[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 1544     G

Unique Paper Code      : 2162011101

Name of the Paper     : Plant Diversity and Evolution

Name of the Course    : B.Sc. (Hons.) Botany

Semester           : I

Duration : 2 Hours        Maximum Marks : 60

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **four** questions in all, including Question No. **1** which is compulsory.

3. **All** parts of question must be answered together.

4. **All** questions carry equal marks.

5. Draw diagrams wherever required in support of your answer.

P.T.O.

1.   (a) Define the following terms (**any five**):   (1×5=5)

     (i) Prophage

     (ii) Pyrenoid

     (iii) Dolipore septum

     (iv) False indusium

     (v) Apophysis

     (vi) Inflorescence

(b) Fill in the blanks (**any five**):   (1×5=5)

     (i) The theory of natural selection was proposed by _____.

     (ii) Bryophytes are known as _____ of plant kingdom.

     (iii) Pteridophytes are cryptogams with well-developed _____ system.

     (iv) *Ephedra* is the source of _____ used for the treatment of asthma.

     (v) Colony of Volvox is known as _____.

     (vi) _____ is the main constituent of the fungal cell wall.

(c) Give an example (scientific name) (**any five**) :

(1×5=5)

(i) Bread Mould

(ii) ss-RNA virus causing disease in plant

(iii) Gymnosperm with vessels in secondary wood

(iv) Maiden hair fern or 'Walking fern

(v) Cord Moss

(vi) Marine brown algae with pneumatocysts

2. Differentiate between the following (**any three**) :

(5×3=15)

(a) Eubacteria and Archaebacteria

(b) Bryophytes and Pteridophytes

(c) Chlorophyceae and Phaeophyceae

(d) Zygomycota and Basidiomycota

3. Draw the well-labelled diagram for the following (**any three**) :

(5×3=15)

(a) Structure of bacteriophage

(b) VS passing through gills of *Agaricus* sp.

P.T.O.

(c) VS of sporophyll-*Adiantum* sp.

(d) Stages in sexual reproduction (conjugation) in *Spirogyra* sp.

4. Answer the following (Attempt any **three**) : (5×3=15)

(a) What is heterospory? Discuss the evolution of seed habit in *Selaginella*.

(b) What are Myxomycetes? Discuss its affinities with Fungi.

(c) Discuss the various systems of classification in angiosperms.

(d) Discuss the various means of reproduction in *Marchantia*.

5. Write short notes any **three** : (5×3=15)

(a) Transformation in Bacteria

(b) Types of Lichens

(c) Lytic cycle in bacteriophage

(d) Male and Female Strobilus of *Gnetum*

(1000)

[This question paper contains 4 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : 1582          G

Unique Paper Code : 2162011102

Name of the Paper : Cell Biology: Organelles and Biomolecules

Name of the Course : **B.Sc. (Hons) Botany**

Semester : I

Duration : 2 Hours          Maximum Marks : 60

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Question No. **1** is compulsory.

3. Attempt **four** questions in all.

1.  (a) Define (any five)          (1×5=5)

   (i) Heterochromatin

   (ii) Actin

   (iii) Hydrogen bond

P.T.O.

(iv) Essential fatty acids

(v) Disaccharide

(vi) Nuclear lamina

(b) Match the following enzymes with the cell organelle in which they are localized.   (1×5=5)

| | |
|---|---|
| (i) RUBISCO | (a) Mitochondria |
| (ii) Acid Phosphatase | (b) ER |
| (iii) Succinic dehydrogenase | (c) Nucleus |
| (iv) DNA polymerase | (d) Chloroplast |
| (v) Cytochrome b$_5$ oxidase | (e) Lysosome |

(c) Expand the following (any five)     (1×5=5)

(i) SnRNA

(ii) NOR

(iii) mRNA

(iv) NADH

(v) ATP

(vi) ORF

(5×3=15)

2. Write short notes on (any three) :

    (i) Nucleosome model

    (ii) Cytoskeletal elements

    (iii) Cell cycle and its regulation

    (iv) Double helical structure of DNA

(3×5=15)

3. Differentiate between (any five) :

    (i) SER and RER

    (ii) Cell wall and Cell membrane

    (iii) Lysosome and Peroxisome

    (iv) Nucleoside and Nucleotide

    (v) Saturated and Unsaturated fatty acids

    (vi) Endocytosis and Exocytosis

4. Draw well labelled diagrams of the following (any three) : (5×3=15)

    (a) Ultrastructure of Mitochondria

P.T.O.

(b) Nuclear Pore Complex

(c) Fluid Mosaic model of cell membrane

(d) Ultrastructure of Chloroplast

5.  (a) Discuss in detail the structure and role of ATP as energy currency of the cell. (7)

(b) Discuss the role of Golgi apparatus in processing, packaging and sorting of proteins. (8)

6.  (a) What are different types of chemical bonds? Discuss about their significance in biology. (7)

(b) Discuss different stages of cell division in a gametic eukaryotic cell. (8)

Your Roll No...............

Sr. No. of Question Paper : 1620

G

Unique Paper Code : 2162011103

Name of the Paper : Basic Laboratory and Field Skills in Plant Biology

Name of the Course : B.Sc. (Hons.) Botany

Semester : I

Duration : 2 Hours          Maximum Marks : 60

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **four** questions in all.

3. All questions carry equal marks.

4. Question No. **1** is compulsory.

5. All parts of a question must be answered together.

P.T.O.

1. (a) Expand the following (any five) : (5×1=5)

    (i) HPLC

    (ii) BLAST

    (iii) BOD

    (iv) HEPA

    (v) EDTA

    (vi) TEM

  (b) Define the following (any five) : (5×1=5)

    (i) Catalogue

    (ii) Mordant

    (iii) Central tendency

    (iv) Buffer

    (v) Serial dilution

    (vi) Microtome

  (c) Fill in the blanks (any five) : (5×1=5)

    (i) _____ nm is the wavelength range of a visible range spectrophotometer.

    (ii) SDS-PAGE is used for the separation of _____ molecules.

(iii) An electric device used to measure hydrogen-ion activity (acidity or alkalinity) in solution is called _____ .

(iv) The chemical molecules that have the ability to absorb light of a certain wavelength and then re-emit light at a longer wavelength is called _____ .

(v) YEB media is used for culturing _____ .

(vi) 1 ml solution is equal to _____ microliters.

2.  Differentiate between the following **(any five)** :

$(5 \times 3 = 15)$

(i) Fluorescence microscope and Electron microscope

(ii) Primary data and Secondary data collection

(iii) MS Excel and MS PowerPoint

(iv) Molarity and Normality

(v) Sample mean vs population mean

(vi) Pour plate vs spread plate method

P.T.O.

3. Write short notes on the following (**any three**) :

$$(3 \times 5 = 15)$$

    (i) Agarose Gel Electrophoresis

    (ii) Laboratory safety symbols

    (iii) Autoclave

    (iv) Replica plating

4.   (a) Define resolution. Describe different factors that influence the resolution and resolving power of a microscope.    (8)

    (b) What is a biological database? Explain different types of databases with examples.    (7)

5.   (a) The length in cm of 10 Vernonia plants is given below. Calculate the standard deviation, standard error and coefficient of variation.    (10)

| S. No. | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|--------|----|----|----|----|----|----|----|----|----|----|
| Length (cm) | 20 | 22 | 27 | 30 | 31 | 32 | 35 | 40 | 45 | 48 |

    (b) Draw a bar diagram of the given data :    (5)

| Year | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|------|------|------|------|------|------|------|------|
| Production of wheat (Tons) | 320 | 360 | 440 | 880 | 680 | 850 | 550 |

Your Roll No...............

Sr. No. of Question Paper : 1563      G

Unique Paper Code        : 2162012302

Name of the Paper       : Bryophytes, Pteridophytes and Gymnosperms

Name of the Course      : **B.Sc. (Hons.) Botany**

Semester                : III

Duration : 2 Hours           Maximum Marks : 60

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt any **Four** questions in all.

3. **All** questions carry equal marks.

4. Question No. **1** is compulsory.

5. Draw diagrams and write botanical names wherever necessary.

6. All parts of a question must be answered together.

P.T.O.

1. (a) Fill in the blanks (**any five**) :  (5×1=5)

   (i) The water conducting cells found in bryophytes are called _____.

   (ii) Catapult type of spore dispersal mechanism is seen in _____.

   (iii) Apogeotropic and dichotomously branched roots of *Cycas* are called _____.

   (iv) In Marchantia, the protective covering surrounding a group of archegonia is _____.

   (v) *Gnetum* has _____ type of female gametophyte.

   (vi) The fossil of *Rhynia* was discovered by _____.

   (b) Match the following (**any five**) :  (5×1=5)

   | | |
   |---|---|
   | (i) Sago palm | (a) *Anthoceros* |
   | (ii) Coenosorus | (b) *Pinus* |
   | (iii) Pseudoelaters | (c) *Cycas* |
   | (iv) Resurrection plant | (d) *Selaginella* |
   | (v) Sulphur shower | (e) *Marchantia* |
   | (vi) Appendiculate scale | (f) *Pteris* |

(c) Give the botanical name of the following **(any five)** :

(5×1=5)

    (i) Chilgoza pine

    (ii) Incipient heterospory

    (iii) Fossil pteridophyte

    (iv) A gymnosperm without archegonium

    (v) An aquatic bryophyte

    (vi) Bryophyte with pyrenoid

2. Draw well labelled diagrams **(any three)** : (3×5=15)

(a) L.S. ovule of *Cycas*

(b) L.S. capsule of *Funaria*

(c) V.S. *Marchantia thallus* passing through gemma cup

(d) T.S. intemode of *Equisetum*

(e) L.S. female cone *Pinus*

(f) L.S. strobilus of *Selaginella*

3. Differentiate between the following **(any three)** :

(3×5=15)

(a) Leptosporangiate and Eusporangiate sporangial development

(b) Antheridiophore and Archegoniophore of *Marchantia*

P.T.O.

(c) Male and Female plants of *Cycas*

(d) Apospory and Apogamy

(e) Elaters of *Equisetum* and *Marchantia*

(f) Sporophyte of *Anthoceros* and *Funaria*

4. Write short notes on (any three) : (3×5=15)

   (a) Hydrophytic and xerophytic characteristics of *Equisetum*

   (b) Heterospory and seed habit

   (c) Cycas is a living fossil

   (d) Affinities of *Gnetum*

   (e) Morphological nature of rhizophore

   (f) Sporophyte of *Anthoceros*

5. (a) With the help of suitable diagrams, describe the different types of steles in pteridophytes. (8)

   (b) Discuss the significance of *Physcomitrella* **or** *Ceratopteris* as a model system. (7)

6. (a) Explain progressive sterilization of sporogenous tissue in the sporophyte of genera studied by you. (8)

   (b) Write the economic importance of Pteridophytes. (7)

   (1000)

[This question paper contains 4 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : 1525      **G**

Unique Paper Code     : 2162012301

Name of the Paper     : Phycology – The World of Algae

Name of the Course     : **B.Sc. (Hons.) Botany**

Semester     : III

Duration : 2 Hours        Maximum Marks : 60

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **four** Questions in all.

3. Question No. **1** is compulsory.

4. Draw well labelled diagrams wherever necessary.

1. (a) Provide a suitable example (genus) of the following (any five) :      (1×5=5)

     (i) Spermocarp

     (ii) Watermelon algae

     (iii) Red tides

P.T.O.

(iv) Endophytic algae

(v) Wanderplasm

(vi) Cup-shaped chloroplast

(vii) Hormogonia

(b) Fill in the blanks (any five) :                (1×5=5)

(i) Bioremediation of soil using Blue Green algae was studied by _____ .

(ii) _____ is an example of prokaryotic algae.

(iii) Algal division which do not have any motile stages in their life cycle are _____ and _____ .

(iv) Multinucleate and multiflagellate zoospores are called _____ .

(v) The term algae was coined by _____ .

(vi) The reserve food material of red algae is _____ .

(vii) Having erect and prostrate system in thallus organization is known as _____ .

(c) Match the following :      (1×5=5)

| | |
|---|---|
| (i) Sea lettuce | (a) Diatoms |
| (ii) Rolling alga | (b) *Sargassum* |
| (iii) Laminarin | (c) *Ulva* |
| (iv) Diatomaceous earth | (d) *Dunaliella* |
| (v) Halophilic alga | (e) *Volvox* |

2. Differentiate between **(any three)** :     (5×3=15)

    (i) Carposporophyte and tetrasporophyte

    (ii) Cyanophyceae and Chlorophyceae

    (iii) Unilocular and plurilocular sporangia of *Ectocarpus*

    (iv) Zoospore and Aplanospore

    (v) Nucule and Globule

3. Draw a well labelled diagram of **any three** of the following :     (5×3=15)

    (i) E.M. of *Chlamydomonas / Chlorella*

    (ii) V.S Receptacle of *Sargassum* showing bisexual conceptacles

    (iii) Single trichome of *Nostoc*

                           P.T.O.

(iv) Pennate diatom

(v) Thallus showing sex organs of *Vaucheria*

4. Write short notes of the following (**any three**) :

$(5 \times 3 = 15)$

   (i) Asexual reproduction in *Volvox*

  (ii) Criteria of classification by Fritsch

 (iii) Evolutionary significance of *Prochloron*

 (iv) *Chlamydomonas* as model system

  (v) Significant contributions of R.N. Singh and M.O.P. Iyengar

5. (a) What are phycocolloids. Give their economic importance with suitable examples. (7)

   (b) Explain the cell division in *Oedogonium*. Give an account of the special features and sexual reproduction in *Oedogonium*. (8)

(or)

Define ocean acidification. Discuss ecological importance of algae. (8)

[This question paper contains 8 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : 1601      **G**

Unique Paper Code     : 2162012303

Name of the Paper     : Genetics and Plant Breeding

Name of the Course     : B.Sc. (Hons.) Botany (NEP)

Semester     : III

Duration : 2 Hours          Maximum Marks : 60

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **four** questions in all.

3. Question No. **1** is compulsory.

4. All parts of a question should be answered together.

P.T.O.

1. (a) Define (any five) :

                                     $(5 \times 1 = 5)$

    (i) Frameshift mutation

    (ii) Pleiotropy

    (iii) Trisomy

    (iv) Test cross

    (v) Heterosis

    (vi) Epistasis

(b) Give the important contribution of (any five) :

                                       $(5 \times 1 = 5)$

    (i) Carl Correns

    (ii) H. J. Muller

    (iii) A. Strutevant

    (iv) G. H. Hardy and W. Weinberg

(v) W. Bateson and R. Punnett

(vi) H. Nilsson-Ehle

(c) Answer the following in one word (any five)

(5×1=5)

(i) Number of Barr *bodies* in a female with chromosomes 44 + XO

(ii) Number of gametes formed in the cross AABbCc x aabbCc

(iii) When a purine is replaced by another purine in DNA

(iv) Number of linkage groups present in *Drosophila*

(v) Name a manmade cereal crop

(vi) The movement of genetic material from one region to another within the genome

2. Differentiate between **(any five)** (5×3=15)

   (a) Pure line selection and mass selection

   (b) Maternal inheritance and maternal effect

   (c) Allopatric and sympatric speciation

   (d) Sex-linked and sex-limited characters

   (e) Missense and nonsense mutation

   (f) Codominance and incomplete dominance

3. Write short notes on **any three** of the following :

   (3×5=15)

   (a) Lethal alleles

   (b) Chemical mutagens

   (c) Introduction of plant species

   (d) Sex determination in humans

(e) CIB method for detection of mutation in *Drosophila*.

4. (a) What is polygenic inheritance? Explain with the help of a cross using suitable example. Write any three characteristic features of this mode of inheritance. (7)

(b) Explain the origin of amphidiploid *Gossypium hirsutum* (New world cotton) and hexaploid wheat from their progenitors with the help of suitable crosses. (4+4=8)

5. A mutant stock of *Drosophila* homozygous for three sex linked genes -sc(scute), ec(echinus) and cv(crossveinless) was crossed to a wild type. A female $F_1$ heterozygous for all the three genes when test crossed with a homozygous recessive parent, gave the following result:

P.T.O.

| Phenotypic class | No. of progeny |
|---|---|
| + + + | 370 |
| ec + sv | 45 |
| + + cv | 75 |
| + sc + | 50 |
| ec sc cv | 385 |
| ec sc + | 70 |
| + sc cv | 2 |
| ec ++ | 3 |

(i) Which classes represent the parental types, single cross overs and double cross overs. (3)

(ii) Determine the recombination frequencies between each pair of genes, their order and map the distance between the genes on the chromosome. (6)

(iii) Define coefficient of coincidence and interference. Calculate the value of coefficient of coincidence for the given data. (6)

6. (a) Compare and contrast paracentric inversion with pericentric inversion with the help of suitable diagrams. (7)

(b) A man with type O blood marries a woman with type AB blood. What proportion of their children would you expect to have blood types same as either of their parents? What are the possible blood types of the children? Explain with the help of cross. (5)

(c) What is the expected sex of *Drosophila* with the following chromosome arrangements? (3)

    (i) 4X4A

1691

8

2X3A

1X3A

(1000)

[This question paper contains 4 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : **4341**        **G**

Unique Paper Code        : 32161301

Name of the Paper        : Anatomy of Angiosperms

Name of the Course       : **B.Sc. (Hons.) Botany**

Semester                 : III

Duration : 3 Hours          Maximum Marks : 75

## Instructions for Candidates

1.  Write your Roll No. on the top immediately on receipt of this question paper.

2.  Question No. **1** is compulsory and attempt **five** questions in all.

3.  Draw well-labelled diagrams wherever required and answer all parts of question.

1.  (a) Define the following **(Any five)** :        (5×1=5)

    (i) Adcrustation

    (ii) Dermatogen

    (iii) Aleurone grains

P.T.O.

(iv) Reaction wood

(v) Styloids

(vi) Errera's rule

(b) Match the following :                    (5×1=5)

|   |   |   |   |
|---|---|---|---|
| 1) Salt gland | | a) Intrafascicular cambium |
| 2) Carnuaba wax | | b) *Atriplex* |
| 3) Included phloem | | c) Cucurbitaceae |
| 4) Bicollateral vascular bundles | | d) *Salvadora persica* |
| 5) Procambium | | e) *Copernicia nucifera* |

(c) Fill in the blanks :                    (5×1=5)

(i) Vascular bundles localized in the pith region are called _____ .

(ii) Epidermal cell giving rise to root hair is known as _____ .

(iii) Inulin is an example of _____ .

(iv) _____ is an unbranched β–1, 3-glucan.

(v) Time interval between successive leaf primordia is called _____ .

2. Write short notes on : **(Any three)** (3×5=15)

   (i) Applications of Plant Anatomy in Pharmacognosy

   (ii) Parenchyma

   (iii) Hydathodes

   (iv) Periderm

3. Differentiate between : **(Any five)** (5×3=15)

   (i) Storied and non-storied cambium

   (ii) Simple and bordered pits

   (iii) Dicot and monocot root

   (iv) Tunica Corpus and Körper-Kappe theory

   (v) Ring porous and diffuse porous wood

   (vi) Sclereids and fibres

4. Draw well labelled diagrams of **(Any three)** :

                                        (3×5=15)

   (i) V.S. *Zea mays* leaf

   (ii) T.S of *Ficus* leaf showing lithocyst

  (iii) V.S. Shoot apical meristem

  (iv) T.S *Hydrilla* stem

5. (a) What do you understand by the seasonal activity of cambium? Explain with the help of a well-labelled diagrams. (8)

  (b) Explain with examples various types of vascular bundles in plants. (7)

6. (a) Describe epidermal tissue system with special reference to various types trichomes in plants. (8)

  (b) Phloem wedges are formed as a result of anomalous secondary growth. Discuss the statement with the help of well labelled diagram. (7)

7. (a) Along with suitable examples, describe the anatomical adaptations shown by xerophytes. (8)

  (b) Describe the structure and function of tracheary elements with the help of suitable diagrams. (7)

Your Roll No...............

Sr. No. of Question Paper : **4395**　　　　**G**

Unique Paper Code　　　: 32161302

Name of the Paper　　　: Economic Botany (LOCF)

Name of the Course　　　: **B.Sc. (H) Botany**

Semester　　　　　　　: III

Duration : 3 Hours　　　　　　Maximum Marks : 75

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt any **five** questions.

3. **All** questions carry equal marks.

4. Question no. **1** is compulsory.


1. (a) Expand **any five** of the following :　　　(5×1=5)

　　　(i) CIMAP

　　　(ii) NBPGR

　　　(iii) IRRI

　　　(iv) ICRISAT

　　　(v) CDRI

　　　(vi) SBI

　　　(vii) CPRI

P.T.O.

(b) Fill in the blanks (any five) :                    (5×1=5)

    (i) A major plant source used as a substitute of coffee is _____ .

    (ii) Hashish and Charas are obtained from _____ .

    (iii) Paper used in cigarette wrapping is obtained from _____ .

    (iv) _____ is an example of bast fibre.

    (v) A drug plant used as myocardial stimulant is _____ .

    (vi) Fruit mature underground in _____ .

    (vii) Practice of ratooning is used for propagating _____ .

(c) Match the following :                    (5×1=5)

    (i) *Cocos*                1. Parboiling

    (ii) *Gossypium*          2. Tapping

    (iii) *Oryza*             3. Kalpavriksha

    (iv) *Hevea*              4. Stimulant

    (v) *Camellia*            5. Ginning

2.  Differentiate between **any five** of the following :
                                         (5×3=15)

   (i) Charas and Ganja

   (ii) Flue curing and Air Curing

   (iii) Animal Fibre and Plant Fibre

   (iv) Indica and Japonica Rice

   (v) White Jute and Tossa Jute

   (vi) Drying and Non-drying Oils

3. Draw well-labelled diagrams of the followings **(any three)** :                           (3×5=15)

   (i) T.S of Fennel fruit

   (ii) T.S. of Hesperidium

   (iii) L.S. of Wheat Caryopsis

   (iv) L.S. of Coconut fruit

   (v) Portion of sugarcane stem

4. (a) Give a detailed account of processing and uses of coffee.                                                          (5)

   (b) Write brief note on economic importance of Legumes.                                                          (5)

   (c) Discuss health hazards and uses of Tobacco.

                                                                    (5)

5. (a) What is nobilisation? Explain the phenomenon highlighting its genetic explanation.          (5)

(b) Discuss the various methods of extraction of essential oils. (5)

(c) What is alternate bearing in mango? Give probable reasons and remedies for this. (5)

6. (a) How are millets different from cereals? List major millets and their economic importance.

**OR**

Discuss the origin of Hexaploid Wheat. (5)

(b) What do you understand by centre of origin of crop plants? Discuss in light of Vavilov's concept and list major centres given by him with examples. (5)

(c) Give a brief account of tapping and uses of rubber. (5)

7. (a) Mention the scientific name, chief chemical constituents and uses of the following :

   (i) Quinine

   (ii) Hemp

   (iii) Clove

   (iv) Opium

   (v) Mustard (5×1.5=7.5)

(b) Write an account of harvesting and processing of black tea. (7.5)

(1000)

[This question paper contains 8 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : 4509      G

Unique Paper Code      : 32161303

Name of the Paper      : Genetics

Name of the Course      : B.Sc. (Hons.) Botany

Semester      : III

Duration : 3 Hours          Maximum Marks : 75

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. **All Questions carry equal marks.**

3. Question No. **1** is compulsory.

4. Attempt **five** questions in all including Question No. **1**.

P.T.O.

1. (a) Define the following (**any five**) :

     (i) Criss-cross inheritance

     (ii) QTL inheritance

     (iii) Transposons

     (iv) Penetrance

     (v) Lethal alleles              (1×5=5)

  (b) (i) What are linkage groups? How many linkage groups are present in Drosophila?

     (ii) What are the antigen and antibody components of blood groups A and B?

     (iii) Name a manmade cereal crop.

     (iv) What do you understand by genetic drift?

     (v) Define speciation.         (1×5=5)

(c) A man with blood type O marries a woman with blood type AB. Among their children, what proportion would you expect to have blood types parents of either of the two. What proportion would you expect to have blood types different from both parents. Explain.                     (5)

2.   A mutant stock of *Drosophila* homozygous for three sex linked genes -sc(scute), ec(echinus) and cv(crossveinless) was crossed to a wild type. A female F$_1$ heterozygous for all the three genes when test crossed with a homozygous recessive parent, gave the following result :

| | |
|---|---|
| + + + | 370 |
| ec + sv | 45 |
| + + cv | 75 |
| + sc + | 50 |
| ec sc cv | 385 |
| ec sc + | 70 |
| +sc cv | 2 |
| ec ++ | 3 |

(i) Which classes represent the parental types, single cross overs and double cross overs? (3)

(ii) Determine the recombination frequencies between each pair of genes, their order and map the distance between the genes on the chromosome. (6)

(iii) Define coefficient of coincidence and interference. Calculate the value of coefficient of coincidence for the given data. (6)

3. (a) Explain the genic balance theory of sex determination in *Drosophila*. What is the expected sex of an individual with the following chromosome arrangements? (8)

   (i) 4X4A

   (ii) 2X3A

   (iii) 1X3A

   (iv) 3X4 A

   (v) 2X1A

   (b) What is epistasis? Explain dominant and recessive epistasis with one suitable example each.

   (7)

4.  (a) What are mutagens? Briefly explain the use of physical mutagens in crop improvement.      (5)

(b) Explain the mechanism of inheritance in shell coiling of snails.      (5)

(c) Explain the cytological basis of crossing over in maize.      (5)

5.  Differentiate between the following **(any five)**

(i)   Deletion and duplication

(ii)  Auto and allopolyploidy

(iii) Test cross and back cross

(iv)  2-point and 3-point test cross

(v)   Segregational and neutral petites

(vi)  Gene and genotype frequency      $(3 \times 5 = 15)$

6. (a) In poultry, the genes for rose comb R and pea comb P together produce a walnut comb. Alternate alleles of both in a homozygous condition (rrpp) produce a single comb. What would be the possible phenotypes and their ratios in the following crosses :

    (i) RrPp X RrPp

    (ii) RrPp X Rrpp

    (iii) Rrpp X rrpp

    (iv) RRPP X Rrpp

    (v) rrPP X RRpp          (5)

    (b) What are Barr bodies? What would be the number of such bodies in the human cells of normal male, Turner's syndrome and a female with Down's syndrome.          (5)

    (c) Differentiate between para-and pericentric inversions with suitable diagrams.          (5)

7. (a) Elaborate on the experiment performed by Seymour and Benzer to understand the fine structure of gene. (8)

   (b) What is sex linked inheritance? Explain with a suitable example. (7)

Your Roll No...............

Sr. No. of Question Paper : 4323      **G**

Unique Paper Code      : 32161501

Name of the Paper      : Reproductive Biology of Angiosperms

Name of the Course      : **B.Sc. (Hons.) Botany**

Semester      : V

Duration : 3 Hours      Maximum Marks : 75

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **five** questions in all including Question Number **1** which is compulsory.

3. All parts of a question must be answered together.

4. **All** questions carry equal marks.

5. Draw well-labelled diagrams and write the botanical name wherever necessary.

1. (a) Give contributions of **any five** of the following :

(1×5=5)

     (i) P. Maheshwari

     (ii) G.B. Amici

     (iii) E. Strasburger

P.T.O.

(iv) H.Y. Mohan Ram

(v) S.G. Nawaschin

(vi) J. Heslop-Harrison

(b) Define **any five** of the following :　　　(1×5=5)

   (i) Polyspory

   (ii) FGU

   (iii) Double fertilization

   (iv) Caruncle

   (v) Pollinia

   (vi) Parasexual hybrization

   (vii) NPC system

(c) Give a genus family name for **any five** in which any of the following feature is present-　(1×5=5)

   (i) Pseudoembryosac

   (ii) Pseudomonads

   (iii) Egg cell having filiform apparatus

   (iv) Circinotropous ovule

   (v) Néméc phenomenon

   (vi) Occurrence of all five types of microspore tetrads

   (vii) Persistent nucellus

   (viii) Nucellar beak

2. Write short note on **any five** of the following :

$(3 \times 5 = 15)$

   (i) Obturator

   (ii) Pollen wall proteins

   (iii) Cleavage polyembryony

   (iv) Hellobial endosperm

   (v) Adventive embryony

   (vi) MGU

3. Differentiate between **any five** :    $(5 \times 3 = 15)$

   (i) Endothelium and endothecium

   (ii) Bisporic and tetrasporic embryosac development

   (iii) Tenuinucellate ovule and crassinucellate ovule

   (iv) GSI and SSI

   (v) Nuclear and cellular endosperm

   (vi) Hollow style and solid style

   (vii) Hyphydrophily and ephydrophily

4. (a) Briefly explain the importance of callose in microsprogenesis.    (5)

   (b) Briefly explain *Polygonum* type of embryosac development in angiosperms.    (5)

   (c) Describe any two methods to overcome self-incompatibility in plants.    (5)

5. (a) Briefly discuss the various means of seed dissemination with examples. (5)

   (b) Describe various types of suspensor haustoria in angiosperms. (5)

   (c) Elaborate on the importance of apomixis in crop improvement. (5)

6. (a) Describe in detail any two methods to test pollen viability. (5)

   (b) Explain the types of embryogeny in angiosperms. (5)

   (c) Briefly explain any two types of germline transformation methods. (5)

7. (a) Discuss the role of synergids during fertilization in angiosperms. (5)

   (b) Draw well-labelled diagram of the following :
   $(2 \times 2.5 = 5)$

      (i) L.S. of orthotropous, bitegmic, crassinucellate ovule showing *Polygonum* type of embryo sac

      (ii) T.S. young tetrasporangiate anther showing sporogenous tissue

   (c) Enlist key characters of anemophilous and entomophilous flowers. (5)

**(1000)**

[This question paper contains 8 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : 1665　　　　　　G

Unique Paper Code　　　　: 2163012002

Name of the Paper　　　　: Biostatistics and Bioinformatics for Plant Sciences

Name of the Course　　　 : **B.Sc. (Hons.) Botany (DSE)**

Semester　　　　　　　　 : III

Duration : 2 Hours　　　　　　　Maximum Marks : 60

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **Section A** and **Section B** on separate sheets.

3. Question no. 1 of both the sections is compulsory.

4. Attempt any **three** questions from **Part A** and **three** questions from **Part B** including Q. No. 1 of both the sections.

5. Attempt all parts of a question together.

P.T.O.

## Section A

1. (a) Define the following (any five) :      (5×1=5)

     (i) Metabolomics

     (ii) Composite database

     (iii) Paralogous sequence

     (iv) Bioinformatics

     (v) Alignment

     (vi) Monophyletic clade

(b) Give an example of each of the following (any five) :      (5×1=5)

     (i) Nucleotide sequence database

(ii) Chemical database

(iii) Literature database

(iv) Alignment tool

(v) Protein database

(vi) File format

2. Differentiate between the following **(any four)** :

(2.5×4=10)

(a) Primary and Secondary database

(b) Genomics and Proteomics

(c) NCBI and PDB

(d) Pairwise sequence and Multiple sequence alignment

(e) Maximum likelihood and Maximum Parsimony method

3.  Write short notes on **(any two)** :  $(5 \times 2 = 10)$

    (a) PlantPepDB

    (b) Applications of bioinformatics in drug discovery

    (c) Concepts of gaps and penalty in alignment

4.  (a) Elaborate on various types of standard BLAST. (5)

    (b) Draw and label the various parts of a phytogenetic tree. What do each of these parts signify. Comment. (5)

## Section B

1. (a) Define the following (any five) :      $(5 \times 1 = 5)$

     (i) Inferential statistics

     (ii) Skewness

     (iii) Alternate hypothesis

     (iv) Secondary data

     (v) Dispersion

     (vi) Mean deviation

(b) Fill in the blanks (any five) :      $(5 \times 1 = 5)$

     (i) The formula for coefficient of variation is

     _____ .

P.T.O.

(ii) In _____ sampling, the population is divided into subgroups, and then samples are randomly selected from each subgroup.

(iii) In the process of data analysis, _____ involves organizing data into tables to make it understandable and informative for the audience.

(iv) The _____ is the simplest measure of dispersion and is calculated as the difference between the highest and lowest values in a dataset.

(v) _____ correlation is a relationship between two variables that move in opposite directions.

(vi) _____ is a measure of the tailedness of a distribution.

2. Differentiate between the following **(any two)** :

$(5×2=10)$

(a) Student's t test and chi-square test

(b) Karl Pearson method and Spearman Rank method

(c) Descriptive and inferential statistics

3. Write short note on **(any two)** : $(5×2=10)$

(a) Limitations and applications of biostatistics

(b) Presentation of data

(c) Quartile deviation—merits and demerits

P.T.O.

4.    (a) Discuss various similarities and dissimilarities

between correlation and regression.          (4)

(b) Calculate standard deviation & standard error from

the given dataset :                          (6)

| Marks obtained | 18 | 29 | 16 | 12 | 26 | 33 | 25 | 17 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|

[This question paper contains 4 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : 4428          G

Unique Paper Code          : 32167503

Name of the Paper          : Analytical Techniques in Plant Sciences

Name of the Course         : **B.Sc. (Hons) Botany – DSF**

Semester                   : V

Duration : 3 Hours                    Maximum Marks : 75

## Instructions for Candidates

1.  Write your Roll No. on the top immediately on receipt of this question paper.

2.  Attempt **five** questions in all, including Question **1** which is compulsory.

3.  Attempt all parts of a question together.

1.  (i)  Define (any five):                    (1×5=5)

    (a)  $R_f$

    (b)  Fluorochromes

    (c)  Half–Life

    (d)  Magnification

    (e)  Chromosome painting

P.T.O.

(f) Cryofixation

(g) Blotting technique

(ii) Match the columns :      (1×5=5)

| (a) Albert Claude | (i) Confocal Microscopy |
| (b) James Alwine | (ii) Chromatography |
| (c) Henri Becquerel | (iii) Northern Blotting |
| (d) Marvin Minsky | (iv) Autoradiography |
| (e) Tswett | (v) Centrifugation |

(iii) Expand (any five) :      (1×5=5)

(a) CBB

(b) GFP

(c) RPM

(d) FACS

(e) MALDI

(f) ELISA

2. With the help of labelled illustrations only explain the steps of (any three) :      (5×3=15)

(i) Southern Hybridization

(ii) Polyacrylamide Gel Electrophoresis

(iii) Ion Exchange Chromatography

(iv) FISH

3. Differentiate between the following **(any three)** :

                                          (5×3=15)

   (i) Scanning, and Transmission Electron microscopy

   (ii) HPLC and GLC

   (iii) Paper, and, Thin layer Chromatography

   (iv) Freeze-fracture, and, Freeze-etching

4. Write short notes on **any three** of the following :

                                            (5×3=15)

   (i) Shadow Casting

   (ii) Affinity Chromatography

   (iii) Applications of Radioisotopes in research

   (iv) Marker Enzymes

5. Describe the principle and applications of the following techniques **(any three)** :           (5×3=15)

   (i) X-Ray Diffraction

   (ii) Column Chromatography

   (iii) Ultracentrifugation

   (iv) Confocal Microscopy

6. (i) Give brief answers to the following. Attempt **any five** :                          (2×5=10)

        (a) What is the difference between resolution and magnification? What would be the

effect on resolution if numerical aperture of lens is increased or decreased.

(b) Why ultracentrifuges are refrigerated and heavily armored.

(c) Why are fixatives used during sample preparation in microscopy?

(d) The "Temperature, pH and osmotic potential of the medium are important during homogenization of the tissue." Justify the statement.

(e) TLC is advantageous over paper chromatography. Why?

(f) DNA moves towards the positive electrode in AGE. Why?

(ii) Using appropriate illustrations explain the working of Flow Cytometry.                    (5)

7    (i) Discuss briefly the principle of centrifugation, and describe the procedures in the differential centrifugation technique for isolating subcellular particles.                                    (5)

(ii) Elaborate the principles of pulse-chase experiment with suitable example.        (5)

(iii) Explain the principle of spectrophotometer using Beer-Lamberts Law.                    (5)

[This question paper contains 4 printed pages.]

Your Roll No...............

Sr. No. of Question Paper : 2368          G

Unique Paper Code        : 2164001001

Name of the Paper        : Plant Diversity and Human Welfare

Name of the Course       : Common Prog. Group

Semester                 : I

Duration : 2 Hours                    Maximum Marks : 60

## Instructions for Candidates

1.  Write your Roll No. on the top immediately on receipt of this question paper.

2.  Attempt any **four** questions in all.

3.  Question No. **1** is compulsory.

4.  All questions carry equal marks.

5.  All parts of a question must be answered together.

P.T.O.

(e) Petro crops

4. (a) What are essential oils? Give the botanical name, family, part used and any three uses of sandalwood. (5)

(b) Comment briefly on the role of forests within an ecosystem. (5)

(c) Give an account on Ecological importance of legumes. (5)

5. (a) Discuss the similarities between angiosperms and gymnosperms along with the examples. (5)

(b) Briefly summarise the uses of spices in Indian tradition and as food. Which spice is the costliest one and why? (5)

(c) Emphasize on the uses of Medicinal plants in drug industry in context to Sarpgandha. (5)

(500)