प्रदेश लोक सेवा आयोग, कर्णाली प्रदेश

प्रदेश निजामती सेवाको वन सेवा, वोटानी समूह, अधिकृतस्तर सातौं तहको खुला, अन्तर तह र आन्तरिक अन्तर सेवा प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम र परीक्षा योजना

पाठ्यक्रमको रूपरेखाः- यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ।

| | | |
|---|---|---|
| प्रथम चरणः | लिखित परीक्षा (Written Examination) | पूर्णाङ्कः- २०० |
| अन्तिम चरणः | (क) सामूहिक परीक्षण (Group Test) | पूर्णाङ्कः- १० |
| | (ख) अन्तर्वार्ता (Interview) | पूर्णाङ्कः- ३० |

परीक्षा योजना (Examination Schedule)

१. प्रथम चरणः लिखित परीक्षा (Written Examination) पूर्णाङ्कः २००

| पत्र | विषय | खण्ड | पूर्णाङ्क | उत्तीर्णाङ्क | परीक्षा प्रणाली | प्रश्नसंख्या Xअङ्क | समय |
|---|---|---|---|---|---|---|---|
| प्रथम | General Subject | Part I: General Knowledge and General Ability Test | १०० | ४० | वस्तुगत (Objective): बहुबैकल्पिक प्रश्न (Multiple Choice Questions) | ५०X१=५० | १ घण्टा ३० मिनेट |
| | | Part II: General Technical Subject | | | | ५०X१=५० | |
| द्वितीय | Technical Subject | | १०० | ४० | विषयगत (Subjective): छोटो उत्तर लामो उत्तर | ८X५=४० ६X१०=६० | ३ घण्टा |

२.अन्तिम चरणः सामूहिक परीक्षण (Group Test) र अन्तर्वार्ता (Interview) पूर्णाङ्कः ४०

| पत्र/विषय | पूर्णाङ्क | परीक्षा प्रणाली | समय |
|---|---|---|---|
| सामूहिक परीक्षण (Group Test) | १० | सामूहिक छलफल (Group Discussion) | ३० मिनेट |
| अन्तर्वार्ता (Interview) | ३० | बोर्ड अन्तर्वार्ता (Board Interview) | |

द्रष्टव्यः

१. यस पाठ्यक्रमलाई प्रथम चरण र अन्तिम चरणमा विभाजन गरिएको छ।

२. खुला र समावेशी समूहको एउटै प्रश्नपत्रबाट परीक्षा सञ्चालन हुनेछ।

३. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ।

४. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ। तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन।

५. बहुवैकल्पिक प्रश्नहरु हुने परीक्षामा क्याल्कुलेटर प्रयोग गर्न पाइने छैन।

६. विषयगत प्रश्नहरुको हकमा तोकिएको अङ्कमा एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरु (Short notes) सोध्न सकिनेछ।

७. परीक्षा हलमा मोवाइल फोन, स्मार्ट वाच, हेड फोन वा यस्तै प्रकारका विद्युतीय उपकरण, पुस्तक, नोटबुक, झोला लगायतका बस्तुहरु लैजान पाइने छैन।

८. परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा दिईए अनुसार हुनेछ।

९. विषयगत प्रश्न हुने पत्र/विषयका प्रत्येक भाग/खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन्। परीक्षार्थीले प्रत्येक भाग/खण्डका प्रश्नहरुको उत्तर सोही भाग/खण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ।

१०. यस पाठ्यक्रम अनुसारका पत्र/विषयका विषयवस्तुमा जुनसुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगावै संशोधन भई कायम रहेका विषयवस्तुलाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ।

११. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र अन्तिम चरणको परीक्षामा सम्मिलित गराइनेछ।

१२. लिखित परीक्षा र अन्तिम चरणको सामूहिक परीक्षण र अन्तर्वार्ताको कुल प्राप्ताङ्कको आधारमा अन्तिम परीक्षाफल प्रकाशित गरिनेछ।

१३. पाठ्यक्रम लागू हुने मितिः २०८१।०९।०२

प्रदेश लोक सेवा आयोग, कर्णाली प्रदेश

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## प्रथम पत्र (Paper I): General Subject

## Part (I):

## General Awareness & General Ability Test (50 Marks)

1. General Awareness and Contemporary Issues (25×1 Mark = 25 Marks)
   - 1.1 Physical, socio-cultural and economic geography and demography of Nepal with special focus on Karnali Province
   - 1.2 Major natural resources of Nepal
   - 1.3 Geographical diversity, climatic conditions, and livelihood & lifestyle of people
   - 1.4 Notable events and personalities, social, cultural and economic conditions in modern history of Nepal
   - 1.5 Current periodic plan of Karnali Province and Nepal
   - 1.6 Information on sustainable development, environment, pollution, climate change, biodiversity, science and technology
   - 1.7 Nepal's international affairs and general information on the FAO, SAARC & WTO
   - 1.8 The Constitution of Nepal
   - 1.9 Governance system and Government (Federal, Provincial and Local)
   - 1.10 Provisions of civil service act [(Karnali Province Civil Service Act, 2080, Regulations, 2080 and Local Services (Formulation and Operation) Act, 2081)] and regulation relating to organizational structure, posts of service, fulfillment of vacancy and code of conduct
   - 1.11 Functional scope of public services
   - 1.12 Public Service Charter
   - 1.13 Concept, objective and importance of public policy
   - 1.14 Fundamentals of management: planning, organizing, staffing, directing, controlling, coordinating, decision making, motivation and leadership
   - 1.15 Government planning, budgeting and accounting system
   - 1.16 Major events and current affairs of national and international importance
   - 1.17 Public service delivery system and its barriers in Nepal
2. General Ability Test (25 ×1 Mark = 25 Marks)
   - 2.1 Verbal Ability Test (8×1 Mark = 8 Marks)

     Jumble words, Series, Analogy, Classification, Coding-Decoding, Matrix, Ranking Order Test, Direction and Distance Sense Test, Common Sense Test, Logical Reasoning, Assertion and Reason, Statement and Conclusions
   - 2.2 Numerical Ability Test (9×1 Mark = 9 Marks)

     Series, Analogy, Classification, Coding, Arithmetical reasoning/operation, Percentage, Ratio, Average, Loss & Profit, Time & Work, Data interpretation & Data verification
   - 2.3 Non-verbal/Abstract Ability Test (8×1 Mark = 8 Marks)

     Figure Series, Figure Analogy, Figure Classification, Figure Matrix, Pattern Completion/Finding, Analytical Reasoning Test, Figure Formation and Analysis, Rule Detection, Water images, Mirror images, Cubes and Dice &Venn-diagram

## Part (II):
## General Technical Subject (50 Marks)

# 1. Algae and Lichens

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:

1.1.2.1. Oscillatoria
1.1.2.2. Anabaena
1.1.2.3. Chlamydomonas
1.1.2.4. Ulothrix
1.1.2.5. Spirogyra
1.1.2.6. Volvox
1.1.2.7. Oedogonium
1.1.2.8. Vaucheria
1.1.2.9. Chara
1.1.2.10. 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

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:

2.1.2.1. Plasmodiophora
2.1.2.2. Saprolegnia
2.1.2.3. Albugo
2.1.2.4. Rhizopus
2.1.2.5. Yeast
2.1.2.6. Eurotium
2.1.2.7. Puccinia
2.1.2.8. Agaricus
2.1.2.9. Alternaria

2.2. Bacteria : Structure, nutrition, reproduction and economic importance

2.3. Virus : General concept of virus and bacteriophage process.

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:

2.4.3.1. Damping off disease
2.4.3.2. Late blight disease on potato
2.4.3.3. Downy mildew disease on spinach
2.4.3.4. Rust disease on wheat
2.4.3.5. Fusarium wilt disease
2.4.3.6. Ring rot disease on potato
2.4.3.7. Bean mosaic disease

## 3. Bryophytes, Pteridophytes, Gymnosperms and Palaeobotany

- 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:
    - 3.1.2.1. Marchantia
    - 3.1.2.2. Anthoceros
    - 3.1.2.3. 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:
    - 3.2.2.1. Lycopodium
    - 3.2.2.2. Selaginella
    - 3.2.2.3. Equisetum
    - 3.2.2.4. Pteris
    - 3.2.2.5. Marsilea
- 3.3. Gymnosperms
  - 3.3.1. General introduction, classification and economic importance of Gymnosperms with reference to Nepal.
  - 3.3.2. detailed study of the following genera:
    - 3.3.2.1. Cycas
    - 3.3.2.2. 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

## 4. Taxonomy and Economic Botany

- 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:
    - 4.1.5.1. Dicotyledon;
      - 4.1.5.1.1. Ranunculaceae
      - 4.1.5.1.2. Cruciferae
      - 4.1.5.1.3. Rutaceae
      - 4.1.5.1.4. Rosaceae
      - 4.1.5.1.5. Solanaceae
      - 4.1.5.1.6. Malvaceae
      - 4.1.5.1.7. Leguminosae
      - 4.1.5.1.8. Labiatae
      - 4.1.5.1.9. Scrophulariaceae
      - 4.1.5.1.10. Polygonaceae
    - 4.1.5.2. Monocotolyden;
      - 4.1.5.2.1. Gramineae
      - 4.1.5.2.2. Orchidaceae

4.2. Economic Botany
- 4.2.1. General account and distribution of the following medicinal plants with reference to Karnali province and Nepal:
- 4.2.2. Tropical and sub-tropical plants:
  - 4.2.2.1. Piper longum Linn., Piperaceae (Pipla/Murjhang)
  - 4.2.2.2. Rauwolfia serpentina Benth. ex Kurz, Apocynaceae (Chad Maruwa/ Sarpaganda)
  - 4.2.2.3. Terminalia chebula Retz., Combretaceae (Harro)
  - 4.2.2.4. Phallanthus emblica Linn. Euphorbiaceae (Amala)
- 4.2.3. Temperate plants:
  - 4.2.3.1. Acorus calamus Linn., Araceae (Bojho)
  - 4.2.3.2. Cinnamomum tamala Nees., Lauraceae (Tej Pat)
  - 4.2.3.3. Swertia chirata Ham., Gentianaceae (Chiraito)
  - 4.2.3.4. Valeriana wallichii DC., Velerianaceae (Sugandhwala)
  - 4.2.3.5. Zanthoxylum armatum DC., Rutaceae (Timur)
  - 4.2.3.6. Taxus baccata Linn. Taxaceae (Lothe Sallo)
- 4.2.4. Sub-Alpine and Alpine plants:
  - 4.2.4.1. Cordyceps sinensis (Berk) Sacc. Clavicipitaceae, fungus (Yarsa Gumba)
  - 4.2.4.2. Ephedra gerardiana Wall., Gnetaceae (Bhutu Kesh/ Somalata)
  - 4.2.4.3. Nardostachys jatamansi DC., Valerianaceae (Jatamonsi)
  - 4.2.4.4. Dactylorhiza hategira (D. Don) Soo. Var. incarnate, Orchidaceae (Panch Aunla)
  - 4.2.4.5. Neopicrorhiza kurroa Royle ex Benth., Scrophulariaceae (Kutki)

## 5. Cytology and Genetics, Plant Breeding, Evolution, Anatomy and Embryology

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;
  - 5.1.8.1. Chromosomal aberration
  - 5.1.8.2. Chromosomal number variation (polyploidy)
  - 5.1.8.3. 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

## 6. Ecology

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. Earth's energy Budget
6.5. Plant community and succession
6.6. Concept of ecosystem (forest, grassland and fresh water)
6.7. Environmental pollution with reference to air and water
6.8. Vegetation (phytogeography) and major natural resources in Nepal with focus on the Karnali province
6.9. National parks and wildlife reserves of Nepal with reference to Karnali province as tools of Nature conservation

## 7. Plant physiology

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

## 8. Applied technology and Convention and Treaties

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 In vitro culture techniques and principles
8.1.4. Application of In vitro 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. Karnali Province Forest Act and Rules
8.2.5. Environment Protection Act and Rules
8.2.6. Provincial Environment Protection Act and Rules
8.2.7. Environmental Assessment; IEE, EIA process
8.2.8. Nepal Environment Policy and Action Plan (NEPAP)

प्रथम पत्रको Part II को General Technical Subject विषयका एकाईहरुबाट यथासम्भव निम्नानुसार प्रश्नहरु सोधिनेछ।

| Unit | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| Objective Questions | 5 | 5 | 5 | 10 | 10 | 5 | 5 | 5 |

प्रदेश लोक सेवा आयोग, कर्णाली प्रदेश

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द्वितीय पत्र (Paper II): Technical Subject

Section A- 30 Marks

1. Algae and Lichens
   - 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:
       - 1.1.2.1. Oscillatoria
       - 1.1.2.2. Anabaena
       - 1.1.2.3. Chlamydomonas
       - 1.1.2.4. Ulothrix
       - 1.1.2.5. Spirogyra
       - 1.1.2.6. Volvox
       - 1.1.2.7. Oedogonium
       - 1.1.2.8. Vaucheria
       - 1.1.2.9. Chara
       - 1.1.2.10. 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.
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   - 2.1. Fungi
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     - 2.1.2. Structure and life cycle of the following taxa:
       - 2.1.2.1. Plasmodiophora
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       - 2.1.2.3. Albugo
       - 2.1.2.4. Rhizopus
       - 2.1.2.5. Yeast
       - 2.1.2.6. Eurotium
       - 2.1.2.7. Puccinia
       - 2.1.2.8. Agaricus
       - 2.1.2.9. Alternaria
   - 2.2. Bacteria : Structure, nutrition, reproduction and economic importance
   - 2.3. Virus : General concept of virus and bacteriophage process.
   - 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:
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  - 3.2.2.2. Selaginella
  - 3.2.2.3. Equisetum
  - 3.2.2.4. Pteris
  - 3.2.2.5. Marsilea

3.3. Gymnosperms
- 3.3.1. General introduction, classification and economic importance of Gymnosperms with reference to Nepal.
- 3.3.2. detailed study of the following genera:
  - 3.3.2.1. Cycas
  - 3.3.2.2. 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

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:
  - 4.1.5.1. Dicotyledon;
    - 4.1.5.1.1. Ranunculaceae
    - 4.1.5.1.2. Cruciferae
    - 4.1.5.1.3. Rutaceae
    - 4.1.5.1.4. Rosaceae
    - 4.1.5.1.5. Solanaceae
    - 4.1.5.1.6. Malvaceae
    - 4.1.5.1.7. Leguminosae
    - 4.1.5.1.8. Labiatae
    - 4.1.5.1.9. Scrophulariaceae
    - 4.1.5.1.10. Polygonaceae
  - 4.1.5.2. Monocotolyden;

4.1.5.2.1. Gramineae
4.1.5.2.2. Orchidaceae

4.2. Economic Botany
4.2.1. General account and distribution of the following medicinal plants with reference to Karnali province and Nepal:
4.2.2. Tropical and sub-tropical plants:
4.2.2.1. Piper longum Linn., Piperaceae (Pipla/Murjhang)
4.2.2.2. Rauwolfia serpentina Benth. ex Kurz, Apocynaceae (Chad Maruwa/ Sarpaganda)
4.2.2.3. Terminalia chebula Retz., Combretaceae (Harro)
4.2.2.4. Phallanthus emblica Linn. Euphorbiaceae (Amala)
4.2.3. Temperate plants:
4.2.3.1. Acorus calamus Linn., Araceae (Bojho)
4.2.3.2. Cinnamomum tamala Nees., Lauraceae (Tej Pat)
4.2.3.3. Swertia chirata Ham., Gentianaceae (Chiraito)
4.2.3.4. Valeriana wallichii DC., Velerianaceae (Sugandhwala)
4.2.3.5. Zanthoxylum armatum DC., Rutaceae (Timur)
4.2.3.6. Taxus baccata Linn. Taxaceae (Lothe Sallo)
4.2.4. Sub-Alpine and Alpine plants:
4.2.4.1. Cordyceps sinensis (Berk) Sacc. Clavicipitaceae, fungus (Yarsa Gumba)
4.2.4.2. Ephedra gerardiana Wall., Gnetaceae (Bhutu Kesh/ Somalata)
4.2.4.3. Nardostachys jatamansi DC., Valerianaceae (Jatamonsi)
4.2.4.4. Dactylorhiza hategira (D. Don) Soo. Var. incarnate, Orchidaceae (Panch Aunla)
4.2.4.5. Neopicrorhiza kurroa Royle ex Benth., Scrophulariaceae (Kutki)

## 5. Plant physiology
5.1. Macro and Micro-nutrients in plants and their roles
5.2. Absorption, translocation and transpiration
5.3. Growth regulating substances (auxins, cytokinins, gibberellins, ethylene, and abscissic acid)
5.4. Tropism- Phototropism
5.5. Photoperiodism and Vernalization
5.6. An overview of respiration and factors affecting respiration
5.7. An overview of photosynthesis and factors affecting photosynthesis
5.8. Concept of C3 and C4 plants
5.9. Relationship between biochemistry and Plant physiology

## Section C- 20 Marks

## 6. Cytology and Genetics, Plant Breeding, Evolution, Anatomy and Embryology
6.1. Cytology and Genetics
6.1.1. Structural organization of prokaryotic and eukaryotic cells
6.1.2. Ultra-structure and function of cell wall, cell membrane, endoplasmic reticulum, golgi bodies, vacuoles, microbodies, mitochondria, plastids, microtubules, centrosome, flagella, nucleus and nucleolus
6.1.3. Structure and function of Nucleic acids referring double helix, and circular DNA & RNA
6.1.4. Physical and chemical nature of chromosomes

6.1.5. Chromosomal behaviour during mitotic and meiotic divisions
6.1.6. Cell cycle and its different phases and significance
6.1.7. Significance of linkage, chiasma formation and crossing over
6.1.8. Elementary idea of different types of mutation in chromosome;
6.1.8.1. Chromosomal aberration
6.1.8.2. Chromosomal number variation (polyploidy)
6.1.8.3. Gene mutation
6.1.9. Mendel's laws of inheritance, post-Mendelian expression and interaction of genes, and multiple alleles

6.2. Plant Breeding
6.2.1. Nature and scope of plant breeding
6.2.2. Selection, Hybridization and Mutation breeding process as tools of crop improvement

6.3. Evolution
6.3.1. Natural variation and Darwinian evolution

6.4. Anatomy
6.4.1. Structure and classification of meristem
6.4.2. Apical cell and Histogen theories in the differentiation of root and shoot apices
6.4.3. Secondary growth in root and stem, and occurrence of anomalous secondary structure in some plants
6.4.4. Anatomical modification and ecological adaptation

6.5. Embryology
6.5.1. General account of microsporogenesis and megasporogenesis
6.5.2. Development of male and female gametophytes
6.5.3. Fertilization and endosperm formation
6.5.4. Embryogenesis in a typical dicotyledonous & monocotyledonous plants

## Section D- 20 Marks

## 7. Ecology

7.1. General concept and scopes of ecology
7.2. Biotic and abiotic ecological factors
7.3. Biogeochemical cycles of Carbon, Water, Phosphorous, Nitrogen and Sulphur
7.4. Earth's energy Budget
7.5. Plant community and succession
7.6. Concept of ecosystem (forest, grassland and fresh water)
7.7. Environmental pollution with reference to air and water
7.8. Vegetation (phytogeography) and major natural resources in Nepal with focus on the Karnali province
7.9. National parks and wildlife reserves of Nepal with reference to Karnali province as tools of Nature conservation

## 8. Applied technology and Convention and Treaties

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 In vitro culture techniques and principles
8.1.4. Application of In vitro 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. Karnali Province Forest Act and Rules

8.2.5. Environment Protection Act and Rules

8.2.6. Provincial Environment Protection Act and Rules

8.2.7. Environmental Assessment; IEE, EIA process

8.2.8. Nepal Environment Policy and Action Plan (NEPAP)

## द्वितीय पत्रको प्रश्न तालिका

| खण्ड | A-30 | | | B-30 | | C-20 | D-20 | |
|---|---|---|---|---|---|---|---|---|
| एकाई | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| छोटो प्रश्नसंख्या | 1 | 1 | - | 1 | 1 | 2 | 1 | 1 |
| लामो प्रश्नसंख्या | 1 | | 1 | 1 | 1 | 1 | 1 | |

सामूहिक छलफल

यस प्रयोजनको लागि गरिने परीक्षण १० पूर्णाङ्क र ३० मिनेट अवधिको हुनेछ जुन नेताविहिन सामूहिक छलफलको रुपमा अवलम्वन गरिनेछ। दिइएको प्रश्न वा Topic का विषयमा पालैपालोसँग निर्दिष्ट समयभित्र समूहवीच छलफल गर्दै प्रत्येक उम्मेदवारले व्यक्तिगत प्रस्तुति गर्नुपर्नेछ। यस परीक्षणमा मूल्याङ्कनको लागि देहाय अनुसारको ३ जना भन्दा बढीको समिति रहनेछ।

आयोगका अध्यक्ष वा अध्यक्षले तोकेको सदस्य – अध्यक्ष

आयोगका सदस्य – सदस्य

मनोविज्ञानवेत्ता – सदस्य

दक्ष/विज्ञ (१ जना) – सदस्य