



UNIVERSITY OF MYSORE

Ph.D. Entrance Examination, Oct. - 2017

SUBJECT CODE :

02

QUESTION BOOKLET NO.

00069

Entrance Reg. No.

QUESTION BOOKLET

(Read carefully the instructions given in the Question Booklet)

SUBJECT :

MOLECULAR BIOLOGY

MAXIMUM MARKS : 100

MAXIMUM TIME : THREE HOURS

(Including initial 10 minutes for filling O.M.R. Answer sheet)

INSTRUCTIONS TO THE CANDIDATES

1. The sealed questions booklet containing 50 questions enclosed with O.M.R. Answer Sheet is given to you.
2. Verify whether the given question booklet is of the same subject which you have opted for examination.
3. Open the question paper seal carefully and take out the enclosed O.M.R. Answer Sheet outside the question booklet and fill up the general information in the O.M.R. Answer sheet. If you fail to fill up the details in the form of alphabet and signs as instructed, you will be personally responsible for consequences arising during scoring of your Answer Sheet.
4. During the examination:
 - a) Read each question carefully.
 - b) Determine the Most appropriate/correct answer from the four available choices given under each question.
 - c) Completely darken the relevant circle against the Question in the O.M.R. Answer Sheet. For example, in the question paper if "C" is correct answer for Question No.8, then darken against Sl. No.8 of O.M.R. Answer Sheet using Blue/Black Ball Point Pen as follows:

Question No. 8. (A) (B) ● (D) (Only example) (Use Ball Pen only)

5. Rough work should be done only on the blank space provided in the Question Booklet. Rough work should not be done on the O.M.R. Answer Sheet.
6. If more than one circle is darkened for a given question, such answer is treated as wrong and no mark will be given. See the example in the O.M.R. Sheet.
7. The candidate and the Room Supervisor should sign in the O.M.R. Sheet at the specified place.
8. Candidate should return the original O.M.R. Answer Sheet and the university copy to the Room Supervisor after the examination.
9. Candidate can carry the question booklet and the candidate copy of the O.M.R. Sheet.
10. The calculator, pager and mobile phone are not allowed inside the examination hall.
11. **If a candidate is found committing malpractice, such a candidate shall not be considered for admission to the course and action against such candidate will be taken as per rules.**

INSTRUCTIONS TO FILL UP THE O.M.R. SHEET

1. There is only one most appropriate/correct answer for each question.
2. For each question, only one circle must be darkened with BLUE or BLACK ball point pen only. Do not try to alter it.
3. Circle should be darkened completely so that the alphabet inside it is not visible.
4. Do not make any stray marks on O.M.R. Sheet.

ಗಮನಿಸಿ : ಸೂಚನೆಗಳ ಕನ್ನಡ ಆವೃತ್ತಿಯು ಈ ಪುಸ್ತಕದ ಹಿಂಭಾಗದಲ್ಲಿ ಮುದ್ರಿಸಲ್ಪಟ್ಟಿದೆ.

PART - A

[50 × 1 = 50]

1. Among the biotic components of the ecosystem, the producer system is ____
(A) Sea (B) Rivers
(C) Green Plants (D) Animals

2. Which of the following bacterium is considered as 'natural genetic engineer'
(A) *Agrobacterium tumefaciens*
(B) *Agrobacterium radiobactor*
(C) *Psuedomonas putida*
(D) *Thermus aquaticus*

3. What is movement of cell against concentration gradient is called
(A) osmosis (B) active transport
(C) diffusion (D) passive transport

4. Aspirin comes from which of the following?
(A) Willow bark (B) Oak tree
(C) Acacia (D) Eucalyptus

5. The medulla oblongata is a part of human _____.
(A) Heart (B) Liver
(C) Gonads (D) Brain

6. Which of the following statements about the regulation of a metabolic pathway is correct?
(A) Most metabolic pathways are not regulated
(B) Regulation of metabolic pathways always involves changing the amount of enzymes.
(C) Metabolic regulation always depends on control by hormones.
(D) Most metabolic pathways are regulated.

7. Which enzyme is not present in muscle?
(A) Phosphorylase b (B) Hexokinase
(C) Glucose-6-phosphatase (D) Glycogen synthase
8. As compared to saturated fats, unsaturated fats contain
(A) more energy (B) less energy
(C) equal energy (D) doesn't contain any energy
9. In structural biochemistry, Ramachandran plot is used -
(A) to visualize dihedral angles ψ against ϕ of amino acid residues
(B) to visualize dihedral angles ψ against ϕ of glucose residues
(C) to visualize dihedral angles ψ against ϕ of fatty acid residues
(D) to visualize dihedral angles ψ against ϕ of nucleotide amino acid residues
10. Molarity of a solution is expressed as :
(A) the number of moles of a solute present in one litre of the solution.
(B) the number of moles of a solute present in 1000 gm of the solvent.
(C) the number of gram equivalent of solute present in one litre of solution.
(D) the ratio of the number of moles of solute to the total number of moles of solute.
11. Which one of the following is not a colligative property?
(A) Osmotic pressure (B) Elevation of boiling point
(C) Freezing point (D) Depression in freezing point
12. Hemolysis is the phenomenon on which cells are swelled up and then burst if placed in a _____.
(A) isotonic solution (B) none of these
(C) hypertonic solutions (D) hypotonic solution

13. During the unfolding reaction of a helix, breakage of each hydrogen bond requires about 2kJ/mol. This implies hydrogen bonds are
- (A) much stronger in proteins than in water
 - (B) not reformed with water
 - (C) slightly weaker in proteins than in water
 - (D) slightly stronger in proteins than in water
14. The Standard Gibb's free energy, ΔG° , is
- (A) the residual energy present in the reactants at equilibrium
 - (B) the residual energy present in the products at equilibrium
 - (C) the difference in the residual energy of reactants and products at equilibrium
 - (D) the energy required to convert one mole of reactants to one mole of products
15. Elements which are good catalysts and have ability to change their oxidation number are
- (A) transition elements
 - (B) Nobel gases
 - (C) alkalis
 - (D) all of them
16. Half-life of first order reaction is
- (A) greater
 - (B) lesser
 - (C) high
 - (D) constant
17. FAD is reduced to FADH_2 during
- (A) electron transport phosphorylation
 - (B) lactate fermentation
 - (C) Krebs cycle
 - (D) glycolysis
18. A biological redox reaction always involves
- (A) an oxidizing agent
 - (B) a gain of electrons
 - (C) a reducing agent
 - (D) all of these

19. Coenzyme Q is involved in electron transport as
- (A) directly to O_2
 - (B) a lipid-soluble electron carrier
 - (C) covalently attached cytochrome cofactor
 - (D) a water-soluble electron donor
20. Which of the following is not a feature of oxidative phosphorylation?
- (A) Direct transfer of phosphate from a substrate molecule to ADP
 - (B) An electrochemical gradient across the inner mitochondrial membrane
 - (C) A membrane bound ATP synthase
 - (D) A proton motive force
21. How many CO_2 molecules are exhaled for each O_2 molecule utilized in cellular respiration?
- (A) 1
 - (B) 3
 - (C) 6
 - (D) 12
22. Proteins can be separated by the following except
- (A) Electrophoresis
 - (B) Ultra-centrifugation
 - (C) Gas chromatography
 - (D) Salt separation
23. Hemoglobin electrophoresis is based on
- (A) Molecular weight
 - (B) Charge
 - (C) Solubility
 - (D) All
24. Molecular size is assessed by
- (A) Sedimentation
 - (B) Absorption mass spectroscopy
 - (C) Lyophilization
 - (D) Salting out
25. The gall stones or kidney stones can be best identified by the techniques
- (A) Fluorescence spectroscopy
 - (B) Electron microscopy
 - (C) Nuclear magnetic resonance
 - (D) X-ray diffraction

26. In agarose gel electrophoresis, DNA is moved towards the
(A) DNA doesn't move (B) anode
(C) cathode (D) none of above
27. The wavenumber of a transition is 2000 cm^{-1} . In what part of the electromagnetic spectrum does this come?
(A) Ultraviolet-visible (B) Microwave
(C) Infrared (D) Radio wave
28. According to the Beer-Lambert Law, on which of the following does absorbance not depend?
(A) Colour of the solution
(B) Distance that the light has travelled through the sample
(C) Extinction coefficient of the sample
(D) Solution concentration
29. _____ ions help in photolysis of water
(A) Mn^{++} (B) Mg^{++}
(C) Cl^- (D) both (A) and (C)
30. In which of the following light, rate of photosynthesis is maximum?
(A) white (B) discontinuous white
(C) red (D) blue
31. This is where respiration occurs in plants.
(A) Ribosomes (B) Chloroplast
(C) Nucleus (D) Mitochondria
32. Which of the following statements about photorespiration is untrue?
(A) gas exchange resembles respiration
(B) carboxylase activity of rubisco is involved
(C) increases the energy cost of photosynthesis
(D) is also called C_2 pathway

33. How many molecules of ATP are hydrolyzed to form two molecule of ammonia?
(A) 10 (B) 5
(C) 16 (D) 12
34. Which of the following is used as carbon atom source while producing urea in the urea cycle?
(A) Arginine (B) Aspartic acid
(C) Carbon dioxide (D) Glucose
35. Auxin :
(A) This hormone causes leaves to age and fall off of the plant
(B) This hormone produced in the stem to promote cell elongation.
(C) This hormone is produced in the apical portion of stems.
(D) Cell division is stimulated by this hormone
36. Transport of organic solutes in attained by help of
(A) xylem (B) phloem
(C) stem (D) roots
37. Walls of left ventricle are thicker than walls of right ventricle because
(A) it has to pump blood to the whole body
(B) it has to pump the blood to lungs
(C) blood reaches this ventricle in huge amount
(D) blood reaches this ventricle with extra pressure
38. Aerobic respiratory pathway is also termed as _____ pathway.
(A) Anabolic (B) Amphibolic
(C) Symbolic (D) Catabolic
39. The term "gustation" explicitly refers to which sense?
(A) Hearing (B) Taste
(C) Smell (D) Touch

40. Human receptors are classified into the types :
- (A) sensory and motor receptors
 - (B) photoreceptors, mechanoreceptors, chemoreceptors and thermoreceptors
 - (C) Pacinian, Meissner and Ruffini receptors
 - (D) central, peripheral and sympathetic receptors
41. For specific antigen recognition by T cells,
- (A) antigen is bound by a T cell membrane antibody
 - (B) denaturation of antigen does not reduce epitope recognition
 - (C) MHC molecules are not required
 - (D) antigen exposure during T cell maturation is required
42. A virus vaccine that can activate cytotoxic T cells must contain,
- (A) a high dose of virus particles
 - (B) an adjuvant to stimulate T cell division
 - (C) live virus
 - (D) virus peptides
43. Why must mitosis be so precise?
- (A) so differentiation does not occur
 - (B) to coordinate cell death
 - (C) so daughter cells have the identical DNA sequence as the parent cell
 - (D) Mitosis is not a precise process
44. What does a target cell require to respond to an extracellular signal molecule?
- (A) Access to the signal molecule
 - (B) The presence of an appropriate receptor for the signal molecule
 - (C) Appropriate intracellular signaling pathways
 - (D) When the response does not require new gene transcription or new protein synthesis.

45. Nuclear receptors belong to which class of transcription factor?
- (A) Helix-loop-helix proteins
 - (B) Helix-turn-helix proteins
 - (C) Leucine zipper proteins
 - (D) Zinc finger proteins
46. Which of the following statements, concerning regulation of trp operon expression by attenuation, is correct?
- (A) The leader peptide sequence encodes enzymes required for tryptophan synthesis.
 - (B) The leader peptide sequence contains no tryptophan residues.
 - (C) Rapid translation of the leader peptide allows completion of the mRNA transcript.
 - (D) Rapid translation of the leader peptide prevents completion of the mRNA transcript.
47. To express eukaryotic genes in prokaryotes library used is
- (A) cDNA library
 - (B) bDNA library
 - (C) aDNA library
 - (D) zDNA library
48. The virus mediated gene transfer using genetically modified bacteriophages is called
- (A) transfection
 - (B) transduction
 - (C) transformation
 - (D) conjugation

49. Which type of genomics studies similarities and differences among the genomes of multiple organisms?
- (A) comparative genomics
 - (B) structural genomics
 - (C) functional genomics
 - (D) multiple genomics
50. Which of the following is a sequence alignment tool provided by NCBI?
- (A) Chime
 - (B) FASTA
 - (C) BLAST
 - (D) Clustal W

PART - B

[5 × 10 = 50]

1. a) Briefly summarize the steps in the electron transport chain from NADH to oxygen. Mention the important Mitochondrial Diseases.
- b) Write a short note on five kingdom classification proposed by R.H. Whittaker.

[5 + 5 = 10]

2. a) Explain the preparation of end labeled DNA.
- b) Write on the physiological basis of urine formation in human. Mention the role of hormones.

[4 + 6 = 10]

3. a) Write on cell adhesion. Give an account on the biological role of adhesion molecules.
b) Discuss the Evolution of gene concept.

[6 + 4 = 10]

4. a) What are LFTs? Explain the causes of liver diseases.
b) What is epigenetics? Write a short note on DNA methylation.

[5 + 5 = 10]

5. a) Explain the use of microarray techniques in histological and cytological specimens.
b) Explain any TWO of the followings :
i) Animal cell culture.
ii) Genome of Zebra fish, and
iii) Molecular modeling.

[5 + 5 = 10]



ಅಭ್ಯರ್ಥಿಗಳಿಗೆ ಸೂಚನೆಗಳು

1. ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯ ಜೊತೆಗೆ 50 ಪ್ರಶ್ನೆಗಳನ್ನು ಹೊಂದಿರುವ ಮೊಹರು ಮಾಡಿದ ಪ್ರಶ್ನೆ ಪುಸ್ತಕವನ್ನು ನಿಮಗೆ ನೀಡಲಾಗಿದೆ.
2. ಕೊಟ್ಟಿರುವ ಪ್ರಶ್ನೆ ಪುಸ್ತಕವು, ನೀವು ಪರೀಕ್ಷೆಗೆ ಆಯ್ಕೆ ಮಾಡಿಕೊಂಡಿರುವ ವಿಷಯಕ್ಕೆ ಸಂಬಂಧಿಸಿದ್ದೇ ಎಂಬುದನ್ನು ಪರಿಶೀಲಿಸಿರಿ.
3. ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯ ಮೊಹರು ಜಾಗ್ರತೆಯಿಂದ ತೆರೆಯಿರಿ ಮತ್ತು ಪ್ರಶ್ನೆಪತ್ರಿಕೆಯಿಂದ ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯನ್ನು ಹೊರಗೆ ತೆಗೆದು, ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯಲ್ಲಿ ಸಾಮಾನ್ಯ ಮಾಹಿತಿಯನ್ನು ತುಂಬಿರಿ. ಕೊಟ್ಟಿರುವ ಸೂಚನೆಯಂತೆ ನೀವು ನಮೂನೆಯಲ್ಲಿನ ವಿವರಗಳನ್ನು ತುಂಬಲು ವಿಫಲರಾದರೆ, ನಿಮ್ಮ ಉತ್ತರ ಹಾಳೆಯ ಮೌಲ್ಯಮಾಪನ ಸಮಯದಲ್ಲಿ ಉಂಟಾಗುವ ಪರಿಣಾಮಗಳಿಗೆ ವೈಯಕ್ತಿಕವಾಗಿ ನೀವೇ ಜವಾಬ್ದಾರಾಗಿರುತ್ತೀರಿ.
4. ಪರೀಕ್ಷೆಯ ಸಮಯದಲ್ಲಿ:
 - a) ಪ್ರತಿಯೊಂದು ಪ್ರಶ್ನೆಯನ್ನು ಜಾಗ್ರತೆಯಿಂದ ಓದಿರಿ.
 - b) ಪ್ರತಿ ಪ್ರಶ್ನೆಯ ಕೆಳಗೆ ನೀಡಿರುವ ನಾಲ್ಕು ಲಭ್ಯ ಆಯ್ಕೆಗಳಲ್ಲಿ ಅತ್ಯಂತ ಸರಿಯಾದ/ ಸೂಕ್ತವಾದ ಉತ್ತರವನ್ನು ನಿರ್ಧರಿಸಿ.
 - c) ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯಲ್ಲಿನ ಸಂಬಂಧಿಸಿದ ಪ್ರಶ್ನೆಯ ವೃತ್ತಾಕಾರವನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ತುಂಬಿರಿ. ಉದಾಹರಣೆಗೆ, ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿ ಪ್ರಶ್ನೆ ಸಂಖ್ಯೆ 8ಕ್ಕೆ "C" ಸರಿಯಾದ ಉತ್ತರವಾಗಿದ್ದರೆ, ನೀಲಿ/ಕಪ್ಪು ಬಾಲ್ ಪಾಯಿಂಟ್ ಪೆನ್ ಬಳಸಿ ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯ ಕ್ರಮ ಸಂಖ್ಯೆ 8ರ ಮುಂದೆ ಈ ಕೆಳಗಿನಂತೆ ತುಂಬಿರಿ:
 ಪ್ರಶ್ನೆ ಸಂಖ್ಯೆ 8.(A) (B) (C) (D) (ಉದಾಹರಣೆ ಮಾತ್ರ) (ಬಾಲ್ ಪಾಯಿಂಟ್ ಪೆನ್ ಮಾತ್ರ ಉಪಯೋಗಿಸಿ)
5. ಉತ್ತರದ ಪೂರ್ವಸಿದ್ಧತೆಯ ಬರವಣಿಗೆಯನ್ನು (ಚಿತ್ತು ಕೆಲಸ) ಪ್ರಶ್ನೆ ಪತ್ರಿಕೆಯಲ್ಲಿ ಒದಗಿಸಿದ ಖಾಲಿ ಜಾಗದಲ್ಲಿ ಮಾತ್ರವೇ ಮಾಡಬೇಕು (ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆಯಲ್ಲಿ ಮಾಡಬಾರದು).
6. ಒಂದು ನಿರ್ದಿಷ್ಟ ಪ್ರಶ್ನೆಗೆ ಒಂದಕ್ಕಿಂತ ಹೆಚ್ಚು ವೃತ್ತಾಕಾರವನ್ನು ಗುರುತಿಸಲಾಗಿದ್ದರೆ, ಅಂತಹ ಉತ್ತರವನ್ನು ತಪ್ಪು ಎಂದು ಪರಿಗಣಿಸಲಾಗುತ್ತದೆ ಮತ್ತು ಯಾವುದೇ ಅಂಕವನ್ನು ನೀಡಲಾಗುವುದಿಲ್ಲ. ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯಲ್ಲಿನ ಉದಾಹರಣೆ ನೋಡಿ.
7. ಅಭ್ಯರ್ಥಿ ಮತ್ತು ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರು ನಿರ್ದಿಷ್ಟಪಡಿಸಿದ ಸ್ಥಳದಲ್ಲಿ ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯ ಮೇಲೆ ಸಹಿ ಮಾಡಬೇಕು.
8. ಅಭ್ಯರ್ಥಿಯು ಪರೀಕ್ಷೆಯ ನಂತರ ಕೊಠಡಿ ಮೇಲ್ವಿಚಾರಕರಿಗೆ ಮೂಲ ಓ.ಎಂ.ಆರ್. ಉತ್ತರ ಹಾಳೆ ಮತ್ತು ವಿಶ್ವವಿದ್ಯಾನಿಲಯದ ಪ್ರತಿಯನ್ನು ಹಿಂದಿರುಗಿಸಬೇಕು.
9. ಅಭ್ಯರ್ಥಿಯು ಪ್ರಶ್ನೆ ಪುಸ್ತಕವನ್ನು ಮತ್ತು ಓ.ಎಂ.ಆರ್. ಅಭ್ಯರ್ಥಿಯ ಪ್ರತಿಯನ್ನು ತಮ್ಮ ಜೊತೆ ತೆಗೆದುಕೊಂಡು ಹೋಗಬಹುದು.
10. ಕ್ಯಾಲ್ಕುಲೇಟರ್, ಪೇಜರ್ ಮತ್ತು ಮೊಬೈಲ್ ಫೋನ್‌ಗಳನ್ನು ಪರೀಕ್ಷಾ ಕೊಠಡಿಯ ಒಳಗೆ ಅನುಮತಿಸಲಾಗುವುದಿಲ್ಲ.
11. ಅಭ್ಯರ್ಥಿಯು ದುಷ್ಕೃತ್ಯದಲ್ಲಿ ತೊಡಗಿರುವುದು ಕಂಡುಬಂದರೆ, ಅಂತಹ ಅಭ್ಯರ್ಥಿಯನ್ನು ಕೋರ್ಸ್‌ಗೆ ಪರಿಗಣಿಸಲಾಗುವುದಿಲ್ಲ ಮತ್ತು ನಿಯಮಗಳ ಪ್ರಕಾರ ಇಂತಹ ಅಭ್ಯರ್ಥಿಯ ವಿರುದ್ಧ ಕ್ರಮ ಕೈಗೊಳ್ಳಲಾಗುವುದು.
ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯನ್ನು ತುಂಬಲು ಸೂಚನೆಗಳು
 1. ಪ್ರತಿಯೊಂದು ಪ್ರಶ್ನೆಗೆ ಒಂದೇ ಒಂದು ಅತ್ಯಂತ ಸೂಕ್ತವಾದ/ಸರಿಯಾದ ಉತ್ತರವಿರುತ್ತದೆ.
 2. ಪ್ರತಿ ಪ್ರಶ್ನೆಗೆ ಒಂದು ವೃತ್ತವನ್ನು ಮಾತ್ರ ನೀಲಿ ಅಥವಾ ಕಪ್ಪು ಬಾಲ್ ಪಾಯಿಂಟ್ ಪೆನ್ನಿನಿಂದ ಮಾತ್ರ ತುಂಬತಕ್ಕದ್ದು. ಉತ್ತರವನ್ನು ಮಾರ್ಪಡಿಸಲು ಪ್ರಯತ್ನಿಸಬೇಡಿ.
 3. ವೃತ್ತದೊಳಗಿರುವ ಅಕ್ಷರವು ಕಾಣದಿರುವಂತೆ ವೃತ್ತವನ್ನು ಸಂಪೂರ್ಣವಾಗಿ ತುಂಬುವುದು.
 4. ಓ.ಎಂ.ಆರ್. ಹಾಳೆಯಲ್ಲಿ ಯಾವುದೇ ಅನಾವಶ್ಯಕ ಗುರುತುಗಳನ್ನು ಮಾಡಬೇಡಿ.

Note : English version of the instructions is printed on the front cover of this booklet.

SEAL

SEAL