M-58

ENTRANCE EXAMINATIONS – 2016

Ph.D. Animal Biology

Code number: M-58

Hall Ticket Number:

Maximum Time: 2 hours Maximum Marks: 75

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. Make sure that you have clearly marked the Booklet Code on your OMR sheet.***
- ***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 10 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 into consideration in case of a tie i.e., when more than one student gets equal marks, to prepare the merit list.***

PART "A"

1. A lethal congenital defect resulting from failure to close anterior neuropore during embryonic development is

A) Anencephaly B) Spina bifida
C) Encephaloceles D) Hydranencephaly

2. Which of the following stimulate glycogenolysis?

A) Insulin and glucagon B) Glucagon and epinephrine
C) Insulin and epinephrine D) Glucagon and norepinephrine

3. International Union for Conservation of Nature (IUCN) is also called as

A) Man and biosphere Program B) World conservation union
C) World conservation consortium D) Worldwide conservation program

4. Gram-negative rod-shaped bacteria when incubated with lysozyme become spherical due to

A) Degradation of cell wall B) Change in lipid content of cell wall
C) Osmotic changes D) Degradation of cell membrane

5. In an enzyme catalyzed reaction, a non-competitive inhibitor causes

A) Decrease of Vmax
B) Decrease of both Km and Vmax
C) Increase of Km
D) Decrease of Km and Increase of Vmax

6. The MHC class I and class II molecules present antigenic peptides to CD8+ and CD4+ T cells respectively. MHC class II molecules acquire their peptide ligands from

A) Endoplasmic reticulum
B) Mitochondria
C) Endosomes
D) Golgi apparatus

7. Which one of the following hormones is most susceptible to open loop stimuli?

A) Luteotropin
B) Thyrotropin
C) Luteinizing hormone
D) Follicle stimulating hormone

8. Addition of cytochalasin B to cultured mammalian germ cells that have just begun meiosis results in

A) Arrest of cells in meiotic prophase I
B) The cells will not survive for meiotic division
C) The cells will go through meiosis I, but will have interference in crossing over
D) The cells will complete meiosis I, but get arrested at cytokinesis

9. Which one of the following systems is required for regulating arterial pressure, blood volume and systemic vascular resistance?

A) Thymus-thymosin-lymphatic system
B) Renin-angiotensin-aldosterone system
C) Insulin-glucagon-glucose system
D) Corticoliberin-corticotropin- cortisol system

10. Which of the following codons is differently coded in *Drosophila* and *Homo sepians*

A) AGA
B) GAA
C) ATG
D) AAG

11. Molecular phylogenies in eukaryotes are constructed based on the nucleotide sequence of the gene encoding

A) 5S rRNA
B) 16S rRNA
C) 23S rRNA
D) 18S rRNA

12. The length of DNA whose molecular weight is 3×10^7

A) 18,544 bp
B) 54,448 bp
C) 34,544 bp
D) 48,544 bp

13. A homodimeric protein of molecular mass 60 kDa was subjected to SDS-PAGE after boiling with a buffer containing mercaptoethanol. Which of the following is visualised in the gel upon staining with Coomassie blue?

A) Single band of 30 kDa
B) Single band of 60 kDa
C) Single band of 120 kDa
D) Two bands of 30 and 60 kDa

14. During starvation, the tissue proteins and lipids are mobilized towards the formation of glucose by a process called

A) Glycogenesis
B) Glycogenolysis
C) Gluconeogenesis
D) Proteolysis and lipolysis

15. In a cell-free protein synthesizing system, given that the protein synthesis can begin without the need for an initiator codon, the synthetic mRNA of repeating sequence 5'-CACACACACACACACACACACACACAC.... will code for

A) One protein, with an alternative sequence of three different amino acids
B) Three proteins, each consisting of a different single amino acid
C) One protein, with alternative sequence of two different amino acids
D) Two proteins, each with an alternative sequence of two different amino acids

16. Synaptic pruning is a process usually seen during

A) Adolescence
B) Aging
C) Menopause
D) Non-neural pathology

17. By using the Hardy-Weinburg principle, which one of the expression represents the frequency of the homozygous recessive genotype?

A) 2pq
B) q^2
C) p^2
D) q

18. Biological oxygen demand (BOD) indicates

A) Oxygen content in water
B) Level of microbial pollution in water
C) Ozone content in water
D) Level of metal pollution in water

19. Metabolic function of lung include which one of the following?

A) Inactivation of ADH
B) Conversion of Angiotensin II to Angiotensin I
C) Activation of Bradykinin
D) Inactivation of Serotonin (5HT)

20. The molecular weight of an alpha-helical protein is 35 kDa. Assuming that the mean molecular mass of amino acid residue is 110 Da, and the rise per amino acid in the alpha helix is 1.5Å, the length of the protein will be

A) 52.5 Å
B) 105 Å
C) 477 Å
D) 747 Å

21. Following statement holds true for nucleolus

A) Clustering of tRNA genes and their transcription
B) Clustering of Ribosomal protein genes and their transcription
C) Clustering of SnoRNA genes and their transcription
D) Clustering of Ribosomal RNA genes and their transcription

22. A phenotypically normal couple has had one normal child and a child with cystic fibrosis, an autosomal recessive disease. The incidence of cystic fibrosis in the population from which this couple came is 1/1000. If their normal child eventually marries a phenotypically normal person from the same population, what is the risk that the newlyweds will produce a child with cystic fibrosis?

A) 0.01 B) 0.02
C) 0.04 D) 0.06

23. In an *in vitro* transcription reaction, γ-32 ATP is used along with normal NTPs. The transcript made is

A) radiolabeled and the amount of radioactivity remains constant
B) Unlabeled
C) radiolabeled and the radioactivity increases with increase of transcript size
D) is radiolabeled only at the 3' end of the transcript

24. Two fragments are generated when DNA polymerase I is treated with subtilisin. The large fragment known as Klenow fragment represents

A) C-terminal part of DNA polymerase – I
B) N-terminal part of DNA polymerase – I
C) Central domain of DNA polymerase – I
D) Both C- and N-terminal fragments of DNA polymerase – I

25. The myoglobin content of human and whale muscles is 8 and 80 g/kg respectively. If 4.49 $\times 10^{-4}$ moles of oxygen is bound to one kg of human myoglobin, the amount of oxygen bound to one kg of whale myoglobin would be

A) 4.49×10^{-3} moles
B) 4.49×10^{-4} moles
C) 44.9×10^{-3} moles
D) 44.9×10^{-4} moles

PART "B"

26. Paracrine factors found in gradient that guides axonal growth cones and axon migration during embryonic development of animals are

A) Cadherins
B) Integrins
C) Netrins
D) Neutrophins

27. Cushing's disease is caused by excess production of

A) Growth hormone
B) TSH
C) Thyroid hormone
D) ACTH

28. The time between 542 – 488 million years ago marks one of the following periods

A) Cambrian
B) Silurian
C) Ediacaran
D) Devionion

29. According to International Union for Conservation of Nature's "Red list", what is the status of Red Panda (*Allurus fulgens*)?

A) Critically endangered species
B) Extinct species
C) Vulnerable species
D) Endangered species

30. Dinitrophenol, an uncoupler of oxidative phosphorylation

A) Inhibits electron transport without impairment of ATP synthesis
B) inhibits both electron transport and ATP synthesis
C) allows electron transport to occur without impairment of ATP synthesis
D) inhibits cytochrome B6

31. Immunoglobin class-switch recombination involves

A) Rearrangement of immunoglobulin heavy chain from proximal V-DJ to distal V-DJ rearrangement
B) Replacement of Cμ heavy chain C region with and alternate C region
C) Introduction of point mutations into the V regions
D) Replacement of blocks of sequences in the V regions with sequences derived from the V regions of pseudogene

32. Which one of the following hormones is lactogenic?

A) Somatomammotropin
B) Luteotropin
C) Somatotropin
D) Gonadotropin

33. Fat droplets can be stained histochemically by

A) Sudan black B
B) Azure A
C) Feulgen
D) Toludine blue

34. Crinophagy is commonly seen in

A) Pancreas
B) Adrenal cortex and medulla
C) Parathyroid and thymus
D) Thyroid and pituitary

35. What is the basic functional unit of eukaryotic genome?

A) Nucleosome
B) Topologically associated domains
C) Chromosomal loops
D) Euchromatin

36. Which of the cloning vectors does not contain promoter upstream of the reporter gene?

A) Expression vector
B) Cosmid vector
C) YAC
D) Promoter test vector

37. Proliferative cell nuclear antigen (PCNA), which complexes with DNA polymerases, is similar to _____ of prokaryotic DNA polymerase

A) α-subunit
B) β-subunit
C) β'-subunit
D) σ – factor

38. Superovulation can be triggered naturally in all the follicles EXCEPT

A) Mature follicle
B) Primordial follicle
C) Antral follicle
D) Graafian follicle

39. One of the important characteristics of biological community is

A) Sex ratio
B) Mortality
C) Natality
D) Stratification

40. Which of the following represents convergent evolution?

A) Starfish and cuttlefish
B) Bacterium and protozoan
C) Dogfish and whale
D) Rat and dog

41. The pH of a solution containing 25 gm of hydrochloric acid dissolved in 1.5 litres of water is

A) 0.34
B) 0.56
C) 0.68
D) 0.72

42. According to neo-Darwinism, natural selection is through

A) Differential reproduction
B) Genetic bottleneck
C) Gene flow
D) Behavioral isolation

43. Which of the following is NOT a particulate pollutant?

A) Dust
B) Soot
C) Ozone
D) Smoke

44. In exercising muscles, the major increase in blood flow is due to

A) Sympathetic vasodilation
B) Sympathetic vasoconstriction
C) Metabolic vasodilation
D) Muscle pumping

45. The molarity of a 1 mg/ml protein solution corresponds to 5.62×10^{-5} M. Given the molar absorption coefficient of this protein at 580nm is 15000 $cm^{-1}M^{-1}$, the absorbance of this solution will be

A) 0.84
B) 0.59
C) 0.99
D) 0.62

46. Aggregates of lymphoid tissue present in the distal portion of small intestine are known as

A) Villi
B) Rugae
C) Choroid plexus
D) Peyer's patches

47. The sedimentation rates of tropomyosin (molecular weight = 93 kDa) and hemoglobin (molecular weight =65 kDa) are 2.6S and 4.3S respectively. The slow sedimentation of tropomyosin is because

A) Tropomyosin is rod shaped whereas hemoglobin is spherical
B) Tropomyosin has higher molecular weight than hemoglobin
C) Tropomyosin is a monomer whereas hemoglobin is a tetramer
D) Tropomyosin is a non-transporter protein unlike hemoglobin

48. A soluble bone morphogenic protein (BMP) antagonist that blocks signaling during embryonic development is

A) Nodal
B) Noggin
C) Nexin
D) Chordin

49. Which of the following is a diploblast?

A) Cat fish
B) Silver fish
C) Cuttle fish
D) Jelly fish

50. The ability of immune system to recognize self-antigens versus non-self antigens is defined as

A) Specific immunity
B) Tolerance
C) Antigenic immunity
D) Autoimmunity

51. In order to confirm antibody specificity, which one of the following methods is more robust when performing immunohistochemistry?

A) Use of primary antigen preadsorbed with primary antibody
B) Use of primary antigen preadsorbed with secondary antibody
C) Use of secondary antigen preadsorbed with primary antibody
D) Use of secondary antigen preadsorbed with secondary antibody

52. The maternal and paternal chromosomes pair with each other in one of the following stage of cell cycle

A) Prophase of mitosis
B) Prophase II of meiosis
C) S phase of mitosis and meiosis
D) Prophase I of meiosis

53. The cell contact in tissue is maintained by _____ protein

A) Cadherin
B) Beta actin
C) Integrin
D) Tubulin

54. One of the following gene exhibits imprinted expression

A) Insulin
B) β-Globin
C) β-Actin
D) IGF-2

55. To identify *E. coli* colonies containing recombinant plasmid, α-complementation is performed. What is the α-fragment?

A) β-galactosidase
B) C-terminal part of β-galactosidase
C) Central domain of β-galactosidase
D) N-terminal part of β-galactosidase

56. Polyproteins are

A) Polypeptides that contain one or more proteins
B) Proteins having more than one function
C) Polypeptides that participate to make more than one functional protein
D) Multimeric proteins

57. The successful establishment of a species in a new area is referred to as

A) Climax
B) Sere
C) Ecesis
D) Invasion

58. The codon that codes for methonines other than the first methionine in a protein during eukaryotic cell translation is

A) AUG
B) UUU
C) GUG
D) AGG

59. Protein-protein interactions are identified by using the technique of

A) Mass spectroscopy
B) Western blotting
C) Chromatin Immunoprecipitation
D) Yeast two-hybrid system

60. Gastric acid secretion is decreased by

A) Vagal inhibition
B) Noradrenalin
C) Luminal peptides and proteins
D) Distension of bowel wall

61. Which of the following phenotype commonly results from *Hox* gene mutation in *Drosophila*?

A) Abnormal body length
B) Two different eye colors
C) Fewer appendages than normal
D) Larger number of appendages than normal

62. What is the life expectancy of a blue whale in natural environment?

A) 10 – 20 years
B) 30 – 40 years
C) 40 – 60 years
D) 70 – 90 years

63. Which of the following is not result of the non-disjunction of the sex chromosomes?

A) Down's Syndrome
B) Turner's syndrome
C) Klinefelter's syndrome
D) Prader – Willi syndrome

64. During synaptic transmission of nerve impulse, neurotransmitter (p) is released from synaptic vesicles by the action of the ion (q). Choose the correct p and q

A) p = acetylcholine, q = Ca^{2+}
B) p = acetylcholine, q = Na^{+}
C) p = GABA, q = Ca^{2+}
D) p = GABA, q = Na^{+}

65. During early embryonic development radial cleavage pattern is commonly seen in the eggs of
A) Annelids
B) Tunicates
C) Molluscs
D) Echinodermates

66. Which of the following animal phylum comprises the highest number of endangered species?
A) Pisces
B) Reptilia
C) Aves
D) Mammalia

67. Under normal conditions, which one of the immunoglobulins is present in highest concentration in human plasma?
A) IgG
B) IgA
C) IgD
D) IgE

68. The karyotype designation 47, XX, +13 designates
A) female with monosomy 13
B) female with 13 extra chromosomes
C) female with trisomy 13
D) female with 46 chromosomes

69. Which of the following enzymes require NAD+ as cofactor
A) T4 DNA ligase
B) *E. coli* DNA ligase
C) *Eco*RI
D) *Hind*III

70. The succession in which a pond ecosystem is converted to a climax forest community can be called as
A) Hydrach succession
B) Mesarch succession
C) Xerarch succession
D) Cyclic succession

71. Genetic drift is observed only in
A) Larger populations
B) Mendelian populations
C) Island populations
D) Smaller populations

72. During synthesis of a hexa-NAG, the glycosidic oxygen between the sugars D and E was labelled with ^{18}O. When hydrolyzed with lysozyme, the isotope will appear in the
A) C-4 hydroxyl of di-NAG (residues C-D)
B) C-4 hydroxyl of di-NAG (residues D-E)
C) C-4 hydroxyl of di-NAG (residues E-F)
D) C-4 hydroxyl of di-NAG (residues B-C)

73. Rifampicin inhibits prokaryotic transcription by binding to RNA polymerase. Which of the following subunit of RNA polymerase interacts with rifampicin?
A) α-subunit
B) β-subunit
C) β'-subunit
D) σ – factor

74. Bacterial two-component regulatory systems consists of
A) Promoter – polymerase
B) Sigma factor – RNA polymerase
C) mRNA – ribosome
D) Sensor kinase – response regulator

75. During embryonic development, *Gap* gene mutants of *Drosophila*

A) Lack head
B) Lack large regions of the body
C) Show defects in every segment
D) Lack portions of every other segment

For rough work