

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

पाठ्यक्रमको रूपरेखा :- यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइने छ :
प्रथम चरण :- लिखित परीक्षा पूर्णाङ्क :- २००
द्वितीय चरण :- सामूहिक परीक्षण र अन्तर्वार्ता पूर्णाङ्क :- ४०

प्रथम चरण – लिखित परीक्षा योजना (Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या X अङ्कभार	समय
प्रथम	वनस्पति विज्ञान	१००	४०	वस्तुगत बहुवैकल्पिक (MCQs)	१००X१ = १००	१ घण्टा १५ मिनेट
द्वितीय		१००	४०	विषयगत	१०X१० = १००	३ घण्टा

द्वितीय चरण

विषय	पूर्णाङ्क	परीक्षा प्रणाली	समय
सामूहिक परीक्षण (Group Test)	१०	सामूहिक छलफल (Group Discussion)	३० मिनेट
व्यक्तिगत अन्तर्वार्ता	३०	मौखिक	-

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ ।
- पाठ्यक्रमको प्रथम तथा द्वितीय पत्रको विषयवस्तु एउटै हुनेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- प्रथम तथा द्वितीय पत्रहरूको एकाईहरूबाट सोधिने प्रश्नहरूको 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

- वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको 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 ।
- बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- विषयगत प्रश्नका लागि तोकिएका १० अङ्कका प्रश्नहरूको 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 टिप्पणीहरू (Short notes) सोध्न सकिने छ ।
- द्वितीय पत्रमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- यस भन्दा अगाडि लागू भएका माथि उल्लिखित सेवा, समूहका पाठ्यक्रम खारेज गरिएका छन् ।
- पाठ्यक्रम लागू मिति :- २०६२/ २ / २३ देखि (२०७२/०७/२४ को निर्णय अनुसार सामूहिक परीक्षण समावेश)

प्रथम र द्वितीय पत्र – बनस्पति विज्ञान सम्बन्धी 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

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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

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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 प्रश्नहरू (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 प्रश्नहरू (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

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नेपाल आर्थिक योजना तथा तथ्याङ्क, इन्जिनियरिङ्ग, कृषि, वन, विविध र शिक्षा सेवाका सबै समूह/उपसमूह,
राजपत्राङ्कित तृतीय श्रेणी र एवं स्वास्थ्य सेवाको सातौं र आठौं तहका पदहरूमा
प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र
लिइने **सामूहिक परीक्षण (Group Test)** को लागि

सामूहिक छलफल (Group Discussion)

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

आयोगका सदस्य	-	अध्यक्ष
आयोगका सदस्य	-	सदस्य
मनोविज्ञ	-	सदस्य
दक्ष/विज्ञ (१ जना)	-	सदस्य

सामूहिक छलफलमा दिइने नमूना प्रश्न वा Topicw

उदाहरणको लागि - उर्जा संकट, गरीबी निवारण, स्वास्थ्य बीमा, खाद्य सुरक्षा, प्रतिभा पलायन जस्ता Topics मध्ये कुनै एक Topic मात्र दिइनेछ।