



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 (Biological 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
 - ROVER vehicle
 - PSLV
 - GSLV
 - ORBITOR
- Symbol for S. I. Unit of temperature
 - $^{\circ}\text{C}$
 - $^{\circ}\text{F}$
 - K
 - All
- 10^{-12} is represented by
 - pico
 - tera
 - femto
 - peta
- ISO stands for
 - Indian Standards Organization
 - International Organization for Standardization
 - International Standard Organization
 - 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?
 - Election Commission of India
 - Delimitation Commission of India
 - President of India
 - Parliament
- Which of the following is depicted in a Two thousand rupees Indian currency note?
 - Rani ki vav
 - Mars planet
 - Chandrayaan
 - Sanchi Stupa
- Who is the chairman of the Chiefs of Staff Committee?
 - General Bikram Singh
 - General Bipin Rawat
 - Admiral Karambir Singh
 - 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

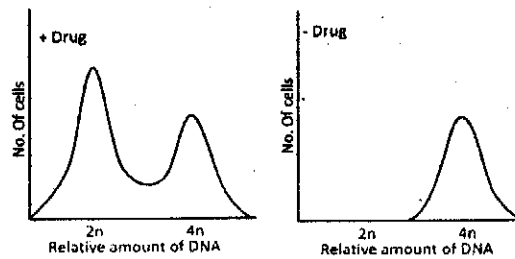
17. National Science Day is celebrated in India on 28 Feb every year in the memory of:
- A. Sir C.V. Raman
 - B. Dr. A.P.J. Abdul Kalam
 - C. Dr. Har Gobind Khorana
 - D. Dr. Srinivasa Ramanujan
18. India's highest civilian award Bharat Ratna for the year 2019 has been awarded to:
- A. Bhupen Hazarika
 - 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?
- Daughter in law
 - Cousin
 - Sister
 - Sister in law
27. The year in which the currency symbol of Indian rupee was adopted?
- 2000
 - 2010
 - 2020
 - None of the above
28. First Indian to Preside over the International Court of Justice?
- Nagendra Singh
 - Dr. Hardayal
 - Neeru Chadha
 - None of the Above
29. Nehru Cup was associated with:
- Snake Boat Race
 - Football
 - Hockey
 - Swimming
30. Founder of the Red Cross was?
- Henry Durant
 - Trigwilly H
 - Baden Powell
 - Frederick Parasse
31. What is the current population of India?
- 107 crores
 - 10.7 crores
 - 15.7 crores
 - 137 crores
32. Frances H. Arnold won the Nobel Prize in 2018 for:
- Chemistry
 - Physics
 - Economic Science
 - Medicine
33. The present Governor of Kerala
- P Sathasivam
 - R. L. Bhatia
 - Sheila Dikshit
 - 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. The molecule that does not involve in the maturation of red blood cells?
- A. Folic acid
 - B. Tocopherol
 - C. Pyridoxine
 - D. Vitamin B12
42. Which of the following is used as the excitation source in a confocal microscope?
- A. Mercury lamp
 - B. Electron beam
 - C. Lasers
 - D. Masers

43. In which of the following cells of organ of Corti, the membrane protein, prestin, is found?
- Outer hair cells
 - Inner hair cells
 - Outer phalangeal cells
 - Inner phalangeal cells
44. A sample from a population contains 65 individuals with AA genotype, 30 individuals with Aa genotype and 15 individuals with aa genotype. the frequency of 'a' allele will be:
- | | |
|---------|---------|
| A. 0.58 | B. 0.27 |
| C. 0.42 | D. 0.75 |
45. Protein conformational dynamics cannot be determined by:
- Mass spectroscopy
 - NMR spectroscopy
 - Differential scanning calorimetry
 - Fluorescence microscopy
46. The assay system that specifically detects apoptotic cells is:
- ⁵¹Cr release assay
 - MTT (tetrazolium dye based) assay
 - FACS analysis based on FITC - annexin V
 - Trypan blue exclusion assay
47. During eukaryotic cell division, the transition of metaphase to anaphase is regulated by the degradation of:
- Aurora A Kinase
 - CDK1
 - Cyclin B1
 - Polo-like kinase
48. A combination of detection techniques are listed here: (i) Western blot and Southern blot; (ii) Northern blot and Western blot; (iii) ELISA and RT-PCR; (iv) PCR and electron microscopy. Choose the correct combination that can be used for the diagnosis of influenza virus infections:
- (i) and (ii) only
 - (iii) and (iv) only
 - (ii) and (iii) only
 - (i) and (iv) only
49. Ability of a membrane protein to span the lipid bilayer strictly depends on the presence of:
- parallel β sheets
 - antiparallel β sheets
 - Zinc finger domain
 - α helices
50. Junctions which tether cytoskeletal filaments inside the cell are known as:
- Occluding junction
 - Channel - forming junctions
 - Signal - relaying junctions
 - Anchoring junctions
51. The microscope that can visualize a protein fused to an appropriate reporter in a living cell is:
- Scanning electron microscope
 - Fluorescence microscope
 - Differential interference contrast microscope
 - Phase contrast microscope

52. A newly identified drug was analysed on a culture of subconfluent HeLa cells. The effect drug was analyzed by fluorescence activated cell sorting (FACS) profile of untreated (- Drug) versus treated (+ Drug) cells. Based on the FACS profile is shown below, the drug inhibits:



- A. G2/M phase of the cell cycle
 B. S phase of the cell cycle
 C. G1 phase of the cell cycle
 D. G₀ phase of cell cycle
53. The rapid diffusion of small water soluble molecules diffuse between the cytoplasm of adjacent cells occurs through:
- A. Anchoring junctions
 B. Adherens junctions
 C. Gap junctions
 D. Tight junctions
54. The second messenger which opens calcium ion pores in endoplasmic reticulum and plasma membrane is:
- A. Diacylglycerol
 B. Inositol triphosphate
 C. Phosphatidyl inositol biphosphate
 D. cAMP
55. The section that divides a human body into dorsal and ventral sections is:
- A. Coronal
 B. Sagittal
 C. Transverse
 D. Abdominopelvic
56. Is it possible to convert a skin fibroblast cell into a liver hepatocytes cell? If yes, how?
- A. Yes, through re-differentiation approach
 B. Yes, through trans-differentiation approach
 C. Yes, through de-differentiation approach
 D. Not possible
57. Which of the following is a gaseous chemical messenger in cell signaling?
- A. Hydrogen sulfide
 B. Carbon monoxide
 C. Nitric oxide
 D. All of the above
58. When a cell ceases motility or changes its trajectory upon clash with another cell, it is called?
- A. Cellular senescence
 B. Carcinogenesis
 C. Conflict of interest
 D. Contact inhibition

59. What is cytokinesis and karyokinesis?
- Division of cellular content and division of nuclear content, respectively.
 - Division of cellular content and fusion of nuclear content, respectively.
 - Fusion of cellular content and division of nuclear content, respectively.
 - Fusion of cellular content and fusion of nuclear content, respectively.
60. What are exosomes?
- Chromosomes that are found in extracellular matrix.
 - A membrane-less organelle found in animal cells.
 - Small membrane vesicles secreted by most cells.
 - None of the above
61. Which one of the following statements is correct?
- Gap junctions block transport of ions, water and other substances between adjacent cells.
 - Desmosomes mediate adhesion between adjacent cells and cells - extracellular matrix.
 - Both are correct
 - Both are incorrect
62. Induced pluripotent stem cell technology involves:
- Conversion of adult cells into stem cells.
 - Conversion of stem cells into adult cells.
 - Conversion of one type of adult cell into another adult cell type.
 - Conversion of one type of stem cell into another stem cell type.
63. Which of the following is believed to be a key cause of immortalization of cancer cells in many tumors?
- Complete loss of telomeres
 - Inactivation of the telomerase enzyme
 - Reactivation of the telomerase enzyme
 - Shortening of telomeres
64. Which of the following does NOT protect body surfaces:
- Mucus
 - Gastric acid
 - Gut microflora
 - Salivary amylase
65. A segment of DNA has 1200 A-bases out of 6000 bases in total. What is the percentage of G-bases?
- 10%
 - 20%
 - 30%
 - 40%
66. Mendelian classical experiments demonstrated that the traits show:
- Epistasis
 - Co-dominance
 - Incomplete dominance
 - Dominance and recessiveness
67. Which of the following is NOT a stop codon?
- UGG
 - UGA
 - UAG
 - UAA

68. Immunization is an example of:
- Artificially acquired in passive mode
 - Artificially acquired in active mode
 - Naturally acquired in passive mode
 - Naturally acquired in active mode
69. Following factors influence the phenotype of an organism
- Food habits and mutations
 - Mutations and genotype
 - Genotype and environment
 - Environment and food habits
70. What would be the genotype of progeny when the parents' genotype is AABbCcdeeFF and aabbCCDDEEff, respectively?
- aaBBccDDeeFF
 - AaBbCCddEeFe
 - AABBccDDeeFe
 - AaBbCcDdEeFf
71. Addition of which of the following subunit converts RNA polymerase core enzyme into a holoenzyme?
- σ
 - α
 - δ
 - ρ
72. Find the incorrect pair:
- Proteins – peptide bond
 - Nucleic acid – hydrogen bond
 - Polysaccharide – glycosidic bond
 - Phospholipids –phosphate linkage
73. Which of the following is the genetically engineered insulin?
- Humulin
 - Rumulin
 - H-insulin
 - R-insulin
74. Which of the following is considered as second line of defense?
- Immune response
 - Skin and mucosal membrane
 - Inflammatory response
 - Inflammatory response and skin and mucosal membrane
75. Which of the following is the main antibody of both primary and secondary immune response?
- IgM
 - IgA
 - IgG
 - IgE
76. Correct statements about erythrocytes is:
- They fight infection.
 - They Lack a nucleus.
 - Produced in the spleen.
 - Important for the formation of blood clot.

77. Targeted drug for HER2-positive breast cancers is
- Imatinib
 - Trastuzumab
 - 5-fluorouracil
 - Sunitinib
78. What is Cas9?
- RNA molecule that binds to target DNA via complementary base pairing
 - DNA sequence that binds the Caspase protein
 - Viral protein that disrupts bacterial membranes
 - Protein enzyme that cuts both strands of DNA at sites specified by an RNA guide.
79. CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) and CRISPR-associated (Cas) system discovered in bacteria is akin to human:
- Digestive system
 - Respiratory system
 - Circulatory system
 - Immune system
80. Which of the following is a non-essential amino acid?
- | | |
|-----------|--------------|
| A. Serine | B. Threonine |
| C. Lysine | D. Histidine |
81. How many chiral centers are present in isoleucine?
- | | |
|------|------|
| A. 1 | B. 2 |
| C. 3 | D. 4 |
82. Cells in a suspension culture were counted and found to be 2.7×10^6 cells/ml. This is further diluted to 1:27 and 100 μ l of diluted cells were seeded per well into a 96 well plate. What is the final cell number per well?
- 1×10^5
 - 2.7×10^4
 - 2.7×10^5
 - 1×10^4
83. Which Electrophoresis is the best for the separation of large DNA fragments?
- PAGE
 - AGE
 - PFGE
 - SDS-PAGE
84. In Maxam–Gilbert sequencing pyrimidines (C+T) are hydrolysed using:
- Formic acid
 - Hydrazine
 - Dimethyl sulphate
 - Piperidine
85. Which is not a protein sequence database?
- SWISS-PROT
 - PIR
 - PET-DB
 - PSD

86. MAtDB is a Database for:
- A. Monkey
 - B. Arabidopsis
 - C. E.coli
 - D. Human
87. Most common childhood leukemia:
- A. Acute lymphocytic leukemia (ALL)
 - B. Chronic myeloid leukemia (CML)
 - C. Chronic lymphocytic leukemia (CLL)
 - D. Acute myeloid leukemia (AML)
88. Which reagent is used to precipitate DNA?
- A. Ethanol
 - B. Isopropanol
 - C. Both A and B
 - D. None of the above
89. Why the quantity of template used is critical for a next sequencing reaction? Which of the following is a correct answer?
- A. Excess template reduces the length of a read
 - B. Excess template reduces the quality of a read
 - C. Too little template will result in no readable sequence
 - D. All of the above
90. What will heterozygous single nucleotide substitution look like on chromatogram after sequencing a DNA sample?
- A. Two peaks of equal height at the same position
 - B. One peak thrice the height at the same position
 - C. Three peaks of equal height at the same position
 - D. An additional peak at adjacent position
91. Which of the following is considered a polishing step in a protein purification process?
- A. Affinity chromatography
 - B. Ion-exchange chromatography
 - C. Size-exclusion chromatography
 - D. Hydrophobic interaction chromatography
92. In affinity chromatography, which of the following conditions would be the most appropriate for eluting target proteins from an affinity column?
- A. Low salt concentrations
 - B. High salt concentrations
 - C. Adding a buffer containing a ligand which competes for binding to the column
 - D. Just keep washing buffer through the column, isocratic elution
93. Which can be used to differentiate between individual DNA binding proteins or a protein complex that recognize the same DNA sequence?
- A. Footprinting
 - B. EMSA and ChIP
 - C. EMSA only
 - D. ChIP only

94. Prokaryotic genetic system has:
- A. Neither DNA nor histones
 - B. DNA but no histones
 - C. Both DNA, RNA and histones
 - D. RNA, DNA and H1 histones
95. Which Ig is transferred through milk?
- A. IgG
 - B. IgE
 - C. IgA
 - D. IgM
96. The most definitive method for determining if actin is a component of an isolated membrane preparation would be to analyze the membrane proteins by?
- A. Thin layer chromatography
 - B. Western blot
 - C. Poly acrylamide gel electrophoresis
 - D. Column chromatography
97. Which of the following serves as a specific binding site for the proteins involved in membrane fusion during exocytosis?
- A. Phosphatidylinositol
 - B. Phosphatidylinositol 3, 4-biphosphate
 - C. Phosphatidylinositol 3, 5-biphosphate
 - D. Phosphatidylinositol 4, 5-biphosphate
98. The normal specific gravity of blood plasma is in the range:
- A. 0.90 to 1.0
 - B. 1.06 to 1.065
 - C. 1.025 to 1.035
 - D. 1.1 to 1.15
99. Which of the following is not a function of iron?
- A. Oxygen transport
 - B. Cofactor in enzymes
 - C. Role in oxidative metabolism
 - D. Gene regulation
100. The intrinsic fluorescence of proteins is mainly due to the presence of:
- A. Alanine
 - B. Tryptophan
 - C. Histidine
 - D. Methionine