

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 8589

J

Unique Paper Code : 32161101

Name of the Paper : MICROBIOLOGY AND
PHYCOLOGY

Name of the Course : B.Sc. (Hons.) BOTANY
(Admission 2019 onwards)

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. All parts of a question must be attempted together.
3. Illustrate your answers with suitable diagrams wherever necessary.
4. This question paper has six questions.
5. All questions carry equal marks.
6. Attempt any **FIVE** questions, including Question No. 1, which is compulsory.

P.T.O.

1. This Question is **COMPULSORY**.

(a) Fill in the blanks :

(1×5=5)

- (i) _____ coined the term 'Algae'.
- (ii) Rust of Tea is caused by _____.
- (iii) A colony with a definite number and arrangement of cells is called _____.
- (iv) The principle component of bacterial cell wall is _____.
- (v) Smallest known infectious agents that lack protein coat are called _____.

(b) Briefly explain the following terms : (2×5=10)

- (i) Clump formation
- (ii) Cystocarp
- (iii) Synzoospore
- (iv) Air bladders
- (v) Fimbriae

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

- (a) Unilocular sporangium & plurilocular sporangium
- (b) Gongrosira stage & palmella stage
- (c) Phaeophyta & rhodophyta
- (d) Gram positive bacteria & gram negative bacteria

Give labelled diagrams for **any three** of the following :

(5×3=15)

- (a) Lytic cycle
- (b) *Chara* - L.S. globule
- (c) *Chlamydomonas* - E.M.
- (d) *Polysiphonia* - Thallus bearing Cystocarp

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

(5×3=15)

- (a) Structure of TMV
- (b) Morphology of *Fucus*
- (c) Sexual reproduction in *vaucheria*
- (d) Cell division in *Oedogonium*

5. Discuss **any three** of the following :

(a) Unusual habitats of Algae

(b) Industrial products from Algae

(c) Bacterial growth curve

(d) Symptoms & control measures of any two viral diseases

6. Explain **any three** of the following :

(a) Thallus organization in coleochaete

(b) Vegetative reproduction in BGA

(c) Binary fission in bacteria

(d) Importance of viruses in the field of medicine

[This question paper contains 4 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : 8609 J

Unique Paper Code : 32161102

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

Name of the Paper : Biomolecules and cell Biology

Semester : I

Time : 3 Hours

Maximum Marks : 75

Instructions for Candidates :

- Write your Roll No. on the top immediately on receipt of this question paper.
- Attempt any **five** questions in all, including Question No. 1 which is compulsory.
- All** parts of a question must be attempted together.

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

1×5=5

- Buffers
- Peptide bond
- Prosthetic group
- Isoelectric point

P.T.O.

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- (v) Free energy
- (vi) Nuclear lamina

(b) Give structures of the following (any **five**):

1×5=5

- (i) Lactose
- (ii) Cellulose
- (iii) Amino acid with positively charged R group
- (iv) Adenine
- (v) Sterol
- (vi) Isoprene

(c) Match the following :

1×5=5

- | | |
|---------------------------|---------------------|
| (i) Acid Phosphatase | (a) Lipid synthesis |
| (ii) Ribosome | (b) Lysosome |
| (iii) Beta Sheet | (c) Carrier protein |
| (iv) SER | (d) Nucleolus |
| (v) Facilitated transport | (e) Silk Protein |

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

3×5=15

- (i) Globular and Fibrous protein
- (ii) Euchromatin and Heterochromatin
- (iii) Primary and Secondary cell wall
- (iv) Endergonic and Exergonic reactions

- (v) Competitive and Non-competitive inhibition
(vi) B and Z DNA

3. Write short notes on (any **three**) : $3 \times 5 = 15$

- (i) Nuclear pore complex
(ii) Regulation of cell cycle
(iii) tRNA
(iv) Water as a universal solvent

4. Draw well labelled diagrams (any **three**) : $3 \times 5 = 15$

- (i) Ultrastructure of mitochondria
(ii) Ultrastructure of primary cell wall
(iii) Metaphase II stage of meiosis
(iv) Fluid mosaic model

5. (a) Discuss the role of endoplasmic reticulum in folding, processing and quality control of protein. 10

(b) Name a marker enzyme for the following organelles : 5

- (i) Inner mitochondrial membrane
(ii) Lysosome
(iii) Peroxisomes
(iv) Golgi bodies
(v) Chloroplast stroma

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6. (a) Define activation energy. Explain mechanism of enzyme action with the help of various theories. 8
- (b) Give structure and function of lysosomes. 7

This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7383 J
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 together.

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

(i) Passage cell

(ii) Plastochrone

(iii) Tension wood

P.T.O.

(iv) Angular collenchyma

(v) Ray tracheid

(vi) Lysigenous cavity

(b) Match the following:

(5×1=5)

(i) Vesselless angiosperms

(a) Ficus

(ii) Casparian strip

(b) Root hair

(iii) Bulliform cells

(c) Trochodendron

(iv) Trichoblast

(d) Endodermis

(v) Cystolith

(e) Grasses

(c) Give suitable examples where following are present
(any five)

(5×1=5)

(i) Brachysclereids

(ii) Amphicribral vascular bundle

(iii) Lacunar collenchyma

(iv) Velamen

(v) Glandular trichome

(vi) Articulated laticifer

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

(3×5=15)

- (a) KorperKappe theory
- (b) Application of plant anatomy in systematics
- (c) Origin of lateral roots
- (d) Lenticels
- (e) Hydathodes

Differentiate between **(any five)**

(5×3= 5)

- (a) Storied and Non storied cambium
- (b) Ray and fusiform initials
- (c) Heart and sap wood
- (d) Vessel and tracheid
- (e) Simple and bordered pits
- (f) Collenchyma and sclerenchyma
- (g) Ring porous and diffuse porous wood

4. (a) Elaborate the process of secondary growth in dicot stem. (10)

(b) Define quiescent centre and its significance. (5)

5. Draw well labelled diagrams (any three) (5×3=15)
- (a) T.S. Dicot root
 - (b) V.S. shoot apex
 - (c) Kranz anatomy
 - (d) T.S. wood showing tyloses
 - (e) Periderm
6. (a) Elucidate the anatomical adaptations in xerophytes. (10)
- (b) Explain seasonal activity of cambium (5)
7. (a) Discuss various types of stomata present in angiosperms with suitable examples. (10)
- (b) Elaborate cytodifferentiation of sieve tube elements. (5)

[This question paper contains 5 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7384 J
Unique Paper Code : 32161302
Name of the Paper : Economic Botany
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. Attempt **Five** questions in all including question No. 1 which is compulsory.
3. All parts of a question must be answered together.
4. All questions carry equal marks.
5. Draw labelled diagrams and write the botanical name wherever necessary.

1. (a) Give botanical name and family of the following:
(5×1)

P.T.O.

- (i) Plant that causes Lathyrism
- (ii) Plant roots of which are used for making screen in coolers
- (iii) Plant that yields digitalin
- (iv) Plant leaves of which are used for wrapping tobacco in bidi
- (v) Plant that is known as "King of Spices"

(b) Match the following:

(5×1)

- | | |
|----------------------------------|---------------|
| (i) <i>Papaver somniferum</i> | (a) Ginning |
| (ii) <i>Corchorus capsularis</i> | (b) Ratooning |
| (iii) <i>Linum usitatissimum</i> | (c) Lancing |
| (iv) <i>Gossypium hirsutum</i> | (d) Retting |
| (v) <i>Saccharum officinarum</i> | (e) FLax |

(c) Expand **any five** of the following:

(5×1)

- (i) IPR
- (ii) CRRI

(iii) CTRI

(iv) NBPGR

(v) IARI

(vi) CPRI

Draw labelled diagrams of **any three** of the following
(Write botanical name and family): $(3 \times 5 = 15)$

(i) L.S. of clove

(ii) Portion of sugar cane stem

(iii) T.S. of schizocarpic fruit

(iv) L.S. cotton seed

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

(i) Fatty oils and essential oils

(ii) Porous wood and non-porous wood

(iii) *C. capsularis* and *C. olitorius*

(iv) Flue curing and sun curing

(v) Black tea and Green tea

(vi) Millets and Cereals

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

(i) Vavilov's concept of centres of origin of cultivated plants

(ii) Bi-products of sugarcane industry

(iii) Tapping of latex from para rubber tree

(iv) Tobacco and its Health hazards

(v) Extraction methods of essential oils

(vi) TPS technology

5. Write botanical name, family, part used and economic importance of any five the following: (5×3=15)

(i) Saffron

(ii) Linseed

(iii) Teak

(iv) Cotton

(v) Mustard

(vi) Wheat

(vii) Groundnut

(a) Coconut is a multi- purpose plant. Comment on the statement. (5)

(b) Write note on importance of legumes to man and ecosystem. (5)

(c) Give a detailed account of the morphology and economic importance of wheat. (5)

(a) What is retting? Explain this process in jute. (5)

(b) Write botanical name, family, part used and chemical constituents of any two drug yielding plants you have studied (5)

(c) Comment on the advantages and disadvantages of Green Revolution. (5)

Sr. No. of Question Paper : 7385 J
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. Attempt **Five** questions in all.
3. Question No. **1** is compulsory.

1. (a) Give contributions of the following scientists
(any 5) : (1×5)

- (i) Nilsson-Ehle
- (ii) R. C. Punnett

(iii) L. Cuenot

(iv) H. J. Muller

(v) Hugo de Vries, K. Correns, E. Tschermak

(vi) S. Benzer

(b) Define the following terms (any 5): (1×5)

(i) Holandric genes

(ii) Allele

(iii) Chi-square test

(iv) Recon

(v) Karyotype

(vi) Allopatric speciation

(c) Expand the following (any 5): (1×5)

(i) SRY

(ii) QTL

(iii) 5-BU

(iv) F1

(v) NTG

(vi) cM

2. Write short notes on the following (any 3) : (5×3)

(a) Multiple Alleles

(b) ClB experiment

(c) Cis-trans complementation test

(d) Kappa particle inheritance in *Paramecium*

3. Differentiate between the following (any 3) : (5×3)

(a) Physical and Chemical mutagen

(b) Euploidy and Aneuploidy

(c) Dominance and Epistasis

(d) Continuous and discontinuous variations

4. (a) Explain Hardy-Weinberg Law with an example.

(8)

P.T.O.

- (b) Discuss maternal influence with the help of an example. (7)
5. (a) Describe pre-zygotic and post-zygotic mechanisms of reproductive isolation in Angiosperms. (8)
- (b) What do you understand by expressivity and penetrance? (5)
- (c) Explain test cross. (2)
6. (a) Explain lethal alleles and their inheritance with examples. (6)
- (b) What is chromosomal inversion? Discuss its consequence during gamete formation. (9)
7. (a) In *Drosophila*, Lyra (*Ly*) and Stubble (*Sb*) are dominant mutations located on two separate loci on chromosome 3. A recessive mutation with bright red eyes was also shown to be on chromosome 3. Progeny is obtained by crossing a female who is heterozygous for all three mutations to a male homozygous for bright red mutation (*br*). The

following data is generated :

Phenotype	Number
<i>Ly Sb br</i>	404
+ + +	422
<i>Ly</i> + +	18
+ <i>Sb br</i>	16
<i>Ly</i> + <i>br</i>	75
+ <i>Sb</i> +	59
<i>Ly Sb</i> +	4
+ + <i>br</i>	2

- (i) Calculate Non crossover, Single crossover and Double crossover frequencies. (6)
- (ii) Determine the correct gene sequence and the map distance between each loci. (3)
- (iii) Calculate Coefficient of coincidence (C) and Interference (I). (3)

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(b) Explain genetic drift and its implications.

(1300)

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7549 J
Unique Paper Code : 32163302
Name of the Paper : Intellectual Property Rights
Name of the Course : B.Sc. (H) Botany / B.Sc.
(Prog.) : Skill Enhancement
Course
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. Question No. **1** is compulsory.
4. All questions carry equal marks.
5. Attempt all parts of a question together.

1. (a) Expand the following abbreviations (**any five**) :

(1×5=5)

P.T.O.

- (i) UPOV
- (ii) TRIPS
- (iii) TKDL
- (iv) WIPO
- (v) NGB
- (vi) NBPGR

(b) Define the following (**any five**) :

(1×5=5)

- (i) Bioprospecting
- (ii) Patent
- (iii) Copyright
- (iv) Intellectual Property
- (v) Trade secrets
- (vi) Traditional Knowledge

(c) Fill in the blanks (**any five**) :

(1×5=5)

- (i) Darjeeling Tea is an example

- (ii) Honda car is an example of
- (iii) Post-grant opposition of a patent is filed in the Form no.
- (iv) Patents are granted for a period of
- (v) The Office of the Controller General of Patents, Designs & Trade Marks (CGPDTM) is located in
- (vi) Trademark registration office in Delhi is located in

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

- (a) Collective mark and certification mark
- (b) Bio-prospecting and Bio-piracy
- (c) Process and product patent
- (d) Traditional varieties and GM crops

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

- (i) *Sui-generis* regime
- (ii) Patent cooperation treaty (PCT)
- (iii) National gene banks
- (iv) IPR related to computer software
- (v) Protection of goodwill by trademarks

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

- (a) What has led to the establishment of Traditional Knowledge Digital Library (TKDL) by the Government of India? Discuss the setup of TKDL.
- (b) What is a domain name? What are the safeguards provided to protect it under IPRs?
- (c) Define Trademark. Discuss various types of trademarks with their significance.

(2×7.5=15)

Attempt any two :

- (a) What are the objectives of protection of plant varieties? Discuss the measures taken by Government of India to protect plant varieties.
- (b) What are the objectives of patenting biotechnology inventions? Explain the concept of novelty in biotechnology inventions. Give any two applications of IPR in biotechnology.
- (c) Define a database. List various biological databases. Discuss the objectives and provisions of database protection under IPR laws.

Answer any two of the following : (2×7.5=15)

- (a) Give different types of applications for patent registration in India. With the help of a flow diagram discuss the patent registration procedure in India.
- (b) List the classes of work for which copyright protection is available in India. What amounts to be copyright infringement? Discuss the protective measures provided against copyright infringements.

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(c) Give justification for protection of geographical indications (GIs). What are the current laws which protect GIs in India? Briefly discuss TRIPS agreement (1994) in relation to GIs.

This question paper contains 6 printed pages

Your Roll No.....

J

Sr. No. of Question Paper : 7386

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 No. 1, which is compulsory.
3. All parts of a question must be attempted together.
4. Draw well-labelled diagrams wherever necessary.

1. (a) Fill in the blanks (**any six**) : (6×1=6)

(i) Rejection reaction occurs at the stigma surface in _____ self-incompatibility.

P.T.O

- (ii) Pseudo-embryo sac is a characteristic feature of the family _____.
- (iii) _____ is a fleshy outgrowth of the integument at the micropylar region of the seed which helps in dispersal and germination.
- (iv) Coconut milk is an example of _____.
- (v) The presence of composite endosperm is a characteristic feature of the family _____.
- (vi) The contents of the pollen tube are discharged in _____ cell of the embryo sac.
- (vii) Hypodermal position of megaspore mother cell is characteristic of _____ ovules.

(b) Define **any six** of the following terms :

(6×1=6)

- (i) Cleistogamy
- (ii) Hypostase
- (iii) Palynology

- (iv) Cybrids
- (v) Aril
- (vi) Nemec Phenomenon
- (vii) Diplospory
- (viii) Helobial Endosperm

(c) Write the contributions of the following embryologists (**any two**): (2×1.5=3)

- (i) G.B. Amici
- (ii) E. Strasburger
- (iii) B. M. Johri

Differentiate between **any five** of the following:

(5×3=15)

- (i) Anemophily and Hydrophily
- (ii) Simultaneous and Successive Cytokinesis
- (iii) Vegetative and Generative cell
- (iv) Autochory and Anemochory

(v) Gametophytic and Sporophytic Incompatibility

(vi) Endothecium and Endothelium

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

(3×5=15)

(i) Bisporic Embryo sac development

(ii) Germ line transformation

(iii) Embryogenesis in *Paeonia*

(iv) Pollen wall structure

4. Answer the following (any three):

(3×5=15)

(a) What are the different methods used to overcome incompatibility? Explain any two methods in detail.

(b) Describe the floral mechanisms favouring cross-pollination in bisexual flowers.

(c) What are the various methods used for pollen storage? Briefly outline the practical applications of the technique of pollen storage.

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- (d) Explain the development of *Plumbago* type of embryo sac diagrammatically and mention the ploidy of primary endosperm nucleus.

Attempt any three :

(3×5=15)

- (a) Define apomixis. What is the difference between apospory and adventive embryony?
- (b) Write briefly about the functions of the anther tapetum.
- (c) Explain the structure and the role played by the synergids in double fertilization.
- (d) What is unique about the microsporogenesis in Cyperaceae?

6. Answer the following (any three) :

(3×5=15)

- (a) What are the different pathways taken by the pollen tube to enter the ovule?
- (b) Explain the different factors affecting the germination of pollen grains.

(c) What is the difference between cleavage polyembryony and adventive polyembryony?

(d) Draw well-labelled diagrams of :

- (i) Male Germ Unit of *Plumbago zeylanica*.
- (ii) T.S. tetrasporangiate anther showing secretory tapetum and microspore tetrads.

[This question paper contains 6 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7387 J

Unique Paper Code : 32161502

Name of the Paper : Plant Physiology

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
3. Question No. 1 is compulsory.
4. Draw well-labelled diagrams wherever necessary.

1. (a) Give the term used for the following. Attempt any five. (5x1=5)

(i) The transport mechanism in which two different solutes are moved across the membrane simultaneously.

(ii) The loss of water in the form of vapours from the aerial parts of the plant.

P.T.O.

- (iii) The requirement of cold temperature for flowering.
- (iv) Dark-grown seedlings.
- (v) The continuous system of plant cell protoplasts interconnected by plasmodesmata.
- (vi) Gas bubble formation in the xylem.

(b) Write True or False against the following. Attempt any five. (5x1=5)

- (i) The dissolved solutes in a cell contribute to the osmotic potential of the cell.
- (ii) Magnesium is a micronutrient required by plants.
- (iii) Gibberellins bring about bolting in rosette plants.
- (iv) Channels require ATP to transport solutes across membranes.
- (v) Brassinosteroids are recently discovered plant hormones.

(vi) Sucrose is the most abundant sugar in the phloem.

(c) Fill in the blanks. Attempt any five. (5x1=5)

(i) is the fruit ripening hormone.

(ii) The water potential of pure water is..... .

(iii) The hard seed coat can be rendered permeable to water and oxygen by.....

(iv) is referred to as the rooting hormone.

(v) The concept of forigen was put forth by..... .

(vi) Cytokinins delay

2. Write short notes on **any three** of the following.

(3x5=15)

(i) Root pressure

(ii) Cholodny-Went Hypothesis

(iii) Phloem loading

(iv) Role of ABA during embryogenesis

3. Differentiate between the following. Attempt any three. (3×5=15)
- (i) Passive transport and active transport
 - (ii) Long-day plants and day-neutral plants
 - (iii) Hydroponics and aeroponics
 - (iv) Macronutrients and micronutrients
4. Attempt any three of the following : (3×5=15)
- (i) Discuss the mechanism of action of auxins.
 - (ii) Write an account on phytochrome and its significance.
 - (iii) Explain the effects of any two factors on transpiration.
 - (iv) Describe the *Avena* coleoptile curvature bioassay for auxins.
5. Answer any three of the following. (3×5=15)
- (i) Write an account on aquaporins.
 - (ii) What are mycorrhizae? Explain the role of mycorrhizae in nutrient uptake.

(iii) Discuss stomatal movements in the light of Proton Transport Theory.

(iv) Describe Munich's Mass Flow Hypothesis.

Attempt any three of the following. (3x5=15)

- (i) Using a suitable diagram explain how water moves from the soil to the root up to the xylem.
- (ii) Write an account on jasmonic acid.
- (iii) Discuss the ABC model of flowering.
- (iv) Discuss the role of Gibberellic Acid in induction of α -amylase activity in cereal grains.

Give brief answers to **any five** of the following. (5x3=15)

- (i) What is meant by Triple Response in the context of ethylene?
- (ii) Give one important function each of Ca, S and K.
- (iii) Why are cytokinins called cell cycle regulators?
- (iv) Explain why chelating agents are used in the nutrient media.

- (v) What are ringing/girdling experiments? What is their significance?
- (vi) Explain the effect of blue light on the stomatal movements.

[This question paper contains 7 printed pages]

Your Roll No.

:

Sl. No. of Q. Paper

: **7866** **J**

Unique Paper Code

: 32167501

Name of the Course

: **B.Sc.(Hons.) Botany :**
DSE - 1

Name of the Paper

: Analytical Techniques in
Plant Sciences

Semester

: V

Time : 3 Hours

Maximum Marks : 75

Instructions for candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
 - (b) Question **NO.1** is compulsory.
 - (b) Attempt **five** questions in all, including Question **No. 1**.
 - (d) Attempt all parts of the question together.
1. (a) Name a marker enzyme for the following organelles (any **five**) : 1×5=5
- (i) Lysosomes

P.T.O.

- (ii) Mitochondria
- (iii) Chloroplast
- (iv) Golgi Apparatus
- (v) Endoplasmic Reticulum
- (vi) Nucleus

(b) Fill in the blanks (any **five**) :

1×5=5

- (i) Sedimentation rate of a particle at a specific RCF depends on its and
- (ii) Stepwise isolation of sub-cellular particles during successive centrifugation is called
- (iii) is a specialized kind of chromatography performed under high pressure for better resolution of components.
- (iv) is the technique used for determining the age of fossils.

- (v) Radioisotopes have neutron : proton ratio greater than
- (vi) is the ability to distinguish two close objects as distinct.
- (c) Explain the function/use of the following (any **five**) : 1×5=5
- (i) Deuterium Lamp
 - (ii) Osmium Tetroxide
 - (iii) Lead Shield
 - (iv) Electron Gun
 - (v) Probe
 - (vi) SDS

2. (a) Explain the working of spectrophotometer with reference to the Beer- Lambert law. What are the applications of UV and visible spectrophotometer ? 9

(b) Discuss the technique of autoradiography. List **five** radioisotopes that can be used to study biomolecules/ biological processes. 6

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3. (a) What is Blotting ? Explain the technique of Western/ Southern Blotting in detail. 10

(b) What are the measures of central tendency ? Discuss briefly Arithmetic Mean, Median and Mode. 5

4. (a) Write an account of chromosome banding technique. Mention the application of this technique. 8

(b) Using a ray diagram explain the working of a confocal microscope. 7

5. Differentiate between (any **three**) :

$5 \times 3 = 15$

(a) Paper chromatography and thin layer chromatography

(b) Positive staining and negative staining

(c) AGE and PAGE

(d) SEM and TEM

(e) HPLC and GLC

6. Explain why (any **five**) :

3×5=15

(a) Column of electron microscope is placed under vacuum.

(b) TEMED and APS should be added just before casting of gel.

(c) Salts of heavy metals are used as stain in electron microscopy.

(d) Resolution of electron microscopy is higher than light microscope.

(e) Acrylamide gel are used for DNA Sequencing.

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(f) Small amount of bisacrylamide is added in acrylamide for Polyacrylamide gel polymerization.

(g) Glycerol and bromophenol blue is added to the DNA while loading it onto the gel.

7. Attempt (any **three**) :

5×3=15

(a) In garden pea, Smooth seeds are (R) is dominant to wrinkled seeds (r). In a cross between a plant homozygous for smooth seeds and wrinkled seeds, the following progeny was obtained in F₂ generation

Smooth seeds 5474

Wrinkled seeds 1850

Perform chi-square analysis to see if the data fits into the expected results of the cross.

- (b) With the help of diagram explain affinity chromatography.
- (c) Briefly explain the pulse chase experiment used in biological research.
- (d) Write a short note on X-ray Crystallography.

This question paper contains 7 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : **8006** **J**

Unique Paper Code : 32167502

Name of the Course : **B.Sc.(Hons.)**
Botany : DSE - 2

Name of the Paper : Biostatistics

Semester : V

Time : 3 Hours **Maximum Marks : 75**

Instructions for candidates :

- (i) Write your Roll No. on the top immediately on receipt of this question paper.
- (ii) Attempt any **five** questions in all.
- (iii) Question **NO.1** is compulsory.
- (iv) Nonscientific calculator allowed. Statistical tables provided by the college may be used if required.

1. (a) Define (any **five**) : 1×5=5
- (i) Mode
 - (ii) Null hypothesis

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- (iii) Central tendency
- (iv) Quartile
- (v) Frequency polygon
- (vi) Normal distribution curve

(b) **True and false (any five) :**

1×5=5

- (i) The father of Biostatistics is Francis Galton.
- (ii) Range is not represented as difference between highest and lowest value of the variable.
- (iii) Relative frequency is percentage of each specific frequency out of the total frequency.
- (iv) The variable which influences the values is called as an independent variable.

(v) Standard deviation was first suggested by Karl Pearson.

(vi) The conclusions obtained statistically are universally true.

(c) Identify the symbol and abbreviations used in statistics (any **five**) : 1×5=5

(i) σ

(ii) f_o

(iii) U

(iv) ρ

(v) Q_2

(vi) SE_M

2. (a) What do you mean by sampling? What are the different types of sampling? Point out the merits and demerits of sampling techniques. 2+3+2=7

(b) What do you understand by data? Describe various methods of classification of data with suitable examples. 2+6=8

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3. Differentiate between (any **five**) :

$3 \times 5 = 15$

- (a) Mean deviation and quartile deviation
- (b) Diagram and Graph
- (c) Linear and Non-linear correlation
- (d) Paired and Unpaired t test
- (e) Class interval and Class frequency
- (f) Sampling and Non-sampling error

4. (a) What do you understand by Standard deviation ? How to calculate S.D ? Discuss its merits and demerits.

$1+2+2=5$

(b) Calculate the standard deviation and mean deviation and interpret results of the given data :

$2+2+1=5$

$X = 10, 13, 17, 22, 27, 30, 31, 32$

(c) Calculate the median from the given data :

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Yield (kg)	0-3	3-6	6-9	9-12	12-15
No. of Plants	4	8	22	10	4

5. (a) Following results obtained in a dihybrid cross, involving shape and color of the seeds

Round/ yellow	Round/ Green	Wrinkled/ Yellow	Wrinkled/ Green
317	109	102	32

If the dihybrid ratio is 9:3:3:1, the plants should have been 315 Round/Yellow, 105 Round/Green, 105 Wrinkled/Yellow, 35 wrinkled/green. Calculate χ^2 (Chi-square) value and draw your conclusion.

$$5+2=7$$

- (b) Calculate regression coefficient of the following data. Find out the regression equation :

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X	16.5	11.6	11.4	14.3	14.0	12.2	9.8	14.0	3.5	8.0	12.6	14.4
Y	6.4	6.5	6.6	8.7	6.5	5.9	3.9	3.4	3.0	5.7	4.5	6.5

6. (a) The body weight (kg) of 8 adult males & of 8 adult females is presented in the given table. Find out whether or not the mean weight of males is significantly higher than that of females. Calculate student's t-test at 5% level of significance.

Males wt. (kg)	50	58	60	55	59	56	54	64
Females wt. (kg)	49	52	51	56	55	53	52	48

- (b) Calculate the Karl Pearson's correlation coefficient of the given data :

X	57	42	40	38	42	45	42	44	40	46	44	43
Y	10	26	30	41	29	27	27	19	18	19	31	29

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(c) Write short note (any **two**) :

2.5×2=5

(i) Scatter method of studying correlation

(ii) Regression lines

(iii) Questionnaire with suitable example