श्री चित्रा तिरुनाल आयुर्विज्ञान और प्रौद्योगिकी संस्थान, त्रिवेंद्रम , केरल– 695 011
(एक राष्ट्रीय महत्व का संस्थान, विज्ञान एवं प्रौद्योगिकी विभाग, भारत सरकार)
SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES AND TECHNOLOGY, TRIVANDRUM
KERALA – 695 011
(An Institution of National Importance, Department of Science and Technology, Govt. of India)
टेलीफॉन नं.Telephone No. 0471- 2443152 -फाक्स /Fax- 2550728 , 0471- 2446433
ई-मेल/E-mail :sct@sctimst.ac.in वेबसाइट/ Website : www.sctimst.ac.in

ENTRANCE EXAMINATION - ACADEMIC SESSION JANUARY 2023

Program: PhD Biological Sciences

Time:90 Minutes

Max. Marks: 100

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

1.	A well perfused heart primarily utilizes_____ as a fuel for ATP synthesis.
	a. Glucose b. Lactate c. Glycogen d. Fatty Acid
2.	Which of the following is an inhibitor of electron transport in ETC?
	a. Dinitrophenol (DNP) b. Oligomycin c. Antimycin A d. Thermogenin
3.	A loss of heterozygosity (LOH) in a chromosome indicates the presence of:
	a. A tumor suppressor gene b. An Oncogene c. An epigenetic alteration of DNA d. DNA amplification
4.	Which among the following immunoglobulin crosses placenta?
	a. IgG b. IgM c. IgA d. IgE
5.	A solution contains 100 g/L of NaCl (MW – 58.5). What is the molarity of the solution?
	a. 0.19M b. 1.7M c. 3.0M d. 5.1M
6.	The maximum velocity (Vmax) in attained by an enzyme catalyzed reaction when:

	a. Half the active sites on the enzyme are occupied. b. Enzyme concentration is much larger than the substrate concentration. c. All the active sites on the enzymes are occupied. d. Substrate concentration is at Km.
7.	The breakdown of blood brain barrier will lead to cerebral edema because
	a. Na+ K+ ATPase activity is disrupted. b. Cerebrospinal fluid (CSF) leaks into interstitial space. c. Neuronal Na+ increases. d. Albumin enters the brain parenchyma.
8.	Glucose uptake into the brain occurs through
	a. Insulin independent GLUT1. b. Insulin independent GLUT2. c. Insulin dependent GLUT3. d. Insulin dependent GLUT4.
9.	If isolated cardiac muscle is deprived of Ca2+, it stops beating within one minute, whereas skeletal muscles can continue to contract without an extracellular source of Ca2+. This is because:
	a. A comparatively more developed T-tubular system in cardiac muscle. b. Activity of Ca2+ Na+ exchanger. c. More developed sarcoplasmic reticulum in skeletal muscles. d. The inactivity of Ca2+ release channels in cardiac muscles.
10.	The thin filament of sarcomere is made up of
	a. F-actin, troponins, tropomyosin. b. G-actin, troponins, tropomyosin. c. Two intertwined a helices and four light chains. d. F-actin, troponins and myosin.
11.	The correct sequence of transport of electrons from NADH in Electron transport chain is
	a. Complex I, Cyt Q, Complex II, Cyt c, Complex III, Complex IV, O2 b. Complex II, Cyt Q, Complex III, Cyt c, Complex IV, O2 c. Complex I, Complex II, Complex III, Complex IV, Complex V, O2 d. Complex I, Cyt Q, Complex III, Cyt c, Complex IV, O2
12.	Which of the following depicts the second messenger activity of inositol triphosphate (IP3)?
	a. Release of Ca2+ from endoplasmic reticulum. b. Activation of protein kinase C. c. Activation of protein kinase A. d. Opening of cell membrane Ca2+ channels.

13.	The enzyme telomerase:
	a. Causes cell growth arrest by inactivating p53 b. Causes shortening of telomeres in somatic cells c. Is activated in response to DNA damage d. Maintains the length of telomere by addition of guanine-rich repetitive seqenences
14.	Short interfering RNA is
	a. An enzyme that degrades RNA b. The repeated sequence at the 5' end of a retroviral RNA c. Any segment of an interrupted gene that is represented in the mature RNA product. d. A miRNA that prevents gene expression.
15.	The introduction of _____ in the culture medium enables cells to increase their endogenous production of CO2
	a. Glucose b. HEPES c. Pyruvate d. Growth factors
16.	The peptides that does not belong to peptides at epithelial surfaces forming innate immunity and does not belong to human antimicrobial proteins is _____
	a. Defensin b. Vimentin c. Calprotectin d. Lactoferrin
17.	The process that is described as death-upon-detachment is known as
	a. Metastasis b. Necroptosis c. Extravasation d. Anoikis
18.	When glycogen breakdown to release glucose, it is released in the first step as-----
	a. glucose b. glucose-1-phosphate c. glucsose-6-phosphate d. glucose and glucose-6-phosphate
19.	Which among the following is NOT an extracellular matrix protein
	a. Collagen b. Vitronectin c. Laminin d. Keratin

20.	The total number of cells in 1 ml of a bacterial culture was estimated to be 2.5x10^6. The culture was diluted 25-fold and 100 ul seeded per well of a 96-well plate. What is the final, cell number per well
	a. 1x10^5 b. 2.7x10^4 c. 1x10^4 d. 1.6x10^5
21.	In ELISA, the enzyme is linked to antibody is stabilized by which interaction?
	a. covalent bond b. van der Waal's interactions c. hydrogen bond d. ionic bond
22.	The stable binding of RNA Polymerase at the promoter site is ensured by _____
	a. DNA photolyase b. Sigma factor c. Rec A d. DNA glycosylase
23.	The donation of electrons from NADH and FADHz to oxygen molecule (O2) occurs at
	a. endoplasmic reticulum, chloroplast and mitochondria b. chloroplast only c. mitochondria only d. endoplasmic reticulum only
24.	The immunoglobulin isotypes that plays most important for role in protecting infections that invade through the respiratory or gut mucosa?
	a. Ig A b. Ig D c. Ig M d. Ig E
25.	During the blastocyst stage of a mammalian embryo, the cells of the inner cell mass are
	a. unipotent b. multipotent c. pluripotent d. totipotent
26.	What will the radio activity at the completion of 6 half-lives, after injecting a mouse with radioactive material of current activity of 256 Bq?
	a. 24 Bq b. 16 Bq c. 8 Bq d. 4 Bq

27.	To prepare individual tissue cells from a primary culture, the cell-cell and cell-matrix interaction must be broken. One among the following will NOT be a choice to prepare individual cells from a primary culture by breaking down the cell-cell and cell-matrix interaction
	a. Collagenase b. Separase c. Trypsin d. EDTA
28.	A common chemical event that creates spontaneous mutation is deamination of bases. The base that will be formed by deamination of 5-methylcytosine is
	a. Cytosine b. Uracil c. Guanine d. Thymine
29.	Some statements regarding drug metabolism is given below. Which statement is true?
	a. The therapeutic window is simply the range of drug concentrations that provide therapeutic response without significant adverse effects due to drug toxicity b. A poor metabolizer is a person who cannot metabolize a drug properly and faces risk of underdose. c. An ultrafast metabolizer is a person who metabolizes a drug too quickly and is at a risk of drug overdose d. Each individual drug molecule is metabolized by a specific drug-metabolizing enzyme that is dedicated to metabolism of that drug.
30.	The RNA- protein complex, telomerase, which completes the replication of telomeres during DNA synthesis, is a specialized
	a. RNA dependent DNA polymerase b. DNA dependent DNA polymerase c. DNA dependent RNA polymerase d. RNA dependent RNA polymerase
31.	A protein secretion was studied by fluorescently tagging the protein in yeast. Fluorescence was observed in the following organelles (a) the Golgi, (b) the secretory vesicles, (c) the rough ER. The best sequence of events that occur is
	a) $a \rightarrow b \rightarrow c$ b) $b \rightarrow c \rightarrow a$ c) $c \rightarrow a \rightarrow b$ d) $c \rightarrow b \rightarrow a$
32.	Co-localization of two fluorescently labeled proteins in an organelle in cells is usually visualised by
	a. confocal microscopy. b. phase contrast microscopy. c. interference-contrast microscopy. d. atomic force microscopy

33.	The gap junctions between cells that forms cylindrical channels are made of
	a. N-CAM. b. collagen. c. fibronectin. d. connexin.
34.	The three transcription factors that maintains the pluripotency of the inner cell mass in mammals are
	a. Oct 4, Sox 2 and Nanog b. Oct 4, Sox 2 and Cdx2 c. Sox 2, Nanog and Cdx2 d. Oct 4, Cdx2 and Nanog
35.	A researcher would like to quantify the changes in production of a serum protein for, which an antibody is available. Which one of the following methods would be best suited for the purpose?
	a. Fluorescence in situ hybridization b. Immunofluorescence microscopy c. Enzyme linked immunosorbent assay. d. Fluorescence activated cell sorting
36.	Which of the following is NOT a proteo-glycan formed by linking glycosaminoglycans to proteins
	a. Hyaluronan b. Aggrecan c. Betaglycan d. Syndecan-I
37.	Which among the assay system given can be used to specifically detect apoptotic cells?
	a. FACS analysis with FITC — Annexin V b. Tetrazolitim dye (MTT) based colorimetrie assay c. 51Cr release assay d. Trypan blue exclusion assay
38.	Inward movement of an expanding outer layer spreading over the internal surface during gastrulation is termed as
	a. invagination b. involution c. delamination d. Ingression
39.	Which one ofthe following chemicals is a DNA intercalator?
	a. 5-Bromouracil b. Ethyl methane sulfonate c. Acridine orange d. Penicillin
40.	Application of gene therapy in clinical trials did NOT succeed due to

	a. poor integration of a gene in the host genome b. lack of expression of integrated gene in cells c. degradation of gene inside the cell d. activation of oncogenes consequent to integration of the gene
41.	Which is the important site of formation of glycoproteins and glycolipids in eukaryotic cells?
	a. Endoplasmic reticulum b. Peroxisomes c. Golgi bodies d. Polysomes
42.	Major organ involved in detoxification
	a. liver b. kidney c. GI tract d. skin
43.	Genes commonly expressed in iPSC
	a. Oct-02 b. Sox9 c. KLF4 d. All of the above
44.	miRNA s are
	a. coding RNA b. non coding RNA c. regulate gene expression d. Both 2 & 3
45.	Adult cardiomyocytes lack
	a. mitochondria b. ribosomes c. cell division d. cytoskeletal proteins
46.	The process of growth is maximum during
	a. Senescence b. Dormancy c. Log phase d. Lag phase
47.	Next generation sequencing is not applicable for sequencing
	a. whole genome b. RNA c. peptide d. DNA

48.	Co-localization of two fluorescently labelled proteins in cells is usually visualized
	a. Interference-contrast microscopy b. atomic force microscopy c. Scanning electron microscopy d. Confocal microscopy
49.	Flow cytometry is used to measure
	a. surface receptors b. extra cellular matrix c. Lipid molecules d. RNA
50.	The mRNA of which eukaryotic protein lacks introns?
	a. Haemoglobin b. Myoglobin c. Histone d. Polymerase
51.	Which of the following is not an autoimmune disease?
	a. Alzheimer's disease b. Rheumatoid arthritis c. Psoriasis d. Vitiligo
52.	The CRISPR-Cas9 system in bacteria is akin to our body's
	a. Digestive system b. Immune system c. Circulatory system d. Respiratory system
53.	For sustained expression of a transgene in the successive generation of a cell line in culture, the ideal gene transfer can be obtained using
	a. Lentiviral vector b. Adenoviral vector c. Plasmids d. cosmids
54.	Microfilaments are composed of
	a. actin b. tubulin c. vimentin d. none
55.	Identify the substances having glycosidic bond and peptide bond, respectively in their structure
	a. Cellulose, lecithin b. Inulin, insulin c. Chitin, cholesterol d. Glycerol, trypsin

56.	The following process in developmental biology of animals is dependent on cellular movements?
	a. Morphogensis b. Differentiation c. Cell cycle d. Pattern formation
57.	Which is the genome editing techniques from the following?
	a. TALENS b. ZFNs c. CRISPR/Cas9 d. All of the above
58.	Which of the following method will be used to monitor the protein level in a serum sample against which an antibody is available
	a. Immunofluorescence microscopy b. FISH c. ELISA d. FACS
59.	Nanog is a
	a. transcription factor b. receptor c. cell surface antigen d. Small molecule
60.	Which one of the following is not a post-translational modification in mammalian system?
	a. Palmitoylation b. Glycosylation c. Peptidylation d. Phosphorylation
61	Autogamy refers to
	a. Self destruction of gametes b. Self polliation in flowers c. Flower withering d. Cross pollination of flowers
62	Which of the following is not used to describe variability in the data a. Range b. Standard deviation c. Mode d. Quartiles
63	What day of the week will it be 53 days from a Monday? a. Wednesday b. Friday c. Saturday d. Sunday

64	The part of root which is involved in perceiving gravity is a. Root cap b. Endodermis c. Elongation zone d. Quiescent center
65	The illuminating source used as a source of excitation of fluroscent dyes in a confocal microscope? a. Electron beam b. Masers c. Mercury lamp d. Lasers
66	The regionally localized proteins or mRNAs within the unfertilized egg that regulate development are called a. Cytoplasmic determinants b. Morphometric determinants c. Gene regulators d. Mosaic forming factors
67	Which of the following analytical technique does not use optical measurement? a. ELISA b. Spectrometry c. Flow cytometry d. Differential Scanning Calorimetry
68	The tetanus vaccine given to humans in the case of a deep cut is a a. DNA vaccine b. Toxoid vaccine c. Subunit vaccine d. Recombinant vector vaccine
69	The sum of digits of a two-digit numbers is 6. If the fraction formed by taking 3 less than the number as numerator and 4 more than the number as denominator is 3/4 , what is the a. 36 b. 24 c. 45 d. 54
70	The dye used in Gram staining is a. Giemsa b. Crystal violet c. Methylene blue d. Rhodamine

71	A train of length 110 m is moving at a rate of 180 kmph. How long it will take to cross a platform of 165m? a. 5.5 s b. 1.53 s c. 6.2 s d. 4.4 s
72	The cost of 10 books, 8 pens and 12 pencils is 240 rupees. If 8 books, 6 pens and 10 pencils costs 180 rupees, what would be the cost for 1 book, 1 pen and 1 pencil? a. 25 b. 30 c. 35 d. 40
73	Two numbers are in the ratio 5:4. Gopal subtracts 15 from each so that they're now in the ratio 7:5. Find the smaller number. a. 30 b. 35 c. 40 d. 50
74	Find the odd one out in the series: 13, 19, 29, 39, 41, 53, 59 a. 19 b. 39 c. 29 d. 59
75	Find the missing number: 4, 11, 22, 37, ... a. 43 b. 79 c. 56 d. 59
76	Find the odd one in the group: L, T, E, V, Q a. L b. E c. V d. Q
77	Today is Monday. After 63 days it, will be: a. Tuesday b. Saturday c. Monday d. Sunday

78	Three times the first of four consecultive even numbers is equal to the sum of double of third number and half of fourth number. Identify the second number a. 20 b. 24 c. 28 d. 32
79	When the digits of a two digit number interchanged it become double of its square root. Identify the number a. 64 b. 81 c. 16 d. 36
80	sum of squares of two numbers is 325 and their product is 150. The sum of the numbers is.... a. 30 b. 15 c. 25 d. 20
81	Which property measure the resistance of a liquid to flow a. Density b. Viscosity c. Volume d. Solubility
82	Mesons are found in a. X-rays b. Gamma rays c. Cosmic rays d. Laser beam
83	In a box, there are 8 red, 7 blue and 6 green balls. One ball is picked up randomly. What is the probability that it is neither red nor green? a. 1/3 b. 3/4 c. 7/19 d. 8/21
84	A person buys a shirt with marked price Rs.300/- at 20% discount. In order to make a profit of 20% the person should sell the shirt for a. Rs. 288 b. Rs. 300 c. Rs. 240 d. Rs. 360

85	Which one of the following number is a prime number a. 183 b. 157 c. 121 d. 161
86	A student received following marks in the five of the six courses, 91, 86, 81, 79 and 92. Average of his marks in six subject is 85.How may marks did he received in the sixth subject a. 83 b. 81 c. 85 d. 88
87	What is the sum of the factors of 4b2c2 – (b2 + c2 – a2) 2 ? a. a+b+c b. 2 (a+b+c) c. 0 d. 1
88	A father said to his son, "I was as old as you are at the present at the time of your birth". If the father's age is 38 years now, the son's age five years back was: a. 14 years b. 19 years c. 33 years d. 38 years
89	In a certain store, the profit is 320% of the cost. If the cost increases by 25% but the selling price remains constant, approximately what percentage of the selling price is the profit? a. 30% b. 70% c. 100% d. 250%
90	What is the unit for measuring the amplitude of a sound? a. Deceibel b. Coulomb c. Hum d. Cycles
91	Which of the following metals forms an amalgam with other metals? a. Tin b. Mercury c. Lead d. Zinc

92	The sky appears blue because of: a. Refraction b. Scattering c. Reflection d. Total Internal reflection
93	Why does a compact disc (CD) show a rainbow of colours with white light? It is due to: a. Interference b. Diffraction c. Scattering d. Dispersion
94	A person is driving towards west. What sequence of direction should he follow so that he is driving towards South a. Left,right,right b. Right,right,left c. Left,Left, Left d. Right, right,right
95	Earth, Saturn,Pluto,..... a. Uranus b. Moon c. Galaxy d. Sun
96	Find the odd man out a. RUX b. CFI c. BDG d. FIL
97	How many meaningful words can be formed from the letters of the word 'INDUSTRIAL' a. Four b. Three c. Five d. Six

98	Taj Mahal is related Love in the same way Jallianwala bagh is related to ---- a. Amritsar b. Martyrdom c. War d. Punjab
99	2021 Nobel Prize for chemistry was given for the work on a. Asymmetric organocatalysis b. Method for genome editing c. Lithium-ion batteries d. Evolution of enzymes
100	Atoms of an isotope has a. Same mass number b. Same electronic configuration c. Same atomic number d. Different Mass number

6
C