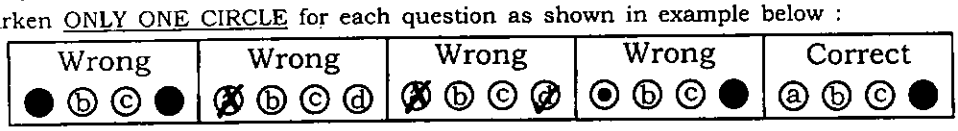
(viii) Calculators and Log Tables may be used.

(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 :



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 cell types cannot regenerate?

   (a) Fibroblast

   (b) Stem cell

   (c) Neuron

   (d) Hepatocyte

2. The concept of 'Natural Selection' was pioneered by

   (a) Gregor Mendel

   (b) Charles Darwin

   (c) Alfred Nobel

   (d) Har Gobind Khorana

3. A student installed a room heater by spending ₹ 2,400. He expected to cut his annual bill of heating oil by 8% by using the room heater and recover the cost of the room heater in 2 years. What was his annual heating bill before installing the room heater?

   (a) ₹ 15,000

   (b) ₹ 7,500

   (c) ₹ 30,000

   (d) ₹ 12,000

4. Which of the following do ***not*** constitute a general class of hormones?

   (a) Steroids

   (b) Polysaccharides

   (c) Polypeptides and proteins

   (d) Derivatives of amino acid tyrosine

5. Richard Feynman was

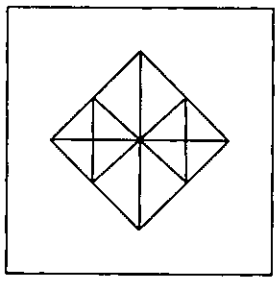
(a) the founder of Virgin Atlantic Airways

(b) a physicist

(c) a Nobel Prize-winning chemist

(d) None of the above

6. The number of triangles in the following figure is



(a) 16

(b) 22

(c) 28

(d) 32

7. Arjun is suffering from thalassemia that he inherited from his father. This is a/an

(a) communicable disease

(b) acquired disease

(c) deficiency disease

(d) congenital disease

8. The 'God Particle' is often referred to as

(a) gold nanoparticles

(b) Higgs' boson particle

(c) silver particle powder used for religious purposes

(d) quantum particle

9. In Gangtok, on 25th December at 9 p.m., the temperature was – 3 °C. Between 9 p.m. and the midnight the temperature dropped 6 °C. Next morning the temperature rose by 8 °C. In the evening the temperature dropped another 4 °C. What was the temperature at evening?

(a) – 5 °F

(b) 23 °F

(c) – 23 °F

(d) 5 °F

10. Which of the following amino acids is specified by only a single codon?

(a) Glutamine

(b) Tryptophan

(c) Asparagine

(d) Isoleucine

11. Which of the following is a fluorescent protein having applications in live cell studies?

(a) Firefly luciferase

(b) Horseradish peroxidase

(c) DsRed

(d) Alkaline phosphatase

12. The salary of one worker in a shop is reduced by 25%. After the protest, the shopkeeper agreed to make it to the original salary. What percentage of salary increase is needed to bring the salary to the original level?

(a) 25%

(b) 33·3%

(c) 25·25%

(d) 20%

13. Six athletes competed in a 100-meter race where, *(i)* Anand finished after Rahul and after two other runners; *(ii)* Rahul finished after Shaheer; *(iii)* Ashutosh finished before Shaheer; and *(iv)* Amit finished before Vishnu. Who ranked at the fifth position?

(a) Anand

(b) Rahul

(c) Ashutosh

(d) Vishnu

14. Translational medicine is a rapidly growing discipline that aims to

(a) translate medical texts from different languages into English using medical transcription

(b) use multidisciplinary, collaborative research for specific medical information and products

(c) provide interpreter services in hospitals

(d) None of the above

15. A person bought 20 pens (P) and pencils (p) together. He got a discount of ₹ 4 per pen and ₹ 1 per pencil. Overall he saved ₹ 44. How many pens and pencils did he buy?

(a) $8P + 12p$

(b) $12P + 12p$

(c) $10P + 12p$

(d) $8P + 8p$

16. Colour blindness is associated with

(a) loss of coloured vision

(b) loss of red and green-coloured vision

(c) loss of blue and red-coloured vision

(d) lack of stereoscopic vision

17. An infectious agent that appears to have no nucleic acid is a

(a) bacterium

(b) bacteriophage

(c) virus

(d) prion

18. The minimum distance at which a microscope is capable of distinguishing two points depends on its

(a) magnification

(b) illumination

(c) resolving power

(d) fluorescence

19. The relationship between X and Y are shown in the pairs of numbers in the following table :

X	Y
2	5
3	10
4	17
5	26

Which of the following describes the relationship between X and Y?

(a) $Y = X + 4$

(b) $Y = 2X + 1$

(c) $Y = 3X - 1$

(d) $Y = \dot{X}^2 + 1$

20. Two proteins in a solution have the same mass. pH of one protein is 6·4. The protein can be purified at the physiological pH using

(a) ion-exchange chromatography (anion exchange)

(b) thin-layer chromatography

(c) ion-exchange chromatography (cation exchange)

(d) gel-filtration chromatography

21. Which of the following amino acids absorbs light at 280 nm?

(a) Glycine

(b) Phenylalanine

(c) Proline

(d) Methionine

22. Triton X-100 is a/an

(a) anionic detergent

(b) nonionic detergent

(c) cationic detergent

(d) mild ionic detergent

23. Which of the following is ***not*** an antioxidant?

(a) Beta-carotene

(b) Vitamin C

(c) Vitamin K

(d) Vitamin E

24. During preparation of an ultrapure electrolyte, it is better to use

(a) double-distilled water

(b) triple-distilled water

(c) triple-distilled water filtered through 0·22 μm filter

(d) milli-Q deionized water without 0·22 μm filter

25. Which among the following represents the weakest form of energy?

(a) Hydrogen bond

(b) Hydrolysis of ATP (phosphoanhydride bond)

(c) van der Waals' interaction

(d) Ionic interaction

26. Which of the following foods is often the best source for long-term energy?

(a) Bottle of Coca-Cola

(b) Millet bread (bajra roti)

(c) White bread (mayda roti)

(d) Sugarcane juice

27. The term 'android' usually refers to

(a) an operating system for mobile smart phones

(b) an operating system for mobile tablets running on Windows

(c) new version of Windows software

(d) None of the above

28. Greenhouse gases in the atmosphere absorb

(a) more visible radiation than infrared

(b) visible radiation and infrared radiation equally

(c) more infrared radiation than visible

(d) neither visible radiation nor infrared

29. Sodium fluoride is added to a 0·10 *M* HF solution. The resultant pH should

(a) increase slightly

(b) increase dramatically

(c) decrease slightly

(d) decrease dramatically

30. You have accidentally touched a highly infectious agent by hand. Which of the following is to be selected as the most logical step based on biosafety regulations?

(a) Sterilize your hand by a short exposure to high-energy gamma radiation

(b) Disinfect your hand with 120 °C steam followed by alcohol

(c) Wash your hand with soap followed by alcohol

(d) Apply co-trimoxazole handwash

PART—B

Answer *any* **forty** questions

31. Competitive inhibitor will change

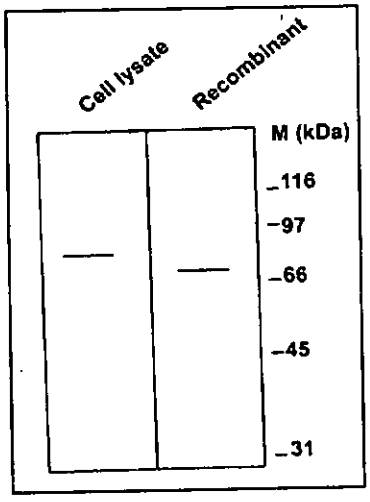
(a) K_m without affecting V_{max}

(b) V_{max} without affecting K_m

(c) both V_{max} and K_m

(d) V_0, V_{max} as well as K_m

32. Western blot analysis of a human protein X (recombinant) purified from bacteria and from mammalian cell lysate shows difference in migration pattern as shown below :



Which of the following is the most likely explanation?

(a) Post-translational modification of the protein present in the cell lysate

(b) Presence of a small contaminating protein along with protein X in the cell lysate

(c) Recombinant protein is truncated

(d) Proteins from cell lysate and recombinant sources run anomalously

33. Familial hypercholesterolemia is a genetic disease by which of the following defects in the gene coding?

(a) LDL receptor

(b) HMG CoA reductase

(c) Squalene monoxygenase

(d) Diacylglycerol acyltransferase

34. A monoclonal antibody binds to G-actin but not to F-actin. Which of the following explanations is most logical?

(a) The epitope in F-actin induces an enzymatic activity inactivating mAb

(b) The epitope in F-actin is surrounded by myosin, thus no mAb interaction is observed

(c) The epitope is likely to be a structure that is buried when G-actin polymerizes to form F-actin

(d) A peptide fragment released from F-actin blocks the mAb interaction with the epitope

35. Which of the following statements is false for the nitric oxide gas?

(a) An intracellular signalling molecule

(b) Deamination of histidine results in nitric oxide production

(c) Stimulates guanylate cyclase to produce cGMP

(d) Can be produced by activated neutrophils

36. Fluorescent imaging for thick living specimen is possible by

(a) phase-contrast microscopy

(b) confocal scanning microscopy

(c) light microscopy

(d) atomic force microscopy

37. The p53 protein is associated with all of the following, ***except***

(a) tumor suppression

(b) programmed cell death

(c) transcription

(d) miRNA synthesis

38. Which of the following is ***not*** a property of cancer cells?

(a) Lack of density-dependent inhibition of cell proliferation

(b) Loss of contact inhibition of movement

(c) Failure to undergo apoptosis

(d) Increased requirement of extracellular growth factors

39. MHC class II molecules are found on

(a) virtually all cells in the body

(b) B cells, dendritic cells and macrophages

(c) virtually all nucleated cells in the body

(d) virally infected cells only

40. Poly A tail of eukaryotic mRNAs originates from

(a) transcription of corresponding poly T region of the respective gene

(b) addition of presynthesized poly A tail to the 3′ end of the primary transcript

(c) sequential addition of A residues at the 3′ end of the primary transcript

(d) a mechanism as yet unknown

41. Which of the following is ***not*** an antibacterial antibiotic?

(a) Tetracycline

(b) Streptomycin

(c) Nystatin

(d) Nalidixic acid

42. DNA replication undergoing in an *E. coli* cell resulted into two circular DNAs interlocked with each other. This may be due to a defective gene encoding, that is

(a) Primase

(b) DNA polymerase I

(c) RNA polymerase

(d) DNA polymerase II

43. Human gut microbiome refers to

(a) microenvironment of the small intestine

(b) the commensal bacteria present in the intestine

(c) biological homeostasis of the gut

(d) microbial infections in the gut

44. If neurons that produce the neurotransmitter dopamine could be generated from stem cells grown in culture, it might be possible to treat people with

(a) Parkinson's disease

(b) Alzheimer's disease

(c) Amyotropic lateral sclerosis (ALS)

(d) brain tumor

45. The innate immune paradigm is based on pattern recognition. The most frequently recognized bacterial 'patterns' recognized by the innate immune system are flagellin, lipoteichoic acid and peptidoglycan. Which of the following statements is most logical?

(a) Gram-negative bacterial mutants which lack lipopolysaccharides (LPS) will evade the innate immune system and prove to be dangerous pathogens

(b) Gram-positive bacterial mutants which lack lipopolysaccharides (LPS) will evade the innate immune system and prove to be dangerous pathogens

(c) Gram-positive bacteria which naturally lack lipopolysaccharides (LPS) are potent pathogens

(d) Bacteria which lack lipopolysaccharides (LPS), flagellin, lipoteichoic acid and peptidoglycan cannot be a pathogen, because they will not survive natural selection

46. The inactive form of the transcription factor NF-kB is located in the cytosol complexed with the inhibitory protein IkBα. During the process of its activation, a mammalian epithelial cell undergoes a massive osmotic shock and is completely dehydrated. Which of the following statements is most logical?

(a) The cell will die because of dehydration

(b) Activated NF-kB will neutralize the osmotic shock and rehydrate the cell

(c) Phosphorylation of the IkBα protein will increase due to the massive osmotic shock

(d) Ubiquitination and dissociation of IkBα from NF-kB will be upregulated in the dried cell

47. Hypoxia (also known as hypoxiation or anoxemia) is a condition in which the body is deprived of adequate oxygen supply. Which of the following statements is most logical?

(a) Since oxygen supply and iron are closely linked, hypoxia modulates genes for iron homeostasis in the body

(b) Since oxygen supply is predominantly mediated by anucleated (lacking nucleus) erythrocytes, hypoxia does not modulate genes for iron homeostasis in the body

(c) Hypoxia does not play any role in inflammation since these pathways are different

(d) Hypoxia results in upregulation of TCA cycle enzymes to produce more ATP

48. A patient with *Streptococcus*-mediated throat infection is suffering from mild fever. The patient undergoes self-medication with paracetamol. Which of the following consequences is most logical?

(a) The patient is cured of infection since paracetamol reduces the fever

(b) The patient is cured of the disease since paracetamol eliminates *Streptococcus* infection

(c) After a period of remission from fever due to paracetamol medication, the infection becomes worse

(d) The patient dies due to analgesic shock

49. During cytokinesis in an animal cell, a constricting ring pinches the dividng cell into two daughter cells. This contractile ring is formed by which of the following structures?

(a) Centrioles

(b) Microtubules

(c) Microfilaments

(d) The spindle apparatus

50. Following a polymerase chain reaction (PCR), you did not observe any expected band. Which of the following facts recorded during troubleshooting is most logical reason for PCR failure?

(a) The dNTP concentration was 200 μM in the final reaction

(b) The primer concentration was 0·2–1 μM in the final reaction

(c) The concentration of magnesium was 0·1 femtomolar in the final reaction

(d) The annealing temperature was 5 °C lower than the T_m of the primer

51. The TLR9 pattern recognition receptor recognizes

(a) CpG motifs

(b) Gram +ve peptidoglycan

(c) Mycobacterial lipoarabinomannan

(d) Gram –ve LPS

52. Listeria is a food-borne pathogen that causes mild gastrointestinal symptoms in most adults but can be fatal to elderly or immunocompromised individuals. Its intracellular movement is powered by

(a) host actin polymerization

(b) flagellum

(c) pseudopodium

(d) pilus

53. Which among the following combinations is correct for the incorporation of amino acid in protein and the utilization of glucose for metabolism?

(a) L-form of amino acid and D-form of glucose

(b) L-form of amino acid and L-form of glucose

(c) D-form of amino acid and L-form of glucose

(d) D-form of amino acid and D-form of glucose

54. Which among the following statements is correct for fruit fly (*D. melanogaster*), roundworm (*C. elegans*), yeast (*S. cerevisiae*) and plant (*A. thaliana*)?

(a) They are all experimental model organisms

(b) Their genomes have been sequenced

(c) Different mutant forms are available to study gene function

(d) All of the above

55. Duchenne Muscular Dystrophies (DMD), the most common type of hereditary muscle wasting disease, is caused by mutation in the gene coding for

(a) actin

(b) myosin

(c) lamin

(d) dystrophin

56. Drugs and xenobiotics are metabolized for clearance from the human body primarily by

(a) cytochrome p450

(b) proteasomal degradation

(c) lysosomal degradation

(d) nuclear receptors

57. Cathedrin, immunoglobulin (Ig) superfamily, integrins and selectins are membrane proteins that constitute the group of

(a) cell adhession molecules

(b) extracellular matrix proteins

(c) tight junction proteins

(d) gap junction proteins

58. Which among the following has the longest half-life?

(a) Tritium (H^3)

(b) Iodine 125

(c) Sulphur 35

(d) Phosphorus 32

59. Typtophan operon in *E. coli* is transcribed from one promoter yielding a long continuous *trp* mRNA. However, the end products are five different proteins. Which of the following statements is logical?

(a) Translation of a long polypeptide followed by proteolytic cleavage to give five proteins

(b) Translation initiates at five different starts sites

(c) Long mRNA is first processed into five smaller mRNAs followed by its translation

(d) None of the above

60. A number of growth factors, hormones and other regulator molecules act by changing the intracellular cAMP. Which of the following signaling molecules does ***not*** use cAMP as the second messenger?

(a) Glucagon

(b) Thyroid-stimulating hormone

(c) Corticotrophin (ACTH)

(d) Steroid

61. Temperature-sensitive mutants are useful tools for studying gene function. A researcher isolated a temperature-sensitive mutant of gene X in *E. coli* following MMS (alkylating agent) mutagenesis technique. When plated, these mutant *E. coli* cells grew at 37 °C but failed to grow at 42 °C. The concept behind this phenomenon is that

(a) the protein X is not expressed at all at the restrictive temperature 42 °C

(b) the protein is expressed but not properly folded at the restrictive temperature 42 °C

(c) the protein is poorly expressed at the restrictive temperature 42 °C

(d) there is a mutation in the corresponding gene that is created at the restrictive temperature 42 °C

62. Anti-rabbit alkaline phosphatase monoclonal antibody refers to

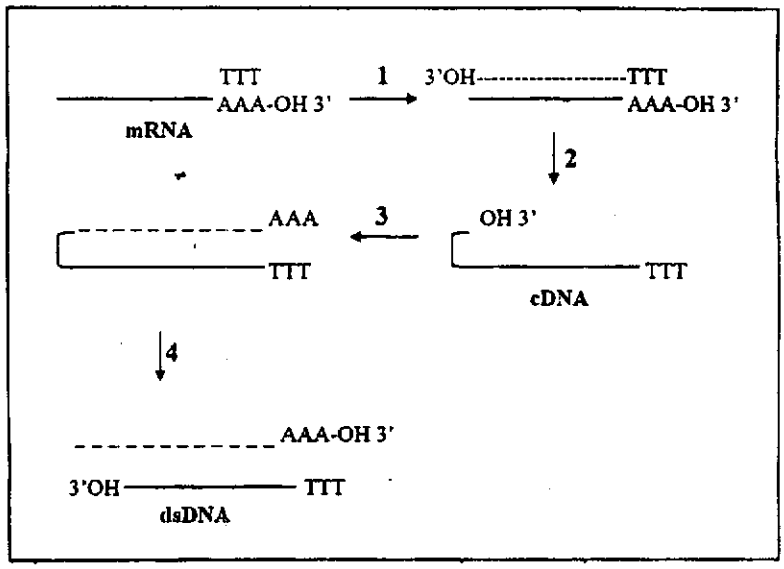
(a) a monoclonal antibody against a rabbit protein

(b) an antibody against alkaline phosphatase

(c) an antibody against a specific epitope

(d) All of the above

63. The reactions below show the formation of dsDNA from mRNA :



1, 2, 3 and 4 in the reaction stand for

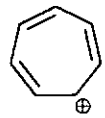
(a) reverse transcriptase, alkali treatment, DNA polymerase, S1 nuclease

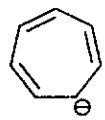
(b) RNA polymerase, reverse transcriptase, DNA polymerase, S1 nuclease

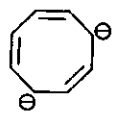
(c) reverse transcriptase, acid treatment, DNA polymerase, endonuclease

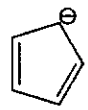
(d) RNA polymerase, alkali treatment, DNA polymerase, endonuclease

64. Which of the following compounds is ***not*** aromatic?

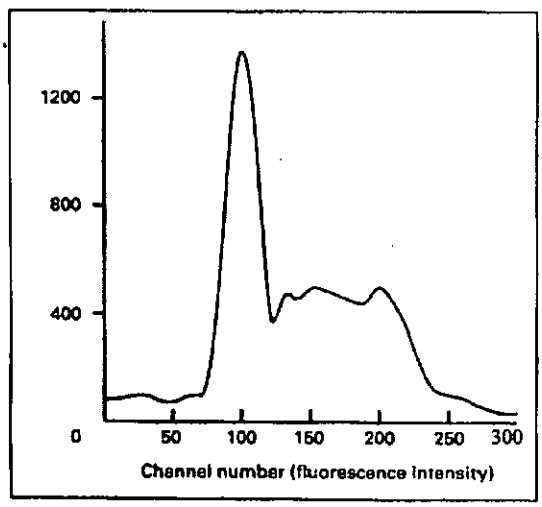
(a) 

(b) 

(c) 

(d) 

65. Different population of cells in G1, G2/M and S cell cycle stages are found following the analysis of image obtained from fluorescence activated cell sorter (FACS) analysis of unsynchronized cultured mammalian cells. In the following figure, *X*-axis shows the number of cells and *Y*-axis shows the channel numbers (fluorescence intensity) :



Which of the following statements is true?

(a) Channel 100 corresponds to G2/M phase cells

(b) Channel 150 corresponds to S phase cells

(c) Channel 200 corresponds to G1 phase cells

(d) Channel 250 corresponds to apoptotic cells

66. In terms of potency, a fertilized egg at 4–8 cell stage can be best considered to be

(a) omnipotent

(b) totipotent

(c) pluripotent

(d) semipotent

67. Which of the following is the reason for the presence of histidine at the active site of enzymes?

(a) It is the only polar residue with a five-member ring at the side chain

(b) It can form salt bridges

(c) Its pK_a is close to 7

(d) It can interact with the substrates better than any other residue

68. Fetal bovine serum is widely used in cell culture, because it contains

(a) high levels of maternal antibodies that protect cultured cells

(b) natural antibiotics that stop contaminations

(c) growth factors and vitamins

(d) All of the above

69. Multiple sclerosis (MS) is usually characterized by spasms and weakness in one or more limbs, bladder dysfunction, local sensory losses and visual disturbances. This disorder is caused by

(a) patchy loss of myelin in the areas of brain and spinal cord

(b) lack of neurotransmitter production

(c) rapid conduction of action potential by the neurons

(d) loss of Na^+ channels from the nodes

70. The detergent sodium dodecyl sulphate is used in SDS-PAGE. If it is not used during protein electrophoresis

(a) proteins will not migrate in the polyacrylamide gel

(b) proteins will migrate in the polyacrylamide gel

(c) the polyacrylamide gel will crack due to heat

(d) All of the above

71. Regression analysis is a statistical process for estimating the relationships among variables. Which of the following is true?

(a) Nonlinear regression analysis is applied when the model function is not linear in the parameters and the sum of squares must be minimized by an iterative procedure

(b) Parameters of a regression model are usually estimated using the method of least squares

(c) Nonparametric regression requires a large number of observations and is computationally intensive

(d) All of the above

72. Clustal is a widely used multiple sequence alignment computer program that

(a) accepts sequences in FASTA formats

(b) allows pairwise sequence alignments

(c) may be used to create a guide tree

(d) All of the above

73. Fibroblasts are important for

(a) maintaining the structural integrity of connective tissues

(b) secreting precursors of the extracellular matrix

(c) producing collagen and glycosaminoglycans

(d) All of the above

74. The maximum proteolysis in the lysosome pathway occurs in

(a) early endosome

(b) late endosome

(c) lysosome

(d) cytoplasm

75. Which among the following act(s) as the first line of defense against infections?

(a) Claudins and Defensins

(b) Colicin and Reutericin

(c) Interleukin-10

(d) All of the above

76. Which of the following is a seven-transmembrane receptor?

(a) Insulin receptor

(b) β-adrenergic receptor

(c) Glucocorticoid receptor

(d) Prolactin receptor

77. cGMP phosphodiesterase-5 found predominantly in the retina of the eye catalyses the conversion of

(a) cAMP to cGMP

(b) GTP to cGMP

(c) cGMP to GMP

(d) cGMP to GDP

78. Each of the following cells is named after the discoverer. Which of the following cells are specialized macrophages located in the liver lining the walls of the sinusoids?

(a) Purkinje cells

(b) Sertoli's cells

(c) Leydig's cells

(d) Kupffer's cells

79. A number of growth factors, hormones and other regulator molecules act by changing the intracellular cAMP. Which of the following signalling molecules does ***not*** use cAMP as the second messenger?

(a) Glucagon

(b) Thyroid-stimulating hormone

(c) Corticotropin (ACTH)

(d) Steroid

80. A person with type-I diabetes

(a) produces insulin but lacks functional insulin receptors

(b) can control sugar level with diet and exercise

(c) lacks β-cells in pancreas

(d) All of the above

81. The bacterium *Helicobacter pylori*

(a) is a major cause of peptic ulcers

(b) infects more people worldwide than HIV

(c) uses type IV secretion system for pathogenesis

(d) All of the above

82. Which of the following is an antifungal drug and is also used intravenously for treating systemic fungal infection?

(a) Amphotericin B

(b) Gentamicin

(c) Kanamycin

(d) Neomycin

83. During which stages of mitosis, the nuclear membrane disappears and reappears?

(a) Interphase and anaphase respectively

(b) Metaphase and telophase respectively

(c) Prophase and cytokinesis respectively

(d) Prophase and telophase respectively

84. Hormone Replacement Therapy (HRT) refers to

(a) hormone supplementation to treat endocrine-related cancers

(b) abuse of anabolic hormones in sports

(c) hormone supplementation due to lack of naturally occurring hormone

(d) supplementation of a synthetic peptide hormone

85. CD1

(a) is encoded in the MHC region

(b) structurally is most similar to MHC class II molecules

(c) can present antigens to gamma delta, but not alpha beta, T cells

(d) can present lipid antigens

86. In C18 'reversed phase chromatography' for proteins

(a) the C18 binds to the hydrophobic part of a protein

(b) the mobile phase usually contains an acidic ion-pairing reagent

(c) the stationary phase is hydrophobic

(d) All of the above

87. Patients are died in diphtheria typically due to production of a toxin that

(a) kills lung epithelial tissue, leaving behind an impermeable membrane

(b) blocks conversion of fibrinogen to fibrin, promoting internal bleeding

(c) stimulates T_H cells to overreact and producing excess cytokines

(d) causing fluid retention, and thus pneumonia in the lungs

88. Which of the following factors is absent in intracellular nuclear receptors?

(a) Zinc fingers

(b) Leucine zipper

(c) Transactivation domain

(d) Nuclear localization signal

89. The production of leukotriene inflammatory stimulators results primarily from the breakdown of membrane phospholipids that results in

(a) production of DAG and PIP

(b) production of arachidonic acid

(c) release of Ca^{2+} from the endoplasmic reticulum

(d) activation of adenylate cyclase

90. One of the principal functions of complement is to

(a) release histamine

(b) bind antibodies attached to cell surfaces leading to cell lysis

(c) help phagocytosis

(d) cross-link allergens

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