



‘সমানো মন্ড্র: সমিতি: সমানী’

UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 5th Semester Examination, 2024

CC11-BOTANY

REPRODUCTIVE BIOLOGY OF ANGIOSPERMS

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- Name one gene for flower development in Angiosperms.
 - What is pollen viability?
 - Define MGU.
 - Define Polyembryony.
 - Distinguish between Polygonum type and Qenothera type embryo sac.
 - Who discovered double fertilization and in which plant?
 - What is a suspensor in an embryo?
 - What are pollinia?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Describe the structure of a typical ovule with suitable diagram. 5
 - Write short note on intra-ovarian and in-vitro pollination. $2\frac{1}{2} + 2\frac{1}{2}$
 - “Flower is a modified shoot” — Justify the statement. 5
 - Briefly describe any one method to test Pollen viability. What is sporopollenin? 4+1
 - What is tapetum? Differentiate between amoeboid and secretory tapetum. What are ubisch bodies? 1+3+1

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Write short notes on: $2\frac{1}{2} \times 4 = 10$
 - Obturator
 - Caruncle
 - Polyads
 - Cybrids
 - What do you mean by Self-incompatibility? What are the methods to overcome self-incompatibility? Define GSI and SSI. $1+6+1\frac{1}{2}+1\frac{1}{2}$
 - Discuss the development of a typical dicot embryo. What is proembryo? Write differences between monocot and dicot embryos. $7+1\frac{1}{2}+1\frac{1}{2}$
 - What is callose? Why callose deposition is significant in pollen biology? Who first observed pollen tube? Define massulae. Write a note on the pollen wall structure. $1+2+1+1+5$

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UNIVERSITY OF NORTH BENGAL
B.Sc. Honours 5th Semester Examination, 2024

CC12-BOTANY
PLANT PHYSIOLOGY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- Define imbibition.
 - What do you mean by water potential?
 - Define photoperiodism.
 - Name one short day plant.
 - What are phytochromes?
 - Which plant hormone causes apical dominance?
 - What is meant by physiologically dry soil?
 - Who proposed the pulsation theory of ascent of sap?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Write differences between: 2½+2½
 - Diffusion and facilitated diffusion
 - Symplast and apoplast.
 - Write short notes on: 2½+2½
 - Cohesion Tension theory
 - Manganese (Mn) as a micronutrient in plant.
 - Discuss the role of abscisic acid in controlling seed dormancy. 5
 - What are antitranspirants? Mention its significance. 2+3
 - Differentiate between active and passive absorption. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Write short notes on: 2½×4 = 10
 - Florigen concept
 - P-Proteins
 - Chelating agents
 - Vernalisation
 - Differentiate between Auxin and Gibberellins. Write a short note on the role of micronutrient in plant. 5+5
 - Describe the structure of phytochrome. Give a brief account of cryptochrome mediated photomorphogenic responses in plants. 5+5
 - Write short notes on: 5+5
 - Mechanism of Phloem loading
 - Role of ABC transporters.

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‘समानो मन्त्रः समितिः समानी’

UNIVERSITY OF NORTH BENGAL

B.Sc. Honours 5th Semester Examination, 2024

DSE-P1-BOTANY

Time Allotted: 2 Hours

Full Marks: 40

The figures in the margin indicate full marks.

The paper contains Paper-1, Paper-2, Paper-3, Paper-4, Paper-5, Paper-6, Paper-7, Paper-8 and Paper-9.

The candidates are required to answer any *one* from the *nine* papers except the one attempted at DSE2. Candidates should mention it clearly on the Answer Book.

PAPER-1**ANALYTICAL TECHNIQUES IN PLANT SCIENCES****GROUP-A**

1. Answer any **five** questions from the following:

1×5 = 5

- What is the full form of FISH?
- Define the term ‘goodness of fit’.
- Mention one importance of Pulse-Chase experiment.
- Mention the temperature and chemical used in cryofixation.
- What do you mean by shadow casting and freeze etching?
- What is the full form of SDS-PAGE?
- What is centrifugation?
- What are the wavelengths used for the detection of nucleic acids and proteins in spectrophotometer?

GROUP-B

2. Answer any **three** questions from the following:

5×3 = 15

- Discuss in brief the working principles of ultracentrifugation. Differentiate between sucrose density gradient and CsCl₂ gradient centrifugation. 3+2
- Differentiate between paper chromatography and column chromatography. 5
- Write the principles of mass spectrometry. 5
- Differentiate between:
 - Molecular sieve chromatography and affinity chromatography
 - Confocal and fluorescence microscopy.
- What is mean deviation? How does it differ from standard deviation? What do you mean by tabular and graphical data? 1+1+3

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) How TEM works, explain with ray diagram. What are the applications of spectrophotometry in biological sciences? 6+4
- (b) Write down the principles and procedure of SDS-PAGE. 3+7
- (c) Write an account on X-ray crystallography highlighting its principles and methods. 4+6
- (d) Selfing of a hybrid plant produced a population with 120 pink and 88 white flowers. Explain with χ^2 analysis, what does the results show? [table value 3.84 for 1 degree of freedom at 0.05 probability level] 10

PAPER-2

BIOINFORMATICS

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- (a) What are the different branches of Bioinformatics?
- (b) What do you understand by Biological databases?
- (c) What is the full form of NCBI?
- (d) Write the full form of BLAST.
- (e) What is PIR?
- (f) What do you mean by MSA?
- (g) Write the full form of BLOSUM.
- (h) Name a software used for phylogenetic analyses.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- (a) Write short notes on: 2½×2 = 5
- (i) QSAR (ii) PAM
- (b) Differentiate between: 2½×2 = 5
- (i) EMBL and DDBJ (ii) PSI-BLAST and RPS-BLAST.
- (c) What is the importance of phylogenetic analyses in bioinformatics? Explain in brief. 5
- (d) What do you mean by alignment? Why is alignment required for analysis? What is CLUSTAL omega? 1+1+3
- (e) Write a short note on the aim and the scope of bioinformatics. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) What is 'fasta'? What is 'pdb'? How are these two data formats different from each other? How can one use 'fasta' format as input to generate 'pdb' files as a search result while doing 'blastp'? 2+2+3+3
- (b) Define scoring matrix. What are rooted and unrooted trees? Write a short note on NJ and ML method of phylogeny. 2+4+4
- (c) What is GenBank? Describe the step by step process of sequence submission in NCBI. 2+8
- (d) Write short notes on: 5+5
- (i) PIR (ii) PDB

PAPER-3

STRESS BIOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
 - (a) What do you mean by PR proteins?
 - (b) Write down the full form of ROS.
 - (c) Distinguish between acclimation and adaptation.
 - (d) Define Oxidative stress.
 - (e) Write down the full form of SAR.
 - (f) What are osmoprotectants?
 - (g) Name one secondary messenger in plants.
 - (h) What is osmotic potential?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
 - (a) Briefly discuss the role of Calcium in stress signalling. 5
 - (b) Write the effect of reactive oxygen species in plants. 5
 - (c) Define Jasmonates. Mention any four important role of Jasmonates in plants. 1+4
 - (d) Describe briefly SAR and PR proteins. $2\frac{1}{2} + 2\frac{1}{2}$
 - (e) Enumerate the pathway of phospholipid signalling, briefly. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
 - (a) What do you mean by water stress? Name different types of Water stress. 2+2+6
Mention the effects and responses of plants against Water stress.
 - (b) Illustrate the responses of plants to salinity and temperature stress. 2+2+6
 - (c) What are compatible solutes? Write down its role in plant system. Enumerate the mechanism of compatible solute production. 1+3+6
 - (d) Discuss the physiological mechanism in relation to changes in root shoot ratio. 6+4
How does aerenchyma development protect the plant against environmental stress?

PAPER-4

PLANT BREEDING

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
 - (a) Define acclimatisation.
 - (b) What is inbreeding depression?
 - (c) Name two self-pollinated crops.
 - (d) What is emasculation?

- (e) Name any two physical mutagens.
- (f) What is mass selection?
- (g) Define allopolyploidy.
- (h) Give one example of Parthenocarpy.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
 - (a) What do you mean by QTL? Write down any four objectives of plant breeding. 1+4
 - (b) Enumerate the concept and mechanism of inheritance with examples. $2\frac{1}{2}+2\frac{1}{2}$
 - (c) Describe the role of mutation in crop improvement. 5
 - (d) Mention the advantages and disadvantages of cross pollinated crops. $2\frac{1}{2}+2\frac{1}{2}$
 - (e) Discuss the genetic basis of heterosis. 5

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
 - (a) Differentiate between: 5+5
 - (i) Monogenic and Polygenic inheritance
 - (ii) Pure line selection and mass selection.
 - (b) What are the plant genetic resources? Discuss in brief different types of plant genetic resources. 2+8
 - (c) Define quantitative inheritance. Briefly explain quantitative inheritance in relation to skin colour in humans. 1+9
 - (d) Explain briefly the history and application of heterosis. Enumerate the important achievements and undesirable consequences of plant breeding. $2\frac{1}{2}+2\frac{1}{2}+2\frac{1}{2}+2\frac{1}{2}$

PAPER-5

NATURAL RESOURCE MANAGEMENT

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
 - (a) Write the full form of CBD.
 - (b) What is biodiversity?
 - (c) Name two renewable energy sources.
 - (d) What is ex-situ conservation?
 - (e) What is EIA?
 - (f) What is sustainable utilization?
 - (g) What is silviculture?
 - (h) Define fossil fuel.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
 - (a) Write short notes on $2\frac{1}{2} \times 2 = 5$
 - (i) GIS
 - (ii) Aquifers

- (b) Briefly discuss about the various procedures of soil restoration. 5
- (c) Discuss the ecological and economic aspects of sustainable utilization. $2\frac{1}{2} \times 2 = 5$
- (d) Write an account on Ramsar convention. 5
- (e) What are the approaches can be taken into account to support sustainable utilization of our natural resources? 5

GROUP-C

3. Answer any **two** questions from the following: $10 \times 2 = 20$
- (a) What are the threats that fresh water reservoirs are facing? What are the management strategies to minimize the crisis? $3+7$
- (b) Describe the management strategies to restore biodiversities. State the significance of National Biodiversity Action Plan. $6+4$
- (c) Write short notes on: $5+5$
- (i) Forest cover and its significance
- (ii) Participatory Resource Appraisal (PRA).
- (d) Discuss how IPR is implemented to protect biodiversity. Write an account on ecological footprint. $5+5$

PAPER-6

HORTICULTURAL PRACTICES AND POST-HARVEST TECHNOLOGY

GROUP-A

1. Answer any **five** questions from the following: $1 \times 5 = 5$
- (a) Write the full form of IPM.
- (b) Define PGRs.
- (c) Name two common diseases of fruit crops.
- (d) Name two common weeds.
- (e) What is budding?
- (f) Name two ornamental plants.
- (g) Give one advantage of meristem culture.
- (h) What is food safety?

GROUP-B

2. Answer any **three** questions from the following: $5 \times 3 = 15$
- (a) Briefly discuss the importance of horticulture in providing food and nutritional security. 5
- (b) What is hydroponics? Briefly outline the process of hydroponics. $1+4$
- (c) Describe the role of micropropagation in horticulture. 5
- (d) Write an account on Japanese garden.
- (e) What are the methods of minimizing losses during storage and transportation taken up by a cultivator?

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
 - (a) Write notes on:
 - (i) Crop sanitation
 - (ii) Biofertilizers
 - (b) How the germplasm of horticultural crops can be conserved and documented? 5+5
Mention different IPR issues related to the germplasm conservation.
 - (c) Write down the scientific names and salient features of the following: (1+2)×3+1
 - (i) Orchid (any)
 - (ii) Cactus (any)
 - (iii) Gerbera
 Define climbers.
 - (d) Write notes on: 5+5
 - (i) Ecotourism
 - (ii) Irrigation methods

PAPER-7

RESEARCH METHODOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
 - (a) What is molality?
 - (b) What is the use of GFP?
 - (c) Name a chemical used in tissue maceration.
 - (d) Give an example of 'acidic' dye.
 - (e) Name a plant species that is used as a model organism in genetic analysis.
 - (f) Name a fixative used in tissue preparation.
 - (g) Define peel mount.
 - (h) Define genomics.

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
 - (a) Write a short note on plagiarism. 5
 - (b) Discuss the principle of maintaining laboratory notebook. 5
 - (c) Differentiate between physical fixation and chemical fixation of tissues. 5
 - (d) Give a brief account of safety measures, used in handling toxic chemicals. 5
 - (e) What is the scale bar? Write its application in microscopic imaging of tissues. 2+3

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
 - (a) When do you use microtome? Describe the procedure for preparing paraffin block with the material. Mention the demerits of microtome. 2+6+2
 - (b) Write short notes on: 5+5
 - (i) Poster presentation
 - (ii) Abbreviations and nomenclature used in scientific writing.
 - (c) Discuss about different types of graphs used in research with suitable examples. 10
 - (d) Write down the significance of staining in the field of biological research. 2+6+2
Classify stain depending on their chemistry. Write a short note on fluorochrome.

PAPER-8

INDUSTRIAL AND ENVIRONMENTAL MICROBIOLOGY

GROUP-A

1. Answer any **five** questions from the following: 1×5 = 5
- Name the fungus producing Penicillin.
 - What is air lift fermenter?
 - Write down the full form of TOC.
 - Name one plant with mycorrhizal association.
 - Define lyophilization.
 - What do you mean by fermentation?
 - Mention one use of ethanol in laboratory.
 - What is B.O.D?

GROUP-B

2. Answer any **three** questions from the following: 5×3 = 15
- Define a bioreactor. What are different types of laboratory bioreactor? What do you mean by Pilot scale fermenters? 1+2+2
 - Describe the role of microorganisms involved in production of antibiotic. 5
 - What are the two types of Mycorrhiza? Describe briefly the symbiotic association of mycorrhiza with roots. 1+4
 - Define water pollution. Mention the role of microbes in domestic water treatment. 1+4
 - Write a note on isolation of microorganism from soil and air. $2\frac{1}{2} + 2\frac{1}{2}$

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- Write a note on microorganisms as indicators of water quality. Describe the determination of TDS and TOC of water sample. 5+5
 - Illustrate the process of hands on microbial fermentation for the production and estimation of enzyme-amylase. 5+5
 - Write short notes on: $2\frac{1}{2} \times 4 = 10$
 - Tower fermenter
 - Fluidized bed bioreactors
 - Spray drying
 - Ultrafiltration
 - Elaborate large scale applications of immobilized enzymes-glucose isomerase and penicillin acylase. 5+5

PAPER-9

BIOSTATISTICS

GROUP-A

1. Answer any **five** questions from the following questions: 1×5 = 5
- What is the significance of histogram?
 - What is alternative hypothesis?

- (c) Define correlation.
 (d) What is meant by ordinal data?
 (e) What is standard error?
 (f) Find the geometric mean of 27 and 12.
 (g) What do you understand by degree of freedom?
 (h) What is random sampling?

GROUP-B

2. Answer any **three** of the following questions: 5×3 = 15
- (a) How is a table formed? Give its components. 2+3
- (b) Lengths of 15 internodes of a herbaceous plant were recorded as (in centimetres): 30, 32, 31, 38, 35, 37, 35, 42, 41, 36, 38, 42, 39, 40 and 44. Calculate the mode of above observation. 5
- (c) Write a note on Computer application in biostatistics. 5
- (d) What are ogives? Explain the methods employed for the collection of primary data. 2+3
- (e) What is arithmetic mean? What are the different types of arithmetic mean? Find the arithmetic mean from the following data where the rate of respiration of 43 plants and their respective frequency is given: 5

Rate of respiration	2	16	20	30	39	40	45	49	50	65	70	79	80
Frequency	3	4	7	7	1	3	5	1	2	2	5	1	2

GROUP-C

3. Answer any **two** questions from the following: 10×2 = 20
- (a) Find the geometric mean for the data given below: 8+2

Marks	4-8	8-12	12-16	16-20	20-24	24-28
Frequency	6	10	18	30	15	12

Differentiate between arithmetic mean and geometric mean.

- (b) Write short notes on: 5+5
- (i) Histogram
- (ii) Correlation and regression.
- (c) What is sampling? Describe the different methods of sampling. What are the criteria for good sampling? 1+7+2
- (d) What do you mean by χ^2 -test of goodness of fit? In F₂ generation, Mendel obtained 620 tall plants and 188 dwarf plants out of total 808 plants. Also, test whether the result is in accordance with Mendelian monohybrid ratio or that they deviate from it. (At 1 degree of freedom, $\chi^2_{\alpha=0.05} = 3.84$).

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