

Hall Ticket Number:

ENTRANCE EXAMINATIONS 2017

Ph. D. Animal Biology

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

Time: 2 hours

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

- | | |
|---|---|
| A) neutralization of net phosphate negative charge on DNA | B) stabilization of hydrogen bonds between nitrogen bases |
| C) hydrophobic effect of H ₂ O in solution | D) increase in thermal conductivity of DNA |

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

- | | |
|----------------|--------------------|
| A) Sudan black | B) Acridine orange |
| C) Trypan blue | D) Ponceau S |

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

- | | |
|-------------------|-------------------|
| A) Dark field | B) Phase contrast |
| C) Laser confocal | D) Compound |

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) Lipoplectamine
- 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 act 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) Down 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