

PUMDET-2023

Subject : LIFE SCIENCES

(Booklet Number)



Duration : 90 Minutes

No. of Questions : 50

Full Marks : 100

INSTRUCTIONS

1. All questions are of objective type having four answer options for each. Only one option is correct. Correct answer will carry full marks 2. In case of incorrect answer or any combination of more than one answer, $\frac{1}{2}$ mark will be deducted.
2. Questions must be answered on OMR sheet by darkening the appropriate bubble marked A, B, C or D.
3. Use only **Black/Blue ink ball point pen** to mark the answer by complete filling up of the respective bubbles.
4. Mark the answers only in the space provided. Do not make any stray mark on the OMR.
5. Write question booklet number and your roll number carefully in the specified locations of the **OMR Sheet**. Also fill appropriate bubbles.
6. Write your name (in block letter), name of the examination centre and put your signature (as is appeared in Admit Card) in appropriate boxes in the OMR Sheet.
7. The OMR Sheet is liable to become invalid if there is any mistake in filling the correct bubbles for question booklet number/roll number or if there is any discrepancy in the name/signature of the candidate, name of the examination centre. The OMR Sheet may also become invalid due to folding or putting stray marks on it or any damage to it. The consequence of such invalidation due to incorrect marking or careless handling by the candidate will be sole responsibility of candidate.
8. Candidates are not allowed to carry any written or printed material, calculator, pen, docu-pen, log table, wristwatch, any communication device like mobile phones, bluetooth devices etc. inside the examination hall. Any candidate found with such prohibited items will be **reported against** and his/her candidature will be summarily cancelled.
9. Rough work must be done on the question booklet itself. Additional blank pages are given in the question booklet for rough work.
10. Hand over the OMR Sheet to the invigilator before leaving the Examination Hall.
11. Candidates are allowed to take the Question Booklet after examination is over.

Signature of the Candidate : _____
(as in Admit Card)

Signature of the Invigilator : _____



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SPACE FOR ROUGH WORK



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1. Biological clocks lead to
 - (A) Convergent evolution
 - (B) Divergent evolution
 - (C) Parallel evolution
 - (D) Natural selection

2. In the human eye, the photosensitive compound is made up at the following component
 - (A) Guanosine and Retinol
 - (B) Opsin and Retinol
 - (C) Transducin and Retinene
 - (D) Opsin and Retinal

3. Malthusian catastrophe is related to
 - (A) Increasing resource to support population growth
 - (B) Decreasing resource due to population growth
 - (C) Population growth is exponential, linear increase of resource
 - (D) Resource growth is exponential, linear increase of population

4. Which one of the following is the closest living relative of human ?
 - (A) *Pan troglodytes*
 - (B) *Homo neanderthalensis*
 - (C) *Sahelanthropus tchadensis*
 - (D) *Homo erectus*

5. "Human population grows in geometric ratio while food materials increase in arithmetic proportion". Charles Darwin was inspired by this theory. This theory was put forward by
 - (A) Hugo de Vries
 - (B) Thomas Mathew
 - (C) Thomas Malthus
 - (D) Bateson

6. Genetic drift operates only in
 - (A) Mendelian population
 - (B) Larger population
 - (C) Smaller population
 - (D) Island population



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7. In a species-area relationship
- (A) The number of species in a sample increases as the area covered by that sample increases.
 - (B) The number of species in an area of habitat increases as the area of that habitat increases.
 - (C) The type of species observed in a habitat alters as the area of habitat alters.
 - (D) Species diversity increases linearly with area size.
8. According of Shelford's law of tolerance, an organism with wide tolerance limit for environmental factor usually shows
- (A) Wide distribution with low population size
 - (B) Wide distribution with high population size
 - (C) Narrow distribution with low population size
 - (D) Narrow distribution with high population size
9. Gause's Principle of competitive exclusion states that
- (A) No two species can occupy the same niche indefinitely for the same limiting resources.
 - (B) Larger organisms exclude smaller ones through competition.
 - (C) More abundant species will exclude the less abundant species through competition.
 - (D) Competition for the same resources excludes species having different food preferences.
10. Which cytokine is actively involved in extrinsic apoptotic pathway ?
- (A) TGF – β
 - (B) IL – 2
 - (C) IL – 6
 - (D) TNF – α
11. The classical and alternative pathways meet in which of the following complement ?
- (A) C4
 - (B) C5
 - (C) Factor D
 - (D) C3



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12. Tissue transplantation between genetically different individuals within a species is termed as
- (A) Isograft (B) Allograft
(C) Xenograft (D) Autograft
13. Which of the following interaction occurs during T cell – B cell co-operation ?
- (A) B7 – CD40L (B) CD40L – CD28
(C) B7 – CD4 (D) CD28 – B7
14. Contraction of gall bladder is caused by
- (A) Gastrin (B) Cholecystokinin
(C) Enterogastrone (D) Secretin
15. Which of the following protects damage to the lungs due to over-stretching ?
- (A) Bohr's effect (B) Haldane effect
(C) Herring Breuer effect (D) Hamburger's phenomenon
16. Hyperpolarization of cardiac muscle is caused by
- (A) Influx of Na^+ (B) Outflux of K^+
(C) Influx of Ca^{++} (D) Outflux of Na^+
17. What will be the net charge of protein at pH 7.4 which has isoelectric point at pH 6.8 ?
- (A) Positive (B) Negative
(C) Neutral (D) Cannot be predicted
18. What fraction of V_{\max} is observed at $[\text{S}] = 4 K_m$?
- (A) $V = 4/5 V_{\max}$ (B) $V = 5/6 V_{\max}$
(C) $V = 6/7 V_{\max}$ (D) $V = 9/10 V_{\max}$



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19. Plateau phase of cardiac action potential is due to
- (A) Opening of K^+ channels (B) Opening of Na^+ channels
(C) Opening of slow Ca^{++} channels (D) Closing of Na^+ channels
20. Main driving force for counter current multiplier system is
- (A) Reabsorption of Na^+ in thick ascending limb
(B) Medullary hyperosmolarity
(C) Action of ADH on aquaporin channels
(D) Urea recycling
21. Which of the following methods would give you the most precise and accurate information about where and when a given gene is expressed ?
- (A) DNA microarray
(B) *In situ* hybridization
(C) Protein microarray
(D) Reporter gene fusion including introns
22. Presence of which of the following on cell surface is an indicator of apoptosis ?
- (A) Phosphatidylcholine (B) Phosphatidylserine
(C) Phosphatidylinositol (D) Cytochrome C
23. Retinoblastoma (Rb) controls which of the following cell cycle phase transitions ?
- (A) $G_0 - G_1$ (B) $G_1 - S$
(C) $S - G_2$ (D) $G_2 - M$
24. Which cytokine can act as both pro-inflammatory and anti-inflammatory mediator ?
- (A) IL - 6 (B) IL - 12
(C) IL - 1 α (D) IL - 10



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25. MHC II molecule present
- (A) Processed self-antigen from proteasomes
 - (B) Processed foreign antigens from phagolysosome
 - (C) Antibodies
 - (D) T - cell antigen
26. The importance of HMP shunt is
- (A) Production of pentose sugars
 - (B) Production of ribose sugars and NADH
 - (C) Production of hexose sugars
 - (D) Production of ribose-5-phosphate and NADPH
27. What is the Hardy-Weinberg Equation ?
- (A) $p^2 + q^2 = 1$
 - (B) $p^2 + 2pq + q^2 = 0$
 - (C) $p^2 + 2pq + q^2 = 1$
 - (D) $p^2 + q^2 = 0$
28. Direct repeats in the IS elements are present
- (A) Within the transposon
 - (B) Upstream the inverted repeat
 - (C) Within the inverted repeat
 - (D) Downstream the inverted repeat
29. Which of the following pair is wrongly matched ?
- (A) Action Potential – Na^+
 - (B) Multiple alleles – ABO Blood group
 - (C) Female Drosophila – Heterogametic
 - (D) Inborn Error – Phenylketonuria



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- 30.** Degeneracy of the genetic code means
- (A) A single base can be part of only one codon
 - (B) One codon cannot specify more than one amino acid
 - (C) One amino acid can be coded by more than one codon
 - (D) Presence of non-sense codons
- 31.** The subunits of RNA Polymerase holoenzyme are
- (A) $\alpha, \beta, \beta', \omega_2, \sigma$
 - (B) $\alpha_2, \beta, \beta', \omega, \sigma$
 - (C) $\alpha_2, \beta, \omega, \omega', \sigma$
 - (D) $\alpha, \alpha', \beta_2, \omega, \sigma$
- 32.** Coenzyme Q is involved in electron transport as
- (A) Supplying directly to molecular O_2
 - (B) A water-soluble electron donor
 - (C) Covalently attached cytochrome cofactor
 - (D) A lipid-soluble electron carrier
- 33.** Water splitting complex is associated with
- (A) Photosystem (PS) – I
 - (B) Lumen of thylakoid
 - (C) Both PS – I and PS – II
 - (D) Inner side of the thylakoid membrane
- 34.** Which of these is not a characteristic of C4 plants ?
- (A) Toleration of higher temperature
 - (B) Response to high light intensities
 - (C) Greater productivity of biomass
 - (D) Photorespiration



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35. Which of the following factors promotes the opening of the stomatal aperture ?
- (A) A decrease in guard cell turgidity.
 - (B) Contraction of the outer walls of guard cells.
 - (C) Radial orientation of the cellulose microfibrils in the cell wall of the guard cells.
 - (D) The longitudinal orientation of the cellulose microfibrils in the cell wall of the guard cells.
36. The suprachiasmatic nucleus influences the release of melatonin by its effect on the _____.
- (A) Hypothalamus
 - (B) Thyroid gland
 - (C) Pituitary gland
 - (D) Pineal gland
37. Teichoic acids are typically found in
- (A) Cell walls of Gram +ve bacteria
 - (B) Outer membranes of Gram +ve bacteria
 - (C) Cell walls of Gram -ve bacteria
 - (D) Outer membranes of Gram -ve bacteria
38. All Enterobacteriaceae share all of the following characteristics except
- (A) Ferment glucose
 - (B) Reduce nitrates to nitrites
 - (C) Oxidase positive
 - (D) Gram negative
39. Match Column – I with Column – II to find which one of the following options have all correct answers

Column – I	Column – II
1. Gap junctions	(a) Fertilization
2. Polyspermy	(b) Cyclic AMP
3. Hyaluronidase	(c) Cortical granules
4. Oocyte maturation inhibition	(d) Connexins

- (A) 1-b, 2-c, 3-a, 4-d
- (B) 1-d, 2-c, 3-a, 4-b
- (C) 1-d, 2-b, 3-a, 4-c
- (D) 1-b, 2-d, 3-c, 4-a



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40. What is the key hormonal trigger for the pre-ovulatory LH surge in the women ?
- (A) Rising level of estradiol (B) Rising level of progesterone
(C) Falling level of estradiol (D) Falling level of FSH
41. In flowering plants a megaspore mother cell (megasporocyte) develops into functional
- (A) Endosperm (B) Embryo – sac
(C) Embryo (D) Ovule
42. Regulatory sequence on mRNA molecule that alters gene expression by undergoing conformational change after binding to the regulatory molecule is known as
- (A) Autocatalytic mRNA (B) Catalytic antibody
(C) Ribozyme (D) Riboswitch
43. lac I codes for
- (A) Inducer (B) β – galactosidase
(C) Transacetylase (D) Repressor
44. Which DNA Polymerase has $5' \rightarrow 3'$ exonuclease activity ?
- (A) DNA Polymerase α (B) DNA Polymerase III
(C) DNA Polymerase I (D) DNA Polymerase δ
45. Function of helicase in DNA replication is
- (A) Induction of negative super coiling in double standard DNA
(B) Breaking the hydrogen bonds between the base pairs
(C) Synthesis of short RNA sequences
(D) Proof reading

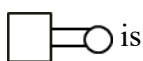


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46. If the gene frequency between genes a and c is 2%, b and c is 13%, b and d is 4%, a and b is 15%, c and d is 17% and a and d is 19%, then the chromosome gene sequence will be as

- (A) a, d, b, c (B) b, b, a, c
(C) a, b, c, d (D) a, c, b, d

47. In the pedigree analysis, the meaning of the symbol



- (A) Still Birth (B) Dizygotic twin
(C) Mating between relatives (D) Sex unspecified

48. Vancomycin is obtained from

- (A) *Streptococcus sp.* (B) *Aspergillus niger*
(C) *Amycolaptosis orientalis* (D) *Bacillus sp.*

49. Purification and recovery of the production after fermentation is called

- (A) Upstream process (B) Downstream process
(C) Surface fermentation (D) Bottom-up process

50. Which was the first disease for which a chemotherapeutic agent was used ?

- (A) Small pox (B) Syphilis
(C) AIDS (D) Malaria



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