



श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकी संस्थान, तिरुवनंतपुरम् -11
SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY,
THIRUVANANTHAPURAM—695 011

ENTRANCE EXAMINATION : ACADEMIC SESSION JANUARY 2020

PROGRAM: PhD (Chemical Sciences)

Time: 90 minutes

Max. Marks: 100

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

- Name of the Launch Vehicle used in Chandrayaan-2
A. ROVER vehicle
B. PSLV
C. GSLV
D. ORBITOR
- Symbol for S. I. Unit of temperature
A. °C
B. K
C. °F
D. All
- 10^{-12} is represented by
A. pico
B. tera
C. femto
D. peta
- ISO stands for
A. Indian Standards Organization
B. International Organization for Standardization
C. International Standard Organization
D. Indian Organization for Standardization
- 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
- 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
- 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
- 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
- Pentacene molecule
 - Black hole
 - A rare form of carbon monoxide in the dust and gas disc around a young star.
 - Interstellar comet
10. Which among these are brain boosting nutrients?
- Essential fatty acids
 - Vitamin C and B-complex
 - Amino acid
 - All of the above
11. Malala Yousafzai- an activist for education of women and children is also the youngest Nobel laureate. She hails from:
- Iran
 - Syria
 - Jordan
 - Pakistan
12. The following is a palindrome:
- DIVIDED
 - MALAYALAM
 - AQUA
 - DRESSED
13. Who is the ace Indian shuttler who is the first Indian to win Badminton World Championships gold:
- Saina Nehwal
 - P.V. Sindhu
 - Sania Mirza
 - Mithali Raj
14. The following was demoted to the status of a 'dwarf planet' in 2006:
- Uranus
 - Mercury
 - Pluto
 - Neptune
15. The following is the state bird of Kerala:
- Great hornbill
 - Rufous treepie
 - Jungle babbler
 - Kingfisher
16. What does UNESCO stand for?
- United Nations Economic, Socio-Cultural Organization
 - United Nations Educational, Scientific and Cultural Organization
 - United Nations Employment, Societal and Corporate Organization
 - None of the above
17. National Science Day is celebrated in India on 28 Feb every year in the memory of:
- Sir C.V. Raman
 - Dr. A.P.J. Abdul Kalam
 - Dr. Har Gobind Khorana
 - Dr. Srinivasa Ramanujan
18. India's highest civilian award Bharat Ratna for the year 2019 has been awarded to:
- Bhupen Hazarika
 - Pranab Mukherjee
 - Nanaji Deshmukh
 - All of the above
19. ISRO's mission Chandrayaan-2 has a lander named:
- Pragyan
 - Vikram
 - Dhawan
 - Sivan
20. Which of the following article of Constitution of India has been revoked recently?
- Article 330
 - Article 350
 - Article 370
 - 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

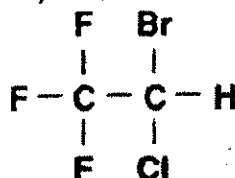
34. A cuboid has six sides of different colours. The red side is opposite to black. The blue side is adjacent to white. The brown side is adjacent to blue. The red side is face down. Which one of the following would be the opposite to brown?
- A. Red
B. Black
C. White
D. Blue
35. Mangalyaan intend for
- 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. In DC Polarography the supporting electrolyte is taken in excess so that:
- A. all migration current is carried out by supporting electrolyte
B. to reduce the effect of concentration
C. to equalize migration and residual current
D. all of the above
42. Which one of the following is a primary analytical method (not using any reference)?
- A. Anodic stripping voltammetry
B. ICP-OES
C. X-Ray Fluorescence spectroscopy
D. Isotopic dilution mass spectrometry
43. Mark-Hownik equation relates molecular mass of a macromolecule with:
- A. Oxidation Potential
B. Critical Micelle Concentration
C. Intrinsic viscosity
D. Absorbance
44. Identify the correct sequence of molecular weight terms of polymers:
- A. $M_n < M_v < M_w < M_z$
B. $M_n > M_v > M_w > M_z$
C. $M_n < M_z < M_w < M_v$
D. $M_w < M_v < M_n < M_z$

45. For a monodisperse polymer, number average molecular weight (M_n) will be:
- A. Twice the value of M_w
 - B. half the value of M_w
 - C. Equal to M_w
 - D. 0
46. In thermogravimetric analysis, is plotted against time/temperature
- A. Current gain
 - B. Potential loss
 - C. Viscosity
 - D. Weight loss
47. A Polymer contains 50 chains of molecular mass 5000 Da and 75 chains of 6000 Da. Its M_n will be:
- A. 5500
 - B. 5300
 - C. 5650
 - D. 5800
48. Liquefied petroleum gas (LPG) is a hydrocarbon mixture of:
- A. Methane and butane
 - B. Propane and butane
 - C. Ethane and propane
 - D. Ethane and butane
49. An ice cube takes up:
- A. same volume of water
 - B. less than the volume of Water
 - C. more than the volume of Water
 - D. none of the above
50. Which letter does not appear on the periodic table?
- A. Q
 - B. J
 - C. G
 - D. D
51. Even though it is considered to be a weak acid, this corrosive acid cannot be stored in glass containers as it will dissolve them. What is this acid?
- A. Periodic acid
 - B. Fluoroantimonic acid
 - C. Hydrofluoric acid
 - D. Salicylic acid
52. Sometimes hot water freezes more quickly than cold water. This phenomenon is called:
- A. Mpemba effect
 - B. Britzberg effect
 - C. Thomsons freezing
 - D. Britner's effect
53. Which was the first man-made element?
- A. Db
 - B. Tc
 - C. Ts
 - D. Os

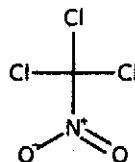
54. What is the temperature range of Oxy-acetylene flame used for welding purpose?
- 1200-1500°C
 - 2200-2500°C
 - 3200-3500°C
 - 5500-5700°C

55. Plexiglas commonly used for hard contact lenses is chemically:
- Polyvinyl Chloride
 - Polypropylene
 - Polyethylene Terephthalate
 - Polymethyl Methacrylate

56. Identify the compound given below, which is used as a hypnotic drug:



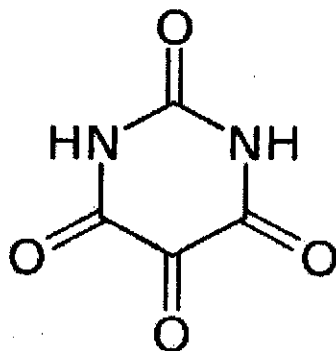
- Fluordane
 - Hindane
 - Halothane
 - Chlorothane
57. Who was known as "merchant of death" ?
- A Oppenheimer
 - Fritz Haber
 - Otto Hahn
 - Alfred Nobel
58. Identify the compound given below which is widely used as a broad-spectrum antimicrobial, fungicide, herbicide, insecticide, and nematicide:



- Chloroform
 - Chloropicrin
 - Chlordane
 - Chloromicin
59. Ernest Ruska was awarded Nobel Prize for the invention of:
- LCD
 - X-Ray Fluorescence
 - Electron Microscope
 - Atomic Force Microscope
60. Which is the softest mineral?
- Graphite
 - Talc
 - Galena
 - Bauxite

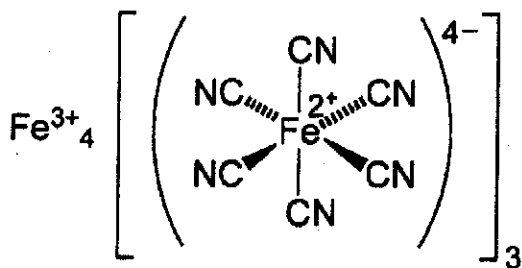
61. Which radioactive nucleus is present in bananas?
- Na-21
 - P-31
 - K-40
 - Co-60
62. Ochre is the oldest known natural pigment. It's chemically:
- Aluminum oxide
 - Copper oxide
 - Manganese oxide
 - Iron Oxide
63. Who discovered the crystalline structure of Insulin?
- Frederic measwal
 - Dorothy Hodgkins
 - Anna franklin
 - Rosalind Franklin
64. Who was known as the father of Polarography?
- Dimitry Mendeleev
 - Mikhail Svett
 - Jaroslav Heyrovski
 - Alaxandre Volta
65. What is the base unit of tannins?
- Pyrogallol
 - Gallic acid
 - Phloroglucinol
 - Glycolic acid
66. Who wrote the book, "The physiology of vision"?
- Subramaniam Chandrasekhar
 - Hargobind Ghorana
 - C. V. Raman
 - J. C. Bose
67. Diacetate of Morphin is widely abused as a narcotic drug. What is its common name ?
- Heroin
 - Hashish
 - LSD
 - Marijuana
68. Color of tomato is due to:
- Anthocyanin
 - Lycopene
 - Carotene
 - Margarine

69. Name the glucose analogue present in maida which has a capacity to kill Insulin producing beta cells of pancreas:



- A. Allitame
- B. Allantoin
- C. Alloxan
- D. Aspartam

70. Identify the dye given below



- A. Alizarin
- B. Paris green
- C. Nile blue
- D. Prussian blue

71. Which metal is present in vitamin B12 ?

- A. Copper
- B. Chromium
- C. Cobalt
- D. Calcium

72. Element number 99 was first discovered in the fallouts of first Hydrogen bomb. American team who discovered it jokingly called it as Pandamonium. What's the name of this radioactive element glowing blue in dark?

- A. Californium
- B. Einsteinium
- C. Fleruvium
- D. Polonium

73. Invar is an alloy used for the preparation of pendulum clocks due to its negligible thermal expansion. It contains:

- A. Copper and Iron
- B. Nickel and Chromium
- C. Iron and Nickel
- D. Titanium and Nickel

74. What is responsible for dancing Cat disease?
- Arsenic
 - Nickel
 - Cadmium
 - Mercury
75. Bis(2-chloroethyl) sulfide was used during world wars as a deadly chemical weapon. What was the common used for this dangerous chemical?
- Lewisite
 - Agent Orange
 - Who me
 - Mustard gas
76. George Ernst Stahl proposed the first theory in chemistry. What was that?
- Isotope theory
 - Phlogiston theory
 - String theory
 - Chromoidal theory
77. Molisch's reagent is used as a chemical agent to detect carbohydrates. It's chemically:
- Ninhydrin in water
 - 2, 4-Dinitrophenyl hydrazine in ethanol
 - α -Naphthol in ethanol
 - Iodine in CCl_4
78. What is known as "Pharaoh's serpent" which is used ion fireworks?
- Mercuric thiocyanate
 - Manganese Thiocyanate
 - Manganese Nitrate
 - Cobalt chloride
79. What is the name given to the final element (118) of periodic table?
- Tennessine
 - Livermorium
 - Fleruvium
 - Organesson
80. Kiliani-Fischer synthesis converts an aldopentose to a:
- Mixture of aldohexose and ketohexose
 - Mixture of aldohexoses differing in configuration at C6
 - Mixture of aldohexoses differing in configuration at C2
 - Single aldohexose
81. The quantum number which is not derived from the solution of Schrodinger wave equation for hydrogen atom is:
- Azimuthal quantum number
 - Principal quantum number
 - Spin quantum number
 - Magnetic quantum number

82. Consider the following statement about chirality:
- i) Molecules which are not superimposable on their mirror images are achiral
 - ii) A chiral molecule have simple axis of symmetry
 - iii) A carbon atom to which four different groups are attached is a chiral centre
 - iv) A compound whose molecules are achiral exhibits optical activity

Which of the statement given above are correct?

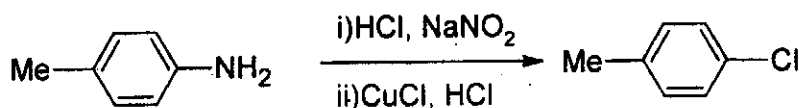
- A. i, ii and iv
 - B. ii, iii and iv
 - C. ii and iii
 - D. i and iv
83. Consider the NMR spectrum of the following compound $\text{ClCH}_2\text{-CHCl}_2$
- (I) (II)

Which one of the following correctly represents the multiplicities of the signals due to the protons marked (I) and (II), respectively:

- A. Doublet, Singlet
 - B. Doublet, Triplet
 - C. Triplet, Doublet
 - D. Singlet, Doublet
84. If the molar solubility of $\text{La}(\text{OH})_3$ at 298 K is x , the solubility product K_{sp} is:
- A. $3x^3$
 - B. $9x^2$
 - C. $27x^3$
 - D. $27x^4$
85. During the course of the chemical reaction, the frequency factor 'A' in the Arrhenius equation is directly related to:
- A. The entropy change in the reaction
 - B. The free energy change in the reaction
 - C. The energy of activation in the reaction
 - D. The change in entropy and free energy in the reaction
86. If the entropy of vaporisation of a liquid is $110\text{JK}^{-1}\text{mol}^{-1}$, and its enthalpy of vaporisation is 50000J mol^{-1} , the boiling point of the liquid is:
- A. 354.5 K
 - B. 454.5 K
 - C. 554.5 K
 - D. 394.5 K
87. Which of the following is paramagnetic ?
- A. $\text{Cr}(\text{CO})_6$
 - B. $\text{Fe}(\text{CO})_5$
 - C. $\text{Ni}(\text{CO})_4$
 - D. $\text{V}(\text{CO})_6$
88. The compound with zero dipole moment is:
- A. cis-2-butene
 - B. trans-2-butene
 - C. but-1-ene
 - D. 2-methyl-1-propene

89. Polymerisation using Ziegler-Natta catalysts is advantageous over free-radical polymerisation because:
- It can lead to living polymers via anionic polymerisation
 - It permits step-reaction polymerisation resulting in a highly crosslinked polymer
 - It gives highly branched polymer with a high degree of crystallinity
 - It gives linear polymer molecules permitting stereochemical control
90. If K is the dissociation constant, C is the concentration of electrolyte and α is the degree of dissociation, then Ostwald's dilution law may be represented mathematically as:
- $K = C\alpha^2 / (1 - \alpha)$
 - $K = C\alpha / (1 - \alpha)$
 - $k = C\alpha^2 / (1 - \alpha)^2$
 - $k = (1 - \alpha) / C\alpha^2$

91. Consider the following reaction:



The name of the reaction and intermediate via which it is known to proceed are respectively:

- Hunsdiecker and benzyne
 - Sandmeyer and a free radical
 - Meerwein and a free radical
 - Sandmeyer and carbanion
92. Radioactive sample has half-life of 1500 years. 1 g of this sample contained in a sealed tube after 3000 years will be reduced to:
- 1 g
 - 0.5 g
 - 0.25 g
 - 0.01 g
93. Among the boron trihalides, BF_3 , BCl_3 , and BBr_3 , the order of Lewis acid strength is:
- $\text{BCl}_3 > \text{BBr}_3 > \text{BF}_3$
 - $\text{BBr}_3 > \text{BCl}_3 > \text{BF}_3$
 - $\text{BCl}_3 > \text{BF}_3 > \text{BBr}_3$
 - $\text{BF}_3 > \text{BCl}_3 > \text{BBr}_3$
94. The crystal field splitting energy for octahedral (Δ_0) and tetrahedral (Δ_t) complexes is related as:
- $\Delta_t = 4/9 \Delta_0$
 - $\Delta_t = 1/2 \Delta_0$
 - $\Delta_0 = -2 \Delta_t$
 - $\Delta_0 = -4/9 \Delta_t$
95. Which of the following compound has the longest C=C (carbon-carbon bond)?
- $\text{CH}_2=\text{CH}_2$
 - $\text{CH}_3-\text{CH}=\text{CH}_2$
 - $\text{CH}_3-\text{CH}_2-\text{CH}=\text{CH}_2$
 - $\text{CH}_3-\text{CH}=\text{CH}-\text{CH}_3$

96. An equilibrium mixture for the reaction:



Had 0.5, 0.1 and 0.4 moles of A_2B , A_2 and B_2 in a two litre vessel respectively. The equilibrium constant (K) is:

- A. 0.004 mol lit⁻¹
- B. 0.008 mol lit⁻¹
- C. 0.016 mol lit⁻¹
- D. 0.032 mol lit⁻¹

97. Fingerprint region in infrared spectroscopy:

- A. 1300-650 cm⁻¹
- B. 3500-2800 cm⁻¹
- C. 1400-1780 cm⁻¹
- D. 2700-1800 cm⁻¹

98. The orbital quantum number 'l=2', the number of values of magnetic quantum number (m) should be:

- A. m=2l+1
- B. m= 2l-1
- C. m= l+2
- D. m= 2l+2

99. The term symbol for particular atomic state is quoted as $^4D_{5/2}$. What are the values of L, S, and J for this state?

- A. L=4, S=3/2, J=5/2
- B. L=4, S=1/2, J=5/2
- C. L=2, S=3/2, J=5/2
- D. L=2, S=3/2, J=5

100. Why C=O stretching vibration of an aldehyde gives rise to a strong absorption in the infra red, whereas absorption due to C=C vibration in an alkene is normally very weak?

- A. C=C group produces relatively large dipole change
- B. C=O group produces relatively large dipole change
- C. C=O group produces relatively weak dipole change
- D. C=O group produces zero dipole change
