Hall Ticket Number:

ENTRANCE EXAMINATION, June 2011
Ph. D Animal Sciences

Time: 2 hours **Maximum Marks: 75**

INSTRUCTIONS: PLEASE READ BEFORE ANSWERING

1. **Enter your hall ticket number on this sheet and the answer (OMR) sheet.**
2. **Answers have to be marked on the OMR sheet with ball point pen (Blue/Black) following the instructions provided there upon.**
3. **All questions carry equal marks.**
4. **0.33 marks will be deducted for every wrong answer.**
5. **There are a total of 10 pages in this question paper booklet including space for rough work. Check the question paper thoroughly before answering.**
6. **The question paper consists of Part A and Part B. The marks obtained in Part A will be considered for the preparation of the merit list when two or more students get equal marks**

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PART "A"

1. Which stage of meiosis prophase I is arrested for long time (termed as "*sleeping beauty*") in human females?

A) Leptotene
B) Diplotene
C) Zygotene
D) Diakinesis

2. Which one of the following reactions is unique to gluconeogenesis?

A) Lactate to pyruvate
B) Phosphoenol pyruvate to pyruvate
C) Oxaloacetate to phosphoenol pyruvate
D) 1,3 Bisphosphoglycerate to 3-phosphoglycerate

3. The number of major and minor grooves present in 100bp of B-form of duplex DNA is

A) 10, 10
B) 100, 100
C) 1,1
D) 4,4

4. If a double helical DNA molecule stretches from the earth to the moon (320,000 Km), calculate the weight of this DNA based on the following information. The DNA double helix weighs about 1×10^{-18} g per 1000 nucleotide pairs; each base pair extends 0.34 nm.

A) 0.94 g
B) 0.94×10^{-3} g
C) 0.1088×10^{-3} g
D) 1.088 g

5. Calculate the molar extinction co-efficient of compound 'X' when 1 mg/ml of 'X' gives an absorbance of 75 at 235 nm. The molecular weight of 'X' is 400

A) 7,500
B) 15,000
C) 22,500
D) 30,000

6. Activation-induced (cytidine) deaminase (AID) plays an important role in the enhancement of antibody

A) Secretion
B) Diversification
C) Affinity
D) Synthesis

7. What happens to the melting point (Tm) of a duplex DNA molecule after the addition of NaCl?

A) Decreases
B) No change
C) Increases
D) Initially increases and then decreases

8. In pregnant women, insulin has been proposed to act as

A) Implantation factor
B) Uterine contraction factor
C) Fetal growth factor
D) Lactation factor

9. In a simple bimolecular ligand-receptor interaction, if B is the amount of bound ligand, F is the amount of free ligand, K is the equilibrium constant and R_0 is the total receptor concentration, the Scatchard equation will be

A) $B/F=K[R_0]-K(B)$
B) $F/B=K[R_0]-K(B)$
C) $B/F=K[R_0]/K(B)$
D) $F/B= K[R_0]/K(B)$

10. A lake rich in mineral and organic nutrients, promoting phytoplanktons but low in oxygen is called as

A) Dystrophic
B) Oligotrophic
C) Eutrophic
D) Ectotrophic

11. The reaction catalyzed by succinate dehydrogenase is inhibited by oxaloacetate. The characteristics of such a type of inhibition are

A) Reversible and competitive
B) Reversible and non-competitive
C) Irreversible and non-competitive
D) Irreversible and competitive

12. Which one of the following statements is *correct* with reference to apoptosis?

A) It is the only mechanism of cell death in multi-cellular organisms
B) The rate of apoptosis must be equal to the rate of cell division at all stages of development
C) Apoptosis requires disruption of the integrity of the cell's plasma membrane
D) Apoptosis involves breakdown of the nuclear DNA

13. A polysaccharide consisting of α-1-6-linked D-glucose units is found in

A) Agarose
B) Cellulose
C) Dextran
D) Glycogen

14. An *E. coli* strain lacking DNA polymerase I will be deficient in DNA

A) methylation
B) splicing
C) repair
D) degradation

15. The protection against smallpox afforded by prior infection with cowpox represents

A) Antigen specificity
B) Antigen cross reactivity
C) Antigen presentation
D) Antigenic diversity

16. The peptide having a sequence of "Gly-His-Phe-Leu-Arg-Ala-Gly-Met-Lys-Gly-Val-Leu" was digested with trypsin. Which one of the following tryptic peptides you would get?

A) Gly-His-Phe-Leu, Arg-Ala-Gly-Met & Lys-Gly-Val-Leu
B) Gly-His-Phe-Leu-Arg, Ala-Gly-Met-Lys & Gly-Val-Leu
C) Gly-His-Phe-Leu-Arg-Ala, Gly-Met-Lys & Gly-Val-Leu
D) Gly-His-Phe-Leu-Arg, Leu-Arg-Ala-Gly-Met & Lys-Gly-Val-Leu

17. Membrane carrier proteins differ from membrane channel proteins by which of the following characteristics?

A) Carrier proteins are glycoproteins while channel proteins are lipoproteins
B) Carrier proteins transport molecules down their electrochemical gradient, while channel proteins transport molecules against their electrochemical gradient
C) Carrier proteins mediate active transport while channel proteins cannot
D) Carrier proteins mediate passive transport while channel proteins mediate active transport

18. Polymorphism is best defined as

A) Co-segregation of alleles
B) Multiple phenotyes, one genotype
C) One locus, multiple abnormal alleles
D) One locus, multiple normal alleles

19. Structure of insects that may be analogous to liver of vertebrates is

A) Malpighian tubules
B) Phallic gland
C) Salivary glands
D) Fat body

20. If the second mutation in the same gene restores the wild-type phenotype, this phenomenon is known as

A) Epistasis
B) Gene conversion
C) Intergenic complementation
D) Intragenic suppression

21. Hydrogenosomes are

A) Organelles that produce hydrogen and ATP from pyruvate
B) Organelles that consume hydrogen and ATP by electron transport
C) Organelles that are defective in producing hydrogen and ATP by electron transport
D) Organelles that produce H_2O_2 in an oxidative reaction involving molecular oxygen and hydrogen atoms removed from specific organic substrates

22. The process that occurs at the 5' position of cytidine and often correlates with gene inactivation is

A) Gene conversion
B) DNA acetylation
C) Gene rearrangement
D) DNA methylation

23. The quantity of glucose present in 1 ml of 0.1 mM glucose solution is

A) 1 nmole
B) 10 nmoles
C) 100 nmoles
D) 1 μmole

24. All the following statements about the M-protein of group A *Streptococci* are correct *except*

A) M-Protein is the major constituent of the capsule of group A *Streptococci*
B) The amino terminal position is variable accounting for over 80 distinct serotypes
C) M protein is the major virulence factor of group A *Streptococci*
D) Antibodies to M-protein confer type-specific immunity

25. One of the following is not an example for the first order protein that binds directly to Ca^{2+}

A) Calcineurin
B) Calretinin
C) Calbindin
D) Calmodulin

PART "B"

26. *Xeroderma pigmentosum* is caused due to genetic defect in

A) Base excision repair
B) Mismatch repair
C) SOS repair
D) Nucleotide excision repair

27. Which one of the following is found only in organisms that contain polycistronic mRNA?

A) Polar mutations
B) Point mutations
C) Missense mutations
D) Alternative splicing sites

28. Atherosclerosis is caused by

A) The proliferation of smooth muscle cells
B) The proliferation and differentiation of epithelial cells
C) The proliferation of endothelial cells
D) The proliferation of skeletal muscle cells

29. Vectors in the genus *Phlebotomus* aid in the transmission of

A) Trypanosomiasis
B) Toxoplasmosis
C) Leishmaniasis
D) Schistosomiasis

30. Which one of the following when present in cooking oil will cause the maximum rancidity (or spoilage) of the oil up on exposure at room temperature

A) $CH_3(CH_2)_{22}COOH$
B) $CH_3(CH_2)_5CH=CH(CH_2)_7COOH$
C) $CH_3(CH_2)_4CH=CHCH_2CH=CH(CH_2)_7COOH$
D) $CH_3(CH_2)_2CH=CHCH_2CH=CHCH_2CH=CHCH_2CH=CH(CH_2)_3COOH$

31. Lining of glandular endothelial cells is <u>NOT</u> a characteristic of

A) Pancreas
B) Pituitary
C) Intestine
D) Liver

32. The function of reduced glutathione in red blood cells is to

A) Produce NADPH
B) Reduce methemoglobin to hemoglobin
C) Reduce pyruvate to lactate
D) Reduce oxidizing agents such as H_2O_2

33. When eukaryotic DNA is denatured by heat and allowed to cool slowly, the sequences that will anneal rapidly are

A) Introns
B) Coding sequences
C) Repetitive sequences
D) Regulatory sequences

34. Creutzfeldt-Jakob disease is caused by

A) Mycoplasma
B) Prions
C) Japanese encephalitis virus
D) SV 40 virus

35. The excitation/emission maxima (nm) of a blue fluorescent dye DAPI (4', 6-diamidino-2-phenylindole) that binds to DNA is

A) 431/480
B) 504/523
C) 358/461
D) 593/618

36. Structures that have the same evolutionary origin, even though they may now have different structures or functions are said to be

A) Analogous
B) Homologous
C) Heterologous
D) Contigious

37. In *Caenorhabditis elegans*, the homeotic gene mab-5 plays an important role in

A) Neuroblast migration
B) Gastrulation
C) Sex determination
D) Axis specification

38. The binomial system of classification was developed by

A) Darwin
B) Wallace
C) Linnaeus
D) Malthus

39. The anterior-posterior polarity of the embryo, larva and adult has its origin in the anterior-posterior polarity of the egg. Which of the following proteins regulate production of the cephalic structures?

A) Nanos and Hunchback
B) Bicoid and Hunchback
C) Nanos and Caudal
D) Bicoid and Caudal

40. Color blindness is caused by

A) Defective cone cell opsin receptor
B) Defective rhodopsin receptor
C) Defective myosin receptor
D) Abnormal rod and cone cell number

41. Which one of the following techniques are used to detect the absence of a given gene in an individual?

A) Northern blotting, RT-PCR
B) Southern blotting, PCR
C) Western blotting, PCR
D) Northern blotting, Differential PCR

42. Which type of cells produce anti-Müllerian hormone to facilitate the development of Wolffian duct system?

A) Leydig cells
B) Sertoli cells
C) Modified müllerian cells
D) Germ cells

43. Electrophoretic Mobility Shift Assay (EMSA) is a technique used for detecting

A) Protein-protein interactions
B) DNA-protein interactions
C) DNA-DNA interactions
D) DNA-RNA interactions

44. The central nervous system of earth worm consists of a pair of following except

A) Suprapharyngeal ganglion
B) Circumpharyngeal connective
C) Epipharyngeal ganglion
D) Subpharyngeal ganglion

45. Approximately how many moles of ATP will be generated as a result of oxidation of one mole of $FADH_2$ in an actively respiring mitochondrion?

A) 3
B) 4.5
C) 2
D) 6

46. The biophysicist Venkataraman Ramakrishnan won the Nobel Prize for Chemistry for the work on

A) Structure and function of the ribosome
B) Structure of RNA polymerase I
C) Structure and function of the ribozyme
D) Structure of RNA polymerase III

47. Compared to that of herbivores, a carnivore's intestine is generally

A) Longer
B) More convoluted
C) About the same
D) Less convoluted

48. Sodium cromoglycate

A) Promotes mast cell degranulation
B) Decreases intracellular cAMP levels in mast cells to release histamines
C) Prevents mast cell activation
D) Increasing the adenylate cyclase activity of mast cells to release histamines

49. Guanosine triphosphate (GTP) is required by which of the following steps in protein synthesis?

A) Aminoacyl-tRNA synthetase activation of amino acids
B) Attachment of ribosomes to endoplasmic reticulum
C) Translocation of tRNA-nascent protein complex from A to P site
D) Attachment of signal recognition protein to ribosomes

50. The prerequisite for the entry of secretory, lysosomal and plasma membrane proteins into endoplasmic reticulum (ER) is

A) Glycosylation
B) Presence of signal sequence
C) Proteolytic cleavage
D) Presence of common sorting signal

51. The binding capacity of DEAE-cellulose can be increased by equilibrating the column with

A) Higher buffer strength
B) Lower buffer strength
C) Higher pH
D) Lower pH

52. If the cell has one chromosome in excess of the normal number of chromosomes present in the nucleus, it is referred to as

A) Aneuploid
B) Polyploid
C) Triploid
D) Tetraploid

53. The cluster of differentiation marker CD29 is associated with

A) B cells
B) Leukocytes
C) Macrophages
D) Dendritic cells

54. When the nucleus of a frog red blood cell which *does not* replicate DNA is transplanted into an enucleated frog egg, the egg goes through several cell divisions. Which of one the following is the best interpretation for the phenomenon?

A) The transplanted nucleus plays no role in cell division
B) An enucleated egg can divide even in the absence of transplanted nucleus
C) The cytoplasmic determinants do not control the nuclear DNA division
D) The cytoplasmic determinants control the nuclear DNA synthesis

55. What is the O-antigen of *Enterobacteriaceae*?

A) Cell surface polysaccharide
B) A flageller protein
C) A peptidoglycan matrix important for cellular rigidity
D) Cell wall lipopolysaccharide

56. Major risk factor associated with intracytoplasmic sperm injection is

A) Microdeletion of Y chromosome
B) Microdeletion of X chromosome
C) The development of chromosomal anomaly
D) The development of somatic mutation

57. Vitamin K is involved in posttranslational modification of the blood clotting factors by acting as cofactor for the enzyme

A) Carboxylase
B) Hydroxylase
C) Decarboxylase
D) Oxidase

58. Elevation of intracellular inositol triphosphate (IP3) results in the release of Ca^{2+} from which of the following organelles

A) Peroxisome
B) Smooth endoplasmic reticulum
C) Lysosome
D) Mitochondrion

59. Which one of the following compartments in the human nucleus is associated with gene silencing?

A) Transcription factors
B) Cajal bodies
C) Perinucleolar domain
D) PML bodies

60. Apodemes in cockroach provide

A) Attachment to tracheal system
B) Attachment to muscles
C) Attachment to cuticle
D) Strength to internal organs

61. Nitrifying bacteria are examples of

A) Photoautotrophs
B) Chemoautotrophs
C) Photoheterotrophs
D) Chemoheterotrophs

62. The RNA primers used to initiate replication in *E. coli*

A) Are joined together by DNA ligase
B) Are removed by helicase + ATP
C) Are removed by DNA polymerase I by nick translation
D) Result in Okazaki fragments on the leading strand

63. The rate of enzyme-catalyzed reaction was measured using several substrate concentrations, that were much lower than K_m. The dependence of reaction velocity on substrate concentration can best be described as

A) Indirectly proportional to substrate concentration
B) Directly proportional to substrate concentration
C) Zero order with respect to substrate concentration
D) First order with respect to enzyme concentration

64. Which one of the following is <u>NOT</u> one of the Koch's postulated statements?

A) The organism is regularly found in lesion of the disease
B) The organism can be isolated from diseased tissue in pure culture on artificial media
C) Treatment of the disease with a broad spectrum oral antimicrobial compound eradicates the organism and cures the disease
D) Inoculation of a isolate from a pure culture into an experimental animal produces a similar disease

65. Degradation of secretory vesicles in the endocrine glands occurs through its fusion to lysosomes by a process called as

A) Heterophagy
B) Endophagy
C) Crinophagy
D) Polyphagy

66. The principle involved in differential interference contrast (DIC) microscopy is

A) Variation in thickness and refractive index within specimen
B) Gradient of refractive index across the specimen
C) Difference in refractive index for perpendicular beams of polarized light
D) Difference in the refractive index of bi-refringent elements in specimen

67. Which one of the following is <u>NOT CORRECT</u> about the Fc regions of immunoglobulins?

A) They can be cleaved from the Fab regions by papain.
B) They are involved in the activation of the complement cascade
C) They are involved in mast cell binding.
D) They are responsible for antibody binding.

68. Animal diseases that can be transmitted to humans are termed as

A) Zoonoses
B) Panzootic
C) Epizootiology
D) Enzootic

69. In lactating mothers, which one of the following hormones prevent conception for a limited period?

A) Prolactin
B) Somatomammotropin
C) Luteinizing hormone
D) Follicle stimulating hormone

70. A mixture of the following lipids is applied to a silica gel column and the column is then washed with progressing more polar solvents. The mixture containing phosphatidyl choline (PC), phosphatidyl serine (PS), cholesterol (C), cholesteol palmitate (CP) and triacylglycerol (TG) will elute in the following order

A) TG, PS, PC, C, CP
B) CP, TG, C, PC, PS
C) TG, CP, PC, PS, C
D) C, CP, TG, PS, PC

71. Chromosomal analysis reveals a 47, XX+21 karyotype. Which one of the following descriptions best fits this abnormality?

A) A female with Turner's syndrome
B) Edward's syndrome
C) Autosomal aneuploidy
D) Down's syndrome

72. Toxic Shock Syndrome Toxin-1 is an example of super antigen. This is secreted by one of the following bacteria

A) *Streptococcus pyogenes*
B) *Listeria monocytogenes*
C) *Staphylococcus aureus*
D) *Salmonella typhimurium*

73. Which one of the following does not belong to phanerozoic eon?

A) Cenozoic
B) Mesozoic
C) Paleozoic
D) Archeozoic

74. Which one of the following is the most correct sequence of events in gene repair mechanisms in patients with impaired repair process?

A) Nicking, excision, replacement, sealing, recognition
B) Recognition, nicking, excision, replacement, sealing
C) Nicking, sealing, recognition, excision, replacement
D) Recognition, nicking, sealing, excision, replacement

75. Amyloid deposits are hall marks for

A) Parkinson's disease
B) Alzheimer's disease
C) Sensory Aphasia
D) Wernecke's Aphasia