

G-67

ENTRANCE EXAMINATION, 2014

Integrated M.Sc.-Ph.D. Biotechnology

Time: 2 hours

Maximum Marks: 75

HALL TICKET NO.

INSTRUCTIONS

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY BEFORE ANSWERING:

1. Enter your hall ticket number on this sheet and the answer (OMR) sheet.
2. Answers are to be marked only on the OMR answer sheet with BLACK/BLUE ball point/Sketch pen following the instructions provided there upon.
3. Hand over OMR answer sheet at the end of examination.
4. All questions carry one mark each.
5. 0.33 mark will be deducted for every wrong answer.
6. There are total 13 pages (including this page) in this question paper. Check this before you start answering.
7. The question paper consists of **Part "A"** and **Part "B"**. The marks obtained in **Part "A"** will be taken into consideration in case of a tie, when more than one student gets equal marks, to prepare the merit list.
8. Non-programmable scientific calculators are permitted.
9. Cell/Mobile phones are strictly prohibited in the examination hall.

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Part A

1. Which statements are correct about orthoboric acid
 - A) Its basic character is less in polyhydroxy organic compounds than in water
 - B) It can be titrated against NaOH in presence of glycerol using phenolphthaline
 - C) It is a very weak tri-basic acid
 - D) It ionizes water to form H^+ and $H_2BO_3^-$
2. Homolytic fission of C-C bond in ethane gives an intermediate in which carbon is
 - A) Sp^3 hybridized
 - B) Sp^2 hybridized
 - C) Sp hybridized
 - D) Sp^3d hybridized
3. Benzyl cation is stabilized by
 - A) resonance
 - B) hyper-conjugation
 - C) H_2 bonding
 - D) Inductive
4. In which of the following minerals Al is not present
 - A) Diaspore
 - B) Cryolite
 - C) Felspar
 - D) Flouspar
5. H_2O_2 cannot act as
 - A) Oxidizing agent
 - B) Reducing agent
 - C) Antichlor
 - D) Dehydrating agent
6. Pair of elements with equal values of electro negativity
 - A) Be, Al
 - B) Mg, Al
 - C) Mg, Ca
 - D) F, Ne
7. The ratio of energies of radiations having wavelengths of 800nm and 400nm is
 - A) 1:2
 - B) 2:1
 - C) 4:1
 - D) 1:4

8. Which of the following samples has the largest mass
- A) 1.42cm^3 diamond (density - $2.84\text{gm}/\text{cm}^3$)
 - B) 0.75cm^3 opal (density- $2.20\text{ gm}/\text{cm}^3$)
 - C) 1.00cm^3 ivory (density- $1.9\text{gm}/\text{cm}^3$)
 - D) 0.65cm^3 coal (density- $2.7\text{gm}/\text{cm}^3$)
9. The organic portion of bone consist of which of the following proteins
- A) fibrin
 - B) collagen
 - C) actin
 - D) myosin
10. A culture of bacteria produces 5 generations in 2 hours. What is the generation time for this bacterium under those conditions
- A) 12 minutes
 - B) 15 minutes
 - C) 24 minutes
 - D) 30 minutes
11. The Nobel Prize in physiology and medicine for the year 2013 recognized the contributions in the field of
- A) Innate and adaptive immunity
 - B) Vesicle trafficking in the cells
 - C) RNA interference
 - D) Neuroscience
12. Beer's law states that
- A) Absorbance is proportional to both the path length and concentration of the absorbing species
 - B) Absorbance is proportional to the log of the concentration of the absorbing species
 - C) Absorbance is equal to P_0/P
 - D) None of the above
13. The following is not a class of pro-biotic organisms
- A) *Bifidobacterium*
 - B) *Lactobacillus*
 - C) *Saccharomyces*
 - D) *Streptococcus*
14. Benzoylation of phenol in alkaline medium is known as
- A) Friedel Craft reaction
 - B) Wurtz-Fitting reaction
 - C) Schotten- Baumann reaction
 - D) Sabatier- Sander reaction

5. Two tubes of nucleic acids marked X and Y were analyzed for their base composition: Tube-X was found to have 33 percent A, 17 percent G, 17 percent C, and 33 percent T and Tube-Y was 37 percent A, 16 percent G, 22 percent C, and 25 percent T. Which of the following statements are correct with respect to the nature of the nucleic acids in the two tubes
- A) Tube X has double stranded RNA while Tube Y has single stranded DNA
 - B) Tube X has double stranded DNA while Tube Y has single stranded RNA
 - C) Tube X has double stranded DNA while Tube Y has single stranded DNA
 - D) Tube X has single stranded DNA while Tube Y has double stranded DNA
16. You engineered a bacteriophage that had the protein coat of T2 phage and the DNA of T4 phage. The composite bacteriophage was allowed to infect bacteria. What would be the composition of the new phages produced in the bacterial cells
- A) New phages would have the protein coat of T2 and the DNA of T4
 - B) New phages would have the protein coat and DNA of T2
 - C) New phages would have the protein coat and DNA of T4
 - D) New phages would have a mixture of the DNA and proteins of both phages
17. The following compounds have identical molecular weights. Which would have the lowest boiling point
- A) 1-Butanol
 - B) 2-Methyl-1-propanol
 - C) 1,1-Dimethylethanol
 - D) 1-Methoxypropane
18. A concentrated solution of K_2CrO_4 is 15% by weight and the density is 1.129 g/cm^3 . How many grams of the solution are required to prepare 200.00 ml of a 0.150% solution (Atomic weight ; K = 39.10, Cr = 52.0, O = 16.00)
- A) 41.4
 - B) 34.2
 - C) 40.5
 - D) 38.8
19. Structure that have the same evolutionary origin even though they may now have different structure or function are said to be
- A) endemic
 - B) analogous
 - C) homologous
 - D) geometric
20. An object is placed at 10 cm in front of a concave mirror of radius of curvature 15 cm. The nature and magnification of the image in each case will be
- A) Real and inverted
 - B) Virtual and erect
 - C) Real and erect
 - D) Virtual and inverted

21. The angular displacement of a particle is given by $\theta = 5t^4 + 100t^3 + t^2/2 + 8t/3 + 200$. Its angular velocity after 0.3s is
- A) 20 rads^{-1}
 B) 30.51 rads^{-1}
 C) 54.3 rads^{-1}
 D) 33.22 rads^{-1}
22. The angle between the vectors (3,6) and (2,-1) is equal to (in degrees)
- A) 0
 B) 45
 C) 60
 D) 90
23. A die is thrown three times. What is the probability of getting 5 on the third throw
- A) $1/6$
 B) $1/18$
 C) $1/36$
 D) $1/216$

24. The median for the following data set is

Observed values	20	25	30	35	40	45
Frequency	4	5	3	4	7	5

- A) 30
 B) 32.5
 C) 35
 D) 37.5
25. Choose the correct match
- | | |
|--|--|
| <p>GROUP1</p> <p>P. IgA
 Q. IgE
 R. IgG
 S. IgM</p> | <p>GROUP2</p> <p>1. Basophils
 2. δ heavy chain
 3. Secretory component
 4. Pentamer
 5. Crosses placenta</p> |
|--|--|
- A) P-3, Q-1, R-5, S-4
 B) P-3, Q-5, R-2, S-1
 C) P-2, Q-3, R-5, S-4
 D) P-2, Q-1, R-3, S-5

Part B

26. One of the following is the most common and chronic multifactorial disease
- A) Diabetes
 - B) Typhoid
 - C) HIV infection
 - D) Malaria
27. Which will have enantiomers
- A) n-butyl chloride
 - B) ter-butyl chloride
 - C) sec-butyl chloride
 - D) pri-butyl chloride
28. One of the following is not a DNA sequencing method
- A) Maxam-Gilbert sequencing
 - B) Sanger Sequencing
 - C) Pyrosequencing
 - D) MALDI -TOF
29. The following is not an essential part of translational machinery
- A) Ribosomal subunits
 - B) Messenger RNA
 - C) tRNA
 - D) Endoplasmic reticulum
30. One of the following is not an antibiotic
- A) Tetracycline
 - B) Rifabutin
 - C) Amoxicillin
 - D) Betamethasone
31. Which of the following processes shuffle DNA of an organism
- A) Transposition
 - B) Mutation
 - C) Pseudogenization
 - D) All of the above
32. Identify the correct order of electron transport seen during oxygenic photosynthesis
- A) Q_B to Q_A to PC
 - B) Pheophytin to Q_A to Q_B
 - C) Q_A to Q_B to p680
 - D) p700 to p680 to PQ pool

33. Which one of the following is a single celled bacterium
- A) *Nostoc*
 - B) *Synechocystis*
 - C) *Anaebena*
 - D) *Synechococcus*
34. The bioinformatic database, DDBJ is maintained by
- A) Japan
 - B) Europe
 - C) India
 - D) USA
35. The signal sensor of a two component signal transduction systems
- A) Histidine kinase
 - B) Serine kinase
 - C) Response regulator
 - D) Repressor
36. The bond between a fatty acid and glycerol moiety in a phospholipid is
- A) Phosphodiester bond
 - B) Ester bond
 - C) Ionic bond
 - D) Glycosidic linkage
37. Which among the following organisms are oldest
- A) Fungi
 - B) Diplomonads
 - C) Archaea
 - D) Dicots
38. In Gram staining, the primary stain which is useful for identification of bacteria is
- A) Crystal violet
 - B) Safranin
 - C) Methyl red
 - D) Methyl orange
39. The common character for both living and non-living organisms is
- A) Cells
 - B) Movement
 - C) Molecules
 - D) Homeostasis

40. Mad cow disease is caused by
- A) Prions
 - B) Protozoa
 - C) Fungus
 - D) Unknown
41. The enzyme reverse transcriptase is for
- A) Killing the virus
 - B) Avoiding the virus infection
 - C) Making cDNA from RNA
 - D) Making RNA from DNA
42. The term that is used for the bacteria which can withstand pasteurization but does not grow at higher temperatures
- A) Thermoduric
 - B) Thermophiles
 - C) Extreme thermophiles
 - D) Facultative thermophiles
43. Ribose sugar is present in
- A) RNA only
 - B) RNA and ATP
 - C) RNA polymerase and ATP
 - D) RNA polymerase, RNA and ATP
44. The type of gametes produced by an individual with genotype Aa Bb are
- A) AB; ab
 - B) ab; AB
 - C) aB; Ab
 - D) All of the above
45. Mycoplasma differ from the other prokaryotes in the
- A) Absence of cell wall
 - B) Presence of proteins in cell wall
 - C) Presence of chitin in cell wall
 - D) Presence of cellulose in cell wall
46. If glucose labeled with ^{14}C in position 1 is added to a bacterial culture under anaerobic conditions, which carbon atom of lactic acid would be labeled
- A) The methyl carbon
 - B) The carboxyl carbon
 - C) The chiral carbon
 - D) All three carbons

47. The most abundant organic molecule on earth
- A) Flavonoids
 - B) Lipids
 - C) Lignin
 - D) Hemicellulose
48. Which of the following technique is used for quantification of mRNA
- A) Real-time PCR
 - B) Western Blotting
 - C) Gradient PCR
 - D) Nested PCR
49. Which is the best chromatographic method to separate a protein that binds strongly to its substrate
- A) Gel filtration
 - B) Affinity
 - C) Ion exchange
 - D) Hydrophobic interaction
50. In the medium other than nutrients, if any substance is used in excess, that medium is
- A) Simple medium**
 - B) Enriched medium**
 - C) Special medium**
 - D) Enrichment medium**
51. The ratio 1: 2:1 is the expected ratio of _____ in an F2 progeny of a single gene (monohybrid cross)
- A) Phenotypes when one of the alleles is dominant
 - B) Genotypes when one allele is dominant
 - C) Combinations of heterozygous genotypes
 - D) Combinations of Homozygous genotypes
52. Which of the following point mutations would be most likely to affect protein function
- A) CAA to CTA
 - B) CAA to TAA
 - C) GAA to CAA
 - D) TAA to TGA
53. Following molecules are associated with copper and magnesium, respectively
- A) Plastocyanin and DNA polymerase
 - B) Plastoquinone and chlorophyll
 - C) Cytochrome and DNA polymerase
 - D) PSI reaction centre protein and chlorophyll

54. Rapid but non-antigen specific immune responses are produced by the
- A) Adaptive immune response
 - B) Innate immune system
 - C) Leukocytes
 - D) Lymphatic system
55. The term aero tolerant anaerobe refers to an organism that
- A) prefers to grow without oxygen
 - B) requires less oxygen than is present in air
 - C) doesn't use oxygen but can grow in the presence oxygen
 - D) uses oxygen when present or grows without oxygen when absent
56. Industrial microbiologists use "tricks" to increase the amount of chosen end product; this may include
- A) Manipulating the growth environment
 - B) Selecting microbial strains that lack a feedback system
 - C) Both
 - D) None
57. Cells that release histamine and other vasoactive substances in response to allergens are
- A) neutrophils
 - B) macrophages
 - C) NK cells
 - D) mast cells
58. Which of the following disease is not an autoimmune disease
- A) rheumatoid arthritis
 - B) lupus erythematosus
 - C) bovine spongiform encephalitis
 - D) grave's disease
59. Which of the following are true with regard to interferons
- A) Activates B cells to make virus specific antibodies
 - B) Are Th2 cytokines
 - C) Are virus proteins that interfere with activation of cytotoxic T cells
 - D) Inhibits virus replication by infected cells
60. A poikilothermic organism living in the Arctic would have, compared to that organism living in the temperate climate zone, a plasma membrane richer in
- A) Cholesterol
 - B) Long chain fatty acid
 - C) Protein
 - D) Unsaturated fatty acid

61. Colchicine treated cells are arrested in
- A) S phase
 - B) Prophase
 - C) G1 phase
 - D) Metaphase
62. The endosymbiotic origin of plastids from bacteria suggested by all of the following except
- A) Antibiotic sensitivity of plastid ribosomes
 - B) Circular DNA in plastids
 - C) Introns in plastid DNA genes
 - D) Ribosome size in plastids
63. Which of the following are correct statements
- P. All proteins destined for the peroxisomal matrix bind to a cytosolic receptor
 - Q. Zellweger syndrome is associated with impaired transport of proteins into peroxisomal matrix
 - R. Peroxisomal targeting sequence may be C- terminal PTS1 or N terminal PTS2
 - S. Peroxisomal targeting sequence is non cleavable
- A) P, Q
 - B) P, Q, R
 - C) P, R
 - D) P, Q, R, S
64. Hair color in some animals can be black (*BB*), grey (*Bb*), or white (*bb*). If a black and grey animal mate and produce three offspring, what is the probability that only one is grey
- A) 1/8
 - B) 1/4
 - C) 3/8
 - D) 1/2
65. In the normal human being the concentration(s) of various antibodies in the serum in the order
- A) IgM>IgA>IgG>IgE
 - B) IgG>IgA>IgM>IgE
 - C) IgE>IgG>IgM>IgA
 - D) IgA>IgM>IgE>IgG
66. The name of the process by which oil glands in mammalian skin secrete oil is
- A) active transport
 - B) apocrine secretion
 - C) holocrine secretion
 - D) osmosis

67. In first stage of photosynthesis, light energy is used to
- A) move water molecule
 - B) denature chlorophyll
 - C) split water
 - D) produce carbohydrate
68. Water molecule enter plant epidermal cells by
- A) osmosis
 - B) active transport
 - C) translocation
 - D) transpiration
69. The muscle which is under involuntary control is
- A) striated
 - B) smooth
 - C) skeletal
 - D) endothelial
70. Oxidation of fats and carbohydrate with in a cells would be an example of
- A) metabolism
 - B) catabolism
 - C) biosynthesis
 - D) anabolism
71. What percentage of the atmosphere consist of carbon dioxide
- A) 0.03%
 - B) 1%
 - C) 5%
 - D) 7%
72. Ecological pyramids graphically represent trophic structure and function of an ecosystem. Which one of the following type of ecological pyramid is always upright
- A) Pyramid of numbers
 - B) Pyramid of biomass
 - C) Pyramid of energy
 - D) All the above
73. Genes in a polycistronic operon are expressed with a
- A) Single promoter
 - B) Double promoter
 - C) Many promoters
 - D) Promoter is not required for its expression

74. Which one of the following enzymes cannot carry a reversible reaction in the Citric Acid cycle
- A) Citrate synthase
 - B) Succinate dehydrogenase
 - C) Fumarase
 - D) Aconitase
75. One of the following metabolites is not related to primary metabolism
- A) Sucrose
 - B) Anthocyanin
 - C) Pyruvate
 - D) Phosphoglycerate

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