[This question paper contains 4 printed pages.]

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)** : (5×3=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)** : (3×5=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

Dec-2023

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4802 **G**

Unique Paper Code : 42161101

Name of the Paper : Biodiversity (Microbes, Algae, Fungi and Archegoniatae)

Name of the Course : **B.Sc. (Prog.) Life Science**

Semester : I

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** questions carry equal marks.
4. All parts of a question must be answered together.
5. Draw diagrams wherever required.

1. (a) Define the following **(any ten)** : (10×1=10)

(i) Circinate Vernation

(ii) Hormogonia

(iii) Holocarpic

(iv) Synzoospore

(v) Rhizomorph

(vi) Protonema

(vii) Anisogamy

(viii) Calyptra

(ix) Megasporophyll

(x) Sulphur Shower

(xi) Heteroecism

(xii) Akinetes

(b) Match the following : (5)

(a) Heterocyst	(i) Capsule
(b) Capsomere	(ii) Ferns
(c) Rhizome	(iii) *Nostoc*
(d) Operculum	(iv) *Selaginella*
(e) Rhizophore	(v) Virus

2. Distinguish between the following : (5×3=15)

(i) Heterocyst and Akinete

(ii) False indusium and True indusium

(iii) Pycnoxylic and Manoxylic wood

(iv) Conjugation and Transformation

(v) Uredopustule and Teleutopustule

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

(i) V.S. of sporophyll of *Pteris*

(ii) T.S. of *Barberis* leaf showing pycnial and aecial cup

(iii) T.S. of *Pinus* needle

(iv) L.S. sporophyte of *Funaria*

4. Write short note on the following **(any three)** : (3×5=15)

(i) Heterospory in Pteridophytes

(ii) Economic importance of bacteria

(iii) Gametangial copulation in *Rhizopus*

(iv) Alteration of generation in bryophytes

5. (a) Briefly describe the general characteristics of gymnosperms and discuss the reproduction in *Cycas*. (10)

(b) Write a note on Mycorrhiza. Give its significance. (5)

6. (a) Describe the life cycle of *Selaginella* with suitable diagrams. (8)

(b) Describe lytic and lysogenic cycle of viruses. (7)

[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

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

(i) Nucleosome model

(ii) Cytoskeletal elements

(iii) Cell cycle and its regulation

(iv) Double helical structure of DNA

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

(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

(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)

(3)

[This question paper contains 4 printed pages.]

Your Roll No.....

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*

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1767 **G**

Unique Paper Code : 2162521101

Name of the Paper : Plant Diversity and Systematics

Name of the Course : **B.Sc. Life Sciences**

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, **first** question is compulsory.
3. **All** questions carry equal marks.
4. Attempt **all** parts of the questions together.
5. Draw well labelled diagrams wherever required.

P.T.O.

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

(i) Phaeophyceae	(a) Verticillaster
(ii) *Marchantia*	(b) Winged Pollen
(iii) Lamiaceae	(c) Laminarin starch ,
(iv) *Pinus*	(d) Spiral chloroplast
(v) *Spirogyra*	(e) Gemma Cup
(vi) TMV	(f) *Chlamydomonas nivalis*
(vii) Red Snow	(g) ssRNA

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

(i) _____ established the binomial system.

(ii) Number of teeth in the outer peristomial ring of *Funaria* is _____ .

(iii) Spores bearing leaves of Pteridophytes are called _____ .

(iv) According to ICN the name of the family should end with the suffix _____ .

(v) _____ is an edible mushroom.

(vi) Ligulate and appendiculate scales are found in _____ .

(c) Define the following **(Attempt any five)** : (1×5=5)

(i) Heterocyst

(ii) Topotype

(iii) False indusium

(iv) *Nomen conservandum*

(v) Basidiocarp

(vi) Catkin

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

(i) L.S. sporophyte of *Marchantia*

(ii) Coenobium of *Volvox* with daughter Coenobia

(iii) V.S. Sporophyll of *Pteris*

(iv) L.S. antheridial branch of *Funaria*

(v) Conidiophore of *Penicillium*

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

(i) Lytic and Lysogenic cycle

(ii) Long shoot and Dwarf shoot of *Pinus*

iii) Natural and Phylogenetic system of classification

(iv) Gymnosperms and Pteridophytes

(v) Homonym and Synonym

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

(i) Mycoplasma

(ii) Chief characteristic features of Algae

(iii) Gram-positive and Gram-negative Bacteria

(iv) Asexual Reproduction in *Rhizopus*

(v) Adaptations in bryophytes which made them survive on land

(vi) Morphological types of lichens

5. (a) Discuss briefly the various food reserves and photosynthetic pigments in algae of major 4 classes studied by you. (8)

(b) Explain Bentham & Hooker's system of classification. Write its merits & demerits. (7)

6. (a) Write a short note on different modes of genetic recombination in bacteria explaining one of them in detail. (7)

(b) Discuss the principles of ICN. Explain principle of priority with its limitations. (8)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4769 **G**

Unique Paper Code : 42163302

Name of the Paper : Biofertilizers

Name of the Course : **B.Sc Life Science – SEC**

Semester : III

Duration : 2 Hours Maximum Marks : 38

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. This question paper has **7** questions.
3. Attempt **5** questions in all.
4. Question No. **1** is compulsory.
5. **All** questions carry equal marks except question no **1**.
6. Answer **all** parts of a question together.
7. Illustrate your answers with suitable diagram wherever necessary.

P.T.O.

1. (a) Match the following :- (5×0.5=2.5)

Column-1	Column-II
(i) Composting agent	Eisenia foetida
(ii) Biocontrol agent	Anabaena azollae
(iii) Symbiotic relation	Rhizobium
(iv) Root nodules in legumes	Glomus
(v) Microbes which form arbuscules	Trichoderma

(b) Define the following (**Any five**) :- (5×1.5=7.5)

(i) Organic farming

(ii) Mycorrhiza

(iii) Compost

(iv) Phosphorus mobilizer

(v) Mass multiplication

(vi) Nodule

2. Give the reasons for following statements :- (2×3.5=7)

(i) During composting process, we should monitor the temperature.

(ii) *Azolla* as a biofertilizer suitable in paddy fields.

3. Write short notes on the following :- (3.5+3.5=7)

(i) Colonization of AMF

(ii) Carrier based inoculation

4. What is composting? Write different methods of composting and their significance. (7)

5. (a) Describe the preparation of carrier based inoculant of *Azospirillium*. (3.5)

(b) Write detailed note on characteristic of *Azotobacter*. (3.5)

P.T.O.

6. Why Rhizobium is important for legumes? Explain how it develops association with leguminous plants. (2+5=7)

7. Discuss the waste management recycling methods for municipalities and industries. (3.5+3.5=7)

[This question paper contains 4 printed pages.]

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. internode 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 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)

P.T.O.

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 (3×5=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)

P.T.O.

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)

[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)** : (5×1=5)

(i) Frameshift mutation

(ii) Pleiotropy

(iii) Trisomy

(iv) Test cross

(v) Heterosis

(vi) Epistasis

(b) Give the important contribution of **(any five)** : (5×1=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

P.T.O.

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) ClB 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:

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

(ii) 2X3A

(iii) 1X3A

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4213 **G**

Unique Paper Code : 32163302

Name of the Paper : Intellectual Property Rights

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

Semester : III

Duration : 2 Hours Maximum Marks : 38

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **5** questions in all.
3. Question **1** is compulsory.
4. Attempt all parts of a question together.

1. (a) Comment on the following **(any five)** : (1×5=5)

(i) Domain name

P.T.O.

(ii) Plagiarism

(iii) Gene Bank

(iv) Patent

(v) Copyright

(vi) Patentable Invention

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

(i) Banarsi saree is an example of _____ .

(ii) Patents are granted for a period of _____ .

(iii) Arm chair is an example of _____ .

(iv) Patent registration office in Delhi is located at _____ .

(v) The representation of another Author's language, thoughts, ideas, or expressions as one's own original work is known as _____ .

(vi) Conservation of biological diversity, sustainable use of its components and fair usage of its resources comes under _____ Act.

2. Define Trademark and list the types of Trademarks with examples. (1+6=7)

3. How are software programmes related to IPR? Discuss their protection under IPR. (7)

4. Write short notes on the following **(any two)** : (3.5×2=7)

(a) Paris Convention

(b) Madrid Convention

(c) Sui Generis Regime

(d) Importance of IPR

5. Why protection of GIs are required? What are the current laws which protect GIs in India? (7)

P.T.O.

6. (a) What is TKDL? Discuss a case study related to TKDL and how TKDL is protected in India? (5)

(b) Discuss in brief about Intellectual property audit. (2)

[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)** : (5×3=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 : 4876 **G**

Unique Paper Code : 42164301

Name of the Paper : Plant Anatomy and Embryology

Name of the Course : **B.Sc. (Programme) Life Science – DSE**

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 **Section A** and **Section B** on separate sheets.
3. All parts of a question must be answered together.
4. Supplement your answer with well labelled diagram.

P.T.O.

Section A (37 marks)

Attempt **three** *questions from* **Section A** *including Question number* **1**, *which is compulsory.*

1. (a) Give one word answer **(attempt any three)** (1×3=3)

(i) The multiple epidermis to prevent loss of water is present in which type of plants?

(ii) Lateral roots originate from which part of the primary root?

(iii) Which type of collenchyma has thickenings mainly at the angles of the cells?

(iv) Name the cell in which cystolith occurs.

(v) What is the name of the vascular bundle that has phloem on either side of the xylem?

(b) Match the following **(attempt any four)** (1×4=4)

(i) Aerenchyma	*Nerium*
(ii) Quiescent centre	Endodermis
(iii) Casparian strips	Root
(iv) Sunken stomata	*Zea mays*
(v) Bulliform cells	Korper-kappe theory
(vi) Schuepp	hydrophytes

2. Attempt **any three** of the following : (5×3=15)

(i) Describe Kranz anatomy.

(ii) Differences between simple and complex tissues.

(iii) Anatomical differences between monocot and dicot Stem.

(iv) Draw well labelled diagram of T.S. *Hydrilla* stem.

(v) Seasonal activity of cambium.

3. (a) Describe secondary growth in dicot roots with the help of suitable diagrams. (7.5)

(b) Describe anatomical adaptations of hydrophytes with suitable examples. (7.5)

4. (a) Describe the Metcalfe and Chalk's classification of stomata with suitable diagrams. (10)

(b) Discuss various theories explaining the organisation of root apex. (5)

SECTION B (38 marks)

Attempt **three** *questions from* **Section B** *including Question number* **1**, *which is compulsory.*

1. (a) Define the following **(attempt any four)** (1×4=4)

(i) Porogamy

(ii) Hydrophily

(iii) Endothelium

(iv) Aril

(v) Perisperm

(vi) Aleurone layer

(b) Match the following **(attempt any four)** (1×4=4)

(i) Composite endosperm	Absence of endosperm

(ii) Double fertilization	Loranthceae
(iii) Pollination by bats	S.G. Nawaschin
(iv) Podostemaceae	Synergids
(v) Circinotropous ovule	Chiropterophily
(vi) Filliform apparatus	Cactaceae

2. Write short notes on **any three** of the following : (5×3=15)

(i) Anther wall layers.

(ii) Double Fertilization in angiosperms.

(iii) Types of Tapetum.

(iv) Differences between Nuclear and Cellular endosperm.

(v) Structure and organization of egg apparatus.

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

(i) Draw well labelled diagram of T.S. tetrasporangiate anther at tetrad stage.

(ii) Draw well labelled diagram of L.S. monocot embryo.

(iii) Draw well labelled diagram of L.S. anatropus, bitegmic ovule showing *Polygonum* type of embryo sac.

(iv) Differences between Monosporic and Tetrasporic embryo sac.

(v) Discuss embryo-endosperm relationship.

4. Attempt **any two** of the following : (7.5×2=15)

(a) Discuss the adaptive features of anemophilous plants.

(b) Describe different types of ovules found in angiosperms.

P.T.O.

(c) Name five eminent embryologists along with their significant contributions in the field of embryology.

(1000)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1762 **G**

Unique Paper Code : 2162522301

Name of the Paper : Plant Cell and Developmental Biology

Name of the Course : **B.Sc. (P) Life Sciences**

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. Question No. **1** is compulsory.
3. Attempt any **four** questions in all.
4. Attempt **all** parts of the question together.
5. Draw diagrams wherever required.

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

   (i) The Kōrper-Kappe theory of root apex organization was proposed by _____

   (ii) Living mechanical tissue of a dicot plant _____.

P.T.O.

(iii) Mesophyll is undifferentiated into palisade and spongy parenchyma in _____ leaf.

(iv) The ovule which has the micropyle and chalaza at the opposite ends is _____.

(v) Perisperm is different from endosperm because _____.

(vi) Intine of pollen grains is composed of _____ and _____.

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

(i) Meristematic tissue

(ii) Cork cambium

(iii) Megasporogenesis

(iv) Mesogamy

(v) Sclereids

(vi) Pollination

(c) State whether the following statements are True or False. (1×5=5)

(i) In leaves, the vascular bundles are collateral and closed.

(ii) Presence of lignin in cell wall is a characteristic feature of Parenchyma.

(iii) Cork is made up of suberin.

(iv) Tapetum is the outermost layer of anther wall.

(v) Chalaza is the basal part of the ovule.

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

(i) Monocot and Dicot leaf.

(ii) Collenchyma and Sclerenchyma

(iii) Atropous and Amphitropous ovules

(iv) Amoeboid and secretory tapetum

(v) Bisporic and tetrasporic embryo sac

3. Write short notes on **any three** of the following :- (5×3=15)

(i) Endoplasmic Reticulum

(ii) Ovule

(iii) Waiting meristem theory

(iv) Significance of double fertilization

(v) Functions of tapetum

P.T.O.

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

   (i) Plant cell

   (ii) Nucleus

   (iii) Circinotropous ovule

   (iv) T. S. Mature Anther

   (v) T.S. monocot root

5. Attempt the following **(any two)** :

   (a) Describe the anomalous secondary growth in *Bignonia stem* (7.5)

   (b) Explain the detailed structure of endosperm and its function (7.5)

   (c) Explain the detailed structure and function of cell wall (7.5)

[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 8 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4542 **G**

Unique Paper Code : 32167502

Name of the Paper : Biostatistics

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

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 any **five** Questions in all.
3. Question **1** is compulsory.
4. Non-scientific calculators allowed. Statistical tables provided by the college may be used if required.

P.T.O.

1. (a) Define **(Any Five)** (1×5=5)

(i) Level of Significance

(ii) Type I error

(iii) Class interval

(iv) Coefficient of variation

(v) Percentile

(vi) Mode

(b) Fill in the blanks **(Any Five)** (1×5=5)

(i) In a regression equation $y = a + bx$ wherein 'b' represents _____ of the line.

(ii) _____ is the graph of cumulative frequency distribution.

(iii) For a random sample of 9 women, the average resting pulse rate is $x = 76$ beats per minute, and the sample standard deviation (s) is 5.0. The standard error of the sample mean is _____.

(iv) Number of observations falling within a particular class interval is known as _____.

(v) The value of correlation coefficient always lies between _____.

(vi) The nth root of the products of 'n' items is known as _____.

(c) Mark True/False (1×5=5)

(i) If the value of two variables moves downward in same direction, then the correlation is negative.

(ii) Generally, in biological sciences the null hypothesis can be rejected if percentage a value is less than 0.05 percent.

(iii) Measures of Central Tendency for a given set of observations provides scatteredness of observations.

(iv) The symbol 'p' represents Spearman Correlation Coefficient.

(v) Chi-square test was first developed by Karl Pearson.

2. Differentiate between : (3×5=15)

(a) t-test and F test.

(b) Pie Chart and Histogram.

(c) Correlation and Regression.

(d) Measures of Central tendencies and Dispersion.

(e) Mean Deviation and Quartile Deviation.

3. (a) The following table shows number of plants having certain characteristics :

	Flat Leaves	Curled Leaves
White flower	99	36
Red flower	20	5

Using chi-square test examine the hypothesis that the flower colour is independent of flatness of leaf. (5)

(b) A Bag contains 5 red, 3 black and 4 white balls. What is the probability of getting a red or a white ball at random in a single draw? (4)

(c) Draw a (i) Pie diagram and (ii) Bar Diagram on the following data set :

Crops	Area (in thousand acres)
Rice	16
Wheat	25
Jowar	12
Maize	10
Bajra	09
Maize	28

(6)

4. (a) Ten students of a class were given a biostatistics test. After seven-days special training they reappeared for a second test. Marks obtained in two tests are provided below. Apply an appropriate hypothesis test and find out whether special training has been significantly benefitted the students or not? (6)

Students	1	2	3	4	5	6	7	8	9	10
Test 1	21	20	19	18	19	20	18	15	23	17
Test 2	22	21	20	21	22	23	20	18	23	20

(b) Following data-set shows Relative humidity (RH) and rate of transpiration of a mesophytic plant species. Explain the relationship using Karl Pearson Correlation and scatter plot: (6)

RH (%)	5	10	15	25	30	65	80	90
Transpiration rate (ml/h)	50	35	28	20	12	9	5	1

(c) Calculate the 3rd Quartile of the following data-set of marks obtained by students in an entrance examination. (3)

Roll no.	1	2	3	4	5	6	7	8	9	10
Marks (out of 100)	80	98	82	76	45	88	50	70	90	95

5. (a) What do you understand by data? Explain different scales of statistical measurement of data. (6)

(b) What do you mean by sampling? Discuss the different sampling methods used in biostatistics with examples. (9)

6. (a) Number of books purchased by a college library relies on the number of students registered in a year as mentioned in the table below.

Year	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Students (X)	36	28	35	39	30	30	31	38	36	38	29	26
Books (Y)	31	29	34	35	29	30	30	38	34	33	29	26

(i) Find out the linear regression equation of the given data-set.

(ii) Based on above data, predict number of books to be purchased for 15 students in the year 2022. (6)

P.T.O.

(b) Define standard deviation? Discuss its importance with example. Write down merits and demerits. (9)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4905 **G**

Unique Paper Code : 42167902

Name of the Paper : Cell and Molecular Biology

Name of the Course : **B.Sc. (Prog.) Life Sciences DSE**

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 any **five** questions in all.
3. Question No. **1** is compulsory.
4. **All** questions carry equal marks.
5. Attempt **all** parts of a question together.

1. (a) Comment on the following **(any five)** (5×1=5)

   (i) Chiasma

   (ii) Co-repressor

   (iii) Inducible operon

   (iv) Palindromic sequences

P.T.O.

(v) Pribnow Box

(vi) Replisome

(vii) Aminoacyl tRNA

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

(i) A cluster of contiguous genes in prokaryotic systems involved in transcription regulation is called as _____.

(ii) In metaphase, the centromeres of each chromosome are aligned midway across the spindle on a plane called the _____.

(iii) The longest phase during meiotic division is _____.

(iv) Extra – nuclear DNA is found in _____ and _____.

(v) Nucleosomes are linked together by _____.

(vi) Proteins responsible for unwinding of DNA are _____.

(c) Match the following : (5×1=5)

(i) Christian de Duve	(a) Lac operon
(ii) F. Jacob and J. Monod	(b) Electron microscope
(iii) A. Kornberg	(c) Carrier protein

(iv) Facilitated movement	(d) DNA polymerase I
(v) M. Knoll and E. Ruska	(e) Lysosomes

2. Write short notes on the following **(any three)** (3×5=15)

(i) X-ray diffraction

(ii) DNA packaging in eukaryotes

(iii) Fluid mosaic model

(iv) Nuclear pore complex

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

(i) B-DNA and Z-DNA

(ii) Centromere and Telomere

(iii) Primary wall and secondary wall

(iv) Leading and lagging strand

(v) Light microscopy and Confocal microscopy

(vi) Euchromatin and Heterochromatin

4. (a) Give an account of the structure and function of Golgi apparatus. (5)

(b) Explain the process of mitosis with the help of suitable diagrams and describe its significance. (5)

P.T.O.

(c) Describe the process of sample preparation for scanning and transmission electron microscopy. (5)

5. (a) Differentiate between prokaryotic and eukaryotic cell and sub-cellular organelles with the help of suitable diagrams. (5)

(b) Write down the various functions of the chloroplast. Name at least two marker enzymes of chloroplast. (5)

(c) Give a detailed account of the role played by lysosomes in cellular function. (5)

6. (a) Explain the translation process in prokaryotes with the help of suitable diagrams. (10)

(b) Discuss Griffith's and Avery's transformation experiment with the help of suitable diagrams. (5)

7. (a) Give a detailed account of "theta" mode of replication. (5)

(b) Discuss the regulation of gene expression in prokaryotes. (5)

(c) Write a brief account of endosymbiotic theory. (5)

(500)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4701 **G**

Unique Paper Code : 42163512

Name of the Paper : Ethnobotany

Name of the Course : **B. Sc. (P) Life Science - SEC**

Semester : V

Duration : 2 Hours Maximum Marks : 38

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt any **five** questions in all, **first** question is compulsory.
3. Attempt **all** parts of the questions together.

1. (a) Define the following : (1×5=5)

P.T.O.

(i) Traditional medicines

(ii) Ethnobiology

(iii) Biopiracy

(iv) Folklore

(v) *Ex- situ* conservation

(b) Fill in the blanks : (1×5=5)

(i) World Biodiversity Day is celebrated on _____

(ii) NMPB stands for _____

(iii) Father of Indian Ethnobotany _____

(iv) Immunity promoting drug _____

(v) Anti-diabetic plant _____

2. Write botanical name, family, plant part and ethnobotanical uses of the following **(any two)** : (3.5×2=7)

(a) Nirgundi

(b) Neem

(c) Sarpgandha

3. Write short notes on **(any two)** : (3.5×2=7)

(a) Intellectual Property Rights & Traditional knowledge

(b) Tools for collection of plants

(c) Minor ethnic group of India

4. Explain the role of ethnic groups in the conservation of plant genetic resources. (7)

P.T.O.

5. Name any five plants used by various tribes of India as a source of resin and oils. (7)

6. Define Ethnobotany. Explain the role of temples and sacred places as a source of ethnobotanical knowledge. (7)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 4377 **G**

Unique Paper Code : 32161502

Name of the Paper : Plant Physiology

Name of the Course : **B.Sc. (H) 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. Answer all parts of a question together.
3. Question Number **1** is compulsory.
4. Draw well-labeled diagrams wherever necessary.

1. (a) Name the hormone **(attempt any five)** :
   (i) A natural auxin
   (ii) A natural cytokinin
   (iii) A steroidal hormone
   (iv) A hormone that acts as an anti-transpirant
   (v) A hormone that induces internodal elongation

P.T.O.

(vi) A hormone that induces parthenocarpy (1×5=5)

(b) Explain the following :

(i) A continuous transpirational stream is created in plants.

(ii) The deficiency symptoms of an immobile element are seen earlier in younger leaves.

(iii) Water potential of fully turgid cell is zero.

(iv) Reducing sugars are not translocated in the phloem.

(v) The apoplastic pathway is not available for water to cross the endodermis. (1×5=5)

(c) Give one word for the following :

(i) A nutrient that acts as secondary messenger in the cell-

(ii) Pigment responsible for the perception of blue light-

(iii) A technique used for determining phloem sap composition-

(iv) Seeds whose germination is affected by light-

(v) Suppression of growth of lateral buds- (1×5=5)

2. (a) With suitable illustrations differentiate between different pathways of short-distance transport of water in plants. (5)

(b) Give one contribution of the following scientists :

(i) H.A. Borthwick and S.B. Hendricks

(ii) M. Chailakhyan

(iii) P. Agre

(iv) J. Levitt

(v) H.H. Dixon and J. Jolly (1×5=5)

(c) Define seed dormancy. How is it induced? Discuss its significance. (5)

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

(i) Role of Jasmonates

(ii) Phytosiderophores

(iii) Apical dominance

(iv) Criteria of essentiality

(v) Vernalization (5×3=15)

4. Differentiate between the following **(attempt any five)** :

(i) Loading and unloading of phloem

(ii) Low fluence responses (LFRs) and high irradiance responses (HIRs)

(iii) Pr and Pfr

(iv) Diffusion and Osmosis

P.T.O.

(v) Macro and micronutrients

(vi) Xylem and phloem transport (3×5=15)

5. (a) Describe in brief the factors affecting transpiration. (5)

(b) With the help of suitable illustrations explain the passive transport of ions across membranes. (5)

(c) Discuss different types of hydroponic systems and their merits. (5)

6. (a) Define bioassay and its significance? Describe one bioassay of ethylene. (5)

(b) Comment on the role and deficiency symptoms of **any two** of the following minerals :

(i) Phosphorous

(ii) Nitrogen

(iii) Iron (5×2=10)

7. (a) Discuss the experiment which led to the discovery of phytochrome. How does phytochrome regulate photomorphogenesis? (5)

(b) With the help of suitable diagrams explain the transport of water by cohesion-tension theory. (5)

(c) With suitable illustration/s explain ABC model of flowering. (5)

(1000)

[This question paper contains 4 printed pages.]

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) Némec 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 : (3×5=15)

(i) Obturator

(ii) Pollen wall proteins

(iii) Cleavage polyembryony

(iv) Hellobial endosperm

(v) Adventive embryony

(vi) MGU

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

P.T.O.

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 : (2×2.5=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)