

द्वितीय पत्र (Paper II) : Technical Subject

Section A- 30 Marks

- 1. Algae and Lichens** **10%**
- 1.1 Algae
- 1.1.1 General account, classification and economic importance of algae with reference to Nepal.
- 1.1.2 Structure and life cycle of the following genera:
1. *Oscillatoria*
  2. *Anabaena*
  3. *Chlamydomonas*
  4. *Ulothrix*
  5. *Spirogyra*
  6. *Volvox*
  7. *Oedogonium*
  8. *Vaucheria*
  9. *Chara*
  10. *Batrachospermum*
- 1.2 Lichens
- 1.2.1 Structure and different forms.
- 1.2.2 Economic importance of lichens with reference to Nepal.
- 1.2.3 Lichens as a bio-indicator of the air pollution and a pioneer in the plant Succession.
- 2. Fungi, Bacteria, Virus and Plant Pathology** **10%**
- 2.1 Fungi
- 2.1.1 General account, classification and economic importance of fungi with reference to Nepal.
- 2.1.2 Structure and life cycle of the following taxa:
1. *Plasmodiophora*
  2. *Saprolegnia*
  3. *Albugo*
  4. *Rhizopus*
  5. Yeast
  6. *Eurotium*
  7. *Puccinia*
  8. *Agaricus*
  9. *Alternaria*
- 2.2 Bacteria : Structure, nutrition, reproduction and economic importance
- 2.3 Virus : General concept of virus.
- 2.4. Plant pathology
- 2.4.1 Introduction and scope of plant pathology.
- 2.4.2 Symptoms and plant diseases caused by fungi, bacteria and virus.
- 2.4.3 Study of causal organism, symptom, etiology and control measure of the following diseases in plants:
1. Damping off disease
  2. Late blight disease on potato
  3. Downy mildew disease on spinach
  4. Rust disease on wheat
  5. Fusarium wilt disease
  6. Ring rot disease on potato
  7. Bean mosaic disease

**3. Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany 10%**

- 3.1 Bryophytes
  - 3.1.1 General introduction, classification and economic importance of bryophytes with reference to Nepal.
  - 3.1.2 A detailed study of the following genera:
    - 1. *Marchantia*
    - 2. *Anthoceros*
    - 3. *Polytrichum*
- 3.2 Pteridophytes
  - 3.2.1 General introduction, classification and economic importance of pteridophytes with reference to Nepal.
  - 3.2.2 A detailed study of the following genera:
    - 1. *Lycopodium*
    - 2. *Selaginella*
    - 3. *Equisetum*
    - 4. *Pteris*
    - 5. *Marsilea*
- 3.3 Gymnosperms
  - 3.3.1 General introduction, classification and economic importance of Gymnosperms with reference to Nepal.
  - 3.3.2 A detailed study of the following genera:
    - 1. *Cycas*
    - 2. *Pinus*
- 3.4 Palaeobotany
  - 3.4.1 General account and geological eras and periods
  - 3.4.2 Types of fossils and its formation
  - 3.4.3 Morphology and anatomy of Rhynia fossil

**Section B- 30 Marks**

**4. Taxonomy and Economic Botany 20%**

- 4.1 Taxonomy
  - 4.1.1 Classification system of Bentham and Hooker in higher plants
  - 4.1.2 International system in botanical nomenclatures
  - 4.1.3 History of botanical exploration in Nepal
  - 4.1.4 Role of National Herbarium and its significance
  - 4.1.5 Systematic study, economic importance and affinity of the following families:
    - Dicotyledon;
      - 1. Ranunculaceae
      - 2. Cruciferae
      - 3. Rutaceae
      - 4. Rosaceae
      - 5. Solanaceae
      - 6. Malvaceae
      - 7. Leguminosae
      - 8. Labiatae
      - 9. Scrophulariaceae
      - 10. Polygonaceae
    - Monocotyledon;
      - 1. Gramineae
      - 2. Orchidaceae

- 4.2 Economic Botany
- 4.2.1 General account and distribution of the following medicinal plants with reference to Nepal:
- 4.2.2 Tropical and sub-tropical plants:
1. *Piper longum* Linn., Piperaceae (Pipla/Murjhang)
  2. *Rauwolfia serpentina* Benth. ex Kurz, Apocynaceae (Chad Maruwa/ Sarpaganda)
  3. *Terminalia chebula* Retz., Combretaceae (Harro)
  4. *Phallanthus emblica* Linn. Euphorbiaceae (Amala)
- 4.2.3 Temperate plants:
1. *Acorus calamus* Linn., Araceae (Bojho)
  2. *Cinnamomum tamala* Nees., Lauraceae (Tej Pat)
  3. *Swertia chirata* Ham., Gentianaceae (Chiraito)
  4. *Valeriana wallichii* DC., Valerianaceae (Sugandhwala)
  5. *Zanthoxylum armatum* DC., Rutaceae (Timur)
  6. *Taxus baccata* Linn. Taxaceae (Lothe Sallo)
- 4.2.4 Sub-Alpine and Alpine plants:
1. *Cordyceps sinensis* (Berk) Sacc. Clavicipitaceae, fungus (Yarsa Gumba)
  2. *Ephedra gerardiana* Wall., Gnetaceae (Bhutu Kesh/ Somalata)
  3. *Nardostachys jatamansi* DC., Valerianaceae (Jatamonsi)
  4. *Dactylorhiza hategira* (D.Don) Soo. Var. incarnate, Orchidaceae (Panch Aunla)
  5. *Neopicrorhiza kurroa* Royle ex Benth., Scrophulariaceae (Kutki)
- 7. Plant physiology 10%**
- 7.1 Macro- and Micro-nutrients in plants and their roles
  - 7.2 Absorption, translocation and transpiration
  - 7.3 Growth regulating substances (auxins, cytokinins, gibberellins, ethylene, and abscissic acid)
  - 7.4 Tropism- Phototropism,
  - 7.5 Photoperiodism and Vernalization
  - 7.6 An overview of respiration and factors affecting respiration
  - 7.7 An overview of photosynthesis and factors affecting photosynthesis
  - 7.8 Concept of C3 and C4 plants
  - 7.9 Relationship between biochemistry and Plant physiology

### Section C- 20 Marks

- 5. Cytology and Genetics, Plant Breeding, Evolution, Anatomy and Embryology 20%**
- 5.1 Cytology and Genetics
- 5.1.1 Structural organization of prokaryotic and eukaryotic cells
  - 5.1.2 Ultra-structure and function of cell wall, cell membrane, endoplasmic reticulum, golgi bodies, vacuoles, microbodies, mitochondria, plastids, microtubules, centrosome, flagella, nucleus and nucleolus
  - 5.1.3 Structure and function of Nucleic acids referring double helix, and circular DNA & RNA
  - 5.1.4 Physical and chemical nature of chromosomes
  - 5.1.5 Chromosomal behaviour during mitotic and meiotic divisions
  - 5.1.6 Cell cycle and its different phases and significance
  - 5.1.7 Significance of linkage, chiasma formation and crossing over
  - 5.1.8 Elementary idea of different types of mutation in chromosome;

1. Chromosomal aberration
2. Chromosomal number variation (polyploidy)
3. Gene mutation
- 5.1.9 Mendel's laws of inheritance, post-Mendelian expression and interaction of genes, and multiple alleles
- 5.2 Plant Breeding
  - 5.2.1 Nature and scope of plant breeding
  - 5.2.2 Selection, Hybridization and Mutation breeding process as tools of crop improvement
- 5.3 Evolution
  - 5.3.1 Natural variation and Darwinian evolution
- 5.4 Anatomy
  - 5.4.1 Structure and classification of meristem
  - 5.4.2 Apical cell and Histogen theories in the differentiation of root and shoot apices
  - 5.4.3 Secondary growth in root and stem, and occurrence of anomalous secondary structure in some plants
  - 5.4.4 Anatomical modification and ecological adaptation
- 5.5 Embryology
  - 5.5.1 General account of microsporogenesis and megasporogenesis
  - 5.5.2 Development of male and female gametophytes
  - 5.5.3 Fertilization and endosperm formation
  - 5.5.4 Embryogenesis in a typical dicotyledonous & monocotyledonous plants

#### Section D- 20 Marks

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|-----------|--|------------|
| <b>6.</b> | <b>Ecology</b>   | <b>10%</b> |
| 6.1       | General concept and scopes of ecology  |            |
| 6.2       | Biotic and abiotic ecological factors  |            |
| 6.3       | Biogeochemical cycles of Carbon, Water, Phosphorous, Nitrogen and Sulphur                          |            |
| 6.4       | Plant community and succession   |            |
| 6.5       | Concept of ecosystem (forest, grassland and fresh water)   |            |
| 6.6       | Environmental pollution with reference to air and water  |            |
| 6.7       | Vegetation (phytogeography) in Nepal and major natural resources                                   |            |
| 6.8       | National parks and wildlife reserves of Nepal as tools of Nature conservation                      |            |
| <b>8.</b> | <b>Applied technology and Convention and Treaties</b>  | <b>10%</b> |
| 8.1       | Applied technology   |            |
| 8.1.1     | Introduction, scope and importance of biotechnology  |            |
| 8.1.2     | Grafting, budding and cutting methods in plant propagation   |            |
| 8.1.3     | General account of <i>In vitro</i> culture techniques and principles                               |            |
| 8.1.4     | Application of <i>In vitro</i> cultures  |            |
| 8.1.5     | Cloning and its significance   |            |
| 8.1.6     | Genetically modified (GM) crops or Living modified organism (LMO)                                  |            |
| 8.1.7     | Production of medicine by using genetic engineering  |            |
| 8.2       | Convention, Treaties, Acts and Regulation  |            |
| 8.2.1     | Convention on Biodiversity (CBD)   |            |
| 8.2.2     | Convention on International Trade in Endangered species of Wild Fauna and Flora (CITES)            |            |
| 8.2.3     | Forest Act and Forest Rules  |            |
| 8.2.4     | Nepal Environmental Policy and Action Plan (NEPAP) ( <b>Environment Protection Act and Rules</b> ) |            |

प्रदेश लोक सेवा आयोग, प्रदेश नं. २  
वन सेवा, बोटानी समूह, अधिकृत सातौं तहका पदको खुला तथा अन्तर सेवा प्रतियोगितात्मक परीक्षाका  
पाठ्यक्रम

प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र लिइने  
सामूहिक परीक्षण (Group Test) का लागि

सामूहिक छलफल (Group Discussion)

यस प्रयोजनका लागि गरिन परीक्षण १० पूर्णाङ्क र ३० मिनेट अवधिको हुनेछ जुन नेताविहिन सामूहिक छलफल (Leaderless Group Discussion) का रूपमा अवलम्बन गरिने छ । दिइएका प्रश्न वा Topic का विषयमा पालैपालोसँग निर्दिष्ट समयभित्र समूहबीच छलफल गर्दै प्रत्येक उम्मेदवारले व्यक्तिगत प्रस्तुति (Individual Presentation) गर्नु पर्नेछ । यस परीक्षणमा मूल्याङ्कनका लागि ३ जना भन्दा बढीको समिति रहनेछ ।