

**SREE CHITRA TIRUNAL INSTITUTE FOR MEDICAL SCIENCES & TECHNOLOGY,  
TRIVANDRUM**

**ENTRANCE EXAMINATION: NOVEMBER, 2016**

**PROGRAMME: PhD – BIOLOGICAL SCIENCE STREAM**

**Duration: 120 Minutes**

**Total Marks: 100**

**(Select the most appropriate answer; Each question carries one mark: There is no negative marking)**

- 1) A train running at the speed of 60 km/hr crosses a pole in 9 seconds. What is the length of the train?  
a) 120 meters      b) 180 meters      c) 324 meters      d) 150 meters
- 2) The angle of elevation of a ladder leaning against a wall is  $60^\circ$  and the foot of the ladder is 4.6 m away from the wall. The length of the ladder is:  
a) 2.3 m      b) 4.6 m      c) 7.8 m      d) 9.2 m
- 3) A sum of money at simple interest amounts to Rs. 815 in 3 years and to Rs. 854 in 4 years. The sum is:  
a) Rs. 650/-      b) Rs. 690/-      c) Rs. 698/-      d) Rs. 700/-
- 4) Alfred buys an old scooter for Rs. 4700 and spends Rs. 800 on its repairs. If he sells the scooter for Rs. 5800, his gain percent is:  
a) 4.57%      b) 5.45%      c) 10%      d) 12%
- 5) A fruit seller had some apples. He sells 40% apples and still has 420 apples. Originally, he had  
a) 588 apples      b) 600 apples      c) 672 apples      d) 700 apples
- 6) Today is Monday. After 61 days, it will be  
a) Wednesday      b) Saturday      c) Tuesday      d) Thursday
- 7) The average monthly income of P and Q is Rs. 5050. The average monthly income of Q and R is Rs. 6250 and the average monthly income of P and R is Rs. 5200. The monthly income of P in rupees is:  
a) 3500      b) 4000      c) 4050      d) 5000
- 8) Which one of the following is not a prime number?  
a) 31      b) 61      c) 71      d) 91

9) If  $a - b = 3$  and  $a^2 + b^2 = 29$ , find the value of  $ab$ .

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

10) A bag contains 2 red, 3 green and 2 blue balls. Two balls are drawn at random. What is the probability that none of the balls drawn is blue?

- a) 10/21                      b) 11/21                      c) 2/7                      d) 5/7

11) An accurate clock shows 8 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)  $144^\circ$                       b)  $150^\circ$                       c)  $168^\circ$                       d)  $180^\circ$

12) Find the statement that must be true according to the given information:

Sheela is twelve years old. For three years, she has been asking her parents for a dog. Her parents have told her that they believe a dog would not be happy in an apartment, but they have given her permission to have a bird. Sheela has not yet decided what kind of bird she would like to have.

- a) Sheela's parents like birds better than they like dogs  
b) Sheela does not like birds.  
c) Sheela and her parents live in an apartment  
d) Sheela and her parents would like to move

13) Odometer is to mileage as compass is to

- a) Speed                      b) Hiking                      c) Needle                      d) Direction

14) Optimist is to *cheerful* as pessimist is to

- a) Gloomy                      b) Mean                      c) Petty                      d) Helpful

15) Statement: Unemployment allowance should be given to all unemployed Indian youth above 18 years of age.

Assumptions:

I) There are unemployed youth in India who needs monetary support.

II) The government has sufficient funds to provide allowance to all unemployed youth.

- a) Only assumption I is implicit  
b) Only assumption II is implicit  
c) Either I or II is implicit  
d) Neither I nor II is implicit

16) **Statements:** All mangoes are golden in colour. No golden-coloured things are cheap.

**Conclusions:**

- 1) All mangoes are cheap.
- 2) Golden-coloured mangoes are not cheap.

- a) Only conclusion I follows
- b) Only conclusion II follows
- c) Either I or II follows
- d) Neither I nor II follows

17) Look at this series: 7, 10, 8, 11, 9, 12, ..... What number should come next?

- a) 7
- b) 10
- c) 12
- d) 13

18) The words in the bottom row are related in the same way as the words in the top row. For each item, find the word that completes the bottom row of words.

Candle	Lamp	Floodlight
Hut	Cottage	???

- a) Tent
- b) City
- c) Dwelling
- d) House

19) Apple	Fruit	Supermarket
Novel	Book	???

- a) Vegetable
- b) Magazine
- c) Bookstore
- d) Shopping

20) Here are some words translated from an artificial language.

*gorblflur* means fan belt

*pixngörbl* means ceiling fan

*arthtusl* means tile roof

Which word could mean "ceiling tile"?

- a) gorbltusl
- b) flurgörbl
- c) arthflur
- d) pixnarth

21) A word is underlined followed by four answer choices. You will choose the word that is a necessary part of the underlined word

Book

- a) Fiction
- b) Pages
- c) Pictures
- d) Learning

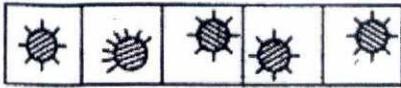
22) Choose the figure which is different from the rest.



- (1)
- (2)
- (3)
- (4)
- (5)

- a) 1
- b) 2
- c) 3
- d) 4

23) Choose the figure which is different from the rest.



(1) (2) (3) (4) (5)

- a) 5                      b) 2                      c) 3                      d) 1

24) Choose the alternative which closely resembles the mirror image of the given combination.

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(1) AƆ 101 ƆN1A ɹA

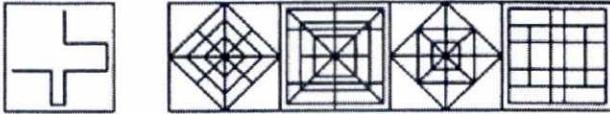
(2) A 101 4 1 A ɹ A T

(3) A 101 Ɔ ƆT A ɹ A ɹ I A

(4) A Ɔ 101 Ɔ N1 A ɹ A T

- a) 1                      b) 2                      c) 3                      d) 4

25) Find out the alternative figure which contains figure (X) as its part.



(X) (1) (2) (3) (4)

- a) 1                      b) 2                      c) 3                      d) 4

26) Identify the figure that completes the pattern



(X) (1) (2) (3) (4)

- a) 1                      b) 2                      c) 3                      d) 4

27) Find the correctly spelt word.

- a) Efficient              b) Treatmeant              c) Beterment              d) Employd

28) Find the correctly spelt word.

- a) Ommineous              b) Omineous              c) Ominous              d) Omenous

29) The study of ancient societies is known as

- a) Anthropology              b) Archaeology              c) History              d) Ethnology

30) List of the business or subjects to be considered at a meeting is termed as

- a) Schedule                      b) Timetable                      c) Agenda                      d) Plan

31) Which of the phrases given below each sentence should replace the phrase printed in *italics* to make it grammatically correct?

The small child does whatever his father *was done*.

- a) has done                      b) did                      c) does                      d) had done

32) The man *to who I sold* my house was a cheat.

- a) to whom I sell                      b) to who I sell                      c) who was sold to                      d) to whom I sold

33) From the given alternatives, choose the one which best expresses the given sentence in Indirect/Direct speech.

"If you don't keep quiet I shall shoot you", he said to her in a calm voice.

- a) He warned her to shoot if she didn't keep quiet calmly.  
b) He said calmly that I shall shoot you if you don't be quiet.  
c) He warned her calmly that he would shoot her if she didn't keep quiet.  
d) Calmly he warned her that be quiet or else he will have to shoot her

34) Pick out the most effective word from the given words to fill in the blank to make the sentence meaningfully complete.

**Fate smiles ..... those who untiringly grapple with stark realities of life**

- a) with                      b) over                      c) on                      d) round

35) If you smuggle goods into the country, they may be ..... by the customs authority.

- a) Possessed                      b) Punished                      c) Confiscated                      d) Fined

36) Joule is the unit of

- a) Temperature                      b) Pressure                      c) Energy                      d) Heat

37) For which of the following disciplines is Nobel Prize awarded?

- a) Physics and Chemistry  
b) Physiology or Medicine  
c) Literature, Peace and Economics  
d) All of the above

38) Professor Amartya Sen is famous in which of the fields?

- a) Biochemistry      b) Electronics      c) Economics      d) Geology

39) What is the name of the CalTech seismologist who invented the scale used to measure the magnitude of earthquakes?

- a) Charles Richter      b) Hiram Walker      c) Giuseppe Mercalli      d) Joshua Rumble

40) Sometimes computers are connected to a UPS system. What does UPS mean?

- a) United Parcel Service  
b) Uniform Product Support  
c) Under Paneling Storage  
d) Uninterruptable Power Supply

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) Why a DNA duplex melts at a specific temperature ( $T_m$ ) on heating?

- a) Loss of base stacking energy  
b) The double helix is intrinsically unstable  
c) The single helix is more stable as compared to the double helix  
d) The DNA double helix is a co-operative structure stabilized by hydrogen bonds and base pairing

43) Harvesting of cells from a growing culture is done by treatment with trypsin. Why such treatment does not kill cells?

- a) Damage occurs to plasma membrane only  
b) Damage occurs to extracellular component  
c) Damage occurs to intracellular only actin  
d) Damage occurs to surface receptors

44) Which of the following hormones initiates biological activities by crossing the plasma membrane and then binding to a receptor?

- a) Glucagon      b) Estradiol      c) Insulin      d) Norepinephrine

45) Number of autosomes present in human sperm is

- a) 21 pairs      b) 23 pairs      c) 22 pairs      d) 24 pairs

46) A gland in human which is both endocrine and exocrine

- a) Liver                      b) Pancreas                      c) Testis                      d) Ovary

47) The G2 phase of the cell cycle is mainly signified by the synthesis of

- a) m-RNA                      b) r-RNA                      c) DNA                      d) ATP

48) The process used to remove electrolytes from a solution of protein:

- a) Electrolysis                      b) Dialysis                      c) Proteolysis                      d) Electrophoresis

49) 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%

50) The gram negative bacteria detect and respond to chemicals in their surrounding using

- a) Porins                      b) Mesosome                      c) Muramic acid                      d) Lipopolysaccharide

51) The cell size is measured in

- a) Å                                      b) mm                                      c) nm                                      d) μm

52) Suppressor genes act

- a) By changing the nucleotide sequence of a mutant gene.  
b) By changing the way the mRNA template is read.  
c) By synthesizing antibodies to the mutant gene.  
d) By synthesizing proteins which block receptors.

53) Autoradiography is

- a) A radiological technique to take an X-ray of bone.  
b) A method to provide accurate information on distribution of radioactive labeled substances in tissue.  
c) A method to provide accurate information on distribution of radioactive labeled substances in a body  
d) One of the steps of an MRI scan.

54) At anaphase of meiosis some chromosomes lag behind. They are called laggards. The cause is:

- a) inversion of chromosomes  
b) acentric chromosome  
c) dicentric chromosomes  
d) duplication of genes

- 55) Proteins in silk fibers are  
a) Chondrin and mucin  
b) Fibroin and sericin  
c) Fibrin and serine  
d) Collagen and elastin
- 56) 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
- 57) Antibiotic of fungal origin is  
a) penicillin                      b) cephalosporin                      c) both A & B                      d) Gentamycin
- 58) The sigma subunit of prokaryotic RNA polymerase  
a) Is part of core enzyme  
b) Binds the antibiotic rifampicin  
c) Is inhibited by  $\alpha$ -amanitin  
d) Specifically recognizes promoter sites.
- 59) Cell membranes typically  
a) Are about 90% phospholipids  
b) Have both integral and peripheral proteins  
c) Contain cholesteryl esters  
d) Contain free carbohydrates such as glucose
- 60) Blood vessels near a wound dilate and become more permeable in response to which, damaged cells release  
a) pyrogens                      b) antibodies                      c) histamine                      d) interferons
- 61) Which part of neuron is covered up by a lipid rich layer?  
a) Dendrites                      b) Cyton                      c) Axon                      d) Nodes of Ranvier
- 62) Cell would normally proceed to mitosis without interruption:  
a) Once it has entered the S phase  
b) Once it has entered the G2 phase  
c) At any time after initiation of cell division  
d) None of the above
- 63) Restriction enzyme was discovered by:  
a) Wakesman  
b) Alexander Flemming  
c) Berg  
d) A. Werner, H Smith and Nathans

- 64) The clonal selection theory states that
- An antigen selects certain B-cells and suppresses them
  - An antigen stimulates the multiplication of B-cells that produce antibodies against it
  - T-cells select those B-cells that should produce antibodies regardless of antigen present
  - T-cells suppress all B-cells except one that should multiply and divide
- 65) Which of the following is used to assist the heart in pumping blood?
- Intra-aortic balloon pump
  - Pacemaker
  - Medical lasers
  - Prosthetic valves
- 66) Retroviruses are well known as cancer causing agents because it
- causes mutations in host genes involved in growth.
  - integrates their proviral DNA next to protooncogenes.
  - generates defective viruses lacking some of the viral genes.
  - integrates their T antigens into the host genome.
- 67) The major site of attack by HIV-virus on immune system is-
- MHC
  - B- Lymphocytes
  - T- Lymphocytes
  - Macrophages
- 68) Select the *false* statement
- Enzymes increase the rate of reaction without being changed by itself
  - Enzymes accelerate reactions by increasing the activation energy
  - Enzymes exhibit specificity
  - Enzymes are sensitive to both temperature and pH
- 69) Which of the following does not function as a "second messenger"
- cAMP
  - cGMP
  - Phosphoinositides
  - lipopolysacharides
- 70) Annealing is the process by which
- A new phosphodiester bond is formed.
  - Complimentary DNA strands reform the correct base pair
  - Elongation of DNA strands takes place
  - DNA strands are separated
- 71) This area of brain plays a role in the execution of stereotyped movements
- Cerebellum
  - Basal ganglia
  - Vestibular nuclei of reticular formation.
  - Cerebral corte supplementary motor area
- 72) The oil spill super bug was
- Pseudomonas strain*
  - Rhodococcus sp.*
  - Trichoderma sp.*
  - None of these

- 73) Which one of the following statements correctly define the term auxotrophic mutants
- a) Mutant cell capable of synthesizing essential growth factors from the minimal medium
  - b) Mutant cells unable to grow in the presence of auxin
  - c) Mutant cells incapable of producing one or two growth factors essential for growth
  - d) Mutant cells resistant to the drug
- 74) Which of the following is a binucleate cell?
- a) Liver cells
  - b) Cartilage cells
  - c) Liver cells and cartilage cells
  - d) Lung cells
- 75) Monoclonal antibodies are:
- a) Highly specific
  - b) Produced by hybridoma technique
  - c) Recognizes single epitope
  - d) All the above
- 76) Which of the following will be translated into protein:
- a) UAA AUG CCC TCC ATT ATG
  - b) AUG CCC UCU AUA GUA GTC
  - c) UAA CCC UCA AUA GUA GUC
  - d) AUG CCC UCU AUG GUC UAG
- 77) The function of lysosome is
- a) Intra cellular digestion
  - b) Lipid synthesis
  - c) Processing and packaging
  - d) Protein synthesis
- 78) The initial effect of ionizing radiation on a cell is that it causes
- a) Base substitutions.
  - b) Bonding between adjacent thymines.
  - c) DNA to break.
  - d) The formation of highly reactive ions.
- 79) Virus-mediated transfer of cellular genetic material from one bacterial cell to another by means of viral particles is called
- a) Induction
  - b) Transfection
  - c) Transformation
  - d) Transduction
- 80) Which of the following is a nontranslated sequence located between the transcription and the translation start site?
- a) Ending frame
  - b) Leader sequence
  - c) Trailer sequence
  - d) Reading frame

- 81) The blood does not clot inside the circulatory system because of:
- Oxygenation of blood
  - Absence of  $\text{Ca}^{2+}$  in blood
  - Heparin in blood
  - The three dimensional bead like structure of fibrinogen
- 82) Which of the following methods would be most appropriate for sterilizing an antibiotic solution?
- Dry heat sterilization
  - Microfiltration
  - Autoclaving
  - Freeze-drying
- 83) Nitroglycerin is administered to human patients with chronic chest pain (angina).
- mimics the action of signal receptors
  - activates hormones that affect the sympathetic nervous system
  - breaks down to nitric oxide, which increases blood flow to the heart
  - interferes with chemical cascades that trigger contraction of heart muscle
- 84) What is added to the 5'-end of many eukaryotic mRNAs after transcription?
- introns
  - a poly A tail
  - a cap structure consisting of a modified G nucleotide
  - the trinucleotide 5'-CCA
- 85) Which of the following is a typical cyclin-dependent kinase inhibitor?
- a) p21      b) p53      c) p65      d) p50
- 86) The enzyme used in the conversion of ssDNA into dsDNA is
- Terminal transferase
  - EcoR1
  - Hind III
  - Reverse transcriptase
- 87) A 40 year old alcoholic comes in with severe pain in his big toe. You decide to administer allopurinol to inhibit which of the following enzymes:
- Xanthine oxidase
  - Thymidine kinase
  - Adenosine deaminase
  - Adenine phosphoribosyl transferase
- 88) With respect to the LAC operon, if both glucose and lactose are present and glucose is low, which of the following is **not** true?
- High CAP
  - Increased uptake of lactose
  - Low cAMP
  - Increased transcription of the LAC operon

89) A 10 year old boy comes to the ER after eating wild mushrooms. The poison associated with these mushrooms most likely directly inhibits the synthesis of the following?

- a) hn RNA                      b) t RNA                      c) DNA                      d) m RNA

90) Which of the following techniques is used for the detection of gene of interest?

- a) Southern Blotting  
b) Polymerase chain reaction  
c) Northern blotting  
d) DNA Foot printing

91) Retroviruses are well known as cancer causing agents because it

- a) causes mutations in host genes involved in growth.  
b) integrates their proviral DNA next to protooncogenes.  
c) generates defective viruses lacking some of the viral genes.  
d) integrates their T antigens into the host genome.

92) Insulin receptor substrates IRS 1/2 are phosphorylated by the receptor tyrosine kinase domain. What would happen if the IRS 1/2 were phosphorylated on a serine/threonine residue?

- a) The insulin signal would be prematurely terminated leading to insulin resistance  
b) The Ras pathway would be activated prematurely and insulin signal amplified.  
c) The PI 3- kinase pathway would be activated prematurely and insulin metabolic effects would be amplified.  
d) GLUT 4 transporters would remain fixed on the cell membrane and would not be able to be internalized.

93) All of the following enzymes are involved in DNA replication **except**:

- a) Helicase    b) Primase    c) DNA polymerase    d) RNA polymerase

94) 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 -----

- a) Are not subsequently phagocytized by macrophages and neutrophils  
b) Do not break open and release the cytoplasmic contents  
c) Are rarely malignant, infected with virus or otherwise unhealthy  
d) Recycle their membrane components to prevent display of antigen on MHC I

95) The major buffer system in intracellular fluid is the:

- a) Phospholipids                      b) Proteins                      c) Bicarbonate system                      d) Phosphate system

96) In the classical model of transcriptional control described by Jacob and Monod, a repressor protein binds to

- a) An enhancer  
b) an AUG sequence  
c) an operator  
d) a ribosome-binding site

97) The completion of the S phase of the cell cycle of a mammalian cell is marked by all of the following EXCEPT:

- a) Histone content per cell is double that of cells in G1
- b) In replicated DNA, newly incorporated bases are paired with parental bases
- c) Each replicated chromosome has four telomeres
- d) Sister chromatids disjoin from one another

98) Actin filaments are found in all of the following EXCEPT the

- a) Flagella of bacteria
- b) sarcomeres of skeletal muscle cells
- c) stress fibres of fibroblasts
- d) microvilli of the intestinal brush border

99) UV in culture rooms are maintained for

- a) Disinfection
- b) Surface sterilization
- c) Cleanliness
- d) Visibility

100) Most of the ATP molecules synthesized in aerobic respiration are during \_\_\_\_\_

- a) Glycolysis
- b) Electron transport
- c) Oxidation of pyruvate
- d) Krebs cycle

**BIOLOGICAL SCIENCES (41-100) STREAM**

1	D	35	C	69	D
2	D	36	C	70	B
3	C	37	D	71	A
4	B	38	C	72	A
5	D	39	A	73	C
6	B	40	D	74	C
7	B	41	C	75	D
8	D	42	D	76	D
9	A	43	B	77	A
10	A	44	D	78	D
11	D	45	C	79	D
12	C	46	B	80	B
13	D	47	C	81	C
14	A	48	B	82	B
15	A	49	D	83	C
16	B	50	D	84	C
17	B	51	D	85	A
18	D	52	B	86	A
19	C	53	B	87	A
20	D	54	B	88	C
21	B	55	B	89	A
22	C	56	C	90	A
23	B	57	C	91	B
24	D	58	D	92	A
25	D	59	B	93	D
26	C	60	C	94	B
27	A	61	C	95	C
28	C	62	A	96	C
29	B	63	D	97	D
30	C	64	B	98	A
31	C	65	A	99	B
32	D	66	B	100	B
33	C	67	C		
34	C	68	B		

*Shreyas*  
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