लोक सेवा आयोग

नेपाल वन सेवा, बोटानी समूहको राजपत्राङ्कित तृतीय श्रेणी पदको खुला र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रमको रुपरेखा :– यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइने छ :

प्रथम चरण :– लिखित परीक्षा पूर्णाङ्क :– २००

द्वितीय चरण :– अन्तर्वार्ता पूर्णाङ्क :– ३०

प्रथम चरण – लिखित परीक्षा योजना (Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या Xअङ्कभार	समय
प्रथम	वनस्पति विज्ञान	१००	४०	वस्तुगत बहुउत्तर (Multiple Choice)	१००X१ = १००	१ घण्टा १५ मिनेट
द्वितीय		१००	४०	विषयगत	१०X१० = १००	३ घण्टा

द्वितीय चरण

विषय	पूर्णाङ्क	परीक्षा प्रणाली
व्यक्तिगत अन्तर्वार्ता	३०	मौखिक

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

२. पाठ्यक्रमको प्रथम तथा द्वितीय पत्रको विषयवस्तु एउटै हुनेछ ।

३. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।

४. प्रथम तथा द्वितीय पत्रहरुको एकाईहरुबाट सोधिने प्रश्नहरुको संख्या निम्नानुसार हुनेछ

प्रथम पत्रका एकाइ	1	2	3	4	5	6	7	8
प्रश्न संख्या	10	10	10	20	20	10	10	10
द्वितीय पत्रका खण्ड	**A**			**B**		**C**	**D**	
द्वितीय पत्रका एकाइ	1	2	3	4	7	5	6	8
प्रश्न संख्या	1	1	1	2	1	2	1	1

५. प्रथम पत्रमा वस्तुगत बहुउत्तर (Multiple Choice) प्रश्नहरुको उत्तर सही दिएमा प्रत्येक सही उत्तर बापत १ (एक) अङ्क प्रदान गरिनेछ भने गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अर्थात् ०.२ अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।

६. द्वितीय पत्रको विषयगत प्रश्नका लागि तोकिएका १० अङ्कका प्रश्नहरुको हकमा १० अङ्कको 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 सकिने छ ।

७. द्वितीय पत्रको पाठ्यक्रमलाई ४ वटा खण्ड/एकाईमा विभाजन गरिएको छ, ४ वटा खण्ड/एकाईको लागि ४ वटै उत्तरपुस्तिका दिईनेछ र परिक्षार्थीले प्रत्येक खण्ड/एकाईका प्रश्नहरुको उत्तर सोही खण्ड/एकाईको उत्तर पुस्तिकामा लेख्नु पर्नेछ ।

८. यस पाठयक्रममा जेसुकै लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरु परीक्षाको मिति भन्दा ३ (तीन) महिना अगाडि (संशोधन भएका वा संशोधन भई हटाइएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा रहेको सम्झनु पर्दछ ।

९. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको अन्तर्वार्तामा सम्मिलित गराइनेछ ।

१०. यस भन्दा अगाडि लागू भएका माथि उल्लिखित सेवा, समूहका पाठ्यक्रम खारेज गरिएका छन् ।

११. पाठ्यक्रम लागू मिति :– २०६२/ २ / २३ देखि

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प्रथम र द्वितीय पत्र – बनस्पति विज्ञान सम्वन्धी विषय

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

2.2.1 Structure, nutrition, reproduction and economic importance of bacteria.

2.3 Virus

2.3.1 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

Monocotolyden;

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., Velerianaceae (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 and monocotyledonous plants

Section D- 20 Marks

6. Ecology **10%**

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

8. Applied technology and Convention and Treaties **10%**

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 of Nepal (FAN) (2049 BS) and Forest Rules (2051 BS)
- 8.2 4 Nepal Environmental Policy and Action Plan (NEPAP) (**Environment Protection Act (EPA), 1996** and the **Environment Protection Rules (EPR), 1997** (amendment 1999)

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वस्तुगत बहुउत्तर नमूना प्रश्नहरु (Sample questions)

1. Lichens multiply by
   A) Isidia B) Soredia C) Ascospore D) All of the above
   Correct Answer:- (D)
2. The palmella stage formation occurs in
   A) *Chlamydomonas* B) *Oedogonium* C) *Vaucheria* D) *Volvox*
   Correct Answer:- (A)
3. Genetic mutation changes the heritable phenotypic characters by altering
   A) the sequence of the templates of RNA synthesis
   B) the sequence of the RNA in the cytoplasm
   C) the sequence of amino acids of proteins formed in the parents
   D) the somatic characters of the parents.
   Correct Answer:- (A)
4. Which of the following is correct for tetrasomic
   A) 2n + 2 B) 2n + 2 + 2 C) 2n - 1 D) 2n - 1 - 1
   Correct Answer:- (A)
5. The interaction among organisms in a community called as biotic factors influence:
   A) The structure of a community only B) The composition of a community only
   C) The function of a community only D) All of these
   Correct Answer:- (D)

विषयगत नमूना प्रश्नहरु (Sample questions)

1. Write an account on the role of Algae in beneficial aspects concerning as food and medicine.
2. Sketch the characteristic feature of alternation of generation of a typical Pteridophyte. Mention which phase is more dominant during its life time.
3. Describe the characters, distribution and economic importance of one plant belonging to the family Ranunculaceae.
4. Mention briefly the function of mitochondria and chloroplast. .
5. What is a mechanical tissue? Describe its importance in plants.
6. In sweet pea, genes C and P are necessary for colored flowers. The flowers are white in the absence of either or both of these genes. What will be the flower color of the offspring of the following crosses and in what proportion?
   a) CcpP x CCPp b) CcPp x Ccpp c) CcpP x CcPp
7. Describe the phenomenon of electron transfer system in photosynthesis.
8. What are main causes of soil erosion? Suggest suitable measures to prevent soil erosion.
9. Give an illustrative account of the life history of fungus *Puccinia* species.
10. Write short notes on any two;-
    (a) DNA (b) meiosis (c) Coralloid root (d) Penicillium