

UNIVERSITY OF MYSORE

Ph.D. Entrance Examination, November - 2020



SUBJECT CODE :

46

QUESTION BOOKLET NO.

504453

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) (C) (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

This part shall contains 50 multiple choice/objective type questions, each question carrying one mark. [50 × 1 = 50]

- 1) Which of the following groups of bacteria is considered as a link between bacteria and virus?
(A) Mycoplasmas (B) Spirochaetes
(C) Actinomycetes (D) Vibrios

- 2) The ability of bacteria to change their morphological form frequently is termed as
(A) Lysogeny (B) Pleomorphism
(C) Alteromorphism (D) None of these

- 3) The white fatty substance that coats axons to increase signal speed is
(A) Myelin (B) Microfibrils
(C) Dendrites (D) Adipocytes

- 4) A bundle of axons in the PNS is called as
(A) Nerve (B) Tract
(C) Ganglion (D) Nucleus

- 5) The melting temperature T_m is defined as the temperature at which half of the DNA strands are in the double helical state and half is in the random coil states. T_m of DNA does not depend on
(A) % GC content (B) Presence of anions
(C) Presence of cations (D) Length of DNA

- 6) Molecules primarily responsible for the formation of lipid raft are
- (A) Phosphatidyl inositol and cholesterol
 - (B) Sphingolipids and cholesterol
 - (C) GPI and cholesterol
 - (D) Phosphatidyl serine and Phosphatidyl
- 7) Chirality of DNA molecule due to
- (A) The bases
 - (B) Base stacking
 - (C) Deoxyribose
 - (D) Hydrogen bonding between base
- 8) FAD is reduced to FADH₂ during
- (A) Glycolysis
 - (B) Krebs cycle
 - (C) Lactate fermentation
 - (D) Electron transport chain
- 9) Most types of virus particles show which types of symmetries?
- (A) Complex and helical
 - (B) Cuboid and helical
 - (C) Bilateral and helical
 - (D) Complex and bilateral
- 10) What is the most important factor for virus classification?
- (A) The geometry of the virus
 - (B) How many proteins the virus has
 - (C) The disease a virus causes
 - (D) Chemistry of the DNA and RNA

- 11) The pH of a 0.02 M solution of an unknown weak acid is 3.7. What is the pKa of this acid?
- (A) 5.7 (B) 4.9
(C) 3.2 (D) 2.8
- 12) Which of the following is a component of the coenzyme A?
- (A) Retinoic acid
(B) Pantothenic acid
(C) Retinol
(D) Pyridoxine
- 13) The average size of 70S ribosome of prokaryotes is
- (A) 200 Å (B) 250 Å
(C) 300 Å (D) 350 Å
- 14) A tetrameric protein always has
- (A) Four identical subunits
(B) Four subunits
(C) Two each of two different subunits
(D) Four dissimilar subunits
- 15) The transamination is the transfer of an amino acid group to
- (A) Keto acid
(B) Aldehyde
(C) Aldose
(D) Other amino acid
- 16) The Glycine is synthesized from
- (A) Serine (B) Proline
(C) Glutamine (D) Valine

- 17) The separation of DNA by electrophoresis, which of the following method is commonly used?
- (A) Agarose - vertical
 - (B) Agarose - horizontal
 - (C) PAGE - vertical
 - (D) PAGE - horizontal
- 18) In $500 \times g$, what does g represent in accordance to centrifugation?
- (A) Gravitational force
 - (B) The centrifugal force is 500 times greater than earthly gravitational force
 - (C) The centrifugal force is 500 times less than earthly gravitational force
 - (D) The centrifugal force is 500 times same as that of earthly gravitational force
- 19) DNA and RNA quantity is assessed by photometric measurements at 260 nm. Additional measurements at 280 nm is performed :
- (A) To distinguish DNA from RNA
 - (B) To calculate the molar absorptivity
 - (C) To determine protein concentration
 - (D) To calculate your DNA/RNA ratio
- 20) The Beer-Lambert Law gives a linear correlation with a positive gradient between
- (A) Wavelength and absorbance
 - (B) Absorbance and concentration
 - (C) Molar extinction coefficient and absorbance
 - (D) Molar extinction coefficient and concentration

- 21) Name the technique which is used to visualize the distribution of the protein in the membrane?
- (A) Patch clamp technique (B) FRAP
(C) Freeze-etching (D) Freeze-fracture technique
- 22) This enzyme was first isolated and purified in the form of crystals
- (A) Urease (B) Protease
(C) Trypsin (D) Chymotrypsin
- 23) Enzymes differ from other catalysts in that only enzymes
- (A) Are not consumed in the reaction
(B) Display specificity toward a single reactant
(C) Fail to influence the equilibrium point of the reaction
(D) Lower the activation energy of the reaction catalyzed
- 24) A reversible inhibitor is found to increase the K_M for a reaction, but has no effect on V_{max} . To which class of reversible inhibitor does it belong?
- (A) Competitive inhibition (B) Noncompetitive inhibition
(C) Uncompetitive inhibition (D) Suicide inhibition
- 25) Classification of organisms as oxygenic or anoxygenic during photosynthesis is based on
- (A) The presence of CO_2 (B) The generation of oxygen
(C) The presence of light (D) The presence of water
- 26) The process which makes the difference between C3 and C4 plants is
- (A) Glycolysis (B) Clavin cycle
(C) Photosynthesis (D) Respiration

- 27) The flow of electrons through the electron transport chain in plants is
- (A) An exergonic (B) An endergonic
(C) An thermogenic (D) An electromagnetic
- 28) When a man inhales air containing a normal concentration of oxygen as well as CO he suffers from suffocation because
- (A) CO reacts with O₂ reducing its percentage in the air
(B) Hemoglobin combines with CO instead of O₂ and from carboxy hemoglobin
(C) CO affects the diaphragm and intercostal muscles
(D) CO affects the nerves of the lungs
- 29) Electrical impulses gather and accumulate in which part of a neuron, in order to initiate an action potential?
- (A) Dendrites (B) Axon hillock
(C) Node of Ranvier (D) Axon terminal branches
- 30) Which part of the body digestion of protein begins?
- (A) Pancreas (B) Stomach
(C) Small Intestine (D) Large Intestine
- 31) Which one of the following hormones is derived from cholesterol?
- (A) TRH (B) TSH
(C) Oxytocin (D) Testosterone
- 32) Cholesterol is essential for normal membrane functions because it
- (A) Spans the thickness of the bilayer ✓
(B) Keeps membranes fluid
(C) Catalyzes lipid flip-flop in the bilayer
(D) Transport the proteins

- 33) The Golgi apparatus is often seen associated with
(A) Mitochondria (B) Rough endoplasmic reticulum
(C) Lysosome (D) Nucleus
- 34) Chromatin is composed of -
(A) Only DNA (B) Only RNA
(C) DNA and protein (D) None
- 35) Which of the following type of cells recognize and kill the abnormal pathogen infected cells?
(A) Mast cells (B) B-lymphocytes
(C) T-lymphocytes (D) Neutrophils
- 36) Which of the following is an extracellular messenger of apoptosis?
(A) Tumour necrotic factor (B) Ribozyme
(C) Endothelial growth factor (D) Caspases
- 37) Which of the following immunoglobulins is present normally in plasma at the highest concentration?
(A) IgA (B) IgD
(C) IgE (D) IgG
- 38) Strand of DNA with the sequence A A C T T G will have a complementary strand with the
(A) CCAGGT (B) AACTTG
(C) TTCAAG (D) TTGAAC
- 39) Mendel discovered principles of inheritance because he :
(A) Ignored all characteristics except a few markedly contrasting ones in which he studied
(B) Studied only the offspring obtained from a single mating
(C) Observed simultaneously all of the many characteristics in which the parents differed
(D) Believed that the hereditary characteristics of two individuals became thoroughly blended in the offspring

- 40) Which of the following chemical mutagen affects only replicating dna?
(A) Acridine dye (B) Alkylating agent
(C) Deaminating agent (D) Base analog
- 41) Which of the following is an internally borne pathogen?
(A) Synchytrium endobioticum (B) Ustilago nuda
(C) Ustilago hardei (D) Ustilago avenae
- 42) Deficiencies of which of the following nutrients can lead to anaemia?
(A) Iodine and vitamin C (B) Copper and iron
(C) Zinc and protein (D) Vitamin D and Zinc
- 43) Which of the following marker is used for the differential diagnosis of obstructive jaundice?
(A) Lactate dehydrogenase (B) Creatine kinase
(C) Carbonic anhydrase (D) 5' - nucleotidase
- 44) G-protein coupled receptors are referred to as _____ transmembrane receptors?
(A) Five transmembrane helices (B) Seven transmembrane helices
(C) Nine transmembrane helices (D) Ten transmembrane helices
- 45) Ras protein is a
(A) G-protein switch
(B) Small monomeric gtpase switches protein
(C) Serine-threonine kinase
(D) Tyrosine kinase

- 46) Which of the following is not required for the expression of genes in the lactose operon?
- (A) Adenylate cyclase
(B) Allolactose
(C) Camp
(D) LacI gene product
- 47) In the zinc finger, which residues in this sequence motif form ligands to a zinc ion?
- (A) Cysteine and histidine
(B) Cysteine and arginine
(C) Histidine and proline
(D) Histidine and arginine
- 48) Where does restriction enzyme *ecor1* cut dna?
- (A) Between the g and a
(B) Between the g and g
(C) Between the g and c
(D) Between the a and t
- 49) Sequencing of genomic dna is included in
- (A) Molecular function
(B) Structural genomics
(C) Phenotypic function
(D) Cellular function
- 50) What is the common site of regulation?
- (A) Cytoplasm
(B) Mitochondria
(C) Nucleus
(D) Chromatin

PART - B

This part shall contains Five questions, each question carrying ten marks.

[5 × 10 = 50]

- 1) a) How does the nervous system mechanism function?
b) Explain mitochondrial electron transport.

- 2) a) Give an account on reversible enzyme inhibition.
b) Discuss the factors affecting oxygen binding.

- 3) a) What are the types of transport systems? Explain active transport system with suitable example.
b) Discuss the main causes of mutation.

- 4) a) How does G - Proteins regulate ion channels?
b) Why DNA methylation is needed for DNA replication?

- 5) a) Mention different types of PCR. Explain how does PCR amplify specific region of DNA?
b) Write a note on DNA sequence analysis and data base searches.



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 ತಪ್ಪು 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 ಅಂತಹ 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.