

Total No. of Questions : 4]

SEAT No. :

PE-4652

[Total No. of Pages : 2

[6516]-1
M.Sc. (Part - I)
BOTANY
BOT-501-MJ : Plant Taxonomy - I (Algae & Fungi)
(2023 Credit Pattern) (NEP 2020) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Define mycology.
- b) Give examples of prokaryotic forms of algae.
- c) What is red tide?
- d) Define lichenized fungi?
- e) What is biocontrol?

Q2) a) Explain in brief any one of the following :

[6]

- i) Explain classification of algae proposed by G.M. Smith.
- ii) Describe thallus organisation & reproduction of chlorophyta.

b) Describe any one of the following :

[4]

- i) Explain about fungal bioprospecting.
- ii) Give Ainsworth (1973) classification system of fungi upto classes.

P.T.O.

Q3) a) Explain in brief any one of the following : [6]

- i) Explain general characters & Thallus structure of ascomycetes.
- ii) Write habitat structure & organisation of lichen.

b) Describe any one of the following : [4]

- i) Describe the role of algae in various industries & write its application.
- ii) Describe reproduction in phaeophyta.

Q4) Write notes on any four of the following : [10]

- a) General characters of algae.
- b) Algal blooms.
- c) ICN for Algae.
- d) Mycorrhizae.
- e) Artificial key for fungal identification.
- f) Non lichenized fungi.



Total No. of Questions : 4]

SEAT No. :

PE-4653

[Total No. of Pages : 2

[6516]-2

M.Sc. (Part - I)

BOTANY

BOT - 502 MJ : PLANT TAXONOMY - II

(Bryophytes and Pteridophytes)

(2023 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.
- 2) Neat labelled diagrams must be drawn wherever necessary.
- 3) Figures to the right indicate full marks.

Q1) Answer the following questions :

[5]

- a) Define actinostele.
- b) Mention types of rhizoids in Marchantiales.
- c) What is cercinate vernation in ferns?
- d) Write any two xerophytic characters in Equisetum.
- e) What is meant by alternation of generation?

Q2) a) Explain in brief any one of the following :

[6]

- i) Describe the structure of sporophyte in Anthoceros.
- ii) Explain the theory of sterilization & reduction in bryophytes.

b) Describe any one of the following :

[4]

- i) Write general characteristics of class Psilopsida.
- ii) Explain reproduction in Pteropsida.

P.T.O.

Q3) a) Explain in brief any one of the following: [6]

- i) Give an outline of classification of pteridophytes by Sporne (1975).
- ii) Describe reproduction in Selaginella.

b) Describe any one of the following: [4]

- i) Give morphological characters of Plagiochasma.
- ii) Write affinities of thallophytes with pteridophytes.

Q4) Write notes on any four of the following: [10]

- a) Equisetum cone
- b) Systematic position of Pteris.
- c) Sporophyte anatomy in Psilopsida.
- d) Rhizoids & scales
- e) Salient features of Calobryales.
- f) General characteristics of bryophytes



Total No. of Questions : 4]

SEAT No. :

PE-4654

[Total No. of Pages : 2

[6516]-3
M.Sc. (Part - I)
BOTANY
BOT-503 MJ: Plant Physiology
(2023 Pattern) (Semester - I) (NEP 2020)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) All questions are compulsory*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Define photosynthesis.
- b) What is photorespiration?
- c) Define Gluconeogenesis.
- d) What is Biotic Stress?
- e) Define stress.

Q2) a) Explain in brief any one of the following.

[6]

- i) Explain the role of reaction centre in photosynthesis.
- ii) Explain the process of glycolysis.

b) Describe any one of the following.

[4]

- i) Describe the Biosynthesis of Brassinosteroids.
- ii) Describe the structure and function of cryptochrome.

P.T.O.

Q3) a) Explain in brief any one of the following. **[6]**

- i) Explain the process of phloem loading.
- ii) Explain the response of plant against pathogenic stress.

b) Describe any one of the following. **[4]**

- i) Describe KOK curve.
- ii) Describe the alternative electron acceptor in Electron transport chain.

Q4) Write notes on any four of the following : **[10]**

- a) RUBISCO
- b) CAM
- c) Cyanide Resistant pathway.
- d) Physiological importance of Polyamines.
- e) Catabolism of Brassinosteroids.
- f) Phytochrome mediated singling mechanism.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

PE4655

[6516]-4

M.Sc.-I

BOTANY

**BOT-504-MJ : Plant Biochemistry
(2023 Credit Pattern) (NEP-2020) (Semester-I)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following questions.

[5]

- a) What are co-enzymes?
- b) Draw the structure of Glycine.
- c) What are Heat Shock proteins?
- d) Define Normality.
- e) What are secondary Metabolites?

Q2) a) Explain in brief any one of the following.

[6]

- i) Allosteric inhibition with reference to ATCase.
- ii) Ramchandran plot.

b) Describe any one of the following.

[4]

- i) Biosynthesis of terpenes.
- ii) Nucleotide synthesis.

P.T.O.

Q3) a) Explain in brief any one of the following. [6]

- i) Alpha-oxidation of fatty acids.
- ii) Shikimate pathway and its role in biosynthesis of secondary metabolites.

b) Describe any one of the following. [4]

- i) Isozymes with reference to LDH.
- ii) Storage proteins.

Q4) Write notes on any four of the following. [10]

- a) Hydropathy plot.
- b) Michaelis-Menton equation.
- c) Proline metabolism.
- d) Mechanism of buffer action.
- e) Nucleotide degradation.
- f) Glyoxylate cycle.



Total No. of Questions :4]

SEAT No. :

PE-4656

[Total No. of Pages : 2

[6516]-5

M.Sc. (Part - I)

BOTANY

**BOT505MJ : Green Belt and Green Credit
(2023 Credit Pattern) (Semester - I) (NEP 2020)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions.

[5]

- a) What do you mean by Green Credit?
- b) What is RRR in mitigation?
- c) Define Green belt.
- d) Define Ecomark.
- e) What are Mangroves?

Q2) a) Explain in brief any one of the following.

[6]

- i) Explain the role of plants in mitigation of pollution.
- ii) Explain Maharashtra Tree Act - 1975 and add a note on ammendments of Tree Act (2016).

b) Describe any one of the following.

[4]

- i) Describe the features of plantations under green belt with examples.
- ii) Describe the steps involved in Nursery development for greenbelt.

P.T.O.

Q3) a) Explain in brief any one of the following. [6]

- i) Explain the strategies and rules for green marking and ecomark.
- ii) Explain the challenges and opportunities in mangrove restoration.

b) Describe any one of the following. [4]

- i) Describe the features of Tree plantation based Green Credits.
- ii) Describe importance of waste management.

Q4) Write note on any four of the following. [10]

- a) Aims and objectives of Green belt plantation design.
- b) Importance of sustainable agriculture based green credit.
- c) Management of forest nursery.
- d) Stages in waste Management
- e) Importance of green credit program
- f) Significance of Green belt.



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

PE4657

[6516]-6

M.Sc. - I

BOTANY

**BOT-510 MJ : Landscape and Gardening
(2023 Credit Pattern) (Semester - I) (NEP 2020)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions.

[5]

- a) Define Landscape development.
- b) What are pergolas.
- c) Enlist any two climbers used in landscape gardening.
- d) What is basic planning in landscaping.
- e) Enlist the types of irrigation system.

Q2) a) Explain in brief any one of the following.

[6]

- i) Define soft elements? Explain any two soft elements used in landscape gardening.
- ii) Explain in detail the principle of scale and proportion in landscape gardening.

b) Describe any one of the following.

[4]

- i) Explain the process of landscape designing for hospitals.
- ii) Write note on the importance of irrigation.

P.T.O.

Q3) a) Explain in brief any one of the following. **[6]**

- i) How maintenance practices are carried out in landscape gardening.
- ii) Define landscape gardening. Explain any one type in brief.

b) Describe any one of the following. **[4]**

- i) Write note on scope and importance of landscape gardening.
- ii) Write in brief succulants used as soft element in landscape gardening.

Q4) Write notes on any four of the following. **[10]**

- a) Use of grid in landscape designing.
- b) Landscape in Industries.
- c) Lawn as soft element in landscape gardening.
- d) Entrance in landscape gardening
- e) Focal point
- f) Walkway as hard element in landscape gardening.



Total No. of Questions : 4]

SEAT No. :

PE-4658

[Total No. of Pages : 2

[6516]-7

M.Sc. (Part - I)

BOTANY

**BOT-511-MJ : Post-Harvest Technology of Commercial Crops
(2023 Credit Pattern) (NEP 2020) (Semester - I)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

Q1) Answer the following questions : [5]

- a) Harvest management.
- b) Define Blanching.
- c) Write any one benefits of packaging.
- d) Define Vacuum Cooling.
- e) What is mean by Grading.

Q2) a) Explain in brief any one of the following : [6]

- i) Explain the chemical methods for identification of maturity?
- ii) Give an account on post harvest treatment.

b) Describe any one of the following : [4]

- i) Describe the control of pest & disease during storage.
- ii) Describe Hazard analysis & critical control points (HACCP)

Q3) a) Explain in brief any one of the following : [6]

- i) Explain the handling techniques to minimize physical damage?
- ii) Give an account on market analysis & target markets.

b) Describe any one of the following : [4]

- i) Describe the significance of harvest management.
- ii) Describe Any two techniques for preserving & Enhancing product quality.

P.T.O.

Q4) Write notes on any four of the following.

[10]

- a) Importance of harvest management.
- b) Define plant Growth regulator.
- c) Necessary cares during harvesting.
- d) Modern packaging system.
- e) Control measures for insect & pest.
- f) Methods for maintaining product quality.



Total No. of Questions : 4]

SEAT No. :

PE-4659

[Total No. of Pages : 2

[6516]-8

M.Sc. (Part - I)

BOTANY

**BOT-512-MJ : Biodiversity Conservation and Utilization
(2023 Credit Pattern) (NEP 2020) (Semester - I)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Figures to the right indicate full marks.*
- 3) *Neat labelled diagrams must be drawn wherever necessary.*

Q1) Answer the following questions : [5]

- a) What is keystone species?
- b) What is Biodiversity?
- c) What are the strategies of sustainable Utilization?
- d) What are the types of Bioresources.
- e) Give full form of ITTA.

Q2) a) Explain in brief any one of the following : [6]

- i) Biodiversity hotspots in India.
- ii) Use of plant Biodiversity.

b) Describe any one of the following : [4]

- i) Phytogeographical regions of India.
- ii) Types of diversity.

Q3) a) Explain in brief any one of the following : [6]

- i) In - Situ conservation.
- ii) Biodiversity management.

b) Describe any one of the following : [4]

- i) Processing and end products of Bioresources.
- ii) Biosphere reserves.

P.T.O.

Q4) Write notes on any four of the following.

[10]

- a) Introduction to Biodiversity.
- b) Endemism in India.
- c) Chico River dam and tribal campaign.
- d) Social approach for conservation.
- e) Bio-Resources.
- f) Participatory forest.



Total No. of Questions : 4]

SEAT No. :

PE-4660

[Total No. of Pages : 2

[6516]-9

M.Sc. (Part - I)

BOTANY

**513 MJ : Integrated Pest Management
(2023 Credit Pattern) (NEP 2020) (Semester - I)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Write any two principles of IPM.
- b) What is diversification?
- c) What is pesticide resistance?
- d) Write types of biopesticides.
- e) Write new technologies in IPM.

Q2) a) Explain in brief any one of the following :

[6]

- i) Explain application techniques and safety precautions for pesticides.
- ii) What are the common symptoms of damage by pests? How they are detected?

b) Describe any one of the following :

[4]

- i) Explain socio-economic implications of pest control methods.
- ii) Describe decision making process in IPM.

P.T.O.

Q3) a) Explain in brief any one of the following : **[6]**

- i) Explain global perspectives on IPM implementation.
- ii) What is pesticide toxicity? Describe different methods of evaluation of it.

b) Describe any one of the following : **[4]**

- i) Describe guiding principles of IPM.
- ii) Explain in brief use of biological control in IPM.

Q4) Write note on any four of the following : **[10]**

- a) Crop rotation
- b) Habitat manipulation
- c) Genetic control methods
- d) Ecological interaction between pest and natural enemies
- e) Types of biopesticides
- f) Designing IPM programmes



Total No. of Questions :4]

SEAT No. :

PE-4661

[Total No. of Pages : 2

[6516]-10
M.Sc. (Part - I)
BOTANY
BOT-514-MJ : Seed Science
(2023 Pattern) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn whenever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions.

[5]

- a) What are Seed?
- b) Enlist Causes of seed dormancy.
- c) What is aim of seed Act 1966?
- d) Enlist Integrated management of seed borne diseases.
- e) Define - Seed Entomology.

Q2) a) Explain in brief any one of the following.

[6]

- i) What are seed science? Give the Difference between seed and grain.
- ii) Explain seed legislation in India and Give types of seed legislation.

b) Describe any one of the following.

[4]

- i) Seed Viability - Explain.
- ii) Structure of Endosperm

P.T.O.

Q3) a) Explain in brief any one of the following. **[6]**

- i) What are Seed Quality testing? Explain Parameters for testing seed Quality.
- ii) Explain Relation of Insect & Plant. Give way of infestation control measures.

b) Describe any one of the following. **[4]**

- i) Give the Diff. Between orthodox Recalcitrant seed.
- ii) Explain seed vigor

Q4) Write notes on any four of the following. **[10]**

- a) Mechanical Seed Dormancy
- b) Quarantine seed
- c) Moisture testing
- d) Methods of Breaking seed dormancy
- e) Grow out test (GOT)
- f) Factors Affecting Seed germination



Total No. of Questions : 4]

SEAT No. :

PE-4662

[Total No. of Pages : 2

[6516]-11

M.Sc. (Part - I)

BOTANY

**BOT - 541 MN : RESEARCH METHODOLOGY IN PLANT
SCIENCES**

(2023 Credit Pattern) (NEP 2020) (Semester - I)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Write any two applications of research methodology.
- b) What is primary data?
- c) Give formula for Chi - Square test.
- d) Difference between mode and mean.
- e) Why H-index used in research paper?

Q2) a) Explain in brief any One of the following :

[6]

- i) Explain in details types of research.
- ii) Describe the characteristics and sources of hypothesis.

b) Describe any one of the following :

[4]

- i) Describe the mechanics of writing research paper.
- ii) Explain the concept and importance of citation in research.

P.T.O.

Q3) a) Explain in brief any one of the following: [6]

- i) Explain the various statistical methods of data analysis.
- ii) Explain the data interpretation software - SPSS.

b) Describe any one of the following: [4]

- i) Techniques involved in defining research problem.
- ii) Explain the purpose of literature review.

Q4) Write notes on any four of the following: [10]

- a) Fundamental research
- b) Review article
- c) Intellectual Property Right (IPR)
- d) Journal Citation Report (JCR)
- e) Plagiarism
- f) Null hypothesis.



Total No. of Questions : 4]

SEAT No. :

PE4663

[Total No. of Pages : 2

[6516]-21

M.Sc. (Part-I)

BOTANY

**BOT-551 MJ : Plant Taxonomy - III (Paleobotany and Gymnosperms)
(NEP 2020) (2023 Credit Pattern) (Semester - II)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions.

[5]

- a) Mention the names of Era given in Geological time scale.
- b) Write the name of leaf genus of pentoxylae.
- c) Mention any two characters of Psilophytales.
- d) Any two characters of Mesoxylon.
- e) Mention any two features of pteridospermales

Q2) a) Attempt any one of the following.

[6]

- i) Write about salient features of lepidodendrales and explain internal morphology of Lepidodendron.
- ii) Describe the external & internal morphology of calamites with neat labelled diagram.

b) Attempt any one of the following.

[4]

- i) Explain any four types of fossils.
- ii) Give the salient features of order cycadeoidates.

P.T.O.

Q3) a) Attempt any one of the following. **[6]**

- i) With the help of diagram explain anatomy of stem of Taxus.
- ii) Describe the male reproductive structures of Gnetum

b) Attempt any one of the following. **[4]**

- i) Write about affinities of Gymnosperms. With pteridophytes.
- ii) Write about salient features of order coniferales.

Q4) Write notes on any four of the following. **[10]**

- a) Genera concept
- b) Williamsonia
- c) Economic importance of Gymnosperms.
- d) Ephedra
- e) Welusitschials
- f) Compression



Total No. of Questions : 4]

SEAT No. :

PE-4664

[Total No. of Pages : 2

[6516]-22
M.Sc.(Part-I)
BOTANY
BOT-552 MJ: Taxonomy of Angiosperms
(2023 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Define Systematics.
- b) What is holotype?
- c) Define species.
- d) Give full form of APG.
- e) Enlist any two contributions of W. Roxburgh.

Q2) a) Attempt any one of the following:

[6]

- i) Discuss in brief about history of ICN.
- ii) Give outline of Bentham and Hooker's system of Classification.

P.T.O.

b) Attempt any one of the following: [4]

- i) Give merits and limitations of Artificial system of classification.
- ii) Explain Principle of priority.

Q3) a) Attempt any one of the following: [6]

- i) Give general characters and economic importance of family Asteraceae.
- ii) Give systematic position and economic importance of family Areaceae.

b) Attempt any one of the following: [4]

- i) Give systematic position with reasons of family orchidaceae.
- ii) Give morphological variations in Family Lentibulariaceae.

Q4) Write notes on any four of the following: [10]

- a) Taxonomic species concept.
- b) Major contributions of J.D. Hooker
- c) Objectives of Systematics.
- d) Flower structure in poaceae.
- e) Affinities of family Nymphaeaceae
- f) Economic importance of Apiaceae.



Total No. of Questions : 4]

SEAT No. :

PE-4665

[Total No. of Pages : 2

[6516]-23

M.Sc. (Part - I)

BOTANY

**BOT - 553 MJ : Cytogenetics and Plant Breeding
(2023 Credit Pattern) (NEP 2020) (Semester - II)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) What is cytogenetics?
- b) Define karyotype
- c) What is male sterility?
- d) What is lethal mutation?
- e) Define Euploidy.

Q2) a) Explain in brief any one of the following :

[6]

- i) What is clonal selection? Give procedure and achievements of clonal selection.
- ii) What is mass selection? Give procedure advantages and disadvantages of mass selection.

b) Describe any one of the following :

[4]

- i) LOD score for linkage testing with suitable example.
- ii) Mapping by tetrad analysis in Neurospora.

P.T.O.

Q3) a) Explain in brief any one of the following: [6]

- i) Cytological consequence of crossing over in inversion and translocation heterozygotes.
- ii) Evolution of major crop plant-wheat.

b) Describe anyone of the following: [4]

- i) Objectives, types and procedure of hybridization.
- ii) What is inbreeding depression? Add a note on genetic basis of inbreeding depression.

Q4) Write notes on any four of the following: [10]

- a) Techniques of Cytogenetics.
- b) Multiplication and distribution.
- c) Advantages and disadvantages of Pureline Selection.
- d) Causes and detection of mutation.
- e) Hybrid Vigor.
- f) Types of mutation.



Total No. of Questions : 4]

SEAT No. :

PE-4666

[Total No. of Pages : 2

[6516]-24

M.Sc. (Part - I)

BOTANY

BOT - 554 MJ : Molecular Biology

(2023 Credit Pattern) (NEP - 2020) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) What are endonucleases?
- b) Enlist types of histone subunits.
- c) Define transcription.
- d) Write about universality of genetic code.
- e) Give role of DNA Poly-I in eukaryotes.

Q2) a) Attempt any one of the following :

[6]

- i) Explain DNA packaging in eukaryotic organisms with suitable diagram.
- ii) Define DNA repair and explain base excision repair mechanism with suitable diagram.

b) Attempt any one of the following :

[4]

- i) Role of DNA Ligase.
- ii) Describe regulation of replication and fidelity.

P.T.O.

Q3) a) Attempt any one of the following : [6]

- i) Define genetic code and explain properties of genetic code.
- ii) What is operon? Describe the mechanism of Lac operon.

b) Attempt anyone of the following. [4]

- i) Add a note on methylation in mRNA Processing.
- ii) Describe structure and function of t-RNA.

Q4) Write notes on any four of the following. [10]

- a) Phosphatases
- b) Need of DNA Packaging
- c) Deamination
- d) Spliceosome
- e) Chaperons
- f) Positive gene regulation



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

PE4667

[6516]-25

M.Sc. - I

BOTANY

BOT 555 MJ: Pharmacognosy

(2023 Credit Pattern) (NEP 2020) (Semester - II)

Time : 2Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions.

[5]

- a) Give the definition of Pharmacognosy.
- b) Give the full form of HPLC.
- c) What is Ethnobotany?
- d) Give any two roles of Ethno-Pharmacology.
- e) Write any two uses of Carotenoids.

Q2) a) Attempt any one of the following.

[6]

- i) Give an account of different extraction methods of crude drugs.
- ii) Write about different factors affecting the cultivation of crude drugs.

b) Attempt any one of the following

[4]

- i) Describe different evaluation methods of adulteration.
- ii) What is adulteration in herbal drugs? Describe the types of adulteration.

P.T.O.

Q3) a) Attempt any one of the following. **[6]**

i) Write the source, macroscopic characters & applications of Aloe Vera.

ii) Explain the chemical nature & characteristic features of limonoids.

b) Attempt any one of the following. **[4]**

i) Write the medicinal and health benefits of Saponins.

ii) Give the applications of Shatavari.

Q4) Write notes on any four of the following **[10]**

a) Indian trade in medicinal & Aromatic plants.

b) Pesticide Residue

c) Disease management in cultivation of medicinal plants

d) Phenolic acids

e) Vitamins

f) Herbal drugs



Total No. of Questions : 4]

SEAT No. :

[Total No. of Pages : 2

PE4668

[6516]-26

M.Sc. (Part - I)

BOTANY

**BOT-560-MJ : Hydroponics Technology
(2023 Credit Pattern) (Semester - II) (NEP 2020)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Figures to the right indicate full marks.*
- 3) Neat labelled diagrams must be drawn whenever necessary.*

Q1) Answer the following questions:

[5]

- a) Define hydroponics.
- b) Give any two deficiency symptoms of nitrogen.
- c) Define hydroponics entrepreneurship.
- d) Enlist the names of macro & micro-nutrients.
- e) What is aeroponics?

Q2) a) Attempt any one of the following:

[6]

- i) Explain the impact of light and temperature on plants grown in hydroponics.
- ii) Explain the effect of humidity and CO₂ on plants grown in hydroponics.

b) Attempt any one of the following:

[4]

- i) Explain in brief history & origin of soil less culture.
- ii) Give the significance of hydroponics entrepreneurship.

P.T.O.

Q3) a) Attempt any one of the following: **[6]**

- i) Explain in detail role of macronutrients used in hydroponics.
- ii) Describe in detail deep water culture.

b) Attempt any one of the following: **[4]**

- i) Give brief protocol for cultivation of tomato through dutch bucket method.
- ii) Explain weed management in hydroponics.

Q4) Write notes on any four of the following : **[10]**

- a) Commercial hydroponics production.
- b) Ebb & flow irrigation system.
- c) Disease and pest control in hydroponics.
- d) Hogland solution
- e) Effect of pH on plants grown in hydroponics.
- f) Future development in hydroponics.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

PE4669

[6516]-27

M.Sc.-I

BOTANY

**BOT-561 MJ : Post-Harvest Technology of NTFP's
(Non-Timber Forest Products)
(2023 Credit Pattern) (NEP-2020) (Semester-II)**

Time :2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever neccessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions.

[5]

- a) Write any two methods of canes conservation
- b) Define Oleoresins.
- c) Write full form of NTFP's.
- d) What is post harvest management?
- e) Give any two plants used for poison.

Q2) a) Explain in brief any one of the following.

[6]

- i) Explain classification & uses of resins.
- ii) Give the methods of extraction & storage of essential oils.

b) Describe any one of the following.

[4]

- i) Explain the processing of Fibers.
- ii) Write a note on sustainable development & Traditional knowledge.

P.T.O.

Q3) a) Explain in brief any one of the following. [6]

- i) What are cutch? Explain Extraction & uses of cutch.
- ii) Explain trans-nature & classification of Tannin yeilding plants.

b) Describe any one of the following. [4]

- i) Write the scope and Importance of NTFP's
- ii) Explain the factors affecting gum formation.

Q4) Write notes on any four of the following. [10]

- a) Cultivation of Bamboo
- b) Formation of Resins in plants.
- c) Methods of extraction for non-essential oils.
- d) Primary processing of NTFP's
- e) Institutes working in NTFP's
- f) Wild fruits



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

PE4670

[6516]-28

M.Sc.-I

BOTANY

**BOT-562 MJ : Plant Resource Management & Geo-Spatial
Techniques**

(2023 Credit Pattern) (NEP-2020) (Semester-II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever neccessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following questions.

[5]

- a) Write any two significance of vavilvo's center of origin in understanding the evolution of Crops plants.
- b) What is remote sensing?
- c) Give any two economic importance of timber.
- d) Define Sacred groves.
- e) Which is a good strategy for conservation and protecting the environment?

Q2) a) Explain in brief any one of the following.

[6]

- i) Explain in details the methods of biodiversity Conservation.
- ii) Describe the origin of cultivated plants.

b) Describe any one of the following.

[4]

- i) Elaborate the role of remote sensing in Agriculture.
- ii) Explain the advantages and limitations of GPS.

P.T.O.

Q3) a) Explain in brief any one of the following. [6]

- i) Explain in detail GIS.
- ii) Describe principle and applications of Geospatial techniques.

b) Describe any one of the following. [4]

- i) Describe in details plants used in beverages industry.
- ii) Explain phytoremediation.

Q4) Write notes on any four of the following. [10]

- a) GIS Techniques.
- b) Environment education.
- c) Plant Resources
- d) Sustainable development
- e) Natural dyes
- f) Economic importance of Gum



Total No. of Questions : 4]

SEAT No. :

PE-4671

[Total No. of Pages : 2

[6516]-29

M.Sc. (Part - I)

BOTANY

BOT-563-MJ : Plant Microbe Interactions

(2023 Credit Pattern) (NEP 2020) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Give source of endophytic fungi.
- b) Enlist factors affecting growth of AM fungi.
- c) Give source of endophytic Bacteria.
- d) Give control measures of Nematode.
- e) Define plant lectins.

Q2) a) Attempt any one of the following :

[6]

- i) Explain defence mechanism in plant during AMF symbiosis.
- ii) Describe mechanism of nutrient uptake and stress tolerance in plants through endophytic bacteria.

b) Attempt any one of the following :

[4]

- i) Explain how do plant nad AMF exchange nutrients & sugar.
- ii) Explain interaction of Rhizobium.

P.T.O.

Q3) a) Attempt any one of the following : [6]

- i) Discuss mechanism of stomatal and cell wall damaging enzymes in bacterial pathogenesis of plants.
- ii) Explain functions of type-III effector protein during pathogen host interaction.

b) Attempt any one of the following : [4]

- i) Discuss control measures of Beet Armyworm. Give role of IPM in it.
- ii) Explain zig-zag model of plant immunity.

Q4) Write short note on any four of the following : [10]

- a) Phytopathogenetic insects.
- b) Diet-Breadth
- c) Control measures of Nematode.
- d) Nematopathogenic fungi.
- e) Endophytic fungi.
- f) Role of SA & JA in plant defence.



Total No. of Questions : 4]

SEAT No. :

PE-4672

[Total No. of Pages : 2

[6516]-30
M.Sc. (Part - I)
BOTANY
BOT-564-MJ : Seed Technology
(2023 Pattern) (Semester - II)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Define seed technology.
- b) What is rouging?
- c) Define sampling.
- d) What is seed certification?
- e) Write any two objectives of seed processing.

Q2) a) Attempt any one of the following :

[6]

- i) Give an account of general principles of seed production.
- ii) Describe in detail procedure of field inspection.

b) Attempt any one of the following :

[4]

- i) Discuss the scope and importance of Seed Technology.
- ii) Explain the role of National Seed Corporation.

P.T.O.

Q3) a) Attempt any one of the following : [6]

- i) Explain the procedure of seed sampling.
- ii) Explain the general layout of seed processing unit.

b) Attempt any one of the following : [4]

- i) Give an account of the objectives of seed certification.
- ii) Define seed treatment. Add a note on its benefits.

Q4) Write notes on any four of the following : [10]

- a) National Seeds Programme (NSP)
- b) Power and duties of seed Inspector.
- c) Self-Incompatibility.
- d) Certification sample.
- e) Duties of seed certification officer.
- f) Private Seed Enterprises.



Total No. of Questions : 7]

SEAT No. :

PE-4673

[Total No. of Pages : 2

[6516]-31
M.Sc. (Part - II)
BOTANY
BOT-601A MJ: ADVANCED TAXONOMY OF ANGIOSPERMS - I
(2023 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Attempt any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) Characteristic features of Angiosperms.
- b) Heterobathmy
- c) Molecular dating
- d) Allopatric speciation
- e) Parallelism
- f) Merits of cronquist system.

Q2) a) Define taxonomy. Give its principles.

[5]

b) Define speciation. Explain sympatric speciation giving example.

[7]

P.T.O.

- Q3)** a) Comment on basic evolutionary trends in angiosperms with respect to stamens. [5]
- b) Define angiosperms. Comment on the probable causes of their evolutionary success. [7]
- Q4)** a) Define cladistics? Give principles of taxometrics. [5]
- b) Give classification, distinguishing characters and economic importance of marvells. [7]
- Q5)** a) Economic importance of rosales. [5]
- b) What is phylogenetic system? Explain plesiomorphic and apomorphic characters. [7]
- Q6)** a) Write distinguishing characters and classification of caryophyllales. [5]
- b) What is APG? Discuss in details about history of APG system of classification. [7]
- Q7) Write short notes on any two of the following :** [12]
- a) Pseudanthium theory
- b) Qualitative versus quantitative characters
- c) Economic importance of Zingiberales



Total No. of Questions : 7]

SEAT No. :

PE-4674

[Total No. of Pages : 2

[6516]-32
M.Sc. (Part - II)
BOTANY

BOT-601B MJ: Cyto-Genetics and Plant Breeding - I
(2023 Credit Pattern) (NEP 2020) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Attempt any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) Enlist any two significance of cytogenetics
- b) What are isochromosomes?
- c) Define crossing over
- d) What is trisomy?
- e) Enlist any two demerits of backcross method.
- f) Write any two merits of pedigree method.

Q2) a) What are observations of chromosomal theory of inheritance?

[5]

b) Describe origin, occurrence, production and types of duplication.

[7]

P.T.O.

- Q3)** a) Explain cytological behaviour of translocation. [5]
b) Describe isochromosome and ring chromosome. [7]
- Q4)** a) Write on effects of autopolyploidy. [5]
b) Describe detail procedure for production of allopolyploid wheat and cotton. [7]
- Q5)** a) Explain contribution of any two Indian plant breeders. [5]
b) Describe cytogenetic basis of apomixis. [7]
- Q6)** a) Explain biochemical basis of self incompatibility. [5]
b) Describe bulk method of plant breeding and add a note on its application. [7]
- Q7) Write short notes on any two of the following. [12]**
- a) Transgenic male sterility.
 - b) Write advantages and disadvantages of selection.
 - c) Write on requirements and applications of backcross method.



Total No. of Questions : 7]

SEAT No. :

PE-4675

[Total No. of Pages : 2

[6516]-33

M.Sc. (Part - II)

BOTANY

BOT - 601C MJ : Plant Physiology -I
(2023 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any 5 questions from Q.2 to Q.7*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following:

[10]

- a) Write about biological significance of water.
- b) Define aquaporins.
- c) What is photorespiration?
- d) Enlist different enzymes involved in ATP Synthesis.
- e) Write the importance of Cryptochromes.
- f) Give the importance of photoperiodism in flowering.

Q2) a) Explain the biosynthesis of cytokinin.

[5]

- b) Describe the mechanism of biological nitrogen fixation with the help of suitable diagram.

[7]

Q3) a) What is active transport? Explain different types of active transport.

[5]

- b) Describe the oxidative phosphorylation and give its importance in cellular respiration.

[7]

P.T.O.

- Q4)** a) Explain the organization of photosynthetic electron transport system. [5]
b) Give the structure of phenol. Describe the biosynthetic pathway of phenol. [7]
- Q5)** a) Explain the physiological role of gibberellin. [5]
b) Describe the role of plant growth hormones in seed growth and development. [7]
- Q6)** a) Describe the mobilization of stored reserve form with any one suitable example. [5]
b) Explain the CO₂ concentrating mechanism in CAM plants. [7]
- Q7) Write short notes on any two of the following:** [12]
a) The free energy concept.
b) Auxin
c) Vernalization



Total No. of Questions : 7]

SEAT No. :

PE-4676

[Total No. of Pages : 2

[6516]-34

M.Sc. (Part - II)

BOTANY

BOT - 601D MJ : Herbal Drug Technology - I

(NEP) (2023 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any 5 questions from Q.2 to Q.7*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following:

[10]

- a) Enlist the exogenous factors affecting cultivation of crude drugs.
- b) Enlist the types of extraction methods.
- c) Give any four applications of HPTLC.
- d) What is drug adulteration?
- e) Write medicinal properties of Ashwagandha.
- f) Give advantages of marine toxins.

Q2) a) Explain microwave assisted extraction method.

[5]

b) Explain biosynthesis pathway of Nicotene.

[7]

Q3) a) What is drug evaluation? Describe detection of pesticide residues. [5]

b) Give an account of scope and use of environment friendly pesticides.[7]

P.T.O.

- Q4)** a) Write applications of GCMS. [5]
- b) Describe Soxhlet extraction method. Give working & principle of Soxhlet apparatus. [7]
- Q5)** a) Describe systematic cultivation and post harvest technology of senna.[5]
- b) Give an account of methods of isolation & purification of marine natural products. [7]
- Q6)** a) Write a note on selection of solvents for extraction of extracts. [5]
- b) Describe in details biosynthesis & extraction of flavanoids. [7]
- Q7)** Write short notes on any two of the following. [12]
- a) In - situ conservation of medicinal plants.
- b) HPLC
- c) Causes & measures of drug adulteration.



Total No. of Questions : 7]

SEAT No. :

PE-4677

[Total No. of Pages : 2

[6516]-35
M.Sc. (Part - II)
BOTANY
BOT-601E MJ : Seed Science and Technology - I
(2023 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any five questions from Q.2 to Q.7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following : **[10]**

- a) Define weed management.
- b) What type of inflorescence present in chilli.
- c) Write any four advantages of organic farming.
- d) Enlist the factors affecting plant growth.
- e) Define genetic deterioration.
- f) Give essential nutrients for plant growth in organic farming.

Q2) a) What are adoptive trials and what role do they play in variety evaluation. **[5]**

b) Explain the future prospects of organic in world agriculture. **[7]**

Q3) a) Describe the fruit morphology of Brinjal. **[5]**

b) Explain cultural practices in vegetable seed production. **[7]**

Q4) a) What role does government policy play in promoting or hindering organic farming. **[5]**

b) Explain the steps in the preparation of botanical pesticides. **[7]**

P.T.O.

Q5) a) Describe the climatic factors that affect the vegetable production. [5]
b) Explain the role of Growers own seed test (GOT) in maintaining genetic purity. [7]

Q6) a) Describe the concept and criteria for hybrid seed production in vegetables. [5]
b) Explain field inspection during vegetable seed production. [7]

Q7) Write short notes on any two of the following : [12]

- a) Weed management.
- b) Release and notification of new variety.
- c) Primary morphological characters of pigeon pea.



Total No. of Questions : 7]

SEAT No. :

PE-4678

[Total No. of Pages : 2

[6516]-36
M.Sc. (Part - II)
BOTANY
BOT-601-FMJ : Applied Ecology & ENV - I
(2023 Credit Pattern) (NEP 2020) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any five questions from Q.2 to Q.7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) What is chemosynthesis.
- b) Define ecosystem & gives its components.
- c) Write attributes of K selected species.
- d) Give any two causes & effect of air pollution.
- e) Define mutualism & give its example.
- f) Write any two causes of Industrial pollution.

Q2) a) Write the effect of water pollution on living organism in detail. [5]

b) Explain the biosphere as an ecosystem and write its ecological process. [7]

Q3) a) Explain in brief ecological efficiencies & pyramids. [5]

b) Describe factor determining the abundance and distribution of species. [7]

Q4) a) Explain in detail threatened flora and fauna of India. [5]

b) What is ecology? Write their development and scope in detail. [7]

P.T.O.

- Q5)** a) Explain the types & Importance of biodiversity. [5]
b) Describe the effect of gaseous & particulates pollutants on animal and plants. [7]
- Q6)** a) Explain biogeochemical cycle in brief. [5]
b) Describe various strategies of biodiversity conservation. [7]
- Q7) Write short note on any two of the following :** [12]
a) National park.
b) Ground water pollution.
c) Trophic level.



Total No. of Questions : 7]

SEAT No. :

PE-4679

[Total No. of Pages : 2

[6516]-37

M.Sc. (Part - II)

BOTANY

**BOT-601-G MJ : Advanced Mycology and Plant Pathology - I
(2023 Credit Pattern) (NEP 2020) (Semester - III)**

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any five questions from Q.2 to Q.7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) What are Haustoria?
- b) What is Parasexuality in fungi.
- c) Name any two thermotolerant fungi.
- d) What is synnema?
- e) What is Plasmodiocarp?
- f) What are imperfect fungi?

Q2) a) Describe Ultrastructure of fungal cell.

[5]

b) Describe outline of fungal classification as per Krik et- al (2008). **[7]**

Q3) a) Explain distinguishing characters of Mastigomycotina.

[5]

b) Describe life cycle pattern of Rhizopus. **[7]**

Q4) a) Describe the types and structures of Basidia.

[5]

b) Explain different stages in development of Ascus and Ascospores. **[7]**

P.T.O.

- Q5)** a) Describe biotic and abiotic causes of plant diseases. [5]
b) Discuss the concept of Host-pathogen interaction. [7]
- Q6)** a) Explain occurrence and significance of fossil fungi. [5]
b) Describe different types of conidia. [7]
- Q7) Write short notes on any two of the following :** [12]
- a) R-gene
 - b) Wood-decaying fungi.
 - c) Entomogenous fungi.



Total No. of Questions : 7]

SEAT No. :

PE-4680

[Total No. of Pages : 2

[6516]-38

M.Sc. (Part - II)

BOTANY

**BOT - 602 MJ : ADVANCED TOOLS AND TECHNIQUES IN
PLANT SCIENCES**

(2023 Pattern) (Semester - III)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any five questions from Q.2 to Q.7*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following:

[10]

- a) Give principle of centrifugation.
- b) Write different staining agents used in electrophoresis.
- c) Define Conductivity.
- d) Enlist softwares used in Digital Herbarium.
- e) Enlist sensors used for soil parameters.
- f) Define Non - radioactive labels.

Q2) a) Comment on TEM.

[5]

b) Comment on various techniques of Remote Sensing.

[7]

Q3) a) Write principle of spectroscopy and explain X-ray crystallography. [5]

b) Explain Atomic force microscopy, give it's applications.

[7]

P.T.O.

- Q4)** a) Explain TLC, give its applications. [5]
b) Describe Agarose gel electrophoresis. [7]
- Q5)** a) Comment on micrometry technique. [5]
b) Explain suitable technique of Localization of specific compounds in cell. [7]
- Q6)** a) Describe visible spectroscopy give its applications. [5]
b) Explain Instrumentation and working of Scintillation Counter. [7]
- Q7)** Write a short notes on any two of the following: [12]
a) Ion exchange chromatography.
b) Properties of radioisotopes
c) Shikimic acid pathway



Total No. of Questions : 4]

SEAT No. :

PE-4681

[Total No. of Pages : 2

[6516]-39

M.Sc. (Part - II)

BOTANY

**BOT-603 MJ: Intellectual Property Rights (IPR)
(2023 Credit Pattern) (NEP 2020) (Semester - III)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) *All questions are compulsory*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Enlist forms of intellectual property
- b) What is patent cooperation treaty?
- c) Define copyright
- d) Enlist any two achievements of international convention on biological diversity.
- e) Define farmers right.

Q2) a) Explain in brief any one of the following.

[6]

- i) Describe in detail trademark registration process.
- ii) Explain in detail procedure for registration of design.

b) Describe any one of the following.

[4]

- i) Explain challenges and considerations during patent filing.
- ii) Explain in detail assignment of trademark.

P.T.O.

Q3) a) Explain in brief any one of the following. [6]

- i) Write in detail on case studies of plant varieties protected under breeders right.
- ii) Describe case studies of successful commercialization of botanical intellectual property rights.

b) Describe any one of the following. [4]

- i) Describe significance of plant breeders rights in agriculture and innovation.
- ii) Explain key features and importance of plant variety protection.

Q4) Write notes on any four of the following : [10]

- a) Difference between geographical indication and trade mark.
- b) Farmers rights under plant variety protection.
- c) Application process of plant breeders right.
- d) Interrelationship between novelty and originality
- e) Limits of patent
- f) Exceptions and limitations of plant breeders right.



Total No. of Questions :4]

SEAT No. :

[Total No. of Pages : 2

PE4682

[6516]-40

M.Sc.-II

BOTANY

BOT-610 MJ : Advanced Horticultural Techniques

(2023 Credit Pattern) (NEP-2020) (Semester-III)

Time :2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following questions.

[5]

- a) What are stock and scion?
- b) Define Canopy architecture.
- c) What are IPR?
- d) Define Aquaponics.
- e) What are biopesticides?

Q2) a) Explain in brief any one of the following.

[6]

- i) Regional, national and international importance of major species and commercial varieties in horticulture.
- ii) Principles and concepts of commercial exploitation in horticulture crops.

b) Describe any one of the following.

[4]

- i) Role of plant growth regulators (PGR) in horticulture.
- ii) Types and classification of canopy development.

P.T.O.

Q3) a) Explain in brief any one of the following. [6]

- i) Techniques for precise nutrient application.
- ii) General techniques of aeroponics and their applications.

b) Describe any one of the following. [4]

- i) Protected cultivation and post harvest handling.
- ii) Principles of Disease management.

Q4) Write notes on any four of the following. [10]

- a) Use of biofertilizers.
- b) Principles of organic horticulture.
- c) Importance of canopy development.
- d) Regulatory horticulture.
- e) Vertical farming.
- f) Role of Biopesticides.



Total No. of Questions : 4]

SEAT No. :

PE-4683

[Total No. of Pages : 2

[6516]-41
M.Sc. (Part - II)
BOTANY
BOT-611 MJ: NURSERY AND PTC TECHNIQUES
(2023 Credit Pattern) (NEP 2020) (Semester - III)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates :

- 1) All questions are compulsory.*
- 2) Neat labelled diagrams must be drawn wherever necessary.*
- 3) Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Define callus.
- b) Write the method suitable for in vitro artificial propagation of plants.
- c) What is weeding?
- d) Name the implements used in nursery.
- e) What do you mean by controlled environment.

Q2) a) Explain in brief any one of the following.

[6]

- i) Two types of nurseries based on seedlings produced.
- ii) Natural methods of plant propagation.

b) Describe any one of the following.

[4]

- i) Anther culture.
- ii) Types of media used in PTC.

P.T.O.

Q3) a) Explain in brief any one of the following. [6]

- i) Pollen culture
- ii) Preparation of explant for PTC.

b) Describe any one of the following. [4]

- i) Scope of nursery.
- ii) Importance of record maintenance in nursery economics.

Q4) Write notes on any four of the following : [10]

- a) Layering in plant propagation.
- b) Methods of sterilization in PTC.
- c) Types of nursery beds.
- d) Use of vitamins in PTC media.
- e) Disease and pest control in nursery.
- f) Benefits of aseptic conditions in PTC.



Total No. of Questions : 7]

SEAT No. :

PE-4684

[Total No. of Pages : 2

[6516]-51
M.Sc. (Part - II)
BOTANY
BOT-651A MJ: ADVANCED TAXONOMY OF ANGIOSPERMS - II
(2023 Credit Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Attempt any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) Write any two applications of RAPD
- b) Write name of two major herbarium in India.
- c) What is mean by biodiversity assessment?
- d) Write about pineatum
- e) Write two roles of molecular markers
- f) What is mean by extinctions?

Q2) a) Explain the techniques of Herbarium preparation.

[5]

- b) Define endemism and discuss the factors contributing to high endemism in the western ghats.

[7]

- Q3)** a) Discuss the significance of plant exploration. [5]
- b) Write the characteristic features, interrelationship and economic importance of family asteraceae. [7]
- Q4)** a) Write the characteristic features and economic importance of family Asparagaceae. [5]
- b) Explain how does the cytology help showing the taxonomic problem.[7]
- Q5)** a) Explain the role of mitochondrial DNA in taxonomy. [5]
- b) Discuss the historical development of botanic gardens and explain it's role in plant conservation. [7]
- Q6)** a) Write the characteristic features and interrelationships of family dilleniaceae. [5]
- b) Explain the major causes of plant extinction. [7]
- Q7) Write short notes on any two of the following. [12]**
- a) Orchidarium
- b) Molecular techniques RFLP
- c) Economic importance of family rubiaceae



Total No. of Questions : 7]

SEAT No. :

PE-4685

[Total No. of Pages : 2

[6516]-52
M.Sc. (Part - II)
BOTANY
BOT-651B MJ: CYTOGENETICS AND PLANT BREEDING - II
(2023 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Attempt any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) Write any two importance of biotechnology in crop improvement.
- b) What is VNTRs?
- c) Define mutation breeding.
- d) What is mean by recombinant DNA technology?
- e) Give any two practical applications of cytogenetics.
- f) Define disease escape.

Q2) a) Explain DNA content and adaptability.

[5]

b) Describe genetic maps using RAPDs.

[7]

P.T.O.

- Q3)** a) Explain laboratory techniques in cytogenetics. [5]
b) What are mutagens? Describe different types of physical & chemical mutagens. [7]
- Q4)** a) Explain any two breeding methods. [5]
b) Give applications of somatic hybridization. [7]
- Q5)** a) Explain techniques of embryo culture in plant tissue culture. [5]
b) Describe cell cycle on molecular basis. [7]
- Q6)** a) Explain euchromatin and heterochromatin. [5]
b) Describe genetic map using RFLP. [7]
- Q7) Write short notes on any two of the following :** [12]
a) Problem in breeding for salinity resistance
b) Applications of genetic engineering.
c) Karyotype.



Total No. of Questions : 7]

SEAT No. :

PE-4686

[Total No. of Pages : 2

[6516]-53
M.Sc. (Part - II)
BOTANY
BOT-651C MJ: Plant Physiology - II
(2023 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Q. 1 is compulsory*
- 2) *Attempt any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) Enlist two roles of ethylene.
- b) What is PS-I and PS-II?
- c) Define shelf life of fruit.
- d) What is leaf area index?
- e) Define transpiration.
- f) What are light saturation curves?

Q2) a) Explain photo inhibition and protection mechanism.

[5]

b) Describe physiological and molecular mechanism of fruit ripening. **[7]**

P.T.O.

- Q3)** a) What is post harvest deterioration of fruit? Explain the factors regulating it. [5]
- b) Describe various biotic and abiotic factors affecting phenology and crop yield. [7]
- Q4)** a) Explain i) Relative growth rate ii) Net assimilation rate [5]
- b) Explain TCA cycle in detail. [7]
- Q5)** a) Explain oxidative phosphorylation in detail. [5]
- b) Explain the phenomenon of phloem loading and unloading in detail. [7]
- Q6)** a) Explain Mitochondrial electron transport system in detail. [5]
- b) Explain Hydroponic media in detail. Add note on its applications. [7]
- Q7) Write short notes on any two of the following :** [12]
- a) Approaches to regulate specific shelf life characters.
- b) Role of respiration in plant carbon balance.
- c) Photorespiration.



Total No. of Questions : 7]

SEAT No. :

PE-4687

[Total No. of Pages : 2

[6516]-54
M.Sc. (Part - II)
BOTANY
BOT-651 DMJ: HERBAL DRUG TECHNOLOGY - II
(2023 Credit Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) Q. 1 is compulsory*
- 2) Attempt any five questions from Q. 2 to Q. 7.*
- 3) Questions 2 to 7 carry equal marks.*
- 4) Neat labelled diagrams must be drawn wherever necessary.*
- 5) Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) Enlist any two advantages of herbal cosmetics.
- b) Give any two scopes of nutraceuticals.
- c) What is protoplasm fusion?
- d) Define monographs
- e) Give any two differences between herbal and conventional drugs.
- f) Write any two methods of stability testing of natural products.

Q2) a) Write a note on Ethnobotany.

[5]

- b) Describe the method of preparation of deodorants and bath soap.

[7]

- Q3)** a) Write a note on formulation and standardization of vitamin and mineral supplements. [5]
- b) Explain the infrastructure of herbal drug industry involved in production of standard extract. [7]
- Q4)** a) Write a note on USP and Ayurvedic Pharmacopoeia. [5]
- b) Explain Indian and International patent laws. [7]
- Q5)** a) Write a note on In - situ conservation of medicinal plant. [5]
- b) Explain the various applications of plant biotechnology in pharmacy & allied fields. [7]
- Q6)** a) Write a note on immobilized cell techniques. [5]
- b) Describe the method of preparation of anti - sunburn and moisturizing cream. [7]
- Q7) Write short notes on any two of the following. [12]**
- a) Technical knowledge for entrepreneurship development.
- b) Procedure for Indian Patent Filling.
- c) Cryopreservation.



Total No. of Questions : 7]

SEAT No. :

PE-4688

[Total No. of Pages : 2

[6516]-55
M.Sc. (Part - II)
BOTANY
BOT-651E MJ: SEED SCIENCE & SEED TECHNOLOGY - II
(2023 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates :

- 1) *Q. 1 is compulsory.*
- 2) *Attempt any five questions from Q. 2 to Q. 7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) Define male sterility in plants. Enlist various types of male sterility.
- b) What is a cloning vector? Mention various types of cloning vectors.
- c) Define seed nanotechnology.
- d) Enlist methods of seed health testing.
- e) Give the names & causal organisms of diseases of seed crops.
- f) Define tissue culture. Enlist various methods of PTC.

Q2) a) Give an account of DNA finger printing & its role in varietal identification.

[5]

b) Discuss various steps involved in hybrid seed production of Maize crop.

[7]

P.T.O.

- Q3)** a) What is CMS? Add a note on its advantages & limitations. [5]
- b) Give an account of diseases of fibre crops w.r.t. causal organism, symptoms and control measures. [7]
- Q4)** a) Describe incubation method of seed health testing. [5]
- b) Give an account of IPR. Add a note on breeder's rights. [7]
- Q5)** a) Define synthetic seeds. Add a note on its production & applications. [5]
- b) Describe polymerase chain reaction with the applications. [7]
- Q6)** a) Define transgenics. Add a note on its applications. [5]
- b) Give an account of diseases of cereals w.r.t. causal organism, symptoms and control measures. [7]
- Q7) Write short notes on any two of the following. [12]**
- a) Cytoplasmic - genetic male sterility.
- b) Germplasm conservation
- c) Blotting techniques & its applications.



Total No. of Questions : 7]

SEAT No. :

PE-4689

[Total No. of Pages : 2

[6516]-56
M.Sc. (Part - II)
BOTANY
BOT-651F-MJ : Applied Ecology and Environment - II
(2023 Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any five questions from Q.2 to Q.7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following : **[10]**

- a) Define global dimming.
- b) What are bioindicators?
- c) Enlist any two causes of global warming.
- d) Define herbivory.
- e) What is species interaction ?
- f) Define microbial metabolism.

Q2) a) Write in detail about acid rain. **[5]**

- b) Enlist and explain the environmental factors affecting on the growth of microbes. **[7]**

Q3) a) Define and explain in detail what is ecological restoration. **[5]**

- b) Describe environmental impact assessment process. **[7]**

Q4) a) Define and explain the concept of biome. **[5]**

- b) Describe in detail about environmental audit. **[7]**

P.T.O.

- Q5)** a) Explain forest ecosystem with example. [5]
b) Enlist and explain any two laws of climate change. [7]
- Q6)** a) Explain the role and impact of GHGs. [5]
b) Define bioremedial process. Explain in detail role of microbes in bioremedial process. [7]
- Q7) Write short notes on any two of the following :** [12]
a) Pre and Post industrial immision.
b) Applied ecology.
c) Basic structure of audit.



Total No. of Questions : 7]

SEAT No. :

PE-4690

[Total No. of Pages : 2

[6516]-57

M.Sc. (Part - II)

BOTANY

BOT-651-GMJ : Advanced Mycology and Plant Pathology - II
(2023 Credit Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any five questions from Q.2 to Q.7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following : **[10]**

- a) Write about IDM.
- b) Write characteristics of lichens.
- c) Write about TMV.
- d) What do you mean by plant disease?
- e) Define phycobiant and mycobiant.
- f) Write causal organism and control measure of citrus canker.

Q2) a) Define Fungi. Explain their economic importance with example. **[5]**

b) Define Mycomyzae. Describe types and write their applications. **[7]**

Q3) a) What is lichen? Describe its thallus structure in detail. **[5]**

b) Explain the symptoms causal organism and control measures of downy mildew of grapes. **[7]**

Q4) a) Write short note on Grassy shoot disease. **[5]**

b) Describe various methods of plant disease control in detail. **[7]**

P.T.O.

- Q5)** a) Explain the concept of pathogen immobilization. [5]
b) Describe applications of fungi in food industry with examples. [7]
- Q6)** a) Write about mycotoxins. [5]
b) Explain nutritional modes of fungi. [7]
- Q7) Write short notes on any two of the following :** [12]
a) Secondary metabolites from lichens.
b) YVMV
c) Medical mycology.



Total No. of Questions : 7]

SEAT No. :

PE-4691

[Total No. of Pages : 2

[6516]-58
M.Sc. (Part - II)
BOTANY
BOT-652-MJ : Bioinformatics and Biostatistics
(2023 Credit Pattern) (Semester - IV)

Time : 3 Hours]

[Max. Marks : 70

Instructions to the candidates:

- 1) *Question 1 is compulsory.*
- 2) *Attempt any five questions from Q.2 to Q.7.*
- 3) *Questions 2 to 7 carry equal marks.*
- 4) *Neat labelled diagrams must be drawn wherever necessary.*
- 5) *Figures to the right indicate full marks.*

Q1) Answer any five of the following :

[10]

- a) Enlist any four genome sequencing technologies.
- b) What is functional annotation?
- c) Define standard deviation and write its formula.
- d) Enlist different methods of data representation.
- e) What is multiple linear regression?
- f) Give any four applications of multivariate statistics.

Q2) a) Describe the process of phylogenetic tree construction.

[5]

- b) Explain in detail post translational modification analysis in proteomics study.

[7]

Q3) a) What is gene sequencing? Explain sanger sequencing method in detail.

[5]

- b) What is sample? Explain different methods of sampling.

[7]

P.T.O.

Q4) a) Write the properties and applications of poisson distribution. [5]

b) Calculate the coefficient of correlation from below given data. Find out the degree of correlation between them. [7]

Plant height (cm)	4	8	14	19	25	28	34
Number of leaves per plant	8	16	28	35	46	56	60

Q5) a) A random samples of 50 plants gives the mean 6.2 and standard deviation 3.2. Can it be regarded as drawn from a normal population with 5.4 at 5% level of significance. Find out whether the test is significant or not (Table Value = 1.96). [5]

b) Explain in detail various approaches of multiple sequence alignment.[7]

Q6) a) Describe any two tools of EMBL. [5]

b) Explain detail mass spectrometry data analysis. [7]

Q7) Write short notes on any two of the following : [12]

a) Principles of experimental design.

b) Principal component analysis.

c) Transcriptomics.



Total No. of Questions : 4]

SEAT No. :

PE-4692

[Total No. of Pages : 2

[6516]-59

M.Sc. (Part - II)

BOTANY

**BOT - 660 MJ : Organic Farming and Soil Health Technology
(2023 Pattern) (Semester - IV)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) What is Zero budget farming?
- b) Give the full form of HACCP.
- c) Define Rhizosphere.
- d) Name any two biopesticides.
- e) Define Crop rotation.

Q2) a) Explain in brief any one of the following :

[6]

- i) Explain the functions of nutrients in growth and development of Crops.
- ii) Give an account of different soil properties concerned with soil chemistry.

b) Describe any one of the following :

[4]

- i) Describe the benefits of Organic farming.
- ii) Mention the role of Organic farm designing in Organic farming.

P.T.O.

Q3) a) Explain in brief any one of the following: [6]

- i) Explain the essential characteristics of Organic farming.
- ii) Explain the classification of market channels of distribution of Organic farming.

b) Describe any one of the following: [4]

- i) Describe the effect of environmental pollution due to chemicals.
- ii) Write an account of management in Organic farming & soil testing.

Q4) Write notes on any four of the following: [10]

- a) Organic farm structures.
- b) Organic fungicides
- c) Comparison between organic and conventional production system.
- d) Ill effects of Green Revolution
- e) Principles of Organic farming
- f) Soil microbial ecology.



Total No. of Questions : 4]

SEAT No. :

PE-4693

[Total No. of Pages : 2

[6516]-60

M.Sc. (Part - II)

BOTANY

BOT - 661 MJ : Green Nano -Technology

(2023 Pattern) (Semester - IV)

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Write about heat capacity of nanoparticle.
- b) What is nanoparticle?
- c) Write about CNTs.
- d) Give any one application of nanoparticle in environmental remediation.
- e) Mention the use of XRD.

Q2) a) Explain in brief anyone of the following :

[6]

- i) Polymeric type of nanomaterials.
- ii) Semiconductor nanomaterials.

b) Describe anyone of the following :

[4]

- i) Structural characterisation of nanoparticles.
- ii) Use of green nano-technology in sustainable agriculture.

P.T.O.

Q3) a) Explain in brief anyone of the following: [6]

- i) Top Down method of nanomaterial synthesis.
- ii) SEM for nanoparticle characterisation.

b) Describe anyone of the following: [4]

- i) Lipid based nanomaterials.
- ii) Optical characterisation of nanoparticles.

Q4) Write notes on any four of the following: [10]

- a) Differential scanning colorimetry.
- b) Nanocrystals
- c) Bioinspired synthesis of nanoparticle.
- d) Principles of green chemistry
- e) Mechanical milling.
- f) Carbon nanotubes.



Total No. of Questions : 4]

SEAT No. :

PE-4694

[Total No. of Pages : 2

[6516]-61

M.Sc. (Part - II)

BOTANY

**BOT : 662 MJ : Mushroom Cultivation Technology
(2023 Credit Pattern) (NEP 2020) (Semester - IV)**

Time : 2 Hours]

[Max. Marks : 35

Instructions to the candidates:

- 1) *All questions are compulsory.*
- 2) *Neat labelled diagrams must be drawn wherever necessary.*
- 3) *Figures to the right indicate full marks.*

Q1) Answer the following questions :

[5]

- a) Define Casing.
- b) Write any two ethnomedicinal imp, of mushroom.
- c) What is Pore Fungi?
- d) Define Spawn.
- e) Define coprophilous habitats.

Q2) a) Explain in brief any one of the following :

[6]

- i) Describe morphology and life cycle of Mushroom.
- ii) Explain nutritional and medicinal value of Mushroom.

b) Describe any one of the following :

[4]

- i) Explain the different culture media used in mushroom cultivation.
- ii) Describe methods of composting.

P.T.O.

Q3) a) Explain in brief any one of the following. [6]

- i) Describe the cultivation of Pleurotus sajor - caju in details.
- ii) Explain preservation techniques of mushroom in details.

b) Describe any one of the following. [4]

- i) Explain the types of marketing in mushroom.
- ii) Write value added product of mushroom with example.

Q4) Write notes on any four of the following. [10]

- a) IPM in mushroom cultivation.
- b) Design of mushroom cultivation Farm.
- c) Processing of mushroom.
- d) Diversity in mushroom.
- e) Government sponsored subsidies for mushroom cultivation.
- f) Health benefits of Mushroom.

