

Hall Ticket Number:

Y-59

ENTRANCE EXAMINATION

2020

INTEGRATED M.Sc. / Ph.D. ANIMAL BIOLOGY & BIOTECHNOLOGY

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.*

- *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.*
- *There are a total of 9 (NINE) 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. How many grams of Ca(OH)_2 present in 1500 mL of 0.0250 M Ca(OH)_2 solution?
A) 4.25 g B) 3.17 g
C) 2.78 g D) 1.85 g

2. Proteins within a family (homologs) present in the same species are called
A) Orthologs B) Paralogs
C) Heterologs D) Epilogs

3. The initial dorsal-ventral axis in amphibian embryos is determined by
A) The point of contact with the uterus B) Gravity
C) The Point of Sperm Entry D) Genetic differences in the cells

4. Which one of the following cells are known as Langerhans cells?
A) Dendritic cells B) Natural Killer cells
C) Plasma cells D) Neutrophils

5. The pH of 500 mL of solution containing 0.0124 grams of $\text{Ca}(\text{OH})_2$ is 10.83. What will be the pH of this solution if 500 ml of distilled water is further added to it?
A) 7.2
B) 9.68
C) 10.83
D) 11.04
6. Which of the following is the genetic material of SAR-CoV2?
A) Single-stranded Positive RNA
B) Single-stranded Negative RNA
C) Single-stranded DNA
D) Double-stranded DNA
7. Stable structures of amphipathic compounds in water are called
A) Missiles
B) Ampholytes
C) Clathrates
D) Micelles
8. In the classical experiment performed by Alfred Hershey and Martha Chase using T2 bacteriophage, choose the correct answer.
A) The protein coat of the virus enters the host bacterial cell
B) The viral coat protein was radiolabelled with ^{35}S
C) The viral coat protein was radiolabelled with ^{32}P
D) The viral DNA recovered from host bacterial cell was radiolabelled with ^{35}S
9. Polytene chromosomes are formed due to
A) extensive transcription
B) pairing of homologous chromosomes
C) repeated DNA replication without cell division
D) failure of DNA replication
10. One of the following methods is used to determine the DNA binding regions of a given transcription factor across the genome.
A) DNA-Seq
B) RNA-Seq
C) ChIP-Seq
D) ATAC-Seq
11. Which process does not belong to downstream processing?
A) Cell sonication
B) Media optimization
C) Broth filtration
D) Debris precipitation
12. Given that the molecular weight of a nucleotide pair is 650 and the length occupied by each base pair is 3.4 Angstroms, what will be the length of a DNA that has a molecular weight of 120×10^6 (YS)
A) 6.1×10^{10} Angstroms
B) 6.1×10^5 Angstroms
C) 12.2×10^{10} Angstroms
D) 12.2×10^5 Angstroms
13. Which of the following bacteria causes syphilis in humans?
A) *Treponema dysenteriae*
B) *Cryptosporidium*
C) *Rickettsia*
D) *Treponema pallidum*

14. The removal of 7th electron from an element of Group VI of the periodic table needs three times more energy than
- A) 5th electron
 - B) 6th electron
 - C) 8th electron
 - D) 18th electron
15. The process of loss of the alkylated base from the DNA molecule by breakage of the bond joining the purine nitrogen with the deoxyribose is termed as
- A) Alkylation
 - B) Transversion
 - C) Transition
 - D) Depurination
16. Which of the following structures is derived from ectomesenchyme?
- A) Motor neurons
 - B) Skeletal muscles
 - C) Melanocytes
 - D) Sweat glands
17. Which one of the following monosaccharaides is not an aldose?
- A) Glucose
 - B) Ribose
 - C) Erythrose
 - D) Fructose
18. In a given human cell, all the maternal chromosomal DNA was fluorescently labeled and allowed it to undergo 30 rounds of mitotic cell divisions. How many of these daughter cells will retain fluorescence labeled chromosomal DNA?
- A) Upto 46 cells
 - B) Upto 92 cells
 - C) Upto 690 cells
 - D) Upto 1380 cells
19. Which enzyme converts glucose to ethanol?
- A) Invertase
 - B) Maltase
 - C) Zymase
 - D) Diastase
20. The difference in energy between the reactant at its ground state and transition state is
- A) Transition energy
 - B) Activation energy
 - C) Free energy
 - D) Heat energy
21. The pH of a solution whose $[OH^-] = 1 \times 10^{-2} M$ is
- A) 2
 - B) 5
 - C) 10
 - D) 12
22. The ionic product of water is
- A) $1 \times 10^{-14} M^2$
 - B) $1 \times 10^{-41} M^2$
 - C) $1 \times 10^{-7} M^2$
 - D) $1 \times 10^{-21} M^2$
23. Feminization of external genitalia happens in XY male due to defective/mutated
- A) 5alpha-reductase
 - B) 21-hydroxylase
 - C) Progesterone receptor
 - D) Aromatase

24. Which of the following features is not correct for a plasmid vector?
 A) Selectable Marker
 B) Reporter gene
 C) An origin of replication
 D) can be used to express high molecular weight proteins
25. An element found in all amino acids but not in carbohydrates is
 A) Carbon
 B) Nitrogen
 C) Oxygen
 D) Sulphur
26. The major greenhouse gasses are
 A) CO₂ and O₂
 B) O₂ and CH₄
 C) N₂O and O₂
 D) CO₂ and CH₄
27. Two fragments of DNA can be joined by
 A) Terminal transferase
 B) Polynucleotide kinase
 C) DNA ligase
 D) DNA polymerase I
28. Cell wall of algae contains
 A) Hemicellulose, pectins and proteins
 B) Cellulose, galactans and mannans
 C) Cellulose, hemicellulose and pectins
 D) Pectins, cellulose and proteins
29. 4-hydroxy proline is present in
 A) Collagen
 B) Plant Cell wall
 C) Keratin
 D) Bacterial cell wall
30. Which of the following can precipitate antigens in an agglutination assay?
 A) Fab
 B) Fc
 C) FCR
 D) F(ab)₂
31. Which one of the following floating plants in rice fields serves as a biofertilizer.
 A) *Azolla*
 B) *Wolffia*
 C) *Salvinia*
 D) *Lemna*
32. Genome of an organism refers to its total
 A) haploid set of chromosomes
 B) diploid set of chromosomes
 C) autosomes
 D) total number of genes
33. Polenske value of fatty acids is indicative of
 A) Degree of unsaturation of fatty acids
 B) Degree of saturation of fatty acids
 C) Amount of volatile fatty acids
 D) Degree of branching in fatty acids extracted through saponification
34. A cluster of polar flagella in bacterium is called
 A) Amphitrichous
 B) Lophotrichous
 C) Monotrichous
 D) Petritrichous

35. "Pharming" is a term that describes

- A) the use of animals in transgenic research
 B) plants making genetically altered foods
 C) large-scale production of cloned animals
 D) synthesis of a drug by a transgenic plant or animal

PART "B"

36. In eukaryotes, RNA polymerase I is

- A) present in nucleus and catalyzes the synthesis of pre-tRNA
 B) present in nucleus and catalyzes the synthesis of pre-rRNA
 C) present in nucleolus and catalyzes the synthesis of pre-tRNA
 D) present in nucleolus and catalyzes the synthesis of pre-rRNA

37. Which one of the following statement is incorrect with reference to anti-doping control of misuse of anabolic steroids by sports personnel/athletes?

- A) When using testosterone as an anabolic steroid, athletes may also take up clomiphene to reduce the ratio of circulating testosterone to LH in an attempt to evade a positive drug test.
 B) Gas chromatography-mass spectrometry allows identification and characterisation of steroids and their metabolites in the urine but may not distinguish between pharmaceutical and natural testosterone.
 C) Indirect methods to detect doping include determination of the testosterone/dihydrotestosterone glucuronide ratio with suitable cut-off values.
 D) Direct evidence may be obtained with a method based on the determination of the carbon isotope ratio of the urinary steroids.

38. In an enzyme-catalyzed reaction, the shape of the curve expressing the relationship between substrate concentration ($[S]$) and initial velocity (V_0) is

- A) Linear
 B) Sigmoidal
 C) Rectangular hyperbola
 D) Straight line parallel to X-axis

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

- A) flagella of bacteria
 B) microvilli of the intestinal brush border
 C) Sarcomeres of the skeletal cells
 D) Contractile rings of dividing animal cells

40. The solubility coefficient of CO_2 is

- A) 0.024
 B) 0.57
 C) 0.012
 D) 0.008

41. Which one of the following enzymes is involved in de novo methylation of DNA in mammals?

- A) DNMT1
 B) DNMT2
 C) DNMT3a
 D) DNMT3L

42. Who discovered the process by which certain amoeboid cells in the coelomic fluid of sea stars engulf and destroy foreign matter such as bacteria?

- A) Warren Lewis
- B) Elie Metchnikoff
- C) Christian de Duve
- D) Edward Michael De Robertis

43. A second mutation in the same gene restores the wild-type phenotype. This phenomenon is referred as

- A) Intragenic suppression
- B) Intergenic complementation
- C) Gene conversion
- D) Synthetic enhancement

44. In the exponential phase of growth of bacterium culture, 100 cfu/ml cells increased to 3200 cfu/ml cells in 2 hours. What is the generation time for this bacterium?

- A) 12 minutes
- B) 15 minutes
- C) 24 minutes
- D) 30 minutes

45. Salk and Sabin polio vaccines are

- A) prepared from two strains of Polio virus.
- B) attenuated vaccines
- C) inactivated and attenuated form of vaccines respectively
- D) attenuated and inactivated forms of vaccines respectively.

46. As the temperature of a reaction is increased, the rate of the reaction increases because the

- A) reactant molecules collide less frequently
- B) reactant molecules collide more frequently and with greater energy per collision
- C) reactant molecules collide more frequently and with less energy per collision
- D) reactant molecules collide less frequently and with greater energy per collision

47. How many L-stereoisomers are present in an aldo-hexose?

- A) 6
- B) 8
- C) 10
- D) 16

48. Which of the following is an epimeric pair?

- A) D-glucose and D-mannose
- B) D-lactose and D-maltose
- C) L-mannose and L-fructose
- D) D-glucose and L-glucose

49. Which of the following is considered as a primary lymphoid organ

- A) Lymph nodes
- B) Mucosal lymphoid tissue
- C) Spleen
- D) Thymus

50. Telolecithal egg is a characteristic of

- A) Birds
- B) Arthropods
- C) Mammals
- D) Echinoderms

51. J chain or joining chain is found in
 A) IgG
 B) IgD
 C) IgE
 D) IgM & IgA
52. The type of cleavage in frog embryo is
 A) Unequal
 B) Rotational
 C) Radial
 D) Planar
53. Which are the best combination hormones/factors to interactively regulate bone and its mineral metabolism?
 A) PTH, Vitamin D, FGF23 and Calcitonin
 B) PTH, Vitamin D, FGF2, Calmodulin
 C) PTH, Vitamin D, T3 and Aldosterone
 D) Aldosterone, Vitamin D, FGF23 and Calcitonin
54. Which of the following amino acids are synthesized from Ribose-5-phosphate?
 A) Glycine
 B) Histidine
 C) Proline
 D) Serine
55. Which one of the following methods is used to purify an enzyme that has Arabinose as substrate from a mixture of cellular proteins?
 A) Gel-shift assay
 B) Electrophoresis
 C) Affinity chromatography
 D) Zonal Sedimentation
56. Which of the following cells are preferred for production of recombinant biopharmaceuticals?
 A) K562
 B) HepG2
 C) MCF7
 D) CHO
57. Book lungs are seen in
 A) Arachnids
 B) Annelids
 C) Molluscs
 D) Echinoderms
58. The hormone that regulates basal metabolic rate is
 A) Parathyroid
 B) Adrenocortical
 C) Thyroid
 D) Gonadotropic
59. Which of the following speciation doesn't require a physical barrier?
 A) Allopatric
 B) Sympatric
 C) Parapatric
 D) Peripatric
60. Which of the following is not true for BCG vaccine?
 A) It is live attenuated bacterial preparation
 B) It is a subunit vaccine
 C) Administered on day one after birth to protect against tuberculosis
 D) It is used in the treatment of certain cancers

61. Which one of the following is a correct statement for Na-K ATPase?
- A) It gives out 3 Na⁺ ions and takes in 2 K⁺ ions B) It gives out 2 Na⁺ ions and takes in 3 K⁺ ions
 C) It gives out 3 Ca²⁺ ions and takes in 2 K⁺ ions D) It gives out 3 Na⁺ ions and takes in 2 Ca²⁺ ions
62. Which of the following reaction mixtures gives a desired PCR product?
- A) Primers, dNTPs, template DNA and DNA polymerase I B) Primers, dNTPs, template DNA and Klenow
 C) Primers, dNTPs, template DNA and Taq DNA polymerase D) Primers, template DNA and Taq DNA polymerase
63. In hemoglobin, the transition from T state to R state (low to high affinity) is triggered by:
- A) Fe²⁺ binding B) heme binding
 C) oxygen binding D) subunit association
64. In a Hardy-Weinberg population with two alleles, B and b that are in equilibrium, the frequency of the allele b is 0.2. What is the frequency of individuals with Bb genotype?
- A) 0.2 B) 0.4
 C) 0.32 D) 0.82
65. The steroid analog drug, RU486, used to terminate early (preimplantation) pregnancies is an antagonist for the receptors of
- A) Testosterone B) Dihydrotestosterone
 C) Estradiol D) Progesterone
66. Which one is an important constituent of rennin-angiotensinogen-aldosterone system?
- A) JGA cells B) Erythropoietin
 C) Plasma cells D) Macular cells
67. Which one of the following statements holds true for eukaryotic transcription?
- A) Genes transcribe continuously but in a stochastic manner B) Genes transcribe discontinuously but in a stochastic manner
 C) Genes transcribe continuously but in a non-stochastic manner D) Genes transcribe discontinuously but in a non-stochastic manner
68. Toll-like receptors (TLRs) play an important role in immune defense by recognizing
- A) microbial component B) conformational differences in antigenic proteins
 C) MHC-peptide complexes D) anti-idiotypic immunoglobulins
69. The hypothalamic nucleus that acts as a biological clock of the body is
- A) Supraoptic nucleus B) Preoptic nucleus
 C) Arcuate nucleus D) Suprachiasmatic nucleus

70. Both birds and bats are good in flight, but bats differ from birds in
- | | |
|--------------------------------|--------------|
| A) Wings | B) Brain |
| C) Number of chambers in heart | D) Diaphragm |

For rough work