

BOTANY

Paper : BOHCT-1.1

Biology and Diversity of Virus, Bacteria and Fungi

Full Marks : 60

Time : 2½ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer all the questions.

GROUP-A

(Biology & Diversity of Virus)

(Marks: 20)

1. Answer any **five** from the following: $2 \times 5 = 10$
 - a) Name one fungus responsible for plant virus transmission. Mention the role of 2-mercapto-ethanol used for isolation of plant viruses.
 - b) Define pathogene.
 - c) Name one single stranded DNA-containing plant virus. Name one viroid disease of monocotyledorous plant.

[Turn over]

- d) Distinguish between monopartite and partite viruses.
- e) Name one tailless phage. What is the full form of PSTV?
- f) Distinguish between activator and satellite viruses.
- g) Mention the technique of viroid multiplication.

2. Answer any **one** from the following: $10 \times 1 = 10$

a) Why is the knowledge of plant virus transmission important in practical point of view? Describe briefly the various modes of insect virus transmission. What is the interrelationship amongs during such transmission? 2+5+3

b) i) What is prion? Mention its chemical nature. Distinguish between Pr^{CS} and Pr^{SC} form. Name one prion disease of human. 2+1+2+1

ii) Briefly describe the outline of plant virus classification system as recommend by ICTV. 4

GROUP-B

(Biology & Diversity of Bacteria)

(Marks: 20)

3. Answer any **five** questions of the following:

2×5=10

- a) What are capnophiles? Give an example.
- b) What is Exponential growth rate?
- c) When a young vigorously growing exponential culture is transferred to the fresh medium of same composition, what will be the lag phase? Why is exponential growth called a Balanced growth?
- d) What are starvation proteins? Mention their function.
- e) Is penicillin an antigen? Explain.
- f) Distinguish between endospore and exospore of bacteria.
- g) Define complement.

4. Answer any **one** of the following: 10×1=10

- a) i) Define competence. Discuss the role of competence in bacterial transformation.
2+3
- ii) Distinguish between stenothermal and eurythermal bacteria. 2

- iii) What is porin? Mention its function. 2
- iv) Name one endospore-producing Gram positive coccus. 1
- b) i) What are Paracolon bacteria? Mention their salient characteristics. 1+2
- ii) Classify Teichoic acid. Mention their function. 2+2
- iii) Distinguish between an immunogen and an antigen. 2
- iv) Cite an example of sulfate-reducing bacterium. 1

GROUP-C

(Biology & Diversity of fungi and their allies)

(Marks: 20)

5. Answer any five of the following: $2 \times 5 = 10$
- a) What are lomasomes? Mention their function.
- b) What are bothrosomes? What are their functions?
- c) Distinguish between paragynous and amphigynous types of antheridia.
- d) Classify gymnohymenial types of apothecial development.

- e) What is 'Eversion mechanism'?
 - f) Distinguish between blastic and thallic conidiogenesis.
 - g) What are the types of dormancy in fungal spores.
6. Answer any one of the following: 10×1=10
- a) Describe the biogenesis of the fungal cell wall. Illustrate the evolution of conidia among Zygomycota members. 5+5
 - b) Write a short note on: 5+5
 - i) Conidial fructifications
 - ii) Ascosporogenesis
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BOTANY

Paper : BOHCT-1.2

Biology and Diversity of Algae, Byophytes & Pteridophytes

Full Marks : 60

Time : 2½ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer all the questions.

GROUP-A

(Biology & Diversity of Algae)

(Marks : 20)

1. Answer the following in brief (any five): $2 \times 5 = 10$
 - a) Give one evidence in support of the Endosymbiotic Theory.
 - b) Name the different α -1, 4 linked glucans found as reserved food material in algae, also give examples of the specific algal groups that possess such reserve food materials.
 - c) State the two pigment-linked criteria that led to the creation of the algal group prochlorophyta.

[Turn over]

- d) What is diel migration? Explain the controlling factors of diel migration in brief.
- e) Distinguish between phragmoplast and phycoplast citing examples for each.
- f) Give a brief account of thylakoid patterns in Oscillatoriales.
- g) Write a short note on paralytic shellfish poisoning.
2. Answer any **one** from the following: $10 \times 1 = 10$
- a) Give an elaborate account of evolutionary trends in green algal lineages. 10
- b) Give reasons for hypobradytely in Cyanobacteria. How does macroevolution correspond with cyanobacterial evolution? Write an explanatory note on 'Horizontal Gene Transfer' in Cyanobacteria. $2+2+6$

GROUP-B

(Biology & Diversity of Bryophytes)

(Marks : 20)

3. Answer any **five** of the following: $2 \times 5 = 10$
- a) Exemplify nematodontous and arthroodontous haplolepidous mosses.
- b) Name one moss each from restricted dwellers of low calcium and saline environment, respectively.

- c) Define guide cells.
- d) How does the sporophyte of the genus *Notothylas* differ from other hornworts?
- e) What is a phorophyte? Name two frequent epiphyllors bryophytes.
- f) What are the differences between the spores of fugitives and colonists?
- g) Name the properties of a substrate that determine colorization by a bryophyte?

4. Answer any **one** of the following: $10 \times 1 = 10$

- a) Mention the different classes of moss with their sailent features. Write the total numbers of genera in the hornworts according to recent taxonomic placement. Explain the evolution of conducting structures in bryophytes.

5+1+4

- b) Write explanatory notes on the substrate specificity of bryophytes in the context of:

- i) metallophytes
- ii) Dung and Cadaver mosses
- iii) Fire mosses
- iv) Halophytic mosses

2.5×4

GROUP-C

(Biology & Diversity of Pteridophytes)

(Marks : 20)

5. Answer the following in brief (any five):

2×5=10

- a) Exemplify the genera showing eusporangiate characters and intermediate characters of leptosporangiate and eusporangiate fern.
- b) Write two non filiclean characters of the order Ophioglossales.
- c) How do the peridophytic gametophytes propagate vegetatively?
- d) What is monomegaspory? Name a genus having monomegaspory.
- e) Mention the environmental classification concerned with fern diversity.
- f) What is sporocyte? How does the sporocyte get nourishment?
- g) What variations are observed in the structure of male gametophytes of heterosporous pteridophytic taxa.

6. Answer any one of the following: 10×1=10

- a) What is the chemical nature of antheridogen? Briefly mention the regulatory role of light

and darkness in antheridium formation.
"Antheridogen is a pheromone"—Justify. Write short notes on the polyploids of microphyllous and megaphyllous pteridophytes. 1+2+2+5

- b) Why is conservation of fern needed? State the reasons for fern species in India getting threatened. Prepare a brief strategic account for conserving fern flora in your locality.

2+4+4

BOTANY

Paper : BOHCT-1.3

Biology and Diversity of Gymnosperms, Taxonomy of Angiosperms & Biosystematics

Full Marks : 60

Time : 2½ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer all the questions.

GROUP-A

(Biology & Diversity of Gymnosperm)

(Marks : 20)

1. Answer any five questions: 2×5=10
- a) What is sperghnum cortex?
 - b) Who discovered the 'type species' of calamopitys and when?
 - c) What is incipient cleavage? Where does it occur?
 - d) Why is Gnetopsida considered as "connecting

[Turn over]

link" between gymnosperms and angiosperms?

- e) Mention the difference between Cycadales and Bennettiales.
- f) Give the names of form-genera of lay to niaceae.
- g) Name the stem and life genera for Pentoxylales.

2. Answer any **one** question: 10×1=10

- a) Give a short note on the affinities of Bennithiales with angiosperm. Mention the distinguishing features of vascular bundles of cycadales. 6+4
- b) Give an account of variations in pollination mechanism in conifers. Briefly describe the pollen-organs of Medullossaceae. 5+5

GROUP-B

(Taxonomy of Angiosperms & Biosystematics)

(Marks : 40)

3. Answer any **ten** of the following: 1×10=10

- a) Name two Indian Journals which are exclusively concerned with taxonomy and related fields.

- b) Enumerate 2 important primitive features of the order Magnoliales;
 - c) What is Neoendemism?
 - d) Define Fancy epithet. Cite one example.
 - e) Write the full form of ICNCP and ICN.
 - f) What are Semantides? Cite an example.
 - g) What is the morphological nature of nutmeg and mace?
 - h) Define Epitype.
 - i) Name, place and year of the latest International Botanical Congress.
 - j) Define Paraphyly?
 - k) What is Glossary? Cite one example.
 - l) What is Syntype?
 - m) Define Eudicots.
 - n) Name 2 families of Magnoliales having one species each.
4. Answer any **five** of the following: $2 \times 5 = 10$
- a) What are Palaeoherbs? Cite two examples.
 - b) Mention the distribution of the family Degeneriaceae and mention the name of a Species.

- c) Distinguish between Flora and Mannual.
 - d) Mention the diagnostic features of the family Amborallaceae.
 - e) Name the subclasses of Liliopsida of Cronquist (1988).
 - f) What is meant by priority of publication?
 - g) Define diagnosis. State its uses.
5. Answer any **two** of the following: $10 \times 2 = 20$
- a) Define Biosystematics. Discuss the different categories of Biosystematics. State its differences with classical taxonomy.
 $2+5+3$
 - b) Define valid publication. State the rules of valid publication of a name of a taxon. What are ISSN and ISBN?
 $2+6+2$
 - c) Write short notes any **two** of the following:
 $5 \times 2 = 10$
 - i) Distribution of sieve tube plastids in angiosperms
 - ii) Endemism in India and
 - iii) Principal ideas about Bio-codes

BOTANY

Paper : BOHCT-1.4

Cytology, Cytogenetics & Genetics

Full Marks : 60

Time : 2½ Hours

The figures in the right-hand margin indicate marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer all the questions.

1. Answer any **ten** questions: 1×10=10
- a) What is bulky adducts?
 - b) What is dosage compensation?
 - c) What is amphidiploid?
 - d) Mention the most significant feature of polytene chromosome.
 - e) Name two tumour suppressor genes.
 - f) Name two genetic diseases relating to skin abnormalities.
 - g) What is the conserved sequence of CAAT box?
 - h) What is O^c mutation?

[Turn over]

- i) Mention the function of the enzyme transposase.
- j) What is sexduction?
- k) What is founder effect?
- l) What is structural gene?
- m) Name the enzyme(s) that is (are) produced in a cell in which there is a nonsense mutation in the *lac Y* gene.
- n) What is the function of the telomerase enzyme?

2. Answer any **five** questions: 2×5=10

- a) What are the highlighting features of sex linked inheritance?
- b) What is bridge species? Cite an example.
- c) Characterize RNA polymerase in relation to its subunits.
- d) Name two plant promoters. Mention the gene construct for Barness Bar.
- e) In a sample of 400 men, 20 have X-linked colour blindness and all others have normal colour vision. Determine the frequencies of mutant and normal alleles.
- f) What is hybrid dysgenesis?

g) Explain composite transposon with one example.

3. Answer any **four** questions: 10×4=40

a) Characterize mutagens with specific examples. State the effect of HNO₂ on DNA. What is tautomerism and how does it induce mutation? 3+3+4

b) Discuss the role of antisense RNA in biotechnology with specific examples. Mention the gene construct for terminator gene sequence. How is Glyphosate resistance induced? 6+2+2

c) Mention the different DNA polymerases with their specific role. Mention the modification that pre-mRNA undergoes in eukaryotic system. What is suppressor mutation? 4+4+2

d) What is IS element? Explain the role of jumping gene in aleurone pigmentation in maize. 2+8

e) What is operon? Briefly discuss the role of leader sequence in controlling the expression of the *E. coli* trp operon. 2+8

- f) In a cross in *neurospora* where one parent express the mutant allele 'a' and the other expresses a wild-type phenotype (+), the following data were obtained in the analysis of ascospores:

	Asci type						
	1	2	3	4	5	6	
Sequence of ascospores in ascus	+	a	a	+	a	+	
	+	a	a	+	a	+	
	+	a	+	a	+	a	
	+	a	+	a	+	a	
	a	+	a	+	+	a	
	a	+	a	+	+	a	
	a	+	+	a	a	+	
	a	+	+	a	a	+	
		39	33	5	4	9	10

Calculate the gene-to-centromere distance.

10