

## नेपाली सेना

### प्रा.उ.से. Optometrist (खुला) पदको पाठ्यक्रम

समय:- ३ घण्टा

पूर्णाङ्क :-१००  
उत्तीर्णाङ्क:-४०

#### उद्देश्य

यो पाठ्यक्रम नेपाली सेनाको प्रा.उ.से. Optometrist पदका उम्मेदवार छनौट परीक्षाको लागि निर्धारण गरिएको हो । प्रा.उ.से. Optometrist पदका उम्मेदवार छनौटको लिखित परीक्षामा सरिक हुने उम्मेदवारहरूको पेशा सम्बन्धि विषयलाई आधार मानि प्रश्नहरू सोधिने छन् ।

- (क) लिखित परीक्षाको माध्यम अंग्रेजी भाषा हुनेछ ।
- (ख) माथि उल्लेखित पत्रहरूको पाठ्यक्रमको रूपरेखा अनुसार विषयवस्तु एउटै हुनेछ ।
- (ग) लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र अर्को चरणको परीक्षामा सम्मिलित गराइनेछ ।
- (घ) नेपाली सेनाको तत्कालिन आवश्यकता तथा विविध परिस्थितिमा नेपाली सेना अनूकूल हुने गरी उल्लेखित विवरणहरूमा हेरफेर हुन सक्नेछ ।
- (ङ) पाठ्यक्रम लागू मिति : २०६८/०९/२८ गते देखि

प्रश्नको किसिम	प्रश्नको संख्या र अंक	कैफियत
लामो उत्तर दिनु पर्ने प्रश्न	५×१०=५०	
छोटो उत्तर दिनु पर्ने प्रश्न	५×५=२५	
बस्तुगत (Objectives)	२५×१=२५	

## Curriculum for प्रा.उ.से. Optometrist

### **Basic concepts of Optics and visual science**

Light and its properties, refractive index  
 Propagation of Light, Wave Theory and Photoelectric effect  
 Interference and Coherence of Light  
 Diffraction- Fresnel and Fraunhofer, Rayleigh's Theory of resolution  
 Polarization and its application  
 Absorption and scattering of light  
 Principle and nature of LASER, LASER applications  
 Photometry  
 Astigmatic lenses – cylindrical lenses, sphero-cylindrical lenses, Jackson cross cylinders  
 Aberration – Classification, Chromatic and mono-chromatic aberrations  
 Prisms and its properties

### **Visual and Optometric Science**

Gross optical anatomy of eye ball, schematic eye and cardinal points  
 Light transmission, refraction and absorption at different ocular surfaces  
 Image formation and anomalies of refraction – Hypermetropia, Myopia, Astigmatism and Presbyopia  
 Axial length of the eye, total dioptric power of the eye, cornea and lens, refractive index of different ocular media  
 Visual and optical axis of eye, Purkinje images, Phakometry  
 Optical properties of cornea – transmittance, birefringence, scattering and absorption  
 Corneal curvature and its measurement and corneal topography measurement  
 Optical properties of lens – Refraction & absorption and optical models of lens  
 Retinal images – size, spectacle and relative spectacle magnification  
 Optics of photoreceptors – Stiles Crawford effect  
 Emmetropization  
 Ocular movements, binocular vision and stereopsis  
 Visual acuity and different forms of visual acuity

### **Organ Systems**

Skull- identification of cranial bones, boundaries of orbit and its contents,  
 Muscles of facial expression and mastication and their nerve supply.  
 Extra ocular muscles- origin, insertion, nerve supply, vascular supply and their functions.  
 Skeletal muscle- properties and action potential  
 Neuro muscular junction  
 Sliding filament mechanism of contraction.  
 Absorption and excretion of  $Ca^{++}$  and  $Pi$ , role of vitamin D, calcitonin and parathyroid in regulation of  $Ca^{++}$  and  $Pi$  homeostasis.  
 Leprosy- pathophysiology, signs, symptoms and diagnosis.  
 Arthritis- pathophysiology, signs, symptoms and diagnosis.

### **Ocular pharmacology**

Ocular anti-infective agents.  
 Ocular NSAIDS.  
 Ocular steroids.  
 Drugs used for glaucoma.  
 Mydriatics/ miotics/ cycloplegics.  
 Antihistamines and allergics.  
 Local anesthetics.  
 Vital dyes.  
 Artificial tears and viscoelastics.

## Ocular System

- Embryology – different stages of development of eye
- Orbit – bones which make the orbit and various fossa and channels in the orbit, orbital contents
- Lids – different layers, nerve and vascular supply, functions of the lids
- Extra ocular muscles – anatomy, insertion, origin, nerve, vascular supply and function
- Lacrimal apparatus – different structures, tear film and lacrimal pump
- Conjunctiva – anatomy, nerve and vascular supply
- Cornea – different layers, limbal anatomy, vascular and nerve supply
- Corneal physiology – hydration control and corneal transparency
- Epi-sclera and Sclera – anatomy, nerve and vascular supply
- Anterior chamber – its angle
- Aqueous humor production and its drainage
- Uvea – anatomy, nerve and vascular supply
- Lens – anatomy and physiology of the lens including accommodation
- Vitreous – anatomy and physiology of vitreous
- Vitreous – its attachments, functions and clinical importance
- Retina anatomy – different layers of retina
- Photoreceptors – anatomy and their functions
- Optic nerve – anatomy

## Visual Science

- Psychophysics of measurement
  - Weber's law , visual threshold and visual sensitivity
- Circadian cycle in vision and visual system
- Contrast sensitivity function
- Light and dark adaptation
- Spatial vision
- Temporal vision
- Color vision and physiological process
  - Color measurement systems
    - Defective color vision
- Reference points, lines and planes, fixational movements, ductions, versions and vergence
- Gaze holding ocular motor function
- Gaze shifting ocular motor functions
- Nystagmus
- Entopic phenomenon

## Optometric Science

- Anomalies of ocular refraction – Myopia, Hypermetropia, Astigmatism
- Accommodation – Accommodative apparatus and its mechanism
- Near triad – Link between convergence, accommodation and miosis
- Ocular aberration – Chromatic and mono-chromatic aberration of eye, effects of ocular surgeries
- Visual fields – Extent of normal visual fields in human
- Principles of retinoscopy, objective and subjective refraction
- Procedure of measurement of spherical ametropia and astigmatism
- Principle and procedures of Optometer and photorefractometer
- Principle of ophthalmic instruments – Ophthalmoscopy (direct and indirect), Slit lamp, lensometer and ultra-sonography
- Presbyopia and techniques of determination
- Ocular-motor imbalance and its causes
- Heterophoria and heterotopia
- Introduction to low vision practice
- Introduction to contact lens practice

**Ocular Disease**

Enumeration of the causes of global ,regional and national blindness  
 Role of optometrist in tackling avoidable blindness  
 Vision 2020 : The right to sight  
 Red Eye  
 Gradual loss of Vision  
 Cataract  
 Open angle Glaucoma  
 Hypertensive retinopathy  
 Diabetic retinopathy  
 Age related macular degeneration  
 Sudden loss of vision  
 Vitreous haemorrhage  
 Retinal detachment ( retinal breaks, rhegmatogenous, non-rhegmatogenous and tractional RD)  
 Central retinal vein occlusion  
 Central retinal artery occlusion  
 Optic neuritis  
 Styne  
 Chalazion  
 Internal hordeolum  
 Pinguecula / pterygium  
 Dacryocystitis with mucocele  
 Preseptal / orbital cellulitis  
 Watering of eye  
 Dacryoadenitis  
 Dacryocystitis  
 Foreign body in the ocular surface  
 Dry eye  
 Trachoma  
 Night blindness  
 Xerophthalmia  
 Retinitis pigmentosa  
 Leukocoria  
 Congenital cataract  
 Retinoblastoma  
 Retinopathy of prematurity  
 Neurophthalmology  
 Papilloedema  
 Pupillary reflexes and their abnormalities  
 Optic atrophy  
 Oculomotor palsies  
 Visual field changes due to lesions in different level of visual pathway  
 Blunt injury  
 Penetrating injury  
 Chemical injury  
 Miscellaneous  
 -congenital anomalies of cornea  
 -degeneration and dystrophy of cornea  
 -secondary glaucoma  
 -congenital glaucoma  
 -intermediate/ posterior uveitis/ endophthalmitis  
 -congenital and developmental lenticular anomalies

- dysthyroid ophthalmopathy
- ocular tumors
- vitreous liquefaction, degeneration, opacities and detachments
- Coats disease
- Ocular ischaemic syndrome
- BRVO/ BRAO
- Retinal dystrophies and degenerations
- Eales disease
- Macular edema
- Macular holes
- Central serous retinopathy
- Phakomatoses
- Oculoplastics: ptosis, entropion, ectropion
- Ocular manifestations in AIDS/Syphilis
- Ocular manifestations in TB
- Headache- Types, Etiology, evaluation techniques and management

### **Optometry I**

- Measurement of visual function
  - measurement in children
  - measurement of visual acuity in pre-verbal and non-verbal patients
  - clinical test for contrast threshold and contrast sensitivity
  - dark adaptation, recovery from glare (macular photo stress test)
- Examinations of visual fields
  - Examination of central visual fields (Amsler and MRM grid), peripheral VF examination
  - Bjerrum's, Goldman and automated perimeter
- Examinations of color vision
- Eye Examinations
  - Anterior segment examinations
  - Posterior segment examinations
- Ultrasonography
- Ocular Photography
- FFA: Principle, methods and interpretations of Fundus Fluorescein Angiography
- Sphygnomanometry
- Ophthalmodynamometry

### **Optometry II**

- Objective Refraction
- Subjective refraction
- Auxillary refractive techniques
  - The principle, methods and application of auto-refraction, photo-refraction and laser refraction
  - Near vision examination
  - Measurement of accommodation
  - Presbyopia
- Binocular vision examination
- Clinical measurement of corneal curvature: Keratometry, Javal's rule,
- MEM – technique of dynamic retinoscopy
- Assessment of Stereopsis

## **Ophthalmic Optics**

Ophthalmic lens materials, manufacture and strength of materials  
 Sign conventions, characteristic of ophthalmic lenses, spherical and spherocylindrical lenses  
 Toric and Astigmatic lenses  
 Lens thickness and lens measure  
 Ophthalmic prisms, prismatic effect and decentration  
 Field of view of ophthalmic lenses  
 Tinted and protective lenses  
 Obliquely crossed cylinders, accurate transposition  
 Aberrations and ophthalmic lens design  
 Absorptive lenses, coatings, transmission, sunglasses standards

## **Advanced visual Science**

Binocular space Perception  
     Binocular space perception  
     Stereo acuity and stereopsis  
     Aniseikonia  
     Theories of binocular vision  
     Near vision complex  
 Visual Electrophysiology  
     Electro-retinogram  
     Electro-oculogram  
     Visually Evoked Cortical Potential

## **Binocular vision 1**

Introduction to binocular vision and ocular motility.  
 Direction of ocular movements  
 The primary and secondary muscle actions  
 Muscle action in binocular movements( Hering's, Sherrington and Donders law)  
 Requirements for binocular vision  
 Monocular/ binocular field of view  
 Field of fixation (monocular/ binocular fixation)  
 The cyclopean eye  
 Corresponding points, Horopters, Panum's fusional area, fixation disparity and associated phorias,  
     physiological diplopia and stereopsis  
 Heterophoria etiology and classification  
 Signs and symptoms: compensation and decompensation  
 Investigation and management of decompensated phoria: associated phorias and fixation disparity  
     analysis  
 Symptoms, signs and etiology of accommodative anomalies  
 Management of accommodative anomalies  
 Symptoms, signs and etiology of convergence anomalies  
 Management of convergence anomalies  
 Introduction to AC/A and CA/C ratio  
 Introduction to Strabismus  
 Introduction to Nystagmus  
 Introduction to Amblyopia  
 Visual Training  
 Prism vergence and relative accommodation exercises  
 Physiological diplopia  
 Synaptophore

**Contact Lens I**

Corneal topography  
 - Classical concepts, tripple zone theory and recent concepts  
 History and evolution of contact lenses, terminology  
 Corneal physiology in relation to contact lens wear  
 Pachymetry  
 Tear film and blinking  
 Lens design and materials, verifications and standards and ordering  
 Solutions and stains  
 Optics of contact lenses  
 Introduction to contact lens prescribing, the preliminary examinations

**Low vision**

Visual impairment, legal, medical and social definitions  
 Prevalence and incidence  
 Common disorders encountered in low vision  
 Examinations of low vision patients  
 Magnifications and field of view associated with Low vision systems  
 Low Vision Aids

**Ophthalmic optics 11**

Multi-focal lens design, performance and clinical considerations  
 Progressive addition lenses  
 Anisometropia and aniseikonia, iseikonic lens design  
 Lenses for high refractive errors, field of view and magnification  
 Special lens designs, lenticular, aspheric, Fresnel lenses and Prisms  
 Ophthalmic dispensing  
 Writing prescription and lens shape presentation  
 Spectacle and frame mountings  
 Frame materials, merits of different types of spectacle frame materials  
 Frame types and component parts  
 Designs and availability of spectacle frames  
 System of spectacle frame and face measurement and their uses in spectacle dispensing  
 Spectacle fittings and principles and practical aspects of lens laying off, edging and frame adjustment  
 Cosmetic and functional dispensing  
 Special considerations for fitting of high power spectacles for different vocations.

**Contact Lens II & Ocular Prosthesis**

Soft Contact lens prescribing  
 Rigid Contact lens prescribing  
 Rigid Gas Permeable Contact lens prescribing  
 Scleral Lens Prescribing  
 Dispensing contact lenses, wearing schedules, daily/extended wear regimes  
 Care and management of contact lenses  
 After care examination  
 Complications of contact lens wear (soft, hard and RGP lens)  
 Special Prescribing Procedures  
 Presbyopia (bifocal and diffractive lenses, mono-vision)  
 Keratoconus  
 Post-keratoplasmy and post-refractive surgery  
 High power lenses (Aphakia, high myopia, astigmatism)  
 Paediatric contact lens practice  
 Orthokeratology  
 Ocular Prosthesis- Different types, materials, design, manufacture and fittings

**Binocular vision 11**

Principle, methods of accommodation and convergence relation AC/A and CA/C ratio  
 Relative accommodation and convergence : signs, symptoms and etiology  
 Strabismus  
 Heterotropia  
 Sensory adaptation to strabismus (suppression, eccentric fixation, abnormal retinal correspondence, amblyopia)  
 Motor adaptation to strabismus  
 Microtropia  
 Management of strabismus  
 Incomitant deviation- investigation and management  
 Nystagmus  
 Brain stem eye movement syndromes  
 Cerebellar eye signs  
 Other oculomotor syndromes  
 Amblyopia: classification, signs, symptoms and etiology  
 Treatment procedures: optical correction, active/ passive therapy, accessory techniques, CAM therapy, pleoptics  
 Visual Training  
 Occlusion therapy, suppression treatment  
 Visual training for eccentric fixation and anomalous retinal correspondence  
 Motor investigations  
 Sensory investigations

**Pediatric Optometry**

Chronological development of vision  
 Expected normal visual performances for various age groups  
 Pediatric growth and development  
 Developmental milestones  
 Causes of developmental delay  
 Pediatric primary care vision examination for:  
     Infants and toddlers  
     Preschool child  
     School age children  
 Case history  
 Visual acuity  
 Refraction  
 Binocular vision, ocular motility and accommodation  
 Ocular injury in pediatric age group, management  
 Pharmacological considerations for pediatric patient  
 Contact lens for pediatric patient  
 Indications for use of therapeutic contact lenses  
 Types of contact lenses for pediatric patients

**Low vision II**

Low Vision Aids  
 Visual field loss and treatment options  
 Psychological and sociological factors and counseling (Visual rehabilitation)  
 Low vision agencies in Nepal



### **Geriatric Optometry**

Anatomic and physiologic changes with age

Changes in ocular structure in reference to lens and retina

Development of cataract and age related maculopathy

Effects of common systemic and ocular diseases

Aphakia and Pseudophakos

### **Community Optometry**

Nutrition and nutritional deficiency conditions.

- Vitamin A- Xerophthalmia, scurvy, chielosis, glossitis, dermatitis and so on.

Occupational ocular problems- sports, driving, agriculture, industries etc.

Role of vision screening programs in schools, industries, sports, driving and different settings.

Eye protection standards and programs.