



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

ENTRANCE EXAMINATION - ACADEMIC SESSION JANUARY 2018

PROGRAMME: Ph.D. BIOLOGICAL SCIENCES STREAM

Time: 120 Minutes

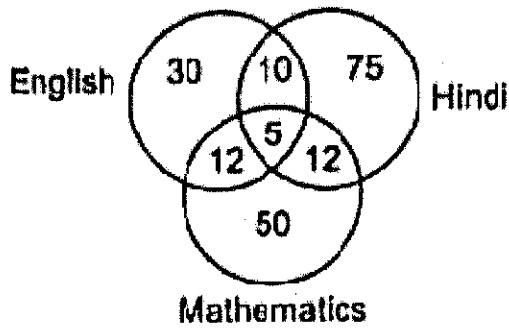
Max. Marks: 100

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

- 1) If 'a' is the smallest prime number greater than 39 and 'b' is the largest prime number less than 10, then ab =
a) 299 b) 287 c) 229 d) 261
- 2) Find the odd number from the series 8, 64, 99, 216, 343, 729, 1728
a) 64 b) 216 c) 729 d) 99
- 3) Which of the following options is the closest in meaning to the word 'ephemeral'?
a) short-lived b) effeminate c) oppose d) ghostly
- 4) A person has the capability of thinking 100 lines of code in five minutes and can type 100 lines of code in 10 minutes. He takes a break for five minutes after every ten minutes. How many lines of codes will he complete typing after an hour?
a) 100 b) 250 c) 350 d) 600
- 5) GENEALOGY: ANCESTRY, ETYMOLOGY: _____
a) Words b) Insects c) Fossils d) Inscriptions
- 6) Complete the equation by correctly identifying the incomplete number of the calculation from the list of options given below.
Equation: $(4.25 + 2.75)^2 + \underline{\quad} = 5^3 - (9 \times 8)$
a) 2 b) 4 c) 6 d) 8
- 7) Cobalt-60 is used in the radiation therapy of cancer and can be produced by bombardment of cobalt-59 with which of the following?
a) Neutrons b) Alpha particles c) Beta particles d) X-rays
- 8) 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

- 9) Which of the following microorganism does not cause disease in human beings?
 a) *Vibrio cholerae* b) *Salmonella typhi* c) *Clostridium titani* d) *Brevibacterium linens*
- 10) The anhydride of $\text{Ba}(\text{OH})_2$ is
 a) BaOH b) BaO c) BaO_2 d) Ba
- 11) Inheritance of acquired characteristics is called _____
 a) Lamarckism b) Neo-Lamarckism c) Mendelism d) Darwinism
- 12) A buffer is made from equal concentrations of a weak acid and its conjugate base. Doubling the volume of the buffer solution by adding water has what effect on its pH?
 a) It has little effect.
 b) It significantly increases the pH
 c) It significantly decreases the pH
 d) It changes the pH asymptotically to the pKa of the acid.
- 13) All proteins absorb electromagnetic radiation of wavelength around 190 nm, which corresponds to an excitation in the protein molecule. In which region of the spectrum is this wavelength found?
 a) X-ray b) Ultraviolet c) Microwave d) Infrared
- 14) What will be the pH of 10^{-8} M HCl?
 a) 7.22 b) 7.14 c) 7.0 d) 6.98
- 15) Which of the following is not having an electromagnetic nature?
 a) X-rays b) UV-rays c) β -rays d) Microwave
- 16) Which number comes next in this sequence? 1, 1.5, 2.5, 4, ___?
 a) 9 b) 8 c) 7 d) 6
- 17) If 3 less than twice a certain number is equal to 2 more than 3 times the number, then 5 less than 5 times the number is
 a) -30 b) -20 c) -5 d) 0
- 18) What is the greatest value of x for which $(3x - 2)(x + 1) = 0$?
 a) -1 b) $-\frac{2}{3}$ c) $\frac{2}{3}$ d) 1
- 19) If the average of 5 numbers is 36 and the average of four of those numbers is 34, then what is the value of the fifth number?
 a) 2 b) 34 c) 35 d) 44
- 20) The surface tension of a liquid vanishes at
 a) triplet point
 b) the boiling point
 c) critical temperature
 d) none of the above

21) Five hundred candidates appeared for the test conducted for English, Mathematics and Hindi. The below diagram gives the number of candidates failed at different tests. What is the percentage of students who failed for at least two tests?



- a) 0.078% b) 1.0% c) 6.8% d) 7.8%

22) A worker may claim Rs15 for each km he travelled in taxi and Rs 5 for each km he travelled in his own car. If in a month he is claiming Rs 500 for travelling 80km, how much does he travelled by taxi?

- a) 10 b) 20 c) 70 d) 40

23) At the end of a business conference ten people shook hands each other. Then how many handshakes were there altogether?

- a) 100 b) 55 c) 10 d) 45

24) A number of people decided to go to picnic and spent Rs.96 on eatables. At the end, four people did not turn up. As a result, others had to contribute Rs. 4 each extra. The number of those who attended the meeting was

- a) 12 b) 8 c) 10 d) 6

25) A bus starts from city X. The number of women in the bus is equal to half the number of men in the bus. When the bus reached city Y, 10 men left the bus and 5 women boarded it. Now, the number of women and men in the bus become equal. If so, how many passengers entered the bus in the beginning from city X.

- a) 15 b) 30 c) 36 d) 45

26) Today is Wednesday, after 62 days it would be

- a) Monday b) Tuesday c) Wednesday d) Saturday

Choose the appropriate word closest to meaning of word given in italics (questions 27 & 28)

27) A *baffling* problem

- a) Simple b) Puzzling c) Difficult d) Fresh

28) *Posthumous* child

- a) illegitimate b) Brilliant c) Born after death of father d) physically weak

Choose the appropriate word closest to meaning of word given in italics (questions 29 to 32)

29) *Hooligan*

- a) Tin Whistle b) Thug c) Street gang d) commotion

30) *Modus vivendi*

- a) Way of work b) Way of life c) Way of Operation d) Way of game

31) *Elucidate*

- a) Clarify b) Interpret c) Confuse d) Contradict

32) *Claustrophobia*

- a) Fear of spider b) Fear of computers c) Fear of being in enclosed area d) Fear of foreigners

33) The length of the side of a square is represented by $x+2$. The length of the side of an equilateral triangle is $2x$. If the square and the equilateral triangle have equal perimeter, then the value of x is

- a) 3 b) 5 c) 6 d) 4

34) The area of the circle is increasing at the rate of $0.7 \text{ cm}^2/\text{sec}$. What is the rate of increase of its circumference?

- a) 0.84 b) 1.4 c) 0.7 d) 1

35) The frequency of the second harmonic of 60 Hz is:

- a) 60 Hz b) 180Hz c) 100Hz d) 120Hz

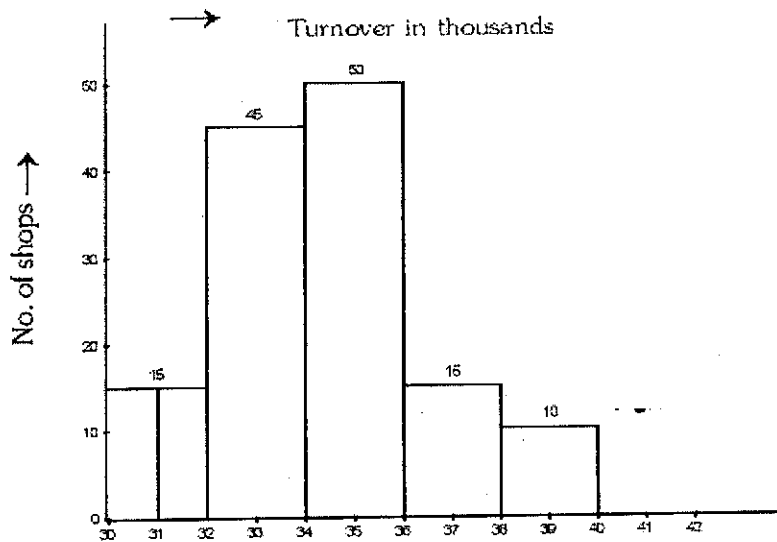
36) If $a - b = 3$ and $a^2 + b^2 = 29$. Find the value of ab .

- a) 10 b) 12 c) 15 d) 18

37) An accurate clock shows o'clock in the morning. Through how many degrees will the hour hand rotate when the clock shows 2 o'clock in the afternoon?

- a) 144° b) 160° c) 168° d) 180°

The results of a survey done on the monthly turnover of some shops are represented as a bar diagram below. Study the chart carefully and answer the questions 38 & 39.



- 38) What percentage of shops has turnover of over Rs.36 thousands
 a) 20% b) 25% c) 5% d) 23%
- 39) How many shops have turnover between Rs.32 thousand and Rs.38 thousand
 a) 35 b) 95 c) 110 d) 55
- 40) Find the word which is nearly opposite in meaning for the word "Extrinsic"
 a) Severe b) Shallow c) Incidental d) Inherent
- 41) Behavior of metaphasic chromosome in a dividing cell can be best studied using the technique
 a) X-ray microscopy
 b) Cell fractionation
 c) Phase contrast microscopy
 d) Scanning electron microscopy
- 42) Albinism, a total lack of melanin pigment is due to a recessive gene. A normal man and a normal woman, both of whom had one albino parent, marry. What is the probability of their having an albino child?
 a) All b) None c) 50% d) 25%
- 43) The gram negative bacteria detect and respond to chemicals in their surrounding using
 a) Porins b) Mesosome c) Muramic acid d) Lipopolysaccharide
- 44) The cell size is measured in
 a) Å b) mm c) nm d) μm

- 45) Suppressor genes act
- By changing the nucleotide sequence of a mutant gene.
 - By changing the way the mRNA template is read.
 - By synthesizing antibodies to the mutant gene.
 - By synthesizing proteins which block receptors.
- 46) Autoradiography is
- A radiological technique to take an X-ray of bone.
 - A method to provide accurate information on distribution of radio active labeled substances in tissue.
 - A method to provide accurate information on distribution of radio active labeled substances in a body
 - One of the steps of an MRI scan.
- 47) Which of the following cell type is LEAST able to regenerate?
- Centro-lobular hepatocytes
 - Cerebral neurons
 - Colonic epithelium
 - Subcutaneous fibroblasts
- 48) The following mediators of acute inflammation are derived from the plasma:
- Complement
 - Kinin
 - Leukotriene
 - A&B
- 49) The following statement regarding Macrophage is wrong
- are derived from blood monocytes
 - have a longer life span than neutrophils
 - can harbour viable organisms
 - multinucleated and do not produce cytokines
- 50) At anaphase of meiosis some chromosomes lag behind. They are called laggards. The cause is:
- inversion of chromosomes
 - acentric chromosome
 - dicentric chromosomes
 - duplication of genes
- 51) Inulin is used in assessing glomular filtration rate because
- It is a polysaccharide of high molecular weight
 - It is insoluble and stored in roots
 - It is a polysaccharide of low molecular weight and unutilized in human tissue
 - It is a low molecular weight compound which do not interfere in the function of kidney
- 52) The most mature cell that can undergo mitosis is
- Myeloblast
 - Promyelocyte
 - Myelocyte
 - Metamyelocyte
- 53) The transition between meiosis I and meiosis II is called
- interkinesis
 - cytokinesis
 - diakinesis
 - karyokinesis

- 54) Proteins in silk fibers are
- | | |
|-----------------------|-------------------------|
| a) Chondrin and mucin | b) Fibroin and sericin |
| c) Fibrin and serine | d) Collagen and elastin |
- 55) The totipotency of the cells of higher organisms is temporarily lost due to:
- | | |
|----------------------|--------------------------|
| a) dedifferentiation | b) increased workload |
| c) differentiation | d) no division of labour |
- 56) Prions (the smallest disease causing agent) is made of:
- | | |
|----------------------|------------------|
| a) Nucleic acid only | b) Proteins only |
| c) Lipids only | d) All the above |
- 57) CD4 a surface antigen, commonly found in T-helper cells is a:
- | | |
|-----------------|------------------|
| a) Glycoprotein | b) Nucleoprotein |
| c) Phospholipid | d) Polysacharide |
- 58) Which of the following is transcribed and then translated to form a protein product:
- | | |
|----------------------------------|-----------------------|
| a) Gene for t-RNA | b) Intron |
| c) Gene for transcription factor | d) Leader and trailer |
- 59) The process used to remove electrolytes from a solution of protein:
- | | | | |
|-----------------|-------------|----------------|--------------------|
| a) Electrolysis | b) Dialysis | c) Proteolysis | d) Electrophoresis |
|-----------------|-------------|----------------|--------------------|
- 60) Lysosomes are present in all animal cells except:
- | | | | |
|----------------|---------------|-----------------|---------------------|
| a) Brain cells | b) Leucocytes | c) Erythrocytes | d) Cells of Sertoli |
|----------------|---------------|-----------------|---------------------|
- 61) Which of the following is not true of cell membrane receptors?
- | |
|---|
| a) They are proteins |
| b) Their numbers increase and decrease in response to stimuli |
| c) They are static components of a cell |
| d) Their properties change with changes in physiological conditions |
- 62) Which of the following is true of RNA processing
- | |
|---|
| a) Exons are excised before the m-RNA is translated |
| b) Assemblies of proteins and snRNPs, called spliceosomes, may catalyze splicing |
| c) The RNA transcript that leaves the nucleus may be much longer than the original transcript |
| d) Large quantities of r-RNA are assembled into ribosomes |
- 63) The most striking example of point mutation is found in a disease called
- | | | | |
|--------------------|----------------|------------------|------------------------|
| a) Night blindness | b) Thalessemia | c) Down syndrome | d) Sickle cell anaemia |
|--------------------|----------------|------------------|------------------------|

- 64) Homologous recombination
- Occurs only between two segments from the same DNA molecule
 - Requires that a specific DNA sequence be present
 - Requires that one of the duplexes undergoing recombination be nicked
 - May result in strand exchange by branch migration.
- 65) Antibiotic of fungal origin is
- penicillin
 - cephalosporin
 - both a&b
 - gentamycin
- 66) 5-Methylcytosines are common sites for mutations because they:
- Are not recognized by the proofreading activity of DNA polymerase.
 - Can mispair with adenine
 - Can deaminate to thymidine.
 - Prevent discrimination between the daughter and parental strand
- 67) When cells die by apoptosis, as compared to by necrosis, they are much less likely to produce inflammation and damage to the surrounding tissue because they
- Are not subsequently phagocytized by macrophages and neutrophils
 - Do not break open and release the cytoplasmic contents
 - Are rarely malignant, infected with virus or otherwise unhealthy
 - Recycle their membrane components to prevent display of antigen on MHC I
- 68) An antibody treated with mercaptoethanol (reduces S=S) will fragment into---
- Separate light and heavy chains
 - Separate light chains and a dimer of heavy chains
 - Separate fragments from the variable and constant domains of the light and heavy chains
 - Fab fragments and F_C fragments
- 69) The sigma subunit of prokaryotic RNA polymerase
- Is part of core enzyme
 - Binds the antibiotic rifampicin
 - is inhibited by α -amanitin
 - Specifically recognizes promoter sites.
- 70) Antibodies are produced against self RBC proteins in
- Addison's disease
 - Auto-immune hemolytic anemia
 - leukemia
 - Hashimoto disease

- 71) An interspersion pattern in DNA consists of
- Highly repetitive DNA sequences
 - The portion of DNA composed of single copy DNA
 - Alternating blocks of single copy DNA and moderately repetitive DNA
 - Alternating blocks of short interspersed repeats and long interspersed repeats.
- 72) The spleen does not:
- House lymphocytes
 - Filter foreign particles, damaged red blood cells, and cellular debris from blood
 - Contain phagocytes
 - Change un differentiated lymphocytes into T-lymphocytes
- 73) Cell membranes typically
- Are about 90% phospholipids
 - Have both integral and peripheral proteins
 - Contain cholesteryl esters
 - Contain free carbohydrates such as glucose
- 74) Blood vessels near a wound dilate and become more permeable in response to which, damaged cells release
- pyrogens
 - antibodies
 - histamine
 - interferons
- 75) The molecular scissors used to cut DNA into specific genes of interest are called
- Exonucleases
 - Restriction endonucleases
 - Ligases
 - Polymerases
- 76) Temperature at which long-term cryopreservation of cells can be done is
- 140° C
 - 120° C
 - 196° C
 - 273° C
- 77) The mucopolysaccharide prominently seen in bone joints is:
- Hyaluronic acid
 - Chondroitin sulphate
 - Heparin
 - Mucilage
- 78) Which part of neuron is covered up by a lipid rich layer?
- Dendrites
 - Cyton
 - Axon
 - Nodes of Ranvier
- 79) B-lymphocytes are primarily involved in
- Humoral immunity
 - Autoimmune disorders
 - Graft rejection
 - Cell-mediated immunity

- 80) What happened to the person who receives the wrong type of blood?
 a) All the arteries dilate b) All the arteries constrict
 c) Red blood cells agglutinate d) The spleen and lymph nodes deteriorate
- 81) The amino acid glycine is used as a main ingredient of buffer in biochemical experiments. In what pH range can glycine be used as an effective buffer due to its amino group?
 a) pH 8.6 to 10.6 b) pH 7.6 to 9.6 c) pH 4.2 to 6.2 d) pH 1.2 to 3.4
- 82) A graft transplanted between two genetically identical individuals is called
 a) Autologous graft b) Syngenic graft c) Xenogeneic graft d) Allograft
- 83) The induction of apoptosis involves the activation of the cytosolic enzyme called
 a) Proteinases b) Caspases c) Endonucleases d) Kinases
- 84) Which of the following macromolecules will yield only one type of monomer following complete hydrolysis?
 a) DNA b) RNA c) lipoprotein d) glycogen
- 85) In glycoproteins, the carbohydrate moiety always gets attached through which of the following amino acids?
 a) Glycine or alanine b) Glutamine or arginine
 c) Asparagine, serine, or threonine d) Aspartate or glutamate
- 86) In the secondary structure formation of a protein, which of the following is responsible for holding an alpha-helix region in its helical form?
 a) Hydrogen bonds b) Ionic bonds
 c) Disulfide bonds d) Hydrophobic interactions
- 87) An X-linked recessive gene produces red-green color blindness in humans. A woman with normal color vision whose father was color-blind marries a color-blind man. What is the probability that their son will be color-blind?
 a) 0 b) 25% c) 50% d) 75%
- 88) Which method is employed for separation of molecules based on its size?
 a) Ion-exchange chromatography b) Gel-filtration chromatography
 c) Affinity chromatography d) All the above
- 89) The cones of the retina
 a) Are much more numerous than the rods b) Do not use transducin in signal transduction
 c) Are responsible for color vision d) None of the above
- 90) Which of the following hormones initiates biological actions by crossing the plasma membrane and then binding to an intracellular receptor?
 a) Insulin b) Calcitonin c) Estradiol d) Angiotensin II

- 91) Conversion of glucose to glycogen occurs in
 a) Kidneys b) Small intestine c) Liver d) Pancreas
- 92) Who is the first to record electroencephalogram (EEG) in human
 a) Hans Berger b) Robert Koch c) Alexander Flemming d) Graham Bell
- 93) Biochips are made up of
 a) semi-conducting molecules inserted into the protein frame work
 b) conducting molecules inserted into the protein frame work
 c) non-conducting molecules inserted into the protein frame work
 d) any of above
- 94) Apoptosis:
 a) is the normal physiological process of programmed cell death.
 b) occurs only in old age.
 c) results in products that are not removed by phagocytosis.
 d) causes inflammation which may damage surrounding cells.
- 95) The "all-or-nothing event" refers to the fact that
 a) nerve cells are continuously active
 b) action potentials occur completely or not at all.
 c) an electrical current crosses the synapse completely or not at all.
 d) all the neurons in a particular "lobe" of the brain fire or none of them fire
- 96) An innovative scanning technique that uses magnetic technology to visualize brain activity is called
 a) PET b) MRI c) CAT d) fMRI
- 97) The most obvious difference between the human brain and the brain of a fish would be in
 a) Hypothalamus b) Thalamus c) Cerebellum d) Cerebral cortex
- 98) If the RBC of human were kept in 0.9% NaCl solution, what sort of change will occur to RBC?
 a) Cell will Burst b) Cell will shrink c) No change to RBC d) RBC will destroy
- 99) Executive Functions: involve problem-solving, planning, initiative, organising, and they monitor and inhibit complex behaviours. These functions are normally associated with which area of the brain?
 a) The neocortex. b) The corpus callosum c) The cerebellum. d) The prefrontal cortex.
- 100) The conduction of a nerve impulse down the axon is called
 a) ion potential b) action potential c) resting potential d) Synapse

