

Hall Ticket Number:

ENTRANCE EXAMINATIONS 2017

Ph. D. Animal Biology

Time: 2 hours

(Ph.D. Admission - January '2018 Session)

Maximum Marks: 80

INSTRUCTIONS: PLEASE READ BEFORE ANSWERING!

- *Enter your hall ticket number on this sheet and the answer (OMR) sheet.*
- *Answers have to be marked on the OMR answer sheet following the instructions provided there upon.*
- *Hand over OMR answer sheet at the end of the examination.*
- *All questions carry one mark each. Answer all, or as many as you can.*
- *0.33 mark will be deducted for every wrong answer.*
- *There are a total of 12 pages in this question paper. Answer sheet (OMR) will be provided separately. Check this before you start answering.*
- *The question paper consists of Part A and Part B. The marks obtained in Part A will be taken in consideration in case of a tie i.e., when more than one student gets equal marks, to prepare the merit list.*

PART "A"

1. Addition of salt to a DNA solution increases its melting temperature. This effect is due to

- | | |
|---|--|
| <p>A) neutralization of net phosphate negative charge on DNA</p> <p>C) hydrophobic effect of H₂O in solution</p> | <p>B) stabilization of hydrogen bonds between nitrogen bases</p> <p>D) increase in thermal conductivity of DNA</p> |
|---|--|

2. Which of the following dye/stain is used to differentiate living cells from the dead cells?

- | | |
|---|---|
| <p>A) Sudan black</p> <p>C) Trypan blue</p> | <p>B) Acridine orange</p> <p>D) Ponceau S</p> |
|---|---|

3. Optical sectioning is a feature of one of the following types of microscopy

- | | |
|---|---|
| <p>A) Dark field</p> <p>C) Laser confocal</p> | <p>B) Phase contrast</p> <p>D) Compound</p> |
|---|---|

4. In SDS-PAGE, one molecule of SDS binds to how many amino acids?

- A) One
- B) Two
- C) Three
- D) Four

5. One of the following is not a chemical method for transfection of mammalian cells

- A) Polybrene
- B) Lipopfectamine
- C) Biolistic
- D) Calcium phosphate

6. In pBlueScript vector, expression of cloned gene is under the control of one of the following promoters?

- A) T3 / T7
- B) T3 / lac
- C) T7 / lac
- D) Lac / lac

7. Which of the following statement is correct for nucleolus?

- A) Clustering of ribosomal protein genes during interphase
- B) Clustering of ribosomal RNA genes during interphase
- C) Clustering of transfer RNA genes during interphase
- D) Clustering of centromeres of various chromosomes during S phase of cell cycle

8. What is the concentration of H^+ in a solution of 0.1M NaOH?

- A) 10^{-13} M
- B) 9^{-13} M
- C) 8^{-13} M
- D) 7^{-13} M

9. Which one of the following techniques is NOT used to lyse microbial cells?

- A) Enzymatic digestion of cell walls
- B) Mechanical disruption of cell walls
- C) Detergent lysis of cell walls
- D) Chemical degradation of cell walls

10. One of the following is the most sensitive detection chemistry employed in real time PCR gene expression analysis

- A) DNA binding dyes
- B) Hydrolysis probes
- C) Hybridisation probes
- D) Molecular beacons

11. One of the following agents blocks the process of glycosylation

- A) Tunicamycin
- B) Colchicine
- C) Vinblastin
- D) Phalloidin

12. The technique used for identification of microRNA targets in a given cell type is

- A) Northern hybridization
- B) HITS-CLIP
- C) RNA immunoprecipitation
- D) Chromatin immunoprecipitation

13. If a bacterium doubles itself every 8 minutes, how many bacteria will be there after 40 minutes, if there were 4 bacteria in the beginning?

- A) 8
- B) 32
- C) 64
- D) 40

14. Following reverse transcription, one of the following genetic elements is absent in double-stranded cDNA

- A) Promoter sequences
- B) 5' and 3' untranslated sequences
- C) Exon sequences
- D) Intron sequences

15. One of the following detection methods is not applicable to localize a protein in tissue sections

- A) Immunofluorescence
- B) Immunohistochemistry
- C) Immunoblotting
- D) Bioluminescence labeling

16. The techniques employed for localization of mRNA in cells is

- A) *In situ* hybridization
- B) Dot blot hybridization
- C) Immunofluorescence assay
- D) Northern hybridization

17. One of the following hormones is responsible for the emotional states such as fear, anger, tension and a rise in blood pressure as well as heart rate.

- A) Somatotropin
- B) Oxytocin
- C) Thyroxine
- D) Adrenaline

18. Anion exchange chromatography separates proteins on the basis of their charge properties. The pH of the buffer in this system must be _____ the isoelectric point of the protein of interest.

- A) Smaller than
- B) Equal to
- C) Greater than
- D) Either equal or smaller than

19. The length of DNA associated with a protein is determined using one of the following techniques

- A) DNA fingerprinting
- B) DNA footprinting
- C) Southern hybridization
- D) Western blotting

20. How many mL of a 0.2 M NaOH solution is required to bring the pH of 20 mL of 0.4 N HCl solution to 7.0?

- A) 10 mL
- B) 20 mL
- C) 40 mL
- D) 500 mL

21. In SDS-PAGE protein migrates in the gel until its

- A) pH is less than its pI
- B) pH is more than its pI
- C) pH is equal to its pI
- D) pI is more than its pH

22. One of the following scientist is associated with the discovery of ABO blood groups

- A) Charles Darwin
- B) Karl Landsteiner
- C) Gregor Mendel
- D) Watson

23. How many microliters of 20% SDS solution are required to make 40 mL of 0.5% SDS?

- A) 1 mL
- B) 2 mL
- C) 5 mL
- D) 10 mL

24. What is the molar concentration of NaCl in a 0.876% saline solution? (Given the mol. wt. of NaCl is 58.4 grams)

- A) 0.05 M
- B) 0.250 M
- C) 0.125 M
- D) 0.350 M

25. What is the approximate pH of a 99% dissociated solution of acetic acid? (Hint: apply Henderson-Hasselbalch equation with pK of acetic acid as 4.76)

- A) 3.76
- B) 4.76
- C) 5.76
- D) 6.76

26. If 25 grams of NaCl is dissolved into a final volume of 500mL, what is the percentage of NaCl in the final solution?

- A) 1%
- B) 2.5%
- C) 5%
- D) 7.5%

27. Far Western is a technique used for detection of

- A) Antigen-antibody interaction
- B) Protein-protein interactions
- C) DNA- protein interactions
- D) RNA-protein interactions

28. A yeast based Flp/FRT system is popularly used for

- A) Insertional inactivation of gene of interest
- B) Introducing random mutations in genome
- C) Conditional gene silencing
- D) Generating point mutations in the gene of interest

29. Following volume is required to make 640mL of 0.5M buffer from an 8x stock buffer.

- A) 40 mL
- B) 60 mL
- C) 80 mL
- D) 100 mL

30. Which of the following phenomenon can cause a specific gene to code for two or more different but related proteins?

- A) Premature mRNA degradation
- B) Alternative RNA splicing
- C) Use of different enhancers
- D) Differential transport

31. Differential gene regulation means that different cell types express different _____ but have same _____.

- A) mRNA, proteins
- B) Proteins, genomes
- C) mRNAs, genes
- D) DNA, genomes

32. Which one of the following chromatographic methods is best suited to separate a protein that can bind strongly to its substrate?

- A) Gel filtration chromatography
- B) Gas chromatography
- C) Cation exchange chromatography
- D) Affinity chromatography

33. Which one of the following reactions is essential for proof-reading process during DNA replication by DNA polymerase III?

- A) 5'-3' exonuclease activity
- B) 5'-3' endonuclease activity
- C) 3'-5' exonuclease activity
- D) 3'-5' endonuclease activity

34. Movement of cell against concentration gradient is called

- A) Osmosis
- B) Active transport
- C) Passive transport
- D) Diffusion

35. The relative strength of the different bonds/interactions (from weakest to strongest) that exist in protein structural levels is

- | | |
|---|---|
| A) Hydrophobic interaction < hydrogen bond < ionic bond < covalent bond | B) Hydrophobic interaction < ionic bond < hydrogen bond < covalent bond |
| C) Ionic bond < hydrogen bond < hydrophobic interaction < covalent bond | D) Ionic bond < hydrophobic interaction < hydrogen bond < covalent bond |

36. In spectroscopy measuring absorbance is preferred than % transmission, because

- | | |
|--|---|
| A) % transmittance depend on incident light | B) Absorbance is directly proportional to the concentration , whereas % transmission is not |
| C) % transmission cannot be measured as accurately as absorbance | D) Absorbance is given as decimal number whereas % transmission is a whole number |

37. "Coomassie Blue" staining of proteins is due to the

- | | |
|---|--|
| A) interaction of dye's positively charged groups with negatively charged carboxylate groups of protein | B) interaction of dye's sulfonic acid groups and positive protein amine groups |
| C) hydrogen bonding | D) the emission of fluorescence by multiple interactions of dye |

38. Eastern blotting technique is commonly used for

- | | |
|---------------------------------------|--|
| A) Detection of DNA | B) Detection of RNA |
| C) Detection of carbohydrate epitopes | D) Detection of antigenic epitopes of proteins |

39. Which one of the following techniques is NOT suitable to detect specific DNA or RNA sequences?

- | | |
|---------|---------|
| A) ISH | B) CISH |
| C) FISH | D) IHC |

40. Pap smear test is used for diagnosis of

- | | |
|------------------------|----------------------------|
| A) bacterial infection | B) hematological disorders |
| C) cervical cancer | D) throat infections |

PART "B"

41. Which of the following is not true for phylum chordate?

- | | |
|-----------------------|--|
| A) Bilateral symmetry | B) Protostome organization |
| C) Presence of coelom | D) Have notochord at some point during development |

42. The main excretory product of frog is

- | | |
|--------------|---------------|
| A) Ammonia | B) Urea |
| C) Uric acid | D) Amino acid |

43. Which one of the following is not a true fish?

- | | |
|----------------|--------------|
| A) Tuna fish | B) Gold fish |
| C) Silver fish | D) Shark |

44. In one of the following orders of insect, the hind pair of wings are modified as halteres

- | | |
|----------------|--------------|
| A) Lepidoptera | B) Diptera |
| C) Coleoptera | D) Hemiptera |

45. Which part of human brain is the centre of memory, learning, thinking and reasoning?

- | | |
|---------------|---------------|
| A) Cerebrum | B) Cerebellum |
| C) Hypophysis | D) Medulla |

46. The diseases where causative agents, carried by humans are transferred to animals are referred to as:

- | | |
|--------------------------|------------------------------|
| A) Communicable diseases | B) Non communicable diseases |
| C) Zoonotic disease | D) Anthroponotic diseases |

47. The children of a colour-blind mother and a normal father will be

- | | |
|--------------------------------------|--|
| A) Normal daughters and sons | B) Colour blind sons and carrier daughters |
| C) Normal sons and carrier daughters | D) Colour blind sons and daughters |

48. On an average the daily volume of saliva secreted by humans is

- | | |
|------------|------------|
| A) 200 ml | B) 500 ml |
| C) 1000 ml | D) 2000 ml |

49. What is the primary cytokine responsible for T cell proliferation and differentiation?

- A) IL-2
- B) IL-6
- C) IL-12
- D) IL-17

50. Lamarck theory of organic evolution is known as

- A) Natural Selection
- B) Inheritance of acquired characters
- C) Decent with change
- D) Chain of life

51. Glutellin, zeins and phaseolines are

- A) storage lipids
- B) storage proteins
- C) storage carbohydrates
- D) storage micronutrients

52. Wings of insects, bats and birds represent

- A) Homologous organs
- B) Analogous organs
- C) Vestigial organs
- D) Similar origin organs

53. Allantoic membrane is an outgrowth of extra embryonic layer(s) of _____

- A) endoderm and mesoderm
- B) ectoderm and endoderm
- C) exclusively from endoderm
- D) exclusively from mesoderm

54. Which one of the following T cells act primarily against virus infected cells?

- A) Th1 helper cells
- B) Th2 helper cells
- C) CD8+ cytotoxic T cells
- D) CD4+ cytotoxic T cells

55. Which one the following is a shortest peptide hormone in mammals?

- A) TSH
- B) TRH
- C) CRH
- D) FSH

56. Replication senescence is associated with following phenomenon

- A) Centromere formation
- B) Telomere shortening
- C) Trinucleotide expansion
- D) Repeat instability

57. The phase of cell cycle in which the ovum exists, when a human female ovulates is

- A) Metaphase I
- B) Prophase I
- C) Metaphase II
- D) Prophase II

58. The development and survival of lymphocytes is determined by signal received through

- A) growth hormone
- B) antigen receptors
- C) innate immune cells
- D) MHC I/MHC II peptides

59. In an individual with a deficient posterior pituitary gland, which of the following symptom is observed?

- A) Reduced basal metabolic rate
- B) Low blood calcium level
- C) Low steroid hormone levels
- D) Dehydration

60. Grave's disease is caused due to the pathophysiological condition of _____

- A) Thyroid gland
- B) Adrenal gland
- C) Islets of Langerhans of Pancreas
- D) Liver

61. Which one among the following vitamins is necessary for blood clotting?

- A) Vitamin A
- B) Vitamin C
- C) Vitamin D
- D) Vitamin K

62. What is the function of IL-7?

- A) B cell growth factor
- B) Terminal B cell T cell growth factor
- C) T cell growth factor
- D) Early B cell and T cell growth factor

63. Sir, EARL WILBUR SUTHERLAND JR. was awarded Nobel Prize in physiology and medicine for his discovery in _____

- A) Oxidative phosphorylation
- B) Cellular signal transduction
- C) Cell cycle
- D) DNA sequencing

64. Which of the following is widely used in nano medicine for drug delivery?

- A) Au-NPs
- B) Ag-NPs
- C) Cu-NPs
- D) Zn-NPs

65. Lampbrush chromosomes are seen at _____

- A) Diplotene of meiotic prophase I
- B) Leptotene of meiotic prophase I
- C) Zygotene of meiotic prophase I
- D) Pachytene of meiotic prophase I

66. 60S subunit of eukaryotic ribosomes is inactivated by which of the following?

- A) Ampicillin
- B) Cycloheximide
- C) Diphtheria toxin
- D) Ricin

67. Class switching to IgE in B lymphocytes is promoted by one of the following interleukin (IL) signal

- A) IL-4
- B) IL-2
- C) IL-7
- D) IL-6

68. Micronemes are the organelles for storage of secretory proteins in one of the following protozoan parasites

- A) *Euglena*
- B) *Trypanosoma*
- C) *Paramecium*
- D) *Plasmodium*

69. Following statement hold true for gene arrangement in human genome

- A) Genes are randomly distributed across all chromosomal DNA in a cell-type specific manner
- B) Genes are non-randomly distributed across all chromosomal DNA in a cell-type specific manner
- C) Genes are clustered and co-expressed across all chromosomal DNA in a cell-type specific manner
- D) Genes are randomly placed and expressed across all chromosomal DNA in cell-type specific manner

70. Which of the following is absent in Gram negative bacteria?

- A) Lipopolysaccharide
- B) Outer membrane
- C) Lipoteichoic acid
- D) Peptidoglycan

71. Both parathyroid hormone and vitamin D are required for absorption of one of the following divalent cation

- A) Fe^{2+}
- B) Ca^{2+}
- C) Mg^{2+}
- D) Zn^{2+}

72. Which one of the following pathology is due to mutations in split genes?

- A) Systemic Lupus Erythematosus
- B) Cystic Fibrosis
- C) Leukemia
- D) Arthritis

73. Following histone modifications are associated with heterochromatin

- A) H3K9me3 and H3K27me3
- B) H3K4me3 and H3K36me3
- C) H3K9me3 and H3K36me3
- D) H3K4me3 and H3K27me3

74. The movement of genetic material by horizontal gene transfer involves

- A) Homologous recombination
- B) Crossing over
- C) Gene splicing
- D) Non homologous recombination

75. In squirrels, the gene for grey fur (G) is dominant over the gene for black fur (g). If 50 % of a large litter of squirrels are grey, the parental cross that produced this litter was most likely

- A) GG X Gg
- B) Gg X gg
- C) GG X GG
- D) gg X gg

76. A chaperone found in *E.coli* is

- A) DnaA
- B) DnaE
- C) DnaB
- D) DnaC

77. A peptide associates with an amphiphile at acidic pH and dissociates from it at alkaline pH. This indicates that

- A) Peptide is anionic at alkaline pH
- B) Peptide is cationic at alkaline pH
- C) Peptide is neutral at acidic pH
- D) Peptide is anionic at acidic pH

78. A common genetic disorder where severely affected people have more than 1000 repeats of the CTG triplet is

- A) Duchenne Muscular dystrophy
- B) Downs syndrome
- C) Fragile X syndrome
- D) Retinoblastoma

79. Sickle cell anemia condition confers protection against one of the following diseases

- A) Trypanosomiasis
- B) Leishmaniasis
- C) Malaria
- D) Toxoplasmosis

80. Yeast artificial chromosome comprises of

- A) Centromere only
- B) Telomere only
- C) Replication of origin only
- D) Centromere, telomere, origin of replication and selectable marker