ENTRANCE EXAMINATION FOR ADMISSION, MAY 2012.

M.Sc. (COMPUTATIONAL BIOLOGY)

COURSE CODE : 310

Register Number :

Signature of the Invigilator
(with date)

COURSE CODE : 310

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 of the 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. The odometer of a new automobile functions improperly and registers only 2 miles for every 3 miles driven. If the odometer indicates 48 miles, how many miles has the automobile actually been driven?

   (A)   24   (B)   72   (C)   64   (D)   32

2. Three consecutive integers are listed in increasing order. If their sum is 102, what is the second integer in the list?

   (A)   28   (B)   34   (C)   29   (D)   33

3. If x is an integer and $2 < x < 7$, how many different triangles are there with sides of lengths 2, 7 and x?

   (A)   one   (B)   two   (C)   three   (D)   four

4. The sum of four consecutive odd integers w, x, y and z is 24. What is the median of the set $\{w, x, y, z, 24\}$?

   (A)   3   (B)   5   (C)   7   (D)   9

5. The length of a rectangle is four times its width. If the perimeter of the rectangle is 40 cm, what is the area?

   (A)   16 cm²   (B)   20 cm²   (C)   40 cm²   (D)   64 cm²

6. If $3x^2 = 4y = 12$, what is the value of $x^2 y$?

   (A)   36   (B)   24   (C)   12   (D)   2

7. When 1.783 is rounded to nearest whole number, the result is how much greater than when 1.783 is rounded to the nearest tenth?

   (A)   0.2   (B)   0.3   (C)   0.4   (D)   0.5

8.
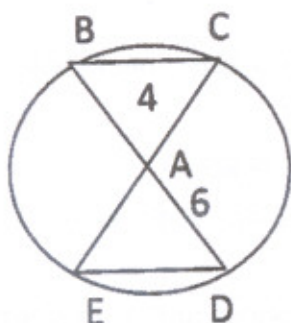
   In the figure above, point A is the centre of the circle and segments BD and CE are diameters and BC = 4, AD=6. Which of the following is true?

   (A)   CA > 6   (B)   CA = 4   (C)   ED = 4   (D)   ED > 4

9. A machine can fill 24 cartons in 1 hour. At this rate, how many cartons can the machine fill in 5 minutes?

   (A) Two (B) Three (C) Five (D) Six

10. If $(x - 2)^2 = 25$ and $x < 0$, what is the value of x?

    (A) −7 (B) −5 (C) −3 (D) −2

11. The diameter of the circle A is 3 times the diameter of the circle B. What is the ratio of the radius of circle A to the radius of circle B?

    (A) 6:1 (B) 3:4 (C) 3:2 (D) 3:1

12. If $k + n < k$, which of the following must be true?

    (A) k = 0 (B) k < 0 (C) n < 0 (D) n = 0

13. Ram has built houses for 5 years less than twice as long as Keshav has. If Keshav has built houses for n years, which of the following expressions represents the number of years that Ram has built houses?

    (A) n − 5 (B) n + 5 (C) 2n − 5 (D) 2n + 5

14. There are exactly 9 buttons in a bag. There are 4 blue buttons and 3 red buttons and the rest are yellow. If one button is drawn at random from the bag, what is the probability that the button is yellow?

    (A) 1/9 (B) 1/7 (C) 2/9 (D) 2/7

15. National University plans on accepting a total of 1,000 students for next year's class. Of the 800 students accepted so far, 60 percent are female and 40 percent are male. How many of the remaining students to be accepted must be male in order for half of the total number of students accepted to be male?

    (A) 100 (B) 120 (C) 160 (D) 180

16. A hotel charges a service fee of Rs. 1.00 per day to use its copy machine. In addition there is a charge of Rs. 0.10 per copy made. Which of the following represents the total charge, in Rupees to use this copy machine to make n copies in one day?

    (A) 0.90 n (B) 1.10 n (C) 1.00 + 10 n (D) 1.00 + 0.10 n

17. For all integers k, let k* be defined by $k* = k(k − 1)$. What is the value of 5*?

    (A) 9 (B) 20 (C) 24 (D) 25

18. If k is a constant and $2x + 5 = 3kx + 5$ for all values of x, what is the value of k?

    (A) 5 (B) 3 (C) 2/3 (D) 3/2

19. In the xy-plane, the line with equation $y = 5x − 10$ crosses the x-axis at the point with coordinates (a, b) what is the value of a?

    (A) −10 (B) −2 (C) 0 (D) 2

3   310

20. If $3x + 9 = 5x + 1$, what is the value of x?
    (A) 1   (B) 2   (C) 3   (D) 4

21. Binary Coded Decimal is defined as
    (A) Ten bits providing ten different values
    (B) Four bits providing ten different values
    (C) Four bits providing ten numeric values
    (D) Five bits providing ten numeric values

22. The location where input/output devices are connected to the computer is known as
    (A) mouse   (B) keyboard   (C) port   (D) bus

23. What is the hexadecimal equivalent of decimal number 566?
    (A) 1FF   (B) 3FF   (C) FF3   (D) FF1

24. The heart of any computer system is
    (A) Memory   (B) CPU   (C) I/O unit   (D) Hard disk

25. Which device can draw continuous lines?
    (A) Plotter   (B) Daisy wheel
    (C) Impact printer   (D) Chain printer

26. In a Web Browser the location of the desired file in a server is be given by
    (A) File name   (B) Path in a URL
    (C) Address   (D) Pointer

27. The file system used in windows is
    (A) Hierarchical   (B) File Allocation Table
    (C) Special purpose   (D) Networking

28. Manipulation and Analysis of data arranged in rows and columns can be easily done with
    (A) Word processing packages   (B) Financial packages
    (C) Spreadsheet packages   (D) Automation packages

29. Which one of the following is not true about linux? It is
    (A) An operating system   (B) An open source software
    (C) Unix like operating system   (D) An Application software

30. One megabyte is equal to
    (A) 1000 kilo bytes   (B) 1024 kilo bytes
    (C) 1024 bytes   (D) 100 kilo bytes

310   4

31. The write-once optical storage media is
    (A) Pen drive
    (B) Magneto-optical disk
    (C) Magnetic tape
    (D) CD-ROM disk

32. Each spreadsheet file is called a workbook because it
    (A) contain text and data
    (B) can be modified
    (C) contain many sheets including worksheets and chart sheets
    (D) contain a book

33. In a database, the key that uniquely identifies each record is
    (A) Field key
    (B) Primary key
    (C) Foreign key
    (D) Unique key

34. Boolean arithmetic is a
    (A) way to express logic statements in a mathematical equivalent format
    (B) very difficult calculation used in astronomy
    (C) fast way to solve the problems around the house
    (D) a way to disapprove things

35. The most significant digit in the decimal number 1234 is
    (A) 1
    (B) 2
    (C) 3
    (D) 4

36. Which of the following is not an output device in a computer?
    (A) Plotter
    (B) Printer
    (C) Visual Display Unit
    (D) Mouse

37. A program is
    (A) a collection of raw data for computer
    (B) a set of instructions given to the computer
    (C) an output produced
    (D) a control signal

38. Which one of the following is part of the CPU?
    (A) Compiler
    (B) Control unit
    (C) Interpreter
    (D) Memory

39. Uniform resource locator is a web page
    (A) hyperlink
    (B) software to find the page
    (C) unique address
    (D) browser

40. The web uses HTTP to support

(A) electronics document

(B) word document

(C) hypertext document

(D) spread sheet document

41. A man who has haemophilia and a woman who does not have haemophilia have a daughter who has haemophilia. Haemophilia is a recessive condition, and the gene is located on the X chromosome. Which of the following can be concluded?

(A) The mother is a carrier for haemophilia

(B) Haemophilia is not a sex-linked trait

(C) Crossing over has occurred

(D) All subsequent daughters of this couple will have haemophilia

42. What happens to the red blood cells that have been added to a flask of saturated NaCl solution?

(A) The cells will undergo mitosis

(B) The cells will increase in volume

(C) The cells will lose water

(D) The cells are hypertonic relative to the surrounding medium

43. Most replication of DNA takes place during which of the following stages of the cell cycle?

(A) S phase

(B) G2 phase

(C) G1 phase

(D) Metaphase

44. The way in which an enzyme and its specific substrate interact is best described by the

(A) fluid-mosaic model

(B) induced-fit model

(C) oparin hypothesis

(D) competitive-exclusion principle

45. Virus particle capable of infection is

(A) microphage

(B) bacteriophage

(C) viroid

(D) virions

46. Which of the following individuals is most fit in evolutionary terms?

(A) A 100-year old man with no offspring

(B) A woman of 40 with seven adult offspring

(C) A woman of 80 with one adult offspring

(D) A child who is not infected with any of the childhood diseases

47. The pathogenic organisms of an infected person are destroyed by the action of
    (A) Leucocytes
    (B) Erythrocytes
    (C) Blood platelets
    (D) Blood plasma

48. Most human pathogens prefer temperatures near that of the human body. They are called
    (A) psychrophiles
    (B) halophiles
    (C) mesophiles
    (D) thermophiles

49. The cartilaginous framework which avoids the food material to enter into the larynx is
    (A) Glottis
    (B) Diaphragm
    (C) Epiglottis
    (D) Trachea

50. Cellular proteins destined for secretion are sorted and packaged in the
    (A) lysosomes
    (B) endoplasmic reticulum
    (C) endosomes
    (D) golgi network

51. Which of the following types of bonds or interactions are least likely to be involved in stabilizing the three-dimensional folding of most proteins?
    (A) Hydrogen bonds
    (B) Disulphide bonds
    (C) Ester bonds
    (D) Electrostatic bonds

52. The term cistorn, muton and recon were introduced by
    (A) Watson and Crick
    (B) Morgan
    (C) S. Benzer
    (D) Meselson

53. Extranuclear genetic material is found in
    (A) Plastid and nucleus
    (B) Nucleus and cytoplasm
    (C) Mitochondria and plastids
    (D) Mitochondria and nucleus

54. A technique of using very small metal particles coated with desired gene in the gene transfer is called
    (A) Liposome
    (B) Electroporation
    (C) Microinjection
    (D) Biolistics

55. All of the following compounds are Capable of forming hydrogen bonds with water except
    (A) methanol
    (B) acetamide
    (C) methyl acetate
    (D) hexane

7   310

56. Reverse transcriptase is
    (A) RNA dependent RNA polymerase
    (B) RNA dependent DNA polymerase
    (C) DNA dependent RNA polymerase
    (D) DNA dependent DNA polymerase

57. The conversion of prothrombin to thrombin in an undamaged blood vessel is prevented by
    (A) Fibrinogen
    (B) Calcium ions
    (C) Heparin
    (D) Thromboplastin

58. The way in which an enzyme and its specific substrate interact is best described by the
    (A) fluid-mosaic model
    (B) induced-fit model
    (C) oparin hypothesis
    (D) lyon hypothesis

59. In order for an animal that was cloned from its mother to grow and develop normally, it must have received
    (A) half of its mother's DNA sequences
    (B) half of its father's DNA sequences
    (C) all if its mother's DNA sequences
    (D) all if its father's DNA sequences

60. Iodine deficiency causes the disease
    (A) Goiter
    (B) Scurvy
    (C) Kwashiorkar
    (D) Anaemia

61. CMOS logic is
    (A) Resistor controlled
    (B) Sound controlled
    (C) Voltage controlled
    (D) Current controlled

62. A 10:1 transformer has an input of 110 volts A.C. What is the output?
    (A) 110 volts DC
    (B) 11 volts AC
    (C) 11 volts DC
    (D) 11 amps AC

63. Eyeglasses, magnifying glasses and optical microscope depend for their operation primarily on the phenomenon of
    (A) reflection
    (B) refraction
    (C) interference
    (D) dispersion

64. All of the following scientists made significant contributions to the field of nuclear physics EXCEPT
    (A) Galileo
    (B) Rutherford
    (C) Curie
    (D) Becquerel

65. A worker hits a metal pipe with a hammer. The ratio of the intensity of loudness as heard by people standing 100 meters away from the worker to the intensity as heard by people standing 200 meters away from the worker is

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

66. An electrically charged, insulated metal rod is observed to attract a neutral pith ball and, after contact is made, to repel the ball. Which of the following can be concluded about the rod?

(A) The rod had a positive charge before contact and negative charge after contact

(B) The rod had a negative charge before contact and positive charge after contact

(C) The rod's charge before and after contact had the same sign

(D) The rod had a charge before contact, but no charge after contact

67. The experimental study of the photoelectric effect and its analysis by Einstein confirmed the assumption of the

(A) photon effect of light

(B) crystal structure of materials

(C) energy-mass relationship of special relativity

(D) discrete charge on the electron

68. A child on a swing can greatly increase the amplitude of the swing's motion by pumping at the natural frequency of the swing. This is an example of which of the following?

(A) Newton's first law of motion   (B) Newton's third law of motion

(C) Resonance   (D) Conservation of momentum

69. Two steel pins sticking to the end a bar magnet do not hang vertically because

(A) of the spherical shapes of their heads

(B) their heads are not properly rounded

(C) like poles repel

(D) are made up of magnetic substance

70. The resolution of electron microscope is higher than optical microscope because of

(A) greater wavelength of electrons   (B) smaller wavelength of electrons

(C) larger aperture   (D) smaller focal length of the lens

71. A laboratory equipment commonly used to transfer an exact volume of liquid from one container to another is

(A) Funnel   (B) Balance

(C) Pipette   (D) Barometer

72. The energy change accompanying the synthesis of a compound from its elements in their standard states is
    (A) Electro negativity
    (B) Activation energy
    (C) Heat of formation
    (D) Reduction potential

73. Which one of the following pairs of substances are isotopes?
    (A) NH_3 and N_2H_4
    (B) ^{16}O and ^{17}O
    (C) O_2 and O_3
    (D) NH_4Cl and NH_4NO_3

74. Which one of the following pairs of substances are strong electrolytes in aqueous solution?
    (A) NH_3 and N_2H_4
    (B) ^{16}O and ^{17}O
    (C) O_2 and O_3
    (D) NH_4Cl and NH_4NO_3

75. Which one of the following subshell contains one pair of electrons in the ground – state electron configuration of the lithium atom?
    (A) 1s
    (B) 2s
    (C) 3s
    (D) 3p

76. Which one of the following gas is a product of the incomplete combustion of hydrocarbons?
    (A) O_2
    (B) CO
    (C) Cl_2
    (D) SO_2

77. A 40.0 g sample of a hydrated salt was heated until all the water was driven off. The mass of the solid remaining was 32.0 g. What was the percent of water by mass in the original sample?
    (A) 13.0%
    (B) 20.0%
    (C) 25.0%
    (D) 75.0%

78. In which of the following compounds does nitrogen have an oxidation number of +5?
    (A) HNO_3
    (B) N_2
    (C) NO_2
    (D) N_2O

79. The element carbon is the chief constituent of all of the following EXCEPT
    (A) coal
    (B) glass
    (C) diamond
    (D) graphite

80. The primary intermolecular attraction that makes it possible to liquefy hydrogen gas is called
    (A) London dispersion forces
    (B) Covalent bonding
    (C) Dipole-dipole interaction
    (D) Ionic bonding

81. Which of the following terms gives a qualitative rather than a quantitative description of the concentration of a solution?
    (A) Molality
    (B) Mass percentage
    (C) Dilute
    (D) Mole fraction

10

82. An active ingredient in common household bleach solution is most likely to be which of the following?

(A) NaCl

(B) NaClO

(C) NaHCO₃

(D) Na₂SO₄

83. The number of neutrons in the nucleus of an atom of mass A and atomic number Z is given by

(A) $A - Z$

(B) $A + Z$

(C) A

(D) Z

84. Which among the following is an exothermic change?

(A) Dissolution of calcium oxide in water

(B) Dissolving ammonium nitrate in water

(C) Formation of nitric oxide from nitrogen and oxygen

(D) Dissociation of water

85. Ethylene (C_2H_4) burns in oxygen to form CO_2 and H_2O. The volume of ethylene and oxygen are in the ratio

(A) 1:1

(B) 1:2

(C) 1:3

(D) 2:3

86. Which of following gases diffuses most slowly?

(A) CO_2

(B) Hydrogen

(C) SO_2

(D) C_2H_6

87. β-particles are particles with

(A) unit mass and unit negative charge

(B) no mass and no negative charge

(C) negligible mass and unit negative charge

(D) 4 units of mass and two positive charges

88. Which of the following carbon compounds is used as a fire-extinguisher?

(A) Carbon disulphide

(B) Carbon tetrachloride

(C) Chloroform

(D) Methylene chloride

89. The compound used in photography is

(A) copper sulphate

(B) ammonium dichromate

(C) magnesium sulphate

(D) sodium thiosulphate

90. The chemical that imparts red color to glass is

(A) FeO

(B) Cu_2O

(C) Mn_3O_4

(D) CdS

91. Chloroform used as anaesthetic should be preserved in the dark in tightly stoppered bottles, otherwise
    (A) it becomes colored
    (B) it gets evaporated in air
    (C) it gets oxidized to phosgene
    (D) it gets decomposed to chloropicrin

92. The most electronegative element among the following is
    (A) sodium
    (B) oxygen
    (C) fluorine
    (D) bromium

93. The gas present in the stratosphere which filters out some of the sun's ultraviolet light and provides an effective shield against radiation damage to living things is
    (A) methane
    (B) ozone
    (C) oxygen
    (D) helium

94. The metal that is used as a catalyst in the hydrogenation of oils is
    (A) Ni
    (B) Pb
    (C) Cu
    (D) Pt

95. The main use of salt in the diet is to
    (A) make the taste of food better
    (B) produce in small amounts the hydrochloric acid required for the digestion of food
    (C) ease the process of cooking
    (D) increase the solubility of food particles in water

96. The most malleable metal is
    (A) platinum
    (B) iron
    (C) silver
    (D) gold

97. The gas used in the manufacture of vanaspati from vegetable oil is
    (A) hydrogen
    (B) oxygen
    (C) carbon dioxide
    (D) nitrogen

98. The following are the half lives of four active isotopes. Which one of the following is the most dangerous to handle?
    (A) 1 billion years
    (B) 200 years
    (C) 0.01 minute
    (D) 20 days

99. The molecule which has the highest percentage of ionic character among the following is
    (A) HI
    (B) HF
    (C) HCl
    (D) HBr

100. The formula C_6H_5-CO-CH_3 represents
    (A) Acetone
    (B) Acetic acid
    (C) Acetophenone
    (D) Phenyl acetate