**Roll No. .....**

| Question Booklet Number |
|---|
| |

**O. M. R. Serial No.**

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | | | | |

# M. Sc. (Fourth Semester)

# (NEP) EXAMINATION, 2025-26

## BOTANY

## (Advanced Plant Physiology and Biochemistry)

| Paper Code | | | | | | | |
|---|---|---|---|---|---|---|---|
| B | 0 | 4 | 1 | 0 | 0 | 5 | T |

| Questions Booklet Series |
|---|
| B |

*Time : 1:30 Hours* ] [ *Maximum Marks : 75*

**Instructions to the Examinee :**

1. Do not open the booklet unless you are asked to do so.

2. The booklet contains 100 questions. Examinee is required to answer 75 questions in the OMR Answer-Sheet provided and not in the question booklet. All questions carry equal marks.

3. Examine the Booklet and the OMR Answer-Sheet very carefully before you proceed. Faulty question booklet due to missing or duplicate pages/questions or having any other discrepancy should be got immediately replaced.

**परीक्षार्थियों के लिए निर्देश :**

1. प्रश्न-पुस्तिका को तब तक न खोलें जब तक आपसे कहा न जाए।

2. प्रश्न-पुस्तिका में 100 प्रश्न हैं। परीक्षार्थी को 75 प्रश्नों को केवल दी गई OMR आन्सर-शीट पर ही हल करना है, प्रश्न-पुस्तिका पर नहीं। सभी प्रश्नों के अंक समान हैं।

3. प्रश्नों के उत्तर अंकित करने से पूर्व प्रश्न-पुस्तिका तथा OMR आन्सर-शीट को सावधानीपूर्वक देख लें। दोषपूर्ण प्रश्न-पुस्तिका जिसमें कुछ भाग छपने से छूट गए हों या प्रश्न एक से अधिक बार छप गए हों या उसमें किसी अन्य प्रकार की कमी हो, तो उसे तुरन्त बदल लें।

**(Remaining instructions on the last page)** **(शेष निर्देश अन्तिम पृष्ठ पर)**

*(Only for Rough Work)*

1. Phototropin belongs to which type of protein family ?

(A) G-protein coupled receptors

(B) Serine/Threonine protein kinases

(C) Histidine kinase

(D) DNA polymerase

2. The C-terminal region of phototropin contains :

(A) DNA-binding domain

(B) Kinase domain

(C) ATP synthase

(D) DNA polymerase

3. Activation of phototropin leads to :

(A) DNA repair

(B) Ethylene production

(C) Autophosphorylation

(D) Chlorophyll degradation

4. The most common signaling mechanism in plants is :

(A) Steroid hormone signaling

(B) Two-component system

(C) Neural signaling

(D) Electrical synapse

5. The two-component signaling system typically consists of :

(A) Histidine kinase and response regulator

(B) Receptor and transcription

(C) Kinase and phosphatase

(D) Auxin and cytokinin

6. Cytokinin signaling in plants represents through a :

(A) MAPK independent pathway

(B) Calcium independent pathway

(C) Two components phosphorelay system

(D) GPCR pathway

7. The plant hormone ethylene is perceived by receptors located in the :

(A) Chloroplast

(B) Nucleus

(C) ER–Endoplasmic Reticulum

(D) Plasma membrane

8. The second messenger commonly involved in plant signaling is :

(A) DNA

(B) Cellulose

(C) Chlorophyll

(D) $Ca^{++}$

9. G-protein signaling in plants differs from animals because plant-G-proteins are :

(A) Not associated with membrane

(B) Located only in chloroplasts

(C) Self activating

(D) Absent

10. Signaling/signal transduction amplification occurs when :

(A) One receptor activates many downstream molecules

(B) Signal is degraded immediately

(C) Hormone is transported

(D) Protein is synthesized

11. Reactive Oxygen Species (ROS) in signaling acts as :

(A) Structural components

(B) Transcription factors

(C) Enzymes

(D) Secondary messengers

12. Nod factor signaling is an example of :

(A) Symbiosis signaling

(B) Antagonism

(C) Parasitism

(D) Competition

13. Nod factors are degraded by :

(A) Nitrogenase

(B) Lipases

(C) Anylases

(D) Chitinases

14. Nod factor receptors are located in :

(A) Cell wall

(B) Nucleus

(C) Plasma membrane

(D) None of the above

15. ENOD genes are :

(A) Chloroplast genes

(B) Viral genes

(C) Plant geneses activated during nodulation

(D) Bacterial genes

16. Which one amongst is an incorrect statement ?

(A) Infection thread formation is triggered by nod factor signaling

(B) Nod factor signaling leads to cortical cell division

(C) Nod factors are secreted into soil rhizosphere

(D) The first visible response to nod factor is nitrogenase activation

17. The two components of nitrogenase are :

(A) Cytochrome and plastocyanin

(B) ATPase and Kinase

(C) NADH and FADH

(D) Fe-protein and Mo-Fe protein

18. The key enzyme involved in nitrogen fixation is :

(A) RuBisCO

(B) Nitrate reductase

(C) Nitrogenase

(D) Nitrite reductase

19. Which molecule protects nitrogenase from oxygen damage in nodules ?

(A) Leghaemoglobin

(B) Myoglobin

(C) Chlorophyll

(D) Chlorovirdin

20. Approximately how many ATP molecules are required to fix one $N_2$ molecule ?

(A) 16

(B) 8

(C) 32

(D) 3

21. Free-living nitrogen fixing bacteria include :

(A) Rhizobium

(B) Frankia

(C) Azotobacter

(D) Bradyrhizobium

22. Which of the following is a symbiotic actino-bacterium ?

(A) Rhizobium

(B) Nostoc

(C) Azospirillum

(D) Frankia

23. Which molecule acts as the initial acceptor of ammonium ?

(A) Glucose

(B) Pyruvate

(C) Oxaloacetate

(D) Glutamate

24. The final product of ammonium assimilation is mainly :

(A) Proteins directly

(B) Lipids

(C) Amino acids

(D) None is correct

25. The GDH pathway is mainly active under :

(A) Normal conditions of light and nitrogen

(B) High ammonium concentration or stress

(C) Low nitrogen conditions

(D) Only in light conditions

26. Sulphate assimilation primarily takes place in :

(A) Nucleus

(B) Vacoule

(C) Mitochondria

(D) Chloroplasts

27. The enzyme responsible for Adenosine Phosphosulphate (APS) formation is :

(A) ATP sulfurylase

(B) Nitrogenase

(C) Sulphite reductase

(D) APS reductase

28. The final product of sulphur assimilation incorporated into amino acid is :

(A) Cysteine

(B) Alanine

(C) Methionine

(D) Glycine

29. Which interaction is mainly responsible for protein tertiary structure ?

(A) Ionic bonds

(B) Disulphide bonds and hydrophobic interactions

(C) Hydrogen bonds

(D) Peptide bonds

30. Which amino acid does not exhibit optical isomer ?

(A) Glycine

(B) Leucine

(C) Valine

(D) Alanine

31. The property of amino acids that allows them to act as both acid and base is called :

(A) Optical Activity

(B) Buffering capacity

(C) Amphoteric nature

(D) Amphipathic nature

32. Denaturation of proteins involves :

(A) Breaking peptide bonds

(B) Formation of new amino acids

(C) Loss of primary structure

(D) Loss of secondary and tertiary structure

33. Sulfur/Sulphur containing amino acid is :

(A) Methionine
(B) Proline
(C) Valine
(D) Phenylalanine

34. The bond that stabilizes $\alpha$-helix in proteins :

(A) Hydrogen bond
(B) Ionic bond
(C) Peptide bond
(D) Disulfide bonds

35. Which one among the following is correct statement ?

(A) Proteins are least soluble at isoelectric point
(B) Lysine is a basic amino acid
(C) Peptide bond formation involves the condensation reaction
(D) All are correct statements

36. Find out the correct statement regarding Ramchandran's plots :

(A) The Ramchandran plots help to determine and allowed conformation of polypeptides
(B) Ramchandran and Sasisekharan are the scientists that developed the Ramchandran plot for protein structure validation
(C) In plant proteins, Ramchandram plot helps in studying enzyme structure
(D) All (A), (B) and (C) are the correct statements

37. The carbohydrate portion of glycoproteins is usually attached via :

(A) Ionic bonds
(B) Peptide bonds
(C) Glycosidic bonds
(D) Hydrogen bonds

38. Which one is the major function of glycoproteins in plants ?

(A) Cell wall structure and signaling
(B) Transpiration
(C) DNA replication
(D) Photosynthesis directly

39. Cellulose is made up of :

(A) $\beta$-D glycose
(B) $\alpha$-D glucose
(C) Fructose
(D) Ribose

40. Which of the following is a storage polysaccharide in plants ?

(A) Glycogen
(B) Chitin
(C) Cellulose
(D) Starch

41. Solubility of carbohydrates is due to :

(A) Lipid group
(B) Hydrocarbon chains
(C) Hydroxyl group
(D) Peptide and glycosidic bonds

42. Which property allows carbohydrates to rotates plane-polarised light ?

(A) Acidity
(B) Solubility
(C) Chirality
(D) Polarity

43. Which carbohydrate is involved in plant cell wall matrix ?

(A) Sucrose
(B) Maltose
(C) Glycogen
(D) Hemicellulose

44. Which vitamin acts as a co-factor for carboxylation reactions ?

(A) Vitamin B7 (Biotin)
(B) Vitamin A
(C) Vitamin C
(D) Vitamin B1

45. Which vitamin is synthesized in skin under UV-light ?

(A) Vitamin A
(B) Vitamin D
(C) Vitamin K
(D) Vitamin E

46. Fat soluble vitamins are stored mainly in :

(A) Blood plasma
(B) Cytoplasm
(C) Liver and adipose tissue
(D) Vacuole

47. The correct statement regarding coenzyme is :

(A) Coenzymes are organic non-protein molecules
(B) Coenzymes are usually derived from vitamins
(C) Coenzymes are function by carrying chemical group or electrons as $NAD^+$
(D) All of the above

48. Which type of co-enzyme binds tightly ?

(A) Holoenzyme
(B) Apoenzyme
(C) Prosthetic group
(D) Both (B) and (C)

49. Coenzyme A contains :

(A) Biotin
(B) Riboflavin
(C) Niacin
(D) Pantothenic acid

50. FAD is involved in :

(A) Hydration
(B) DNA replication
(C) Protein synthesis
(D) Oxidation-reduction reactions

51. Plant stress caused by drought is classified as :

(A) Biotic stress

(B) Abiotic stress

(C) Pathogenic stress

(D) Genetic stress

52. The hormone mainly associated with drought stress response in plants is :

(A) Auxin

(B) Gibberellin

(C) Abscisic acid

(D) Cytokinin

53. High salt conantration in soil causes :

(A) Osmotic stress

(B) Light stress

(C) Mechanical stress

(D) Nutrient toxicity only

54. Which molecule accumulates in plants during drought stress as an osmoprotectant ?

(A) Proline

(B) Cellulose

(C) Lignin

(D) Starch

55. Which enzyme helps protect plants from oxidative streets ?

(A) Amylase

(B) Catalase

(C) Pepsin

(D) Lipase

56. Which antioxidant molecule protects plant cells from oxidative damage ?

(A) Starch

(B) Ascorbic acid

(C) DNA

(D) Cellulose

57. Flooding stress mainly reduces :

(A) Soil nutrients

(B) Light intensity

(C) Carbon dioxide in leaves

(D) Oxygen availability to roots

58. The process by which plants remember previous stress exposure is called :

(A) Stress mutation

(B) Stress memory

(C) Stress replication

(D) Stress fixation

59. Which pigment protects plants from excess light stress ?

(A) Chlorophyll

(B) Hemoglobin

(C) Carotenoids

(D) Melanin

60. The term "Oxidative burst" refers to :

(A) Loss of chlophyll

(B) Formation of proteins

(C) Rapid production of ROS

(D) Breakdown of sugars

61. The basic unit of terpenoids is :

(A) Alkane

(B) Isoprene

(C) Phenol

(D) Benzene

62. Terpenoids are synthesized from :

(A) Nucleotides

(B) Amino acids

(C) Glucose units

(D) Isoprene units

63. Tannins are classified under :

(A) Alkaloids

(B) Terpenoids

(C) Phenolic compounds

(D) Proteins

64. Flavonoids belong to which class of secondary metabolites ?

(A) Alkaloids

(B) Phenolics

(C) Terpenoids

(D) Steroids

65. Alkaloids generally contain :

(A) Silicon

(B) Phosphorus

(C) Sulfur

(D) Nitrogen

66. Which of the following is not a major class of plant secondary metabolites ?

(A) Alkaloids

(B) Terpenoids

(C) Phenolics

(D) Proteins

67. Which secondary metabolite group includes steroids ?

(A) Terpenoids

(B) Alkaloids

(C) Phenolics

(D) Proteins

68. The gaseous plant hormone involved in signaling is :

(A) ABA

(B) Ethylene

(C) Jasmonic acid

(D) Salicylic acid

69. Which of the following is a second messenger in plant signal transduction ?

(A) Auxin

(B) Calcium ions

(C) Cytokinin

(D) Gibberellin

70. Which receptor family is primarily involved in brassinosteroid signaling ?

(A) G-Protein coupled receptor

(B) Histine kinase receptors

(C) Leucine rich repeat receptor kinase

(D) Ion channel receptors

71. In Auxin signaling, the degradation of Auxin/IAA proteins occurs through :

(A) Lysosome

(B) Proteasome Pathway

(C) Ribosome

(D) Golgibodies

72. Which molecule acts as signaling compound in plant defense response ?

(A) Glucose

(B) Salicylic Acid

(C) ATP

(D) Cellulose

73. Stomatal closure during drought stress is manily regulated by :

(A) Auxin

(B) Cytokinin

(C) ABA

(D) Gibberellins

74. The protein kinase involved in many plant signaling cascades is :

(A) DNA Polymerese

(B) RuBisCO

(C) MAP kinase

(D) RNA helicase

75. Photoreceptor sensitive primarily to the phytochrome is :

(A) Blue light

(B) Green light

(C) UV light

(D) Red and far-red light

76. Protein part of phytochrome is called :

(A) Apoprotein

(B) Chromophore

(C) Prosthetic group

(D) Heme or prosthetic group

77. The chromophore attached to phytochrome is :

(A) Phyco-erythrin

(B) Phytochrome A

(C) Phytochromobilin

(D) Bilirubin

78. Phytochromobilin is chemically derived from :

(A) Tryptophan

(B) Heme

(C) Tyrosine

(D) Chlorophyll

79. Which one among the following are correct statements ?

79. The chromophore of phytochrome is attached to the apoprotein via thioether linkage

2. The chromophore of phytochrome is attached to the apoprotein via disulfide bond

3. Phytochrome exists structurally as dimer

4. Phytochrome exists structurally as tetramer

**Codes :**

(A) 1, 2, 3, 4

(B) 1, 3

(C) 3, 4

(D) 2, 3, 4

80. The molecular weight of phytochrome monomer is approximately :

(A) 25 kDa

(B) 60 kDa

(C) 120-125 kDa

(D) 300 kDa

81. The N-terminal region of phytochrome mainly contains :

(A) DNA-binding domain

(B) Chromophore binding domain

(C) ATP-binding site

(D) Ribosomal unit

82. The C-terminal region of phytochrome mainly contains :

(A) Chromophore-binding site

(B) Kinase-related domain

(C) Chlorophyll binding site

(D) Lipid binding site

83. The structural change between Pr and Pfr forms occurs due to :

(A) Protein degradation

(B) Chromophore isomerisation

(C) DNA mutation

(D) Peptide cleavage

84. Phosphorylation in signal transduction generally occurs on which amino acids ?

(A) Glycine and alanine

(B) Serine, thereonine and tyrosine

(C) Proline and leucine

(D) Methionine only

85. Signal transduction in plants begins with :

(A) Gene transcription

(B) Hormone degradation

(C) Signal perception by receptor

(D) Protein synthesis

86. The chromophore of phytochrome belongs to which class of compounds ?

(A) Tetrapyrroles

(B) Flavonoids

(C) Alkaloides

(D) Terpenoides

87. Phytochrome mainly absorbs which wavelength of light ?

(A) Blue and UV

(B) Red and far-red

(C) Green and yellow

(D) UV and infrared

88. Phytochrome primarily regulates plant response to :

(A) Temperature

(B) Gravity

(C) Light

(D) Water

89. The biologically active form of phytochrome is :

(A) Pr

(B) Pfr

(C) Apochrome

(D) Protochrome

90. Phytochrome regulates gene expression mainly by :

(A) Acting as a transcription factor

(B) Acting as a membrane pump

(C) Directly synthesizing mRNA

(D) Fixing carbon

91. Phytochrome mediates which of the following developmental processes ?

(A) Apical dominance

(B) Photomorphogenesis

(C) Transpiration

(D) Nitrogen metabolism

92. Phytochrome influences de-etiolation by :

(A) Inhibiting chlorophyll synthesis

(B) Promoting stem elongation in dark

(C) Promoting chlorophyll synthesis in light

(D) Reducing leaf expansion

93. Seed germination in many photoblastic seeds is promoted by :

(A) UV-light

(B) Green light

(C) Red light

(D) Darkness

94. Plant cryptochromes are structurally similar to :

(A) Phytochrome

(B) Phototropin

(C) DNA photolyases

(D) Chlorophyll

95. The chromophore present in plant cryptochromes is :

(A) Phytochromobilin

(B) Flavinadenine dinucleotide (FA)

(C) Retinal

(D) Biliverdin

96. The N-terminal domain of cryptochrome binds :

(A) ATP

(B) FAD

(C) NADP

(D) Chlorophyll

97. The C-terminal extension (CCE) of cryptochromes is mainly involved in :

(A) Light absorption

(B) Signal transduction

(C) DNA repair

(D) Carbon fixation

98. Cryptochromes interact with which key transcription factor to regulate photomorphogenesis ?

(A) PIF3

(B) COP1

(C) RuBisCO

(D) Auxin

99. Unlike photolyases, plant cryptochromes :

(A) Repair UV-damaged DNA

(B) Contain no chromophore

(C) Function mainly as photoreceptors

(D) Work only in mitochondria

100. Cryptochromes play a role in regulation of :

(A) Nitrogen fixation

(B) Secondary growth

(C) Xylem differentiation

(D) Circadian rhythm

*(Only for Rough Work)*

4. Four alternative answers are mentioned for each question as—A, B, C & D in the booklet. The candidate has to choose the correct answer and mark the same in the OMR Answer-Sheet as per the direction :

**Example :**

**Question :**

Q. 1 (A) ● (C) (D)
Q. 2 (A) (B) ● (D)
Q. 3 (A) ● (C) (D)

Illegible answers with cutting and over-writing or half filled circle will be cancelled.

5. Each question carries equal marks. Marks will be awarded according to the number of correct answers you have.
6. All answers are to be given on OMR Answer Sheet only. Answers given anywhere other than the place specified in the answer sheet will not be considered valid.
7. Before writing anything on the OMR Answer Sheet, all the instructions given in it should be read carefully.
8. After the completion of the examination candidates should leave the examination hall only after providing their OMR Answer Sheet to the invigilator. Candidate can carry their Question Booklet.
9. There will be no negative marking.
10. Rough work, if any, should be done on the blank pages provided for the purpose in the booklet.
11. To bring and use of log-book, calculator, pager and cellular phone in examination hall is prohibited.
12. In case of any difference found in English and Hindi version of the question, the English version of the question will be held authentic.

**Impt. :** On opening the question booklet, first check that all the pages of the question booklet are printed properly. If there is any discrepancy in the question Booklet, then after showing it to the invigilator, get another question Booklet of the same series.

4. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार सम्भावित उत्तर—A, B, C एवं D हैं। परीक्षार्थी को उन चारों विकल्पों में से सही उत्तर छाँटना है। उत्तर को OMR आन्सर-शीट में सम्बन्धित प्रश्न संख्या में निम्न प्रकार भरना है :

**उदाहरण :**

**प्रश्न :**

प्रश्न 1 (A) ● (C) (D)
प्रश्न 2 (A) (B) ● (D)
प्रश्न 3 (A) ● (C) (D)

अपठनीय उत्तर या ऐसे उत्तर जिन्हें काटा या बदला गया है, या गोले में आधा भरकर दिया गया, उन्हें निरस्त कर दिया जाएगा।

5. प्रत्येक प्रश्न के अंक समान हैं। आपके जितने उत्तर सही होंगे, उन्हीं के अनुसार अंक प्रदान किये जायेंगे।
6. सभी उत्तर केवल ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर ही दिये जाने हैं। उत्तर-पत्रक में निर्धारित स्थान के अलावा अन्यत्र कहीं पर दिया गया उत्तर मान्य नहीं होगा।
7. ओ. एम. आर. उत्तर-पत्रक (OMR Answer Sheet) पर कुछ भी लिखने से पूर्व उसमें दिये गये सभी अनुदेशों को सावधानीपूर्वक पढ़ लिया जाये।
8. परीक्षा समाप्ति के उपरान्त परीक्षार्थी कक्ष निरीक्षक को अपनी OMR Answer Sheet उपलब्ध कराने के बाद ही परीक्षा कक्ष से प्रस्थान करें। परीक्षार्थी अपने साथ प्रश्न-पुस्तिका ले जा सकते हैं।
9. निगेटिव मार्किंग नहीं है।
10. कोई भी रफ कार्य, प्रश्न-पुस्तिका के अन्त में, रफ-कार्य के लिए दिए खाली पेज पर ही किया जाना चाहिए।
11. परीक्षा-कक्ष में लॉग-बुक, कैलकुलेटर, पेजर तथा सेल्युलर फोन ले जाना तथा उसका उपयोग करना वर्जित है।
12. प्रश्न के हिन्दी एवं अंग्रेजी रूपान्तरण में भिन्नता होने की दशा में प्रश्न का अंग्रेजी रूपान्तरण ही मान्य होगा।

**महत्वपूर्ण :** प्रश्नपुस्तिका खोलने पर प्रथमतः जाँच कर देख लें कि प्रश्न-पुस्तिका के सभी पृष्ठ भलीभाँति छपे हुए हैं। यदि प्रश्नपुस्तिका में कोई कमी हो, तो कक्षनिरीक्षक को दिखाकर उसी सिरीज की दूसरी प्रश्न-पुस्तिका प्राप्त कर लें।