ENTRANCE EXAMINATION : ACADEMIC SESSION JANUARY 2020

PROGRAM: PhD (Bioengineering)

Time: 90 minutes   **Max. Marks: 100**

(Select the most appropriate answer)
(There are no negative marks for wrong answers)

1. Name of the Launch Vehicle used in **Chandrayaan-2**
   - A. ROVER vehicle
   - B. PSLV
   - C. GSLV
   - D. ORBITOR

2. Symbol for S. I. Unit of temperature
   - A. $^\circ$C
   - B. K
   - C. $^\circ$F
   - D. All

3. 10^{-12} is represented by:
   - A. pico
   - B. tera
   - C. femto
   - D. peta

4. ISO stands for
   - A. Indian Standards Organization
   - B. International Organization for Standardization
   - C. International Standard Organization
   - D. Indian Organization for Standardization

5. Under the constitutional provisions, which authority has the power regarding the formation of new states or altering the boundaries of existing states?
   - A. Election Commission of India
   - B. Delimitation Commission of India
   - C. President of India
   - D. Parliament

6. Which of the following is depicted in a Two thousand rupees Indian currency note?
   - A. Rani ki vav
   - B. Mars planet
   - C. Chandrayaan
   - D. Sanchi Stupa

7. Who is the chairman of the Chiefs of Staff Committee?
   - A. General Bikram Singh
   - B. General Bipin Rawat
   - C. Admiral Karambir Singh
   - D. Air Chief Marshal Rakesh Kumar Singh Bhaduria

8. International Astronomical Union named a minor planet 2006 VP32 (number -300128), between Mars and Jupiter after the following Indian classical singer:
   - A. Pandit Jasraj
   - B. Pandit Ravi Shankar
   - C. Pandit Tansen
   - D. None of the above

9. 2020 Breakthrough prize goes to Scientists who first captured the image of
   A. Pentacene molecule
   B. Black hole
   C. A rare form of carbon monoxide in the dust and gas disc around a young star.
   D. Interstellar comet

10. Which among these are brain boosting nutrients?
    A. Essential fatty acids
    B. Vitamin C and B-complex
    C. Amino acid
    D. All of the above

11. Malala Yousafzai- an activist for education of women and children is also the youngest Nobel laureate. She hails from:
    A. Iran   B. Syria
    C. Jordan   D. Pakistan

12. The following is a palindrome:
    A. DIVIDED   B. MALAYALAM
    C. AQUA   D. DRESSED

13. Who is the ace Indian shuttler who is the first Indian to win Badminton World Championships gold:
    A. Saina Nehwal
    B. P.V. Sindhu
    C. Sania Mirza
    D. Mithali Raj

14. The following was demoted to the status of a 'dwarf planet' in 2006:
    A. Uranus   B. Mercury
    C. Pluto   D. Neptune

15. The following is the state bird of Kerala:
    A. Great hornbill
    B. Rufous treepie
    C. Jungle babbler
    D. Kingfisher

16. What does UNESCO stand for?
    A. United Nations Economic, Socio-Cultural Organization
    B. United Nations Educational, Scientific and Cultural Organization
    C. United Nations Employment, Societal and Corporate Organization
    D. None of the above

17. National Science Day is celebrated in India on 28 Feb every year in the memory of:
    A. Sir C.V. Raman
    B. Dr. A.P.J. Abdul Kalam
    C. Dr. Har Gobind Khorana
    D. Dr. Srinivasa Ramanujan

18. India's highest civilian award Bharat Ratna for the year 2019 has been awarded to:
    A. Bhupen Hazarika
    B. Pranab Mukherjee
    C. Nanaji Deshmukh
    D. All of the above

19. ISRO's mission Chandrayaan-2 has a lander named:
    A. Pragyan
    B. Vikram
    C. Dhawan
    D. Sivan

20. Which of the following article of Constitution of India has been revoked recently?
    A. Article 330
    B. Article 350
    C. Article 370
    D. Article 390

21. Pulitzer price established in
    A. 1917
    B. 1922
    C. 1928
    D. 1918

22. Logo for World Wide Fund for nature
    A. Deer
    B. Panda
    C. Camel
    D. Lion

23. The Flying Sikh of India
    A. Mohinder Singh
    B. Joginder Singh
    C. Yuvarag Singh
    D. Milkha singh

24. ISRO's most powerful rocket to date
    A. PSLV-XL
    B. GSLV Mk-III
    C. GSLV-Mach2
    D. None of the above

25. Spaceflight that first landed humans on the Moon
    A. Apollo 11
    B. Apollo 13
    C. Apollo 8
    D. Apollo 9

26. Manesh, the son of Arun is married to Sibi, whose sister Jisha is married to Hari, the brother of Manesh. How is Jisha related to Arun?
    A. Daughter in law
    B. Cousin
    C. Sister
    D. Sister in law

27. The year in which the currency symbol of Indian rupee was adopted?
    A. 2000
    B. 2010
    C. 2020
    D. None of the above

28. First Indian to Preside over the International Court of Justice?
    A. Nagendra Singh
    B. Dr. Hardayal
    C. Neeru Chadha
    D. None of the Above

29. Nehru Cup was associated with:
    A. Snake Boat Race
    B. Football
    C. Hockey
    D. Swimming

30. Founder of the Red Cross was?
    A. Henry Durant
    B. Trigwilly H
    C. Baden Powell
    D. Frederick Parasse

31. What is the current population of India?
    A. 107 crores
    B. 10.7 crores
    C. 15.7 crores
    D. 137 crores

32. Frances H. Arnold won the Nobel Prize in 2018 for:
    A. Chemistry
    B. Physics
    C. Economic Science
    D. Medicine

33. The present Governor of Kerala
    A. P Sathasivam
    B. R. L. Bhatia
    C. Sheila Dikshit
    D. Arif Mohammad Khan

34. A cuboid has six sides of different colours. The red side is opposite to black. The blue side is adjacent to white. The brown side is adjacent to blue. The red side is face down. Which one of the following would be the opposite to brown?
    A. Red   B. Black
    C. White   D. Blue

35. Mangalyaan intend for
    A. Jupiter Orbiter Mission
    B. Mars Orbiter Mission
    C. Mercury Orbiter Mission
    D. Saturn Orbiter Mission

36. Nanomaterials are materials of which a single unit is sized:
    A. < 100nm
    B. < 1000nm
    C. < 10nm
    D. < 1nm

37. Of all the 3-digit numbers given below which one is divisible by 6?
    A. 149
    B. 150
    C. 151
    D. 166

38. Distance between two stations, X and Y is 778 km. A train covers the journey from X to Y at 84 Km per hour and returns back to X with a uniform speed of 56 Km per hour. Find the average speed of the train during the whole journey?
    A. 67.0 Km/hr.
    B. 67.2 Km/hr.
    C. 69.0 Km/hr.
    D. 69.2 Km/hr.

39. The sum of three numbers is 98. If the ratio of the first to second is 2:3 and that of the second to the third is 5:8, then the second number is?
    A. 20
    B. 30
    C. 48
    D. 58

40. When you reverse the age of the father you will get the age of the son. One year ago the age of the father was twice that of son's age. What are the current ages of son and father?
    A. 37 and 73
    B. 24 and 42
    C. 13 and 31
    D. 15 and 51

41. A medical device is a product such as .... that is intended for use in the diagnosis, prevention and treatment of diseases or other medical conditions.
    A. Instrument/ machine
    B. implant
    C. in vitro reagent
    D. All of the above

42. Amplifiers used to increase the amplitude level of electrophysiological signals are known as:
    A. Radio frequency amplifier
    B. Audio frequency amplifier
    C. Physicochemical amplifier
    D. Bioamplifier

43. Among medical devices, combination products can be combination of
    A. medical device and drug
    B. medical device and biologic
    C. medical device and drug and biologic
    D. All the above

44. General requirements for electrical safety and essential performance of medical electrical equipment is provided in:
    A. IEC 60601
    B. ISO 60061
    C. ISO 14971
    D. ISO 13485

45. Biochemical events are converted to measurable signals by:
    A. Transducer
    B. Amplifier
    C. Op-amp
    D. Transistors

46. Identify the essential components in biosensors:
    A. Biological element only
    B. Biological element & Transducer
    C. Biological element & amplifier
    D. Bioamplifiers

47. The principal ion that is not involved with the phenomena of producing cell potentials is:
    A. Sodium
    B. Potassium
    C. Chlorine
    D. Magnesium

48. The resistance Rt of a metallic conductor at any temperature 't' is given by:
    A. $Rt = Ro(1+\alpha t)$
    B. $Rt = Ro(1-\alpha t)$
    C. $Rt = Ro(\alpha t-1)$
    D. $Rt = Ro(10+\alpha t)$

49. The material used in limb surface electrode is:
    A. Copper
    B. Silver
    C. Gold
    D. Platinum

50. Amplitude of human EEG signal is about (10 to 100) ......, when measured from the scalp
    A. nV
    B. mV
    C. µV
    D. pV

51. The high temperature phase of iron-carbon phase diagram, present in the temperature range of 912-1394°C is:
    A. Austenite
    B. Ferrite
    C. Cementite
    D. Martensite

52. The following is not a mechanism of heat transfer:
    A. Radiation
    B. Induction
    C. Conduction
    D. Convection

53. Near net manufacturing produces components that are close to the final shape and size, requiring minimal machining. The following is not such a process:
    A. Additive layer manufacturing
    B. Closed-die forging
    C. Metal injection molding
    D. Electrodischarge machining

54. The Geiger Counter has high quantum efficiency in the wavelength ($\bar{A}$) range:
    A. 0.2 to 0.3
    B. 0.4 to 0.5
    C. 1.5 to 2.1
    D. 6 to 7

55. A laser beam (λ = 632.8 nm) having a divergence of 1 mrad is directed towards the moon at a distance of approximately 4×10^5 km. The beam would have spread to a diameter of:
    A. 400 km
    B. 200 km
    C. 100 km
    D. 4 km

56. The energy required to remove an electron from an isolated neutral atom is its:
    A. Electron affinity
    B. Fermi energy
    C. Ionization potential
    D. Bond energy

57. Wavelength of light used in Newton's rings experiment when radius of curvature of plano-convex lens is 1 m and diameters of nth and $(n+14)^{th}$ rings are 4.2 mm and 7.0 mm is:
    A. 3600 A
    B. 4600 A
    C. 5600 A
    D. 6600 A

58. In a particular sample, the absorbance is 0.6 for a molar concentration of the solute of 1.0×10^{-4} M and a 2.0 cm path length, the molar absorptivity (per mol per cm) is:
    A. 1.2
    B. 1200
    C. 3000
    D. 3×10^{-4}

59. The most used He-Ne laser has a wavelength of:
    A. 0.5 µM
    B. 0.633 µM
    C. 0.70 µM
    D. 0.80 µM

60. Which of the following polymers would you expect to have the best barrier properties (i.e., provide the best barrier to diffusion of a gas):
    A. Atactic polystyrene
    B. A random ethylene/propylene copolymer (50/50) composition.
    C. Low density polyethylene
    D. High density polyethylene

61. Two crossed polarizers are placed in the part of light beam. The light output is:
    A. Zero
    B. Plane polarized
    C. Circularly polarized
    D. Elliptically polarized

62. The electrical resistivity of copper and aluminum are in the range of:
    A. 1×10^{-8} to 3×10^{-8} Ω.m
    B. 1×10^{-6} to 3×10^{-6} Ω.m
    C. 1×10^{8} to 3×10^{8} Ω.m
    D. 1×10^{6} to 3×10^{6} Ω.m

63. The increase in flow-stress resulting from plastic deformation is referred to as:
    A. Flow hardening
    B. Stress hardening
    C. Strain hardening
    D. Precipitation hardening

64. The percentages of constituent phases in equilibrium in a binary phase diagram can be calculated using this rule:
    A. Gibbs' rule
    B. Rule of mixtures
    C. Lever rule
    D. Le Chatelier's principle

65. The following refers to a failure mechanism responsible for nearly 90% of all structural failures:
    A. Corrosion
    B. Electromigration
    C. Implosion
    D. Fatigue

66. When two dissimilar metals are placed in electrical contact and immersed in an electrolyte, the following results:
    A. A bi-crystal
    B. A grain boundary
    C. A weld
    D. A galvanic couple

67. For a glass of refractive index 1.732, the angle of incidence of ordinary light, for which the reflected beam is completely polarized is:
    A. 30 degree   B. 60 degree
    C. 45 degree   D. 75 degree

68. In a spectrophotometer, the monochromator must be able to resolve two wavelengths 599.9 nm and 6001 nm. The required resolution is:
    A. 100   B. 1000
    C. 3000   D. 5000

69. At the onset of gelation of a reaction mixture the viscosity:
    A. Increases
    B. Decreases
    C. Remains constant
    D. None of the above

70. Which solvent is used to dissolve rubber pieces in the process of chlorination of natural rubber?
    A. Acetone
    B. Carbon tetrachloride
    C. Toluene
    D. Benzene

71. A polystyrene sample has a number average molecular weight of 100,000 and a polydispersity of 5. What is the weight average molecular weight?
    A. 20,000
    B. 100,000
    C. 500,000
    D. 5,000,000

72. Which of the following structures best represents a triblock co-polymer?
    A. (B–B–B - - - B–B) – (A–A–A - - - - A–A)– (B–B - - - - B–B–B)
    B. A–A–A - - - - A–A – B–B - - - - B–B
    C. - - A – B – A – A – B – B – A – A – A – B – A – B – B - -
   D. - A – B – A – B – A – B – A – B - -

73. The properties of two polyethylene samples are given below. Sample 1 was synthesized using a catalyst while Sample 2 was produced by a high pressure process.

	Polyethylene 1	Polyethylene 2
Molecular weight (M$_w$)	150, 000	150, 000
Density (g/cc)	0.96	0.92
Crystalline melting point, °C	131	106
Stiffness, (MPa)	110	30
Hardness (Shore D)	60	40

    Which of the following statements is/are true?
    A. Sample 2 is more branched than sample 1
    B. Sample 1 is more branched than sample 2
    C. Sample 1 is more atactic
    D. None of the above

74. Given below are two transitions from the "solid" to the liquid or rubbery state on a plot of specific volume vs. temperature.
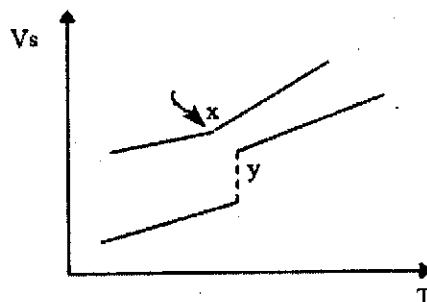
    Which of the following statements is/are true?
    A. The transition X is a T$_m$, while transition Y is a T$_g$
    B. The transition Y is the T$_m$ while X is the T$_g$
    C. Both the transitions X and Y are T$_g$, Y being the T$_g$ of semi-crystalline polymer
    D. Transition X is the T$_m$ of a semi-crystalline material and Y is the T$_m$ of an almost perfect crystal

75. Which of the statements about pseudoplastics is true?
    A. A substance which becomes less viscous as the rate of shear increases
    B. A substance which becomes more viscous as the rate of shear increases
    C. A substance which becomes less viscous over time when a constant shear stress is applied
    D. A substance which becomes more viscous over time when a constant shear stress is applied

76. From instruments point of view, heart is a _____ system
    A. Pneumatic
    B. Electric
    C. Electronic
    D. Hydraulic

77. The basic functional unit of nervous system is:
    A. Nerves   B. Axon
    C. Neuron   D. Dendrite

78. Atrioventricular node is located at:
    A. Upper part of the heart wall between the two atria
    B. Lower part of the heart wall above the two atria
    C. Lower back section of the interatrial septum near the opening of the coronary sinus
    D. Upper part of the heart wall above the two atria

79. Before placing the electrodes the skin should be:
    A. Wet
    B. Dry
    C. Hairy
    D. Oily

80. The delta wave in EEG ranges from
    A. 0.5-4Hz
    B. 4-8Hz
    C. 8-13Hz
    D. 13-22Hz

81. The signal amplitude of EEG is:
    A. 2-200 µV
    B. 2-200mV
    C. 2-2000 µV
    D. 2-2000mV

82. Which of the following is considered to be the primary pacemaker of the heart?
    A. Sinoatrial node
    B. Atrioventricular node
    C. Purkinje fibres
    D. Both A and B together

83. Recording electrical activities associated with heart is known as:
    A. EEG
    B. EOG
    C. EMG
    D. ECG

84. The variation of the electrical potential associated with the passage of a pulse along the membrane of a muscle cell or a nerve cell is called:
    A. Muscle potential
    B. Action potential
    C. Resting potential
    D. Half-cell potential

85. Needle electrode is used to measure:
    A. EKG
    B. EEG
    C. EOG
    D. EMG

86. Electrocardiography was invented by:
    A. Willem Einthoven
    B. Robert Koch
    C. Werner Forssmann
    D. Gertrude B. Elion

87. MRI stands for:
    A. Mechanical Resonance Imaging
    B. Magnetic Resonance Imaging
    C. Mutually Related Imaging
    D. Magnetic Resultant Imaging

88. The interior of the neuron is at a potential of about _____mV relative to the exterior
    A. -70
    B. +70
    C. -170
    D. +170

89. Another name for tricuspid valve is:
    A. Left Atrioventricular valve
    B. Right Atrioventricular valve
    C. Pulmonary valve
    D. Cardiac valve

90. Buffer amplifier converts:
    A. Low impedance signals to high impedance signals
    B. High impedance signals to low impedance signals
    C. AC impedance signals to dc impedance signals
    D. DC impedance signals to ac impedance signals

91. Which of the following is a wireless ECG acquiring system?
    A. Pregelled disposable electrodes
    B. Limb electrodes
    C. Pasteless electrodes
    D. Smart pad

92. The instruments that are used to hold patients head and guide the placement of electrodes are called:
    A. Monotaxic
    B. Stereotonic
    C. Stereotaxic
    D. Monotonic

93. The ground electrode is usually positioned over which body structures?
    A. Bony
    B. Hairy
    C. Fleshy
    D. Sweaty

94. The electrodes that are used when intramuscular EMG is required to look into the electrical activities of deeper or overlaid muscles:
    A. Plate shape electrodes
    B. Surface electrodes
    C. Thin thread electrodes
    D. Fine wire electrodes

95. The contraction of the skeletal muscles results in the generation of action potential in the individual muscle fibers. Record of this action potential is called:
    A. ECG
    B. EMG
    C. EEG
    D. EKG

96. In voluntary contraction of the skeletal muscles, the muscle potential ranges from:
   A. 50 uV – 5 mV
   B. 50 mV – 5 V
   C. 0.05 uV – 2 mV
   D. 50 mV – 500 mV

97. The letter T in the EEG electrode placement system denotes?
   A. Temporal lobe
   B. Temper lobe
   C. Trace
   D. Tympanic

98. According to the international 10/20 system to measure EEG, odd number denotes which side of the brain?
   A. Left
   B. Right
   C. Top
   D. Front

99. Disturbance in the EEG pattern resulting from the external stimuli is called:
   A. Provoked response
   B. Colored response
   C. Evoked response
   D. Impulse response

100. The peak to peak amplitude of the waves that can be picked from the scalp is
   A. 100mV
   B. 100V
   C. 100uV
   D. 10mV

****