



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

PhD ENTRANCE EXAMINATION - ACADEMIC SESSION JANUARY 2019

STREAM: Biomaterial Science and Technology

Time: 90 Minutes

Max. Marks: 100

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

- Ranjan Gogoi is serving as the \_\_\_\_\_ Chief Justice of India.  
a. 46<sup>th</sup>      b. 48<sup>th</sup>      c. 42<sup>nd</sup>      d. 44<sup>th</sup>
- Nadia Murad won the Nobel prize for:  
a. Physics  
b. Chemistry  
c. Peace  
d. Medicine
- S-400 'Triumf' is the name of:  
a. Missile system.  
b. Satellite system  
c. Bomber system  
d. Ecosystem
- MiG-21 is:  
a. Fighter jet  
b. War ship  
c. Submarine  
d. Rescue boat
- Find the correctly spelt word:  
a. Surveilance  
b. Surveillence  
c. Survellence  
d. Survaillence
- Which among the following is responsible for the health hazards associated with paints/varnish?  
a. Formaldehyde      b. Lead      c. Cadmium      d. Chromium

7. Single disease control programs are also called
  - a. Horizontal health programs
  - b. Integrated health programs
  - c. Interventional programs
  - d. Vertical health programs
  
8. A vitamin which is soluble in water:
  - a. Vitamin C
  - b. Niacin
  - c. Riboflavin
  - d. All the above
  
9. Tides are primarily caused by:
  - a. Attraction of the moon
  - b. Farrel's law
  - c. Earth's pressure system
  - d. Ocean Currents
  
10. Primary source of nutrients for plants is:
  - a. Sun light
  - b. Soil
  - c. Chlorophyll
  - d. Pesticides
  
11. Chemical, ionizing agent or virus that can cause birth defects
  - a. Teratogenic
  - b. Mutagenic
  - c. Carcinogenic
  - d. Embryogenic
  
12. Entomology is the scientific study of:
  - a. Insects
  - b. Formation of rocks
  - c. Scientific names
  - d. Behaviour of human beings
  
13. The acronym NFHS used in the surveys for information on maternal and child health in India stand for:
  - a. National Fertility and Health Survey
  - b. National Family and Household Study
  - c. National Family Health Survey
  - d. National Farm and Household Survey

14. The Hathi commission report (1975) was on:

- a. Pharmaceutical industry in India
- b. Hospitals in India
- c. Doctors in India
- d. Nursing in India

15. A disease that spread by contact:

- a. Infectious
- b. Fatal
- c. Contagious
- d. Incurable

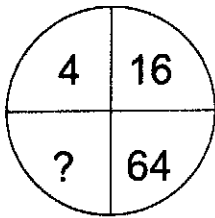
16. The ICDS scheme includes the following components, except

- a. Supplementary nutrition for mothers and children
- b. Growth monitoring
- c. Ante-natal clinics
- d. Immunization

17. Gradual changes in the frequency of a disease over a long time period is referred to as:

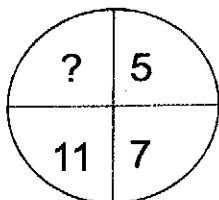
- a. Secular time trends
- b. Cyclic fluctuations
- c. Latency period
- d. Temporal clustering.

18. Find the missing number in the figure below:



- a. 16
- b. 52
- c. 112
- d. 256

19. Find out the missing number in the figure below



- a. 1
- b. 9
- c. 12
- d. 17

20. Find the odd man out:

- a. Parrot                      b. Vulture                      c. Swan                      d. Sparrow

21. Arrange the following words in the order they appear in the dictionary:

1. Scenery 2. Science 3. Scandal 4. School 5. Scatter.

- a. 3,5,1,4,2;  
b. 3,5,4,1,2;  
c. 5,3,4,2,1;  
d. 5,3,2,1,4

22. Complete the following sentences (questions 22-24) by choosing the correct passive forms of the verbs given:

The thief \_\_\_\_\_ yesterday and was prisoned

- a. is caught  
b. is being caught  
c. was caught  
d. has been caught

23. A couple of warnings \_\_\_\_\_ before the storm

- a. will have been issued  
b. have been issued  
c. had been issued  
d. has been issued

24. We know that poems \_\_\_\_\_ these days by you

- a. are being composed  
b. is being composed  
c. have been composed  
d. were being composed

25. Find the word which cannot be formed from the letters of the word, '**REPUBLICAN**'.

- a. CLIP                      b. PURE                      c. ANKLE                      d. BANE

26. Find the word which cannot be formed from the letters of the word,

**'RECOMMENDATION'**.

- a. NATION  
b. COMMENT  
c. COMMON  
d. RECOMMENDS

27. If the first day of the year (other than the leap year) was Friday, then which was the last of that year?
- Wednesday
  - Thursday
  - Friday
  - Sunday
28. If every second Saturday and all Sundays are holidays in a 30 days month beginning on Saturday, then how many working days are there in that month?
- 15
  - 18
  - 23
  - 25
29. The programming language Java was originally developed by:
- Oracle
  - Microsoft
  - Novell
  - Sun Microsystems
30. One Terabyte (1 TB) is equal to:
- 1028GB
  - 1012GB
  - 1000GB
  - 1024 GB
31. Which operating system is developed and used by Apple Inc?
- Windows
  - Android
  - iOS
  - UNIX
32. Pick the odd one out in the following numbers: 13, 23, 33, 43, 53 ?
- 23
  - 33
  - 43
  - 53
33. It was calculated that 75 men could complete a piece of work in 20 days. When work was scheduled to commence, it was found necessary to send 25 men to another project. How much longer will it take to complete the work?
- 25 days
  - 30 days
  - 35 days
  - 40 days
34. What percentage of numbers from 1 to 70 has 1 or 9 in the unit's digit?
- 1
  - 14
  - 20
  - 21
35. REASON : SFBTPO :: THINK : ?
- SGHMJ
  - UIJOL
  - UHNKI
  - UJKPM
36. 'Captain' is related to 'Soldier' in the same way as 'Leader' is related to:
- Chair
  - Followers
  - Party
  - Minister

37. M has a son Q and a daughter R. He has no other children. E is the mother of P and daughter-in law of M. How is P related to M?
- P is the son-in-law of M
  - P is the grandchild of M
  - P is the daughter-in law of M
  - P is the grandfather of M
38. The number that least fits this set: (324, 441, 97 and 64) is \_\_\_\_\_.
- 324
  - 441
  - 97
  - 64
39. It takes 10 s and 15 s, respectively, for two trains travelling at different constant speeds to completely pass a telegraph post. The length of the first train is 120 m and that of the second train is 150 m. The magnitude of the difference in the speeds of the two trains (in m/s) is:
- 2.0
  - 10.0
  - 12.0
  - 22.0
40. The sum of two numbers is 25 and their difference is 13. Find their product.
- 104
  - 114
  - 315
  - 325
41. When glycosaminoglycans are covalently bound to proteins, the molecules are called:
- Glycoproteins
  - Proteoglycans
  - Lectins
  - Peptidoglycans
42. Chemical formula of the calcium phosphate mineral brushite is:
- $\text{CaHPO}_4$
  - $\text{CaHPO}_4 \cdot 2\text{H}_2\text{O}$
  - $\text{Ca}_{10}(\text{PO}_4)_6(\text{OH})_2$
  - $\text{Ca}_{10}(\text{HPO}_4)(\text{PO}_4)_6$
43. Identify the technique to study the ultrastructure of the cells and their organelles and environment:
- Scanning electron microscopy
  - Energy dispersive X-ray analysis
  - Light microscopy
  - Transmission electron microscopy
44. Which among the following is a vasoactive agent:
- Bradykinin
  - Leukotriene B4
  - Thromboxane  $\alpha_2$
  - Interleukin 1
45. Diseases that are caused by the decreased ability of the body to repair its tissues are known as:
- Immunological diseases
  - Degenerative diseases
  - Infectious diseases
  - Congenital diseases

46. Which of the following condition is characterized by ketonuria but without glycosuria?
- Diabetes mellitus
  - Diabetes insipidus
  - Prolonged starvation
  - Addison's disease
47. Which of the following is NOT a unit by which energy is measured?
- Joule
  - Calorie
  - Electron volt
  - Newton
48. Which of the following actions would increase the electric force between two positively charged particles?
- Decreasing the mass of the particles
  - Decreasing the distance between the particles
  - Changing the charges from positive to negative
  - Transferring all the charge from one particle to the other
49. Ultraviolet and x-ray radiation can damage human cells. Which of the following is a property of these two forms of radiation?
- Low wave speed
  - Short wavelength
  - Low wave frequency
  - Small wave amplitude
50. The nature of probe-surface interaction in contact mode AFM:
- Strong attractive force
  - weak attractive force,
  - Strong repulsive force
  - Weak repulsive force
51. Which of the following technologies relies on energy changes of the electrons in the innermost orbital of an atom?
- Microwave ovens
  - X-ray photography
  - Magnetic resonance imaging
  - None of the above
52. A regulator of the enzyme Glycogen synthase is:
- Citric acid
  - 2, 3 bisphosphoglycerate
  - Pyruvate
  - GTP
53. MHC class I proteins, in conjunction with antigens are recognized by:
- Cytotoxic T cells
  - Helper T cells
  - Suppressor T cells
  - Natural killer cells

54. An uncoupler of oxidative phosphorylation is:
- Carboxin
  - Atractyloside
  - Amobarbital
  - Dinitrocresol
55. Dopamine is synthesised from:
- Dihydroxyphenylalanine
  - Epinephrine
  - Norepinephrine
  - Metanephrine
56. The extrinsic pathway, in blood clotting, is initiated when trauma exposes -----, an integral membrane glycoprotein.
- Hageman factor
  - Tissue factor
  - Thrombin
  - Prothrombin
57. The principal cation in extracellular fluid that regulates plasma volume, acid-base balance, and nerve and muscle function is:
- a.  $\text{Na}^+$                       b.  $\text{K}^+$                       c.  $\text{Ca}^{2+}$                       d.  $\text{Mg}^{2+}$
58. The phosphorylation of proteins is catalyzed by enzymes called:
- Protein phosphatases
  - Protein kinases
  - Proteases
  - None of the above
59. Which among the following amino acid is a nutritionally non essential one?
- Arginine
  - Phenylalanine
  - Asparagine
  - Valine
60. The migration of a protein on an SDS polyacrylamide gel is best described as inversely proportional to:
- Negative charge
  - Isoelectric point
  - Log of molecular weight
  - Molecular weight
61. Excitation in the post synaptic membrane is caused by which of the following?
- Increased sodium permeability
  - Increased potassium permeability
  - Decreased acetylcholine permeability
  - Increased GABA permeability



62. Extracellular matrices are least likely to play a major role in which of the following?
- Giving tissues elasticity
  - Giving rise to intracellular signals
  - Promoting the diffusion of oxygen within tissues
  - All the above
63. Translocation of most proteins into the endoplasmic reticulum requires all of the following except:
- GTP
  - Signal peptidase
  - Ribosomes
  - A signal sequence
64. The molecular geometry of thionyl chloride ( $\text{SOCl}_2$ ) is best described as:
- Trigonal planar
  - Tetrahedral
  - Trigonal pyramidal
  - Linear
65. Cobalt -60 is used for radiotherapy of cancer. It can be produced by bombardment of Cobalt-59 by:
- Neutrons
  - $\alpha$ -particle
  - $\beta$ -particle
  - $\gamma$ -rays
66. Which of the group 13 element has its +1 oxidation state more stable than its +3 oxidation state?
- Al
  - In
  - Ga
  - Tl
67. Which of the following type of spectroscopy is a light scattering technique?
- Nuclear magnetic resonance
  - Infra red spectroscopy
  - Raman
  - UV-Vis
68. Among the normal vibrational modes of  $\text{CO}_2$  molecule, i.e., Bending (I), Symmetric stretching (II) & Asymmetric stretching (III), which are the modes that are IR active?
- I and II only
  - II and III only
  - I and III only
  - I, II and III
69. The strongest base in liquid ammonia is:
- $\text{NH}_3$
  - $\text{NH}_2^-$
  - $\text{OH}^-$
  - $\text{NH}_4^+$
70. Which of the following polymer type is not classified on the basis of its application and properties?
- Rubbers
  - Plastics
  - Fibres
  - Synthetic
71. Which of the following is a thermosetting polymer?
- Polystyrene
  - Polyolefins
  - Nylons
  - Phenolic resins

72. Among the following, which are the characteristics of condensation polymerization? I. Only -C-C- linkages present in the polymer structure, II. Use of bifunctional or polyfunctional monomers, & III. Elimination of a small byproduct molecule:
- I, II, III
  - II and III
  - I and II
  - Only III
73. Phosphor imaging is:
- A radiological technique to take an X-ray of bone
  - A method to provide accurate information on distribution of radioactive labelled substances in a tissue
  - A method to provide accurate information on distribution of radioactive labelled substances in a body
  - One of the steps of an MRI scan
74. Which of the following is not true of cell membrane receptors?
- They are proteins
  - Their numbers increase and decrease in response to stimuli
  - They are static components of a cell
  - Their properties change with changes in physiological conditions
75. Which of the following category does cellulose nitrate fall into?
- Natural polymers
  - Synthetic polymers
  - Semi-synthetic polymers
  - None of the above
76. A bacteriophage is:
- A bacteria that resides in macrophages
  - A virus that infects bacteria
  - A bacteria which phagocytoses virus
  - A macrophage which contains bacteria
77. Which of the following monomers are unsuitable for condensation polymerization?
- Propanoic acid and ethanol
  - Butane-dioic acid and glycol
  - Diamines and dicarboxylic acids
  - Hydroxy acids
78. Which of the following kind of polymers are known for their high crystallinity?
- Isotactic
  - Syndiotactic
  - Atactic
  - None of the above
79. The process used to remove electrolytes from a solution of protein:
- Electrolysis
  - Dialysis
  - Proteolysis
  - Electrophoresis

80. A procedure that separates proteins based on size alone:
- Ion exchange chromatography
  - SDS polyacrylamide gel electrophoresis
  - Isoelectric focusing
  - Non-denaturing polyacrylamide gel electrophoresis
81. Which among the following polymers have lowest solubility?
- Polyethylene
  - Polystyrene
  - Nylon 6
  - Cured epoxy
82. The polymer in which steric placements of the substituent are arranged in such a way to give alternate d and l configurations, is known as:
- Isotactic polymer
  - Atactic polymer
  - Syndiotactic polymer
  - None of the above
83. Which of the following cell types is LEAST able to regenerate?
- Centrolobular hepatocytes
  - Cerebral neurons
  - Colonic epithelium
  - Subcutaneous fibroblasts
84. Which of the following is true for the resultant polymer product formed, when molecules of phthalic acid react with molecules of glycerol?
- Branched polymer
  - Cross-linked polymer
  - Linear polymer
  - None of the above
85. Which of the following does not contain amino acid repeat unit?
- Wool
  - Silk
  - Alginate
  - Collagen
86. Glutaraldehyde is used as a fixative for tissues in:
- Transmission and scanning electron microscopy
  - Transmitted light microscopy
  - Fluorescence microscopy
  - Inverted light microscopy
87. A serum sample is moderately hemolysed. Which of the following analysis would be most significantly affected by the hemolysis?
- Potassium
  - Glucose
  - Sodium
  - Urea
88. At a pH of 6.5 the color of a solution with phenol red indicator will be:
- Purple
  - Yellow
  - Orange
  - Red
89. The resolving power of the human eye is:
- 150 $\mu$
  - 125 $\mu$
  - 100 $\mu$
  - 75 $\mu$
90. A 30% NaOH solution has a normality of:
- 6N
  - 3N
  - 7.5N
  - 0.75N

91. One mole of a substance dissolved in 1 Kg of solvent is a:
- Molar solution
  - Molal solution
  - Normal solution
  - None of the above
92. Milk is a model food which contains major dietary requirements except:
- Calcium
  - Protein
  - Vitamin C
  - Carbohydrates
93. The following statement is false regarding Macrophages:
- Are derived from blood monocytes
  - Have a longer life span than neutrophils
  - Multinucleated, do not produce cytokines
  - Involves in the delayed hypersensitivity response
94. Lysosomes are present in all animal cells except:
- Brain cells
  - Leucocytes
  - Erythrocytes
  - Cells of Sertoli
95. Which of the following is a non-metal that remains liquid at room temperature:
- Bromine
  - Gallium
  - Mercury
  - Ferroliquid
96. A commonly used method for the quantitation of serum total protein is the Biuret procedure. The intensity of the color produced in the Biuret reaction is dependent on:
- The molecular weight of protein
  - The acidity of the medium,
  - Carbonate free sodium hydroxide
  - The number of peptide bonds
97. The amount of iron found in the body is primarily controlled by:
- Absorption
  - Bleeding
  - Fecal excretion
  - Urinary excretion
98. The most mature cell that can undergo mitosis is:
- Myeloblast
  - Promyelocyte
  - Myelocyte
  - Metamyelocyte
99. The following mediators of acute inflammation are derived from the plasma:
- Complement
  - Kinin
  - Leukotriene
  - Both a & b
100. In the presence of inflammation, the following are raised:
- Platelets and fibrinogen
  - Ferritin
  - Ceruloplasmin and complement proteins
  - All of the above