

Hall Ticket Number:

F-5

ENTRANCE EXAMINATIONS 2026

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 12 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 alcohol groups can esterify with fatty acids to form mono-, di-, and triglycerides?

A) Sterol	B) Cholesterol
C) Glycerol	D) Sodium chloride
2. To detect an intracellularly expressed protein tagged with Green Fluorescent Protein (GFP), which one of the following techniques can be used?

A) Flow cytometry	B) Inverted light microscopy
C) Ultra-centrifugation	D) Enzyme-substrate assay
3. A researcher has a mixture of three proteins with molecular weights of 10 kDa, 25 kDa, and 46 kDa and separates them using size exclusion chromatography. Which protein will elute first, second, and last from the column?

A) 46kDa-10kDa-25kDa	B) 10kDa-25kDa-46kDa
C) 25kDa-10kDa-46kDa	D) 46kDa-25kDa-10kDa

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4. In blue-white screening using X-gal plates, the appearance of a white colony indicates
- A) a bacterial cell contains no plasmid
 - B) a bacterial cell contains a plasmid with an inserted DNA fragment that disrupts the β -galactosidase gene
 - C) a bacterial cell overexpresses β -galactosidase from a chromosomal lacZ gene copy
 - D) a bacterial cell lacks the lacZ gene in both the plasmid and the host chromosome
5. Which one of the following techniques is used to monitor the spatial and temporal expression of RNA transcripts?
- A) Northern blotting
 - B) Reverse Transcription Polymerase Chain Reaction (RT-PCR)
 - C) *In situ* hybridization
 - D) Western blotting
6. Which one of the following tools is frequently used for the initial quality control of raw RNA-seq data?
- A) FastQC
 - B) DEseq2
 - C) Samtools
 - D) FeatureCounts
7. An isotope preferred for applications requiring high sensitivity and minimal radiation damage is
- A) Phosphorus-32 (^{32}P)
 - B) Tritium (^3H)
 - C) Uranium-238 (^{238}U)
 - D) Radium-226 (^{226}Ra)
8. Chocolate agar medium is commonly used for the cultivation of which one of the following microorganisms?
- A) *Neisseria gonorrhoeae*
 - B) *Mycobacterium tuberculosis*
 - C) *Salmonella typhimurium*
 - D) *Streptococcus pyogenes*
9. In confocal microscopy, the primary function of the pinhole aperture is to
- A) increase fluorescence intensity
 - B) magnify the specimen
 - C) eliminate out-of-focus light
 - D) reduce photobleaching
10. In Dynamic Light Scattering (DLS) analysis, the particle size measured is generally referred to as
- A) atomic radius
 - B) hydrodynamic diameter
 - C) crystal diameter
 - D) nuclear diameter

11. What is the correct sequence in the three-column purification platform used for monoclonal antibody production?

- A) Cation exchange → Protein A affinity → Hydrophobic interaction chromatography
- B) Protein A affinity → Cation exchange → Anion exchange
- C) Hydrophobic interaction chromatography → Size exclusion → Protein A affinity
- D) Size exclusion → Protein A affinity → Ion exchange

12. Why are immortalized cells not necessarily tumorigenic?

- A) Immortalization bypasses cellular senescence but may not activate transformation pathways
- B) Immortalized cells cannot divide rapidly
- C) Immortalization always suppresses oncogene expression
- D) Tumorigenesis requires the absence of mitochondria

13. In RNA secondary structure prediction, "pseudonot" refers to a structure formed by

- A) randomly coiled RNA regions
- B) simple stem-loop interaction
- C) codon-anticodon base pairing
- D) base pairing between loops from different secondary structure regions

14. The catalytic mechanism of telomerase is best described as

- A) DNA-dependent DNA polymerase using chromosomal DNA as a template
- B) RNA-dependent DNA polymerase using its intrinsic RNA as template
- C) DNA-dependent RNA polymerase synthesizing telomeric RNA
- D) RNA-dependent RNA-polymerase synthesizing telomeric RNA

15. A protein shows two major clusters in the Ramachandran plot: one between angles $(-60^\circ, -45^\circ)$, and the other between angles $(-120^\circ, +120^\circ)$. This indicates that the protein comprises of

- A) only α -helices
- B) only β -sheets and random coils
- C) mixture of α -helices and β -sheets
- D) completely disordered protein

16. Global Run-On sequencing (GRO-seq) is used to measure which one of the following aspects of RNA biology in a cell?

- A) Steady-state levels of mRNA
- B) Nascent RNA molecules
- C) RNA-RNA interactions
- D) Rate of mRNA degradation

17. When $\text{pH} = \text{pK}_a$, the ratio of conjugate base to acid is

- A) 10:1
- B) 1:10
- C) 1:1
- D) 0:1

18. A researcher observed that protein "X" shows higher activity due to phosphorylation under diseased conditions. Which one of the following experiments would **NOT** support this observation?

- A) Western blot analysis
- B) Transcription rate analysis
- C) Mass spectrometry analysis
- D) Phosphoamino acid analysis

19. In Fluorescence Recovery After Photobleaching (FRAP), recovery of fluorescence after bleaching mainly indicates

- A) molecular mobility and diffusion
- B) protein degradation dynamics
- C) electron density dynamics
- D) membrane thickness dynamics

20. Which one of the following is a neutral stain?

- A) Picric acid
- B) Giemsa
- C) Neutral red
- D) Malachite green

21. Crystalline compounds formed from non-polar solutes and water are known as (SL2, Chemistry/pH/Biomaterials)

- A) micelles
- B) hydrates
- C) clathrates
- D) liposomes

22. A solution containing aspartic acid ($\text{pI}=2.98$), glycine ($\text{pI}=5.97$), threonine ($\text{pI}=6.53$), and lysine ($\text{pI}=9.74$) in a citrate buffer ($\text{pH } 3.0$) was applied to a Dowex-50 cation exchange column equilibrated with the same buffer. Which amino acid will elute first from the column?

- A) Aspartic acid
- B) Glycine
- C) Threonine
- D) Lysine

23. Which one of the following vectors is most suitable for cloning and stably propagating a single 150 kb human genomic fragment?

- | | |
|------------------|---|
| A) pUC19 vector | B) Lambda phage replacement vector |
| C) Cosmid vector | D) Bacterial Artificial Chromosome vector |

24. Classical molecular dynamics simulations are generally based on which one of the following principles?

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|-------------------------------------|------------------------------------|
| A) The Second law of thermodynamics | B) Newton's second law of motion |
| C) The Beer-Lambert's Law | D) The third law of thermodynamics |

25. If 5 grams of a radioactive substance has a half-life ($t_{1/2}$) of 14 hours, 20 grams of the same substance will have a half-life equal to

- | | |
|-------------|--------------|
| A) 56 hours | B) 3.5 hours |
| C) 14 hours | D) 28 hours |

26. Which one of the following electron microscopy methods is commonly used to study the detailed images of specimen surface topology?

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|-------------------------------------|---------------------------------|
| A) Transmission electron microscopy | B) Scanning electron microscopy |
| C) Tagged electron microscopy | D) Click electron microscopy |

27. Obstruction of the pancreatic duct results in elevated levels of

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|-------------|--------------------|
| A) amylase | B) bilirubin |
| C) secretin | D) cholecystokinin |

28. The Chi-square test is primarily used to determine

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|--|---|
| A) differences between the means of two groups | B) association between qualitative variables |
| C) variance within a single sample | D) correlation between two continuous variables |

29. Which one of the following immunological techniques is used for the quantitative detection of antigen-specific cells within a cell population?

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|----------------------|-------------------|
| A) Indirect ELISA | B) Sandwich ELISA |
| C) Competitive ELISA | D) ELISPOT assay |

30. Cell counting by the dye exclusion method can be performed by

- A) Hemocytometer
- B) Spectrophotometer
- C) Fluorometer
- D) Densitometer

31. Which one of the following landmark achievements in cell culture research was reported by Thomas and Gearhart in 1998?

- A) Establishment of pluripotent embryonic stem cell cultures from the mouse embryos
- B) Isolation and culture of human embryonic stem cells
- C) Demonstration of hormone and growth factor requirements for cell growth in serum-free medium
- D) Isolation of electrically excitable neuroblastoma cells from *in vitro* cultures

32. Gold nanoparticles appear red in solution primarily due to

- A) radioactivity
- B) fluorescence
- C) surface plasmon resonance
- D) chemical oxidation

33. Which one of the following computational tools is widely used for multiple sequence analysis?

- A) ClustalW
- B) AlphaFold
- C) RasMOL
- D) PyMOL

34. Fourier Transform Infrared (FTIR) spectroscopy is primarily used to analyze which one of the following properties?

- A) Particle morphology
- B) Chemical bonding and functional groups
- C) Nucleotide sequence composition
- D) Magnetic susceptibility of the material

35. For endotoxin (lipopolysaccharide, LPS) removal from an *E. coli*-derived recombinant protein, which one of the following methods is most effective?

- A) Incubation at low pH to degrade LPS acyl chains
- B) Heat treatment followed by high-speed centrifugation
- C) Affinity chromatography
- D) Anion exchange chromatography

PART "B"

36. Which one of the following statements is **NOT** true?

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|---|--|
| A) Beta oxidation of long chain fatty acid occurs in mitochondria | B) Fatty acid biosynthesis occurs in peroxisomes |
| C) Peroxisomes utilize H_2O_2 to oxidize variety of substrates | D) Peroxisomes import their repertoire of proteins using sorting signals |

37. Which one of the following human cells are infected by *Leishmania* parasite?

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|---------------|-------------|
| A) T cell | B) B cell |
| C) Macrophage | D) Basophil |

38. Monosaccharide units are linked by $\alpha(1 \rightarrow 4)$ glycosidic bonds in

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|--------------|---------------|
| A) maltose | B) sucrose |
| C) cellulose | D) cellobiose |

39. Which one of the following statements correctly describes genomic imprinting

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|--|--|
| A) Non-random monoallelic expression of a gene | B) Random monoallelic expression of a gene |
| C) Random biallelic expression of a gene | D) Non-random biallelic expression of a gene |

40. Which one of the following technique is used to detect protein-protein interactions?

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|----------------------|----------------------------------|
| A) Western blotting | B) Chromatic immunoprecipitation |
| C) Southern blotting | D) Far Western blotting |

41. Which structure directly projects sensory signals to the cerebral cortex?

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|------------------------|---|
| A) Dorsal root ganglia | B) Primary sensory neurons in the dorsal horn |
| C) Thalamus | D) Second-order neurons in the dorsal horn |

42. In the *lac* operon, which one of the following conditions allow the highest transcription output?

- | | |
|-------------------------------|------------------------------|
| A) High glucose, high lactose | B) Low glucose, high lactose |
| C) High glucose, low lactose | D) Low glucose, low lactose |

43. Crinophagy refers to which one of the following cellular processes?

- A) Fusion of lysosomes with secretory vesicles leading to degradation of secretory proteins
- B) Removal of damaged or excess parts of the endoplasmic reticulum
- C) Selective degradation of peroxisomes by lysosomes
- D) Breakdown of intracellular lipid droplets in lysosomes

44. Which of these are **NOT** the agents of Bioterrorism?

- A) *Bacillus anthracis*
- B) *Clostridium botulinum*
- C) *Tularemia*
- D) *Streptococcus thermophilus*

45. Assuming Hardy-Weinberg equilibrium, what will be the expected genotype frequency of heterozygotes if the frequencies of the two alleles are 0.6 and 0.4?

- A) 0.80
- B) 0.64
- C) 0.48
- D) 0.32

46. A KDEL motif in a protein serves as an import signal to

- A) lysosome
- B) nucleus
- C) mitochondria
- D) endoplasmic reticulum

47. What is the correct histone octamer composition in a nucleosome?

- A) Two copies each of H1, H2A, H2B, H3
- B) Two copies each of H2A, H2B, H3, H4
- C) Four copies of H2A and four copies of H2B
- D) One copy each of H2A, H2B, H3, H4, and four copies of H1

48. Non-templated nucleotide insertion during VDJ recombination is associated with the expression of

- A) DNA glycolase
- B) terminal deoxynucleotidyl transferase
- C) T4 DNA ligase
- D) artemis endonuclease

49. The transition of hemoglobin from the T state to the R state is triggered by

- A) Fe^{2+} binding
- B) heme binding
- C) oxygen binding
- D) Mg^{2+} binding

50. The molecular basis of rigor mortis is best explained by which one of the following events in skeletal muscle?

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|---|---|
| A) ATP depletion prevents dissociation of myosin heads from actin | B) Persistent Ca^{2+} release causes continuous actin depolymerization |
| C) Loss of membrane excitability blocks actomyosin interaction | D) Reduced ATP hydrolysis inhibits myosin binding to actin |

51. Tetracycline inhibits which translation machinery in bacteria?

- | | |
|--------------------------|--------------------------|
| A) 50S ribosomal subunit | B) 40S ribosomal subunit |
| C) 30S ribosomal subunit | D) 60S ribosomal subunit |

52. Dysfunction of which one of the following endocrine glands, other than the gonads, can contribute to improper sex reversal or gonadal dysgenesis in human?

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|------------------|-----------------|
| A) Thyroid gland | B) Thymus gland |
| C) Adrenal gland | D) Pineal gland |

53. When an organizer tissue is transplanted into a non-competent region of an early gastrula embryo, no secondary axis forms. In this scenario, which conclusion is most appropriate?

- | | |
|--------------------------------------|--|
| A) Organizer lacks inductive signals | B) Morphogens are absent |
| C) Organizer acts autonomously | D) Competence of host tissue is required |

54. Which one of the following cell types is considered as the best source for generation of clones using somatic cell nuclear transfer (SCNT) technique?

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|-----------------------------|---------------------------|
| A) Differentiated neurons | B) Skeletal muscle fibers |
| C) Hematopoietic stem cells | D) Cardiac myocytes |

55. Neural crest cells are best described as

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|-------------------------------|--------------------------------|
| A) terminally specified cells | B) fully differentiated cells |
| C) totipotent cells | D) multipotent migratory cells |

56. Covaxin is a

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|------------------------------------|----------------------------|
| A) mRNA-based vaccine | B) live-attenuated vaccine |
| C) inactivated whole-virus vaccine | D) DNA vaccine |

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57. In oxidative phosphorylation, the proton motive force is generated across the
- A) inner mitochondrial membrane
 - B) outer mitochondrial membrane
 - C) endoplasmic reticulum membrane
 - D) nuclear membrane
58. A person developed mild itching and skin irritation immediately after a hair-coloring procedure at a salon. After 72 hours, the symptoms worsened and progressed to contact dermatitis. Identify the appropriate hypersensitivity reaction related to these symptoms.
- A) Type I hypersensitivity
 - B) Type II hypersensitivity
 - C) Type III hypersensitivity
 - D) Type IV hypersensitivity
59. The Warburg effect refers to
- A) increased mitochondrial respiration in tumor cells
 - B) increased glycolysis despite oxygen availability
 - C) complete absence of oxidative phosphorylation
 - D) increased glycolysis in the absence of oxygen only
60. What are the consensus splice sites of eukaryotic pre-mRNA introns?
- A) 5' site: AG; 3' site: GU
 - B) 5' site: GU; 3' site: AG
 - C) 5' site: AU; 3' site: AC
 - D) 5' site: GC; 3' site: AG
61. Which one of the following genes control the final structures of appendages from each segment in *Drosophila* embryo?
- A) Gap genes
 - B) Segment polarity genes
 - C) Pair-rule genes
 - D) Hox genes
62. Which one of the following is considered as Cancer Stem Cell marker?
- A) Bcl-2
 - B) ALDH1
 - C) GAPDH
 - D) Actin
63. Which one of the following best describes a neuron at the resting state?
- A) Na^+/K^+ -ATPase pumps are not active
 - B) The resting state represents the relative refractory period
 - C) Voltage-gated K^+ channels are open
 - D) K^+ ions leak out of a neuron via non-gated K^+ channels

64. Which one of the following pairs correctly represents the longest and the shortest peptide hormones found in human, respectively?

- | | |
|---|--|
| A) Growth hormone and corticotropin-releasing hormone | B) Prolactin and thyrotropin-releasing hormone |
| C) Growth hormone and prolactin | D) Prolactin and thyroid-stimulating hormone |

65. The slow-twitch type I fibers in the skeletal muscle are also called

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|-----------------|--------------------------|
| A) white fibers | B) intermediate fibers |
| C) red fibers | D) fast oxidation fibers |

66. Which one of the following is the characteristic feature of conditional specification during embryonic development?

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|---|---|
| A) It leads to regulative development, in which cells can acquire different developmental fates | B) It leads to mosaic development, where cells cannot change their fate after loss of a blastomere. |
| C) It involves specification of body regions through interactions between cytoplasmic regions | D) It is a developmental feature predominantly observed in most invertebrates |

67. In which one of the following organisms, sex determination is based on the ZZ-ZW chromosomal system?

- | | |
|-----------------------------------|------------------------------------|
| A) <i>Homo sapiens</i> | B) <i>Gallus gallus</i> |
| C) <i>Drosophila melanogaster</i> | D) <i>Ornithorhynchus anatinus</i> |

68. What is a Quantitative Trait Locus (QTL)?

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|--|--|
| A) A genomic locus with genes that do not affect the phenotype of a quantitative trait | B) Several genomic loci with many genes that do not affect the phenotype of a quantitative trait |
| C) A genomic locus with a single gene that affects the phenotype of a quantitative trait | D) Several genomic loci with many genes that affect the phenotype of a quantitative trait |

69. Which one of the following is **NOT** an antigen presenting cell (APC)?

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|---------------------------------------|-------------------------------|
| A) CD11C ⁺ Dendritic cells | B) Follicular Dendritic cells |
| C) B cells | D) Macrophages |

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70. An enzyme involved in regulation of water balance in kidneys is

- A) Vasopressin
- C) Renin

- B) Aldosterone
- D) Angiotensin II

For Rough Work

KEY

University of Hyderabad
Entrance Examinations - 2026
Ph.D. Admissions – July Session

School/Department/Centre: Department of Animal Biology, School of Life Sciences
 Course : Ph.D. Subject : Animal Biology

Q.No.	Answer	Q.No.	Answer	Q.No.	Answer
1	C ✓	26	B ✓	51	C ✓
2	A ✓	27	A ✓	52	C ✓
3	D ✓	28	B ✓	53	D ✓
4	B ✓	29	D ✓	54	C ✓
5	C ✓	30	A ✓	55	D ✓
6	A ✓	31	B ✓	56	C ✓
7	B ✓	32	C ✓	57	A ✓
8	A ✓	33	A ✓	58	D ✓
9	C ✓	34	B ✓	59	B ✓
10	B ✓	35	D ✓	60	B ✓
11	B ✓	36	B ✓	61	D ✓
12	A ✓	37	C ✓	62	B ✓
13	D ✓	38	A ✓	63	D ✓
14	B ✓	39	A ✓	64	B ✓
15	C ✓	40	D ✓	65	C ✓
16	B ✓	41	C ✓	66	A ✓
17	C ✓	42	B ✓	67	B ✓
18	B ✓	43	A ✓	68	D ✓
19	A ✓	44	D ✓	69	B ✓
20	B ✓	45	C ✓	70	C ✓
21	C ✓	46	D ✓		
22	A ✓	47	B ✓		
23	D ✓	48	B ✓		
24	B ✓	49	C ✓		
25	C ✓	50	A ✓		

Note/Remarks :

Signature
 School/Department/Centre

8.6.26

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