ENTRANCE EXAMINATIONS – 2019

(Ph.D. Admissions - January 2020Session)

Ph.D. Animal Biology

Code number: Booklet Code:

Hall Ticket Number:

Maximum Time: 2 hours **Maximum Marks: 70**

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 to the invigilator at the end of the examination.*
- *All questions carry one mark each. Answer all, or as many as you can.*
- *There are a total of 11 (ELEVEN) pages in this question paper. Check this before you start answering. Answer sheet (OMR) will be provided separately.*
- *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 candidate gets equal marks, to prepare the merit list.*

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PART "A"

1. Lipopolysaccharide is abundant in the cell wall of

A) Gram positive bacteria
B) Intracellular parasites
C) Fungi
D) Gram negative bacteria

2. Which one of the following statements about T4 DNA ligase is correct? It catalyses the formation of a phosphodiester bond between two nucleotides carrying

A) 5'-phosphate and 3'-OH in presence of ATP
B) 5'-phosphate and 3'-OH in presence of inorganic phosphate
C) 5'-OH and 3'-phosphate in presence of ATP
D) 5'-OH and 3'-phosphate in presence of inorganic phosphate

V-69

3. Which one of the following is the best method to study the glycolytic fluxes in a cancer cell?

A) Western blotting of glycolytic enzymes
B) RT-PCR analysis of glycolytic enzymes
C) Tracing of radiolabelled carbon
D) Biochemical assay of glycolytic enzymes

4. Complete denaturation of an oligomeric protein by boiling it for 5 minutes will lead to

A) Disruption of primary, secondary and tertiary structures of protein
B) Disruption of secondary, tertiary and quaternary structures of protein
C) Disruption of only tertiary and quaternary structures of protein
D) Disruption of only quaternary structure of protein

5. Immortalization of mouse embryonic fibroblasts (MEFs) is one of the methods to prevent senescence or Hayflick limit. Which one of the following methods is most suitable for the generation of immortalized MEFs?

A) Treatment of MEFs with different growth factors
B) Treatment of MEFs with antibiotics
C) Transformation by overexpression of an oncogene
D) Transformation by overexpression of a house keeping gene

6. Far-western blot is generally used to detect the following biomolecular interactions

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

7. Which one of the following software packages is used to find a protein homologues?

A) BWA
B) TopHat
C) BLAST
D) CLUSTALW

8. Which combination could you use to prepare a buffer solution?

A) Na_2SO_4 and H_2SO_4
B) $Na[CH_3CO_2]$ and CH_3CO_2H
C) $Na[CH_3CO_2]$ and $Na[HCO_2]$
D) $NaNO_3$ and HNO_3

9. Which one of the following radioactive materials emits gamma rays?

A) ^{14}C
B) ^{32}P
C) ^{35}S
D) ^{125}I

10. Genomic DNA from a normal person and breast cancer patient were subjected to bi-sulfite treatment and PCR was performed using primers specific to promoter regions of genes. Biomedical significance of the assay is to

A) Detect SNPs in genomic DNA
B) Study expression of proto-oncogenes
C) Study methylation status
D) Determine the stage of cancer

11. Which one of the following methods is commonly used to obtain homogeneous population of antibodies with known antigenic specificity?

A) Phage display
B) Hybridomas
C) Immunoprecipitation
D) Equilibrium dialysis

12 Homopolymer tailing is commonly used for

A) constructing cDNA libraries
B) shotgun cloning
C) adding poly(A) to eukaryotic RNA
D) constructing genomic libraries

13. Which one of the following diseases cannot be detected by ELISA?

A) HIV
B) Pernicious anemia
C) Lyme disease
D) Sickle cell anemia

14. Which of the following amino acids is/are known as helix breakers?

A) Proline & Glycine
B) Isoleucine & Leucine
C) Valine
D) Threonine

15. Immunoglobulin G was subjected to size exclusion chromatography and was observed to have a size of 150 kDa. SDS-PAGE analysis revealed presence of two bands of size 50 kDa and 25 kDa. So, the oligomeric status of protein is:

A) 3 polypeptide chains of mass 50 kDa
B) One polypeptide chain of mass 50 kDa and 4 polypeptide chains of mass 25 kDa
C) 6 polypeptide chains of mass 25 kDa
D) Two polypeptide chains of mass 25 kDa and two polypeptide chains of mass 50 kDa

16. Which one of the following enzymes is used for DNA 5' end labeling with gamma-^{32}P ATP?

A) Klenow Fragment
B) T4 Polynucleotide Kinase
C) DNA Polymerase I
D) Terminal Transferase

17. OMIM is a database that provides all the information on inheritance of

A) Human
B) Mouse
C) Rabbit
D) Squirrel

18. Which one of the following statements is correct?

A) Molarity does not change with temperature
B) Molality does not change with temperature
C) Normality does not change with temperature
D) Molarity changes with dilution

19. In Western blot,

A) Proteins are separated out on a gel and transferred to a membrane for detection
B) RNA is separated out on a gel and transferred to a membrane for detection
C) DNA is separated out on a gel and transferred to a membrane for detection
D) Glycolipids are separated out on a gel and transferred to a membrane for detection

20. What is the concentration of formate in 10 mM solution of formic acid at pH 4.15?

A) 12 mM
B) 14.4 mM
C) 7.2 mM
D) 3.6 mM

21. Which electrons are mostly being captured in Scanning Electron Microscopy to analyze surface topography of biological specimens?

A) Elastically scattered electrons
B) Primary electrons
C) Secondary electrons
D) Transmitted electrons

22. The doubling time for *Mycobacterium tuberculosis* is

A) 24 sec
B) 24 min
C) 2.4 h
D) 24 h

23. The first human protein produced through recombinant DNA technology is

A) Insulin
B) Erythropoietin
C) Interferon
D) Somatostatin

24. Following test of significance will be used when more than two groups are to be compared

A) Standard error of Mean
B) "t"-test
C) Chi-square test
D) z-test

25. The frequency of males affected by an X-linked recessive disorder is 0.1. What will be the frequency of affected females?

A) 0.1
B) 0.01
C) 0.001
D) 0.2

26. The Thrombin cleavage site in pGEX vectors is

A) Leu-Val-Pro-Arg↓Gly-Ser
B) Val-Leu-Arg-Pro↓Gly-Ser
C) Arg-Leu-Pro-Val↓Gly-Ser
D) Leu-Pro-Val-Arg↓Gly-Ser

27. Sabin-Feldman dye test is used in diagnosis of

A) Leptospirosis
B) Malaria
C) Leishmaniasis
D) Toxoplasmosis

28. For ectopic expression of genes using mammalian expression system, one of the following genetic elements is most essential

A) Translation signals like Kozak
B) Constitutive or inducible promoter
C) Polyadenylation signal
D) Signal peptide-encoding sequence.

29. Endotoxins are characterised by all of the following, except

A) Being stable up to 250 °C
B) Eliciting weak immune response
C) Ability to cause fever
D) Protein

30. Which one of the following is most suitable to be applied on the walls of the scaffold prior to its implantation?

A) Plasmin
B) Ampicillin
C) Laminin
D) Immunoglobulin

31. Which one of the following ribosome subunits is common in prokaryotic and eukaryotic cells?

A) 23S
B) 28S
C) 18S
D) 5S

32. What is the correct order of staining reagents in Gram-Staining?

A) Crystal violet, alcohol, iodine solution, safranin
B) Iodine solution, crystal violet, alcohol, safranin
C) Crystal violet, safranin, alcohol, iodine solution
D) Crystal violet, iodine solution, alcohol, safranin

33. Which one of the following instruments can be used for live sectioning of the tissue?

A) Microtome
B) Ultramicrotome
C) Cryostat
D) Vibrotome

34. A data representing a person's pulse rate is considered as

A) Nominal data
B) Random variable
C) Discrete data
D) Continuous data

35. If normal stem cells have a doubling time of ~24 h and tumor derived stem cells have ~12 h, when both these cells are grown in the presence of radioactive thymidine, what is the amount of radioactivity accumulated in these cells after a week?

A) Half in normal stem cells compared to cancer stem cells
B) Half in cancer stem cells compared to normal stem cells
C) Same in both normal stem cells and cancer stem cells
D) None in both the cells

PART "B"

36. Cyclosporin is an

A) Antibiotic
B) Antifungal
C) Adjuvant
D) Immunosuppressant

37. Which one of the following ATPase pumps is a target for Oligomycin

A) $Na^+ K^+$ ATPase
B) H^+K^+ ATPase
C) F_0F_1 ATP synthase
D) SERCA Ca-ATPase

38. Low levels of acetylcholine in the brain is closely associated with

A) Parkinson's Disease
B) Alzheimer's Disease
C) Huntington's Disease
D) Schizophrenia

39. Denaturation-renaturation kinetics of genomic DNA generates a Cot curve. Which one of the following is incorrect for Cot curve / value

A) identical in all organisms
B) related to the complexity of the DNA
C) high value implies a slower reaction
D) product of the DNA concentration and time for half the DNA to renature

40. The synthesis of bacterial cell wall is inhibited by

A) Tetracycline
B) Puromycin
C) Ampicillin
D) Kanamycin

41. During Ras signaling

A) Cytoplasmic protein kinases are activated
B) Growth factor receptor is dephosphorylated
C) Growth factors bind to receptors in cytosol
D) Cytoplasmic protein kinases are inactivated

42. Identify the false statement

A) Decreased bicarbonate leads to metabolic acidosis
B) Decreased carbonic acid leads to respiratory alkalosis
C) Decreased bicarbonate leads to metabolic alkalosis
D) Hypokalemia is associated with metabolic alkalosis

43. Circadian rhythms in mammals are regulated by

A) Amygdala
B) Hippocampus
C) Suprachiasmatic nucleus
D) Periventricular nucleus

44. Calculate the pKa of lactic acid given the concentration of lactic acid is 0.01 M and the lactate is 0.087 M at pH 4.8

A) 4.0
B) 3.9
C) 3.3
D) 4.1

45. Peptide components of antigen receptor on mature B cells should include

A) Heavy chain and light chain
B) Heavy chain, light chain, B220 and CD19
C) Heavy chain, light chain, lambda 5 and VpreB
D) Heavy chain, light chain, Ig alpha and Ig beta

46. Which one of the following enzymes is not involved in lysosomal storage disease?

A) Beta-galactosidase
B) Alpha 2, 6-sialylated lactosamine
C) Beta-glucocerebrosidase
D) Alpha-iduronidase

47. Each cycle of beta-oxidation produces how many molecules of each of

A) 1 FAD, 1 NAD^+ and 2 CO2 molecule
B) 1 FADH2, 1 NADH and 1 acetyl co-A
C) 1 FADH2, 1 NAD+ and 1 acetyl co-A
D) 1 FAD, 1 NADH and 1 CO2 molecule

48. Local anesthetic drugs act by

A) Inhibiting acetylcholinesterase enzyme in the synapse
B) Blocking nicotinic acetylcholine receptors at synapse
C) Activating acetylcholinesterase enzyme in the synapse
D) Internal block of axonal voltage gate sodium channels

49. Which one of the following is correct about Hershey and Chase experiment?

A) The protein coat of the virus enters the host bacterial cell
B) The viral coat protein can be radiolabelled with ^{32}P
C) The viral coat protein can be radiolabelled with ^{35}S
D) Viral DNA recovered from host bacterial cell is labelled with ^{35}S

50. In humans, "unattached" earlobes are dominant over "attached" earlobes. "Widows peak" hairline is dominant over "non-widows peak" hairline. A female with unattached earlobes and a widows peak hairline and a male with attached earlobes and a widows peak hairline have a child. The child has attached earlobes and a non-widows peak hairline. What are the genotypes of the parents?

A) EeWw and eeww
B) EeWw and eeWw
C) EEWW and eeww
D) EEWW and eeWw

51. Immunotherapy is an exciting area of cancer research in recent years. Which one of the following signaling axis is the primary target in order to inhibit the immune evasion in cancer models?

A) PD-1/PD-L1
B) IL1 beta/IFN gamma
C) PERK/IRE
D) PARP/Caspases

52. Which one of the following cytochrome P450 enzymes is not found/localized in mitochondria?

A) P450 arom/Cyp19a
B) P450 Cyp17/Cyp17
C) P450 Scc/Cyp11a
D) P450 Cyp3A/Cyp3A

53. Melanocyte stimulating hormone is secreted by

A) Pineal gland
B) Pars intermedia of pituitary
C) Pars distalis of pituitary
D) Pars reticulata

54. Maximum absorption of Na^+ and K^+ occurs in

A) Loop of Henle
B) Bowman's capsule
C) Distal Convoluted Tubule
D) Proximal Convoluted Tubule

55. Identify the effector cell type that is adopted when CD4+ T cells are stimulated through INF-gamma?

A) Treg cells
B) TH1 cells
C) TH2 cells
D) Cytotoxic T cells

56. A loss of function mutation in human growth factor WNT1 leads to

A) Cleft palate
B) Craniosynostosis
C) Osteoporosis
D) Ectopic bone formation

57. The name for the type of first cleavage in mammalian embryo is

A) Unequal Cleavage
B) Rotational Cleavage
C) Radial Cleavage
D) Planer Cleavage

58. Thin flat cells that form blood brain barrier are

A) Oligodendrites
B) Astrocytes
C) Schwann cells
D) Erythrocytes

59. Which one of the following nucleotides is required for the elongation stage of protein translation in *E. coli*?

A) ATP
B) CTP
C) GTP
D) UTP

60. ---------- is the major chemical reaction that happens in feto-placental unit for inactivation of fetal adrenal steroids like DHEA

A) Sulfation
B) Hydroxylation
C) Methylation
D) Oxidation

61. Carbohydrate is a polyhydroxy compound of

A) Glucose
B) Oligosaccharide
C) Aldehyde & ketone
D) Glyceraldehyde

62. In case of allosteric enzymes, what is the graphical representation when initial velocity is plotted against substrate concentration?

A) Hyperbola
B) Parabola
C) Sigmoid
D) Straight line with negative slope

63. A bacterial enzyme that dissolves fibrin clot is

A) Hyaluronidase
B) Leukocidin
C) Streptokinase
D) Coagulase

64. Zymosan is an example of a pathogen associated molecular patterns that is present in

A) Bacteria
B) Virus
C) Fungus
D) Protozoa

65. Which part of the brain is responsible for flight or fight response?

A) Caudate
B) Lentiform
C) Amygdala
D) Claustrium

66. Which class of GLUT transporters play a key role in glucose transport in adipocyte and muscle upon insulin activation?

A) GLUT 4
B) GLUT 7
C) GLUT 8
D) GLUT 10

67. An intermediate of the TCA cycle that undergoes reductive amination with glutamine as nitrogen donor is

A) Alpha-ketoglutarate
B) Glutamine
C) NADPH
D) FADPH

68. Which one of the following is not related to puberty onset in human?

A) Kisspeptin
B) Dynorphin
C) Neurokinin-B
D) Vasotocin

69. Which one of the following enzymes is responsible for methylation of hemi-methylated DNA in eukaryotic cells?

A) DNMT1
B) DNMT3a
C) DNMT3b
D) DNMT3L

70. Which one of the following causes gastric ulcers?

A) *Shigella flexneri*
B) *Giardia lamblia*
C) *Helicobacter pylori*
D) *Leptospira interrogans*

For rough work