Hall Ticket Number:

C-13

ENTRANCE EXAMINATION - June 2023

PhD. Animal Biology

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 11 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. Which one of the following is a biodegradable polymer?

| A) | Nylon-6,6 | B) Nylon-6 |
|----|-----------------|------------|
| C) | Nylon-2-nylon-6 | D) Buna-S |

2. A mixture of proteins namely P, Q, R and S having molecular mass 50, 80, 120, and 150 kDa respectively were applied onto a sephadex-G-200 column. The order of their elution will be

1

 A)
 P, Q, R, S
 B)
 S, R, Q, P

 C)
 Q, P, R, S
 D)
 P, Q, S, R

3. The catalytic beta-subunit of central core of 20S proteosome is targeted by

| A) | penicillin | B) | lactacystin |
|----|--------------|----|-------------|
| C) | streptomycin | D) | kanamycin |

4. Which one of the following statements is true? B) Threonine has three chiral carbons; Threonine has two chiral carbons; A) stereoisomers therefore, four stereoisomers are therefore, six are possible possible Threonine has one chiral carbon; D) Threonine has no chiral carbons; C) therefore, two stereoisomers are therefore, no stereoisomers are possible possible 5. The mole fraction of glucose in a solution having a molarity of 2.315 Mol/L is A) 0.05 B) 0.04 C) 0.03 D) 0.02 6. Which one of the following DNA molecules moves faster in agarose gel electrophoresis? A) 4 kb linear duplex DNA B) 4 kb circular duplex DNA C) 4 kb circular supercoiled DNA D) 4 kb linear single stranded DNA 7. In statistical analyses, which one of the following statements is true about the mean, median and mode of a normal distribution? The median is always greater than the A) The mean is always greater than the B) median and mode mean and mode The mode is always greater than the D) The mean, median and mode are all C) mean and median equal 8. Resolving power of a microscope depends on the A) wavelength only B) numerical aperture only C) refractive index only numerical aperture and wavelength D)

9. An adjuvant that contains killed *Mycobacterium* component is

| A) | MF59 | B) | Freund's incomplete |
|----|-------------------|----|---------------------|
| C) | Freund's complete | D) | RC529 |

- A novel type-II restriction endonuclease isolated from a thermophilic bacterium recognizes the sequence - 5'ATAANNNTTAT 3' (N denotes any nucleotide) and cleaves it after the third base (A) starting from the 5'. The resulting nucleotide sequence after digestion will be
 - A) a three nucleotide long 5' overhang B) a seven nucleotide long 5' overhang
 - C) a four nucleotide long 5' overhang
- D) a seven nucleotide long 5 overhangD) a three nucleotide long 3' overhang

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11. A purified multimeric protein appears as a single band with a molecular mass of 60 kDa when separated by reducing SDS-PAGE. When subjected to size exclusion chromatography, this protein elutes between alcohol dehydrogenase (160 kDa) and β-amylase (190 kDa). The possible number of identical sub-units in this protein are

| A) | 1 | B) | 2 |
|----|---|----|---|
| C) | 3 | D) | 5 |

12. What is the concentration of a solution whose absorbance is 0.21, when placed in a path length of 10 cm ($\varepsilon_{max} = 31,500 \text{ M}^{-1} \text{ cm}^{-1}$)?

| A) | 5.67 x 10 ⁻⁷ M | B) | 6.67 x 10 ⁻⁴ M |
|----|---------------------------|----|---------------------------|
| C) | 6.67 x 10 ⁻⁵ M | D) | 6.67 x 10 ⁻⁷ M |

13. Which one of the following scores is a measure of the quality of the identification of the nucleobases generated by automated DNA sequencing?

| A) | Phred score | B) | T-score |
|----|-------------|----|------------------|
| C) | Z-score | D) | Percentile score |

14. If a test statistic analysis rejects the null hypothesis when it is true, then the type of error is

| A) | type-I | B) | type-II |
|----|----------|----|---------|
| C) | type-III | D) | type-IV |

15. A fibrous protein can be distinguished from a globular protein of the same mass by

| A) | SDS | S-PAGE | 2 analysis | B) | fluoi | rescence sp | pectro | oscopy | at 340 nm | |
|----|-----|--------|------------|-------|-------|-------------|--------|--------|-----------|--|
| | | | | - | | | | | | |

C) absorption spectroscopy at 280 nm D) size exclusion chromatography

16. What is the pH of a solution containing 0.2M acetic acid (pKa = 4.7) and 0.1 M sodium acetate?

| A) | 4.4 | B) | 3.4 |
|----|-----|----|-----|
| C) | 5.4 | D) | 6.4 |

17. Which one of the following statements is true for replication of differentiated somatic cells?

- A) Entire genome replicates at a time B) Euchromatin replicate
- C) Heterochromatin replicates earlier than euchromatin
- Euchromatin replicates earlier than heterochromatin
- D) Maternal genome replicates faster than paternal genome

18. Which one of the following techniques allows the quantitative determination of the number of antigen-specific T cells in a given population?

A) Indirect ELISA

- B) Sandwich ELISA
- C) Competitive ELISA D) ELISPOT

19. Which one of the following inhibits protein synthesis in both bacteria and eukaryotes?

- A) Actinomycin D B) Cycloheximide
- C) Tetracycline D) Chloramphenicol
- 20. To promote the attachment and spreading of anchorage-dependent animal cells, the surface of the culture vessels needs to be coated with
 - A) fibrinB) collagenC) pronaseD) vimentin
- 21. Which one of the following types of chromatographic techniques will be the most appropriate to separate dCTP from a mixture of dCTP, dCDP, dCMP?
 - A) Anion exchangeB) Cation exchange
 - C) Gel filtration D) Hydrophobic interaction
- 22. If the weight of a bioproduct is 113 kilograms and the impurities in it are 500 grams, the purity of the bioproduct will be

| A) | 99.12 % | B) | 99.56 % |
|----|---------|----|---------|
| C) | 0.004 % | D) | 99.68 % |

23. Which one of the following is used for the enrichment of Uranium?

| A) | Tubular centrifuge | B) | Disk-stack centrifuge |
|----|--------------------|----|-----------------------|
| C) | Gas centrifuge | D) | Zippe-type centrifuge |

24. Which one of the following is not a correct statement?

- A) Yeast two-hybrid screening is based on reconstitution of transcription factor fragments fused with two proteins whose interactions need to be studied
- C) Reverse genetics is an approach of generating mutants by targeting defined genes
- B) In forward genetics, phenotype analysis precedes genotype analysis
- D) In the interpretation of gene expression analysis, high Ct values are suggestive of mRNA abundance

25. Schaeffer Fulton method is an endospore staining technique that uses stain.

A) carmine

C) acridine orange

- B) malachite green
- D) haematoxylin
- 26. A patient with breast cancer was given a dose of radiation along with chemotherapy and was apparently cured of the tumor. After five years, a tumor was noticed in the patient's lungs, but the doctors confirmed that it was derived from cells of the mammary gland. The following possibilities were suggested by the doctor. Which of the following is correct?
 - A) Bacterial infection, after radiation, B) Migration of residual chemo-resistant led to development of the tumors in cells from the mammary gland resulted the lungs. in tumors in the lungs.
 - C) Epithelial-to-mesenchymal transition had occurred in the lungs.
- D) Cells in the lungs were induced to become a tumor after chemotherapy

and from factors secreted by mammary

27. Choose the appropriate ion exchange chromatography matrix to separate the peptide (GLEKSLVRLGDVQPSLGKESRAKKFQRQ) from a mixture of peptides at pH 7.0,

cells.

A) Diethylaminopropyl B) Diethylaminoethyl D) Quaternary amine

- Carboxymethyl C)
- 28. One of the following statements is incorrect

| A) | Enhancers produce RNA | B) | Promoters produce RNA |
|----|-----------------------|----|-----------------------|
| | | | |

- Introns produce RNA C) Exons produce RNA D)
- 29. Treatment of IgG with pepsin results in production of
 - Fab fragment only A) B) Fc fragment only Fab and Fc fragment D) F(ab')2 fragment and Fc fragment C)
- 30. Which one of the following is the latest human reference genome?
 - A) mm39 B) hg19
 - C) hg38 D) mm10

31. Fluorescence microscopy that requires photoactivatable probes to obtain super-resolution is

- Structured Illumination Microscopy A)
- B) dStochastic Optical Reconstruction Microscopy
- Stimulated Emission C) Depletion Microscopy
- D) Laser Scanning Confocal Microscopy
- 5

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32. Which one of the bacterial component is used for the purification of IgG antibodies?

- A) Protein K
- C) Protein F D) Protein A

33. Which one of the following processes is not employed to distinguish between contaminants and the product based on physiochemical features?

B)

- A) Filtration B)
- Isotachophoresis C)

34. In Rocket Immunodiffusion, the length of the rocket is

- A) directly proportional to the amount of antibody placed in each well
- B) inversely proportional to the amount of antigen placed in each well D)
- C) directly proportional to the amount of antigen placed in each well
- inversely proportional to the amount of antibody placed in each well
- 35. A polymerase chain reaction (PCR) was performed with 400 template DNA molecules in a 100 µl reaction. After 20 cycles of PCR, the number of molecules of the amplified product present in 0.1µl reaction are

| A) | $2.19 \ge 10^4$ | B) | $4.19 \ge 10^4$ |
|----|------------------------|----|------------------------|
| C) | 2.19 x 10 ⁵ | D) | 4.19 x 10 ⁵ |

PART "B"

36. The phospholipase-mediated production of one of the following lipid secondary messenger that has a sustained response for few hours is

| A) | inositol 1,4,5 triphosphate | B) | phosphatic acid |
|----|-----------------------------|----|------------------|
| C) | diacylglycerol | D) | arachidonic acid |

37. Initiation of vulva formation in C. elegans involves

| A) | LIN-3 | B) | Foxo3 |
|----|-------|----|-------|
| C) | BMP | D) | Pax6 |

38. Initiation of nonsense mediated mRNA decay involves

| A) exon junction | complex | B) | intron junction complex |
|------------------|---------|----|-------------------------|
|------------------|---------|----|-------------------------|

C) poly A tail

D) 3' UTR

6

- D) Crystallization
- Batch Adsorption

Protein C

39. In a dihybrid cross that involves recessive epistasis, the phenotypic ratio of the F2 generation is

| A) | 9:3:3:1 | B) | 9:6:1 |
|----|---------|----|-------|
| C) | 9:3:4 | D) | 15:1 |

40. Which one of the following therapies will target only the cancerous cells but not the normal cells?

| A) | Immunotherapy | B) | Chemotherapy |
|----|---------------|----|--------------|
| C) | Radiotherapy | D) | Angiotherapy |

41. Transmission of B cell receptor (BCR) signals are mediated through

| A) | cytoplasmic domain of | B) | BCR co-receptor and Iga |
|----|-------------------------|----|-------------------------------------|
| | immunoglobulin receptor | | |
| C) | BCR co-receptor and Igβ | D) | BCR co-receptor, Iga and Ig β |

42. The bundles of myosin filaments are held in a centered position within the sarcomere by

| A) | activin | B) | troponin |
|----|---------|----|----------|
| C) | actin | D) | titin |

43. Impale fection is a method of DNA delivery based on

| A) | nanomaterials | B) | laser light |
|----|----------------------|----|----------------|
| C) | ultrasonic frequency | D) | magnetic force |

44. Which one of the following cells support, nourish and protect the neurons?

| A) | Nissl bodies | B) | Perikaryon |
|----|--------------|----|-------------|
| C) | Ganglia | D) | Glial cells |

45. Existence of two negative feedback loops is a characteristic feature of

| A) | pancreas | B) | stomach | |
|----|--------------|----|-----------------|--|
| C) | gall bladder | D) | small intestine | |

46. A calcium regulated cytoskeletal protein that does not contain an "EF hand motif" is

| A) | centrin | B) | gelsolin |
|----|------------|----|------------|
| C) | caltractin | D) | troponin C |

47. Which one of the following is not an expected pattern in autosomal dominant inheritance? An affected person mating with an The distribution of trait among sexes A) B) unaffected person should produce should be almost equal approximately 50% affected offspring C) Trait often skips generations D) Transmitted by either sex 48. The tyrosine kinase inhibitor used for the treatment of leukemia is A) imatinib B) prednasalone C) nelarabine D) oncaspar 49. What is a syngeneic graft? A) A graft from the same individual B) A graft from genetically different background of same species C) A graft between genetically identical D) A graft between members of two background of same species different genetic species 50. An enzyme catalyzed reaction has a Km of 1 mM and Vmax of 5 nM/s. What is the reaction velocity when the substrate concentration is 0.25 mM? A) 1 nM/sB) 10 nM/s C) 1 mM/s D) 10 mM/s 51. Which nucleotide in the intron sequences is critical in lariat formation during splicing? A) Uracil B) Cytosine C) Guanine Adenine D) 52. Cortisol is produced in region of the adrenal gland A) zona glomerulosa B) zona reticularis C) zona fasciculata D) medullary region 53. Calcineurin is a A) serine/threonine protein phosphatase B) Ca^{2+} dependent protease C) serine/threonine protein kinase D) Ca^{2+} dependent kinase 54. Which of the interactions between T cells and APCs would lead to anergy? A) B7.1-CD28 B) B7.2-CD28 C) B7-CTLA4 D) CD86-CD28

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55. The number of ammonia and CO2 molecules used in one urea cycle respectively are

- A) 2 and 1 B) 2 and 2
- C) 2 and 3 D) 1 and 2

56. Hypopnea is characterized by

- A) partial obstruction of airways
- C) inability of lungs to eliminate excess carbondioxide

B) collapse of alveolar structureD) abnormally low levels of oxygen in blood

- 57. With reference to survival strategies, one of the following intracellular bacteria prevents phagolysosome fusion
 - A) Listeria monocytogenes B) Rickettsia rickettsii
 - C) Mycobacterium tuberculosis D) Shigella fexneri

58. In the receiving neurons, receptors for neurotransmitters are found on

| A) | dendrites | B) | axons |
|----|-------------------|----|--------------------------|
| C) | synaptic vesicles | D) | pre-synaptic compartment |

59. Androgen Insensitivity Syndrome in humans is a result of the defects in _____ chromosome

| A) | 21 |] | B) | Х |
|----|----|---|----|----|
| C) | Υ | 1 | D) | 18 |

60. A calcium binding protein involved in visual phototransduction is

| A) | calmodulin | B) | calretinin |
|----|-------------|----|------------|
| C) | parvalbumin | D) | recoverin |

61. Which one of the following vitamins is considered as a hormone?

| A) | Vitamin D | B) | Vitamin C |
|----|-----------|----|-----------|
| C) | Vitamin E | D) | Vitamin K |

- 62. Sabin-Feldman test is used to detect the presence of *Toxoplasma*. One of the following is not a correct statement with regard to this test
 - A) The test uses *Toxoplasma* specific antibodies, complement proteins and methylene blue dye
 - C) The detection of parasite in this test indicates "presence of infection"
- B) The detection of parasite in this test indicates "no infection"
- D) The complement proteins in this test are mediators for *Toxoplasma* lysis

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- A) Dr. Shinya
- C) Dr. Ian Wilmut

- B) Dr. Kornberg
- D) Dr. JBS Haldane
- 64. What is the relationship between dorsoventral patterning of the neural tube and patterning of the somites?
 - A) The somites pattern the neural tube after they form
 - C) Sonic hedgehog from the notochord and floor plate of the neural tube confers ventral fates on both the neural tube and the somite, while bone morphogenic proteins confer more dorsal fates
- B) The neural tube plays the role of organizer in being the sole influence on patterning in the somites

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- D) Both the neural tube and the somites acquire their dorsoventral patterning during gastrulation.
- 65. Which one of the following animals has ZZ and ZW sex determination system?

| A) | Bat | B) | Crocodile |
|----|---------|----|-----------|
| C) | Chicken | D) | Platypus |

66. During gastrulation, mammalian and bird hypoblast formation involves

| A) | ingression | B) | epiboly |
|----|-------------|----|------------|
| C) | delaminatio | D) | involution |

67. Which one of the following cells has the shortest S phase of cell cycle?

| A) | Neuron | B) | Cardiac stem cells |
|----|------------------------|----|---------------------|
| C) | Hematopoitic stem cell | D) | Embryonic stem cell |

68. Presence of which of the following conditions in urine are indicative of diabetes mellitus?

| A) | Ketonuria and glycosuria | B) Renal calculi and hyperglycemia |
|----|--------------------------|------------------------------------|
| C) | Uremia and ketonuria | D) Uremia and renal calculi |

69. Wuchereria brancrofti sheath antigen can activate

| A) | TLR3 | B) | TLR2 |
|----|------|----|------|
| C) | TLR4 | D) | TLR9 |

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70. Loss of balance, coordination and decreased muscle tone are associated with the damage in

- A) upper motor neurons
- C) thalamus optics

- B) occipital lobe
- D) cerebellar region

For Rough Work

University of Hyderabad Ph.D. Entrance Examinations - 2023

School/Department/Centre: School of Life Sciences, Department of Animal Biology

| Q.No | ANSWER | Q.No. | ANSWER |
|------|--------|-------|--------|
| 1 | С | 36 | C |
| 2 | В | 37 | A |
| 3 | В | 38 | A |
| 4 | Α | 39 | С |
| 5 | В | 40 | A |
| 6 | С | 41 | D |
| 7 | D | 42 | D |
| 8 | D | 43 | A |
| 9 | С | 44 | D |
| 10 | В | 45 | B |
| 11 | C | 46 | В |
| 12 | D | 47 | · C |
| 13 | A | 48 | A |
| 14 | A | 49 | С |
| 15 | A | 50 | A |
| 16 | A | 51 | D |
| 17 | В | 52 | C |
| 18 | D | 53 | A |
| 19 | A | 54 | C - |
| 20 | В | 55 | A |
| 21 | А | 56 | A |
| 22 | В | 57 | C |
| 23 | С | 58 | A |
| 24 | D | 59 | В |
| 25 | В | 60 | D |
| 26 | В | 61 | A |
| 27 | С | 62 | C |
| 28 | В | 63 | A |
| 29 | D | 64 | C · |
| 30 | С | 65 | С |
| 31 | В | 66 | Ċ |
| - 32 | D | 67 | D |
| 33 | D | 68 | A |
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Note/Remarks :

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K. Saurinorson mature 26/6/2023 Signature

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School/Department/Centre

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अध्यक्ष / HEAD जंतु जैविकी विभाग Department of Animal Biology