

Hall Ticket Number:

**Department of Animal Sciences
Entrance Examination, June 2010
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 on 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 14 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.**

Part A

- 1. Lymphocytes that target and lyse pathogen and virus infected cells are**
 - A. Cytotoxic T cells
 - B. B lymphocytes
 - C. Helper T cells
 - D. Suppressor T cells

- 2. Deletion / mutation of one or more steroid response elements in the 5' flanking region of a gene results in**
 - A. target gene silencing
 - B. lowered binding of the hormone
 - C. decrease in the target gene inducibility
 - D. no effect

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3. The accumulation of glycogen in the vacuoles in Pompe's disease is due to the deficiency of

- A. Glucokinase
- B. Glycogen synthase
- C. Glycogen phosphorylase
- D. α 1,4- glucosidase

4. Which of the following is not caused by a virus?

- A. Hepatitis
- B. German measles
- C. Poliomyelitis
- D. Onchocerciasis

5. _____ connects the right and left cerebral hemispheres

- A. Corpus callosum
- B. Cingulate gyrus
- C. Hippocampus
- D. Cingulate sulcus

6. Usual site of fertilization in human is

- A. Fallopian tube
- B. Vagina
- C. Cervix
- D. Uterus

7. Archaeopteryx is a transitional fossil between

- A. Dinosaur and bird
- B. Bird and mammal
- C. Snake and bird
- D. Crocodile and salamander

8. DPT vaccine protects against

- A. Diphtheria, polio and tetanus
- B. Diphtheria, pertussis and typhoid
- C. Diphtheria, pertussis and tetanus
- D. Diphtheria, polio and typhoid

9. Which of the following is a chemically synthesized promoter?

- A. Lac promoter
- B. Tac promoter
- C. T7 promoter
- D. λ PL promoter

10. Common lesions found in DNA after exposure to ultraviolet light are

- A. Pyrimidine dimers
- B. Single strand breaks
- C. Purine dimmers
- D. Transposition

11. The source of N atom at position 7 in the purine ring is derived from

- A. Glycine
- B. Glutamate
- C. Aspartate
- D. Glutamine

12. In India, Kala-azar is caused by

- A. *Leishmania donovani*
- B. *Leishmania tropica*
- C. *Leishmania major*
- D. *Leishmania chagasi*

13. Infection of *E. coli* with bacteriophage is usually detected by

- A. growth of *E. coli* in agar plates containing ampicillin
- B. appearance of plaques on agar plates
- C. no growth on agar plates
- D. restriction mapping of the bacterial DNA

14. In *S. cerevisiae*, mutations causing segregation petite phenotype

- A. are located in mitochondrial genes
- B. prevent growth under all conditions
- C. cause mitochondria to have better than normal function
- D. are transmitted according to Mendelian rules

15. Stem cells derived from Inner Cell Mass (ICM) of mice embryo are

- A. totipotent
- B. oligopotent
- C. pluripotent
- D. multipotent

16. For expressing the recombinant proteins in the milk of transgenic dairy animals, the following gene promoters are used, except

- A. Albumin
- B. Lactalbumin
- C. Casein
- D. Lactoglobulin

17. Which of the following are least likely to be involved in stabilizing the three-dimensional folding of proteins?

- A. Hydrogen bonds
- B. Hydrophobic interactions
- C. Ester bonds
- D. Disulphide bonds

18. Human heart beat originates from

- A. SA node
- B. Purkinje fibres
- C. AV node
- D. Bundle of His

19. The vitamin required for the formation of collagen fibres and prevention of Scurvy is

- A. Thiamine
- B. Ascorbic acid
- C. Riboflavin
- D. α -tocopherol

20. Which of the following is not an acquired character of cancer cells

- A. Tissue invasion and metastasis
- B. Sensitivity to anti-growth signals
- C. Expression of novel marker proteins
- D. Self sufficiency in growth signals

21. Protein sequencing by Edman's degradation is used to determine

- A. N-terminal amino acid
- B. Methionine
- C. C-terminal amino acid
- D. Internal arginine and lysine residues

22. In cell fractionation, acid phosphatase is used as a marker for

- A. Nuclei
- B. Endoplasmic reticulum
- C. Lysosomes
- D. Cytosol

23. p53 regulates cell cycle at the transition point

- A. S / G2
- B. M / G1
- C. G1 / S
- D. G2 / M

24. The frequency with which an allele is present in the population is primarily influenced by

- A. DNA sequence near the allele
- B. natural selection
- C. Germ line mutations
- D. starting frequency of allele

25. The specialized structures located at the ends of eukaryotic chromosomes are called

- A. Terminators
- B. Long terminal repeats
- C. Telomeres
- D. Kinetochores

Part B

26. All of the following substances move across the plasma membrane of cells by passive diffusion except

- A. Palmitic acid
- B. Aldosterone
- C. Na⁺
- D. Estrogen

27. A bacterial protein-coding gene contains a terminator codon in the middle of the coding region, yet expression of the gene in the bacterium produces a functional protein. Translation of the gene probably requires

- A. the excision of an intron
- B. ribosomes that lack 5S rRNA
- C. suppressor tRNA
- D. nothing specific

28. Incubation of Gram-negative bacteria with lysozyme in an isotonic medium causes rod-shaped bacteria to assume a spherical shape. The cause of this phenomenon is

- A. absorption of water
- B. change in gene expression
- C. damage to plasma membrane
- D. destruction of the cell wall

29. Which of the following is the smallest peptide hormone in animals?

- A. GnRH
- B. GnIH
- C. ACTH
- D. TRH

30. The following statements about poly(A) tail in eukaryotic mRNA is true except

- A. It helps to align eukaryotic mRNA on the ribosome during translation
- B. It is added to the primary transcript in the nucleus
- C. It is not essential for protein synthesis
- D. It stabilizes and increases the half life of the mRNA

31. At the end of S phase of the cell cycle of a mammalian cell, the following are true except

- A. Histone content per cell is the same as that of cells in G1.
- B. Each replicated chromosome has four telomeres.
- C. Sister chromatids remain together and do not disjoin.
- D. The nucleus contains the equivalent amount of DNA of a tetraploid cell in G1.

32. Which of the following hormone is secreted principally by the corpus luteum of the human ovary?

- A. Leutinizing hormone
- B. Gonadotropin releasing hormone
- C. Follicle stimulating hormone
- D. Progesterone

33. Which of the following matings between *E. coli* strains would result in a high frequency of transfer of chromosomal genes?

- A. $F^+ \times F^+$
- B. Hfr x Hfr
- C. $F^+ \times F^-$
- D. Hfr x F^-

34. Actin filaments are found in all of the following except

- A. Flagella of bacteria
- B. Microvilli of intestinal brush border
- C. Sarcomeres of skeletal muscle cells
- D. Contractile rings of dividing animal cells

35. Pertussin toxin modifies the α - subunit of G proteins by

- A. Phosphorylation
- B. ADP-ribosylation
- C. Glycosylation
- D. Acetylation

36. Maturity onset diabetes of the young, MODY is

- A. Monogenic, autosomal dominant inherited disease
- B. Monogenic, sex-linked inherited disease
- C. Type 2 diabetes in a young person
- D. Type 2 diabetes involving multiple genes

37. Glucose and mannose are epimers because

- A. they are mirror images of each other
- B. they differ only in the configuration about one carbon atom.
- C. they rotate the plane of light in opposite directions.
- D. one of them is an aldose and the other a ketose

38. Virus-mediated transfer of cellular genetic material from one bacterial cell to another is called

- A. transfection
- B. transformation
- C. transduction
- D. transposition

39. 'Zinc fingers' are important in cellular recognition because they are

- A. at the catalytic site of many kinases
- B. associated with growth factor receptors
- C. structural motif in many DNA-binding proteins
- D. structures with high redox potential

40. Which of the following adaptations appeared for the first time in the common ancestor of the mammals, birds and modern reptiles?

- A. Membranous lungs
- B. Hinged jaws
- C. Tetrapod limbs
- D. Amniotic eggs

41. The V_{max} and K_m values determined for succinate dehydrogenase are 20 and 4 respectively. What will happen to these values in the presence of malonate?

- A. V_{max} remains same but K_m increases
- B. V_{max} does not change but K_m decreases
- C. V_{max} decreases but K_m is constant
- D. Both V_{max} and K_m decrease

42. Which of the following best describes an enhancer?

- A. It induces the activity of the promoter, independent of its orientation and distance
- B. Its activity is dependent on its distance from the start site of transcription
- C. It enhances transcription only when positioned at the 3' end of the gene
- D. It activates the promoter only when positioned at the 5' end of the gene

43. The following gene family produces paracrine factors, which play an important role during embryogenesis

- A. Hox
- B. Pax
- C. GATA
- D. Hedgehog

44. Skin testing for tuberculosis by Mantoux test is

- A. antibody mediated
- B. autoimmune reaction
- C. delayed type hypersensitivity reaction
- D. immediate hypersensitivity reaction

45. Proteins that are destined for secretion are sorted and packaged in the

- A. Lysosomes
- B. Peroxisomes
- C. Endoplasmic reticulum
- D. Trans Golgi network

46. Which of the following is added to the nuclear lamins that facilitate their targeting to the nuclear envelope during mitosis?

- A. Myristoyl group
- B. 2-geranyl-geranyl group
- C. Isoprenoid tail group
- D. Farnesyl & myristoyl groups

47. Upon exposure to an antigenic determinant, _____ rises first, followed by _____

- A. IgG, IgM
- B. IgM, IgG
- C. IgG, IgE
- D. IgM, IgE

48. 1 ml of 0.04 M sucrose contains _____ of sucrose

- A. 40 pmoles
- B. 40 nmoles
- C. 40 μ moles
- D. 40 moles

49. Microarray analysis revealed the up-regulation of 8 genes in a mammalian cell line exposed to a drug. Which of the following techniques can be used to validate the microarray data?

- A. Northern hybridization and Real Time-PCR
- B. Southern hybridization and PCR
- C. Southern hybridization and Real Time-PCR
- D. Southern hybridization and fluorescence *in situ* hybridization

50. The melting curve of two DNA samples X and Y, at the same pH and ionic strength have T_m values of 80°C and 65°C respectively. This indicates that

- A. AT content of X & Y are equal
- B. AT content of X > Y
- C. GC content is of X > Y
- D. GC content is of X < Y

51. Which one of the following amino acid contributes to the fluorescence of a protein?

- A. Tryptophan
- B. Proline
- C. Leucine
- D. Cysteine

52. Retroviruses replicate

- A. via a double-stranded DNA intermediate
- B. by duplicating its genetic material by elaborating RNA dependant RNA polymerase
- C. independently in the host cytoplasm by virtue of the reverse transcriptase activity
- D. by integrating directly into the host genome

53. All the following statements about genomic imprinting are true except

- A. it involves modification of DNA bases
- B. in humans, imprinting is both maternally and paternally inherited
- C. in mice, it is maternally inherited
- D. it is erased in germ cells

54. Memory and learning are associated with which of the following part of the brain?

- A. Brodmann area
- B. Suprachiasmatic nucleus
- C. Hippocampus and amygdala
- D. Neurohypophysis

55. Inheritance of mitochondrial DNA is

- A. only paternal
- B. both maternal and paternal
- C. only maternal
- D. offspring's own DNA gives rise to mitochondrial DNA

56. Which of the following processes leads to the formation of polytene chromosomes?

- A. Recombination between adjacent chromosome segments
- B. Sister chromatid exchange
- C. Repeated replication without separation of chromatids
- D. Inactivation of one chromosome of each homologous pair

57. All the following statements are true about heterotrimeric G proteins except they

- A. have GTPase activity
- B. phosphorylate proteins
- C. act as binary on-off switches
- D. help to amplify a hormone's signal

58. In *E. coli*, the respiratory chain components are located in the

- A. plasmids
- B. cytoplasmic membrane
- C. cytosol
- D. mitochondrial membrane

59. Anaphylatoxins are a group of

- A. toxins released by bacteria and viruses
- B. complement proteins released during complement activation
- C. proteins released during cell death
- D. cytokines secreted by cytotoxic T cells

60. Which hormone acts by first binding to a cytoplasmic receptor, followed by the binding of the receptor-hormone complex to DNA?

- A. Estradiol
- B. Glucagon
- C. Insulin
- D. Norepinephrine

61. The homeobox is associated with genes coding for proteins that

- A. regulate homeostasis
- B. are involved in segmentation
- C. regulate development
- D. do not play any significant role in eukaryotes

62. The semi-conservative mechanism of replication was proved by

- A. Hershey and Chase
- B. Barbara McClintock
- C. Francois Jacob and Jacques Monod
- D. Meselson and Stahl

63. Which of the following statements about IgG is false?

- A. It is the principal immunoglobulin in secondary immune response.
- B. It is important in mucosal immunity.
- C. It is the most common circulating immunoglobulins in serum.
- D. It is the only immunoglobulin capable of crossing the placenta.

64. Which of the following statement is incorrect about thyroxine?

- A. It is formed by iodination of tyrosine.
- B. T3 is more active than T4.
- C. Most of it is bound to proteins.
- D. Secretion is under the direct control of TRH.

65. tRNA has a clover leaf structure because

- A. of complementary base pairing between inverted repeats in its sequence
- B. RNA polymerase has the unique property of synthesizing it as a folded structure.
- C. of interaction with proteins
- D. it assumes this shape when it enters the ribosome during protein translation

66. Pasteurisation of milk, fruit juices and beer is done to

- A. kill all bacteria
- B. inactivate the enzymes
- C. reduce the number of viable pathogenic bacteria
- D. retain the natural flavor

67. Recombinant tissue plasminogen activator is used for the treatment of

- A. Hepatitis
- B. Hemophilia
- C. Thrombolytic stroke
- D. Thalassemia

68. An organism that has lost the ability to synthesise a particular organic compound for its growth is called

- A. Heterotrophy
- B. Auxotroph
- C. Autotroph
- D. Prototroph

69. Which of the following metal ions is commonly used in the affinity purification of His-tagged recombinant proteins?

- A. Iron
- B. Magnesium
- C. Nickel
- D. Molybdenum

70. The distribution of transmembrane proteins in the plane of a cell membrane can best be visualized by which of the following?

- A. Thin section transmission electron microscopy
- B. Scanning electron microscopy
- C. Freeze fracture electron microscopy
- D. Ultraviolet spectroscopy

71. Cancer may result upon infection with

- A. Baculovirus
- B. Rotavirus
- C. Papillomavirus
- D. T4 bacteriophage

72. In which order do stem cells go in hierarchy?

- A. Pluripotent, totipotent and multipotent
- B. Totipotent, multipotent and pluripotent
- C. Multipotent, pluripotent and totipotent
- D. Totipotent, pluripotent and multipotent

73. The following are true about adult stem cells except

- A. They are undifferentiated cells
- B. They are found throughout the body
- C. They are also known as somatic stem cells
- D. They cannot be used to regenerate damaged tissues

74. A homozygous Rh positive man (RR) marries an Rh negative (rr) woman. The first child is normal but the second child develops hemolytic disease of the newborn. The first child does not develop the hemolytic disease because

- A. the child was heterozygous
- B. the child lacked the Rh antigen
- C. the mother had a previous blood transfusion that protected the child against her antibodies
- D. the mother developed anti-Rh antibodies only after the delivery of the first child

75. A protein was purified by gel filtration chromatography as a 160 kDa protein. When subjected to SDS-PAGE, a 40 kDa band was detected. This indicates

- A. degradation of the protein
- B. that gel filtration chromatography cannot give the correct size of the protein
- C. that the protein consists of monomers of identical molecular mass
- D. that the protein migrates very fast due to the presence of positively charged amino acids

For Rough Work