

प्रदेश लोक सेवा आयोग

गण्डकी प्रदेश

नेपाल स्वास्थ्य सेवा, रेडियोग्राफी समूह, सहायक पाँचौ तह, रेडियोग्राफर पद (प्रदेश/स्थानीय तह)को  
खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

पाठ्यक्रमको रूपरेखा :- यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइने छ। प्रथम

चरण :- लिखित

परीक्षा पूर्णाङ्क :- १००

द्वितीय चरण :- अन्तर्वार्ता

पूर्णाङ्क :- २०

प्रथम चरण - लिखित परीक्षा योजना ( Examination Scheme)

विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या/अङ्कभार	समय
सेवा सम्बन्धी	१००	४०	वस्तुगत बहुउत्तर (Multiple Choice)	५० * २ = १००	४५ मिनेट

द्वितीय चरण

विषय	पूर्णाङ्क	परीक्षा प्रणाली
व्यक्तिगत अन्तर्वार्ता	२०	मौखिक

**द्रष्टव्य:**

- लिखित परीक्षाको माध्यम भाषा अंग्रेजी वा नेपाली अथवा अंग्रेजी र नेपाली दुवै हुन सक्नेछ ।
- पाठ्यक्रमको एकाइहरूबाट सोधिने प्रश्नसंख्या निम्नानुसार हुनेछः—

पाठ्यक्रमका एकाइ	१	२	३	४	५	६	७	८
प्रश्न संख्या	९	११	३	७	९	५	२	४

- वस्तुगत बहुउत्तर (Multiple Choice) प्रश्नहरूको उत्तर सही दिएमा प्रत्येक सही उत्तर बापत २ (दुई) अङ्क प्रदान गरिनेछ भने गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अर्थात् ०.४ अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।
- यस पाठ्यक्रममा जेसुकै लेखिएको भएता पनि पाठ्यक्रममा परेका ऐन, नियमहरू 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 ।
- लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र अन्तर्वार्तामा सम्मिलित गराइनेछ ।
- पाठ्यक्रम लागू मिति:

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## **1. Anatomy and Physiology**

### **1.1 General introduction**

- 1.1.1 The cell
- 1.1.2 Reproduction of the individual

### **1.2 The tissues**

- 1.2.1 Epithelial tissue
- 1.2.2 Connective tissue
- 1.2.3 Skeletal tissue
- 1.2.4 Muscular tissue
- 1.2.5 Nervous tissue

### **1.3 General pathology**

- 1.3.1 Bacteria
- 1.3.2 Viruses
- 1.3.3 Tumours

### **1.4 Surface and regional anatomy**

- 1.4.1 The anatomical position
- 1.4.2 The head
- 1.4.3 The neck
- 1.4.4 The thorax
- 1.4.5 The abdomen
- 1.4.6 The pelvic cavity

### **1.5 The skeleton**

- 1.5.1 The structure of bone
- 1.5.2 Function of bone
- 1.5.3 The development and growth of bones
- 1.5.4 The healing of fractures

### **1.6 The skull**

- 1.6.1 The skull viewed from above
- 1.6.2 The skull viewed from the front
- 1.6.3 The skull viewed from the side
- 1.6.4 The skull viewed from the below
- 1.6.5 The interior of the skullcap
- 1.6.6 The interior of the base of the skull
- 1.6.7 The nasal cavity
- 1.6.8 The accessory nasal sinuses
- 1.6.9 The individual bones of the skull

### **1.7 The vertebral column, ribs and sternum**

- 1.7.1 The vertebral column
- 1.7.2 The ribs
- 1.7.3 The sternum

### **1.8 The bones of the upper limb**

- 1.8.1 The clavicle
- 1.8.2 The scapula
- 1.8.3 The humerus
- 1.8.4 The radius
- 1.8.5 The ulna
- 1.8.6 The carpal bones

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1.8.7 The metacarpal bones

1.8.8 The phalanges

1.8.9 Arteries and nerves related to the bones of the upper limb

1.8.10 Ossification of the bones of the upper limb

**1.9 The bones of the lower limb**

1.9.1 The hipbone

1.9.2 The pelvis

1.9.3 The femur

1.9.4 The patella

1.9.5 The tibia

1.9.6 The fibula

1.9.7 The tarsal bones

1.9.8 The metatarsal bones

1.9.9 The phalanges

1.9.10 The arches of the foot

1.9.11 Arteries and nerves related to the bone of the lower limb

1.9.12 Ossification of the bones of the lower limb

**1.10 The joints of the bones of the lower limb**

1.10.1 types of joints

1.10.2 The muscles and joints of the head

1.10.3 The joints and muscles of the neck and trunk

1.10.4 The joints and muscles of the upper limb

1.10.5 The joint and muscles of the lower limb

**1.11 The circulatory system**

1.11.1 The blood

1.11.2 The blood vessels

1.11.3 The heart

1.11.4 The pulmonary circulation

1.11.5 The systemic circulation

1.11.6 The veins

**1.12 The lymphatic system**

1.12.1 Lymph

1.12.2 The lymphatic vessels

1.12.3 The lymph nodes

1.12.4 The lymphatic drainage of the body

1.12.5 Lymphatic tissue

1.12.6 The spleen

**1.13 The respiratory system**

1.13.1 The nose

1.13.2 The pharynx

1.13.3 The larynx

1.13.4 The trachea

1.13.5 The bronchi

1.13.6 The lungs

1.13.7 The physiology of respiration

**1.14 The digestive system**

1.14.1 The mouth

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- 1.14.2 The salivary glands
- 1.14.3 The pharynx
- 1.14.4 The oesophagus
- 1.14.5 The stomach
- 1.14.6 The small intestine
- 1.14.7 The large intestine
- 1.14.8 The pancreas
- 1.14.9 The liver
- 1.14.10 The biliary apparatus
- 1.14.11 The function of the alimentary system

**1.15 The urinary system**

- 1.15.1 The kidneys
- 1.15.2 The ureters
- 1.15.3 The urinary bladder
- 1.15.4 The urethra
- 1.15.5 The functions of kidneys
- 1.15.6 The control of micturition

**1.16 The nervous system**

- 1.16.1 Nervous tissue
- 1.16.2 The central nervous system
- 1.16.3 The brain
- 1.16.4 The spinal cord
- 1.16.5 The peripheral nervous system
- 1.16.6 The autonomic nervous system

**1.17 The endocrine system**

- 1.17.1 The pituitary gland
- 1.17.2 The thyroid gland
- 1.17.3 The parathyroid gland
- 1.17.4 The adrenal glands

**1.18 The reproductive system**

- 1.18.1 The male reproductive system
- 1.18.2 The female reproductive system

**1.19 The skin and the organs of special sense**

- 1.19.1 The skin
- 1.19.2 The eye
- 1.19.3 The ear
- 1.19.4 The nose
- 1.19.5 The tongue

**2. Radiographic Technique**

**2.1 General radiography**

- 2.1.1 Routine Radiography Technique for upper limb  
(Fingers, thumb, hand, wrist forearm, elbow, humerus, shoulder, scapula, clavicle)
- 2.1.2 Routine Radiography Technique for the lower limb,  
(Toes, foot, calcaneum, ankle, tibia, fibula, knee, femur, hip joint, neck of femur, pelvis)
- 2.1.3 Routine Radiographic technique for thoracic cage and its contents (Chest, heart, ribs and sternum)
- 2.1.4 Routine technique for the abdomen

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Routine technique of plain & erect abdomen x-ray

2.1.5 Routine technique for the spine

(Cervical, thoracic, lumbar, sacrum and coccyx, sacro-illac joint)

2.1.6 Routine technique for the skull

2.1.6.1 The radiograph anatomical landmarks of the skull

2.1.6.2 The process of routine examination of the bones of skull (cranium, facial bone and mandible)

2.1.7 To locate the following by x-rays (scaphoid, foreign body in the hand, head of humerues & axial Shoulder, acromio-calvicular joints, sterno calvicular joints, foreign body in the foot, lateral foot weight bearing, skyline view of patella, tibial Tuberosity)

2.1.8 a) The supplementary views of the chest and abdomen (Apical views, lordotic view & decubitus, oblique views for heart size & lateral with barium swallow, thoracic inlet, diaphragm exursion, inhaled or swallowed foreign body, imperforated anus)

b) The purposes of these views

2.1.9 The supplementary views for the spine and pelvis (soft tissue) (Neck, odontoid peg (open-mouth), vertebral foramina of cervical spine, upper thoracic spine oblique lumbar spine, lumbosacral junction, oblique sacro-illac joints, illum, acetabulum, pelvimetry, skeleton survey)

2.1.10 The supplementary views for the skull (towne's view, submento vertical, sella turcica, temporo-mandibular joint, nasal bones, paranasal sinuses, mastoids, orbits, optic foramina, foreign body in the eye, dental radiography)

2.1.11 Tomography

a) Basic principle of tomogram

b) Practical application of Tomography for the chest, kidney, gall bladder and skeletal system

2.1.12 Registration process

a) The steps of registration of patients

b) The importance of a monthly and annual record, filling system and preparing the Performa invoices

c) Filling of radiographs and reports (x-ray No, hospital number, patient's name, cross reference bill, with patient's name)

## **2.2 Radiographic examination with contrast media**

Special examination with contrast media

2.2.1 Contrast media

2.2.1.1 Definition of the contrast media

2.2.1.2 Types of contrast media

2.2.1.3 Methods of introducing the contrast media

2.2.1.4 Reactions of contrast media

2.2.1.5 Name of the emergency equipments and drugs needed to cope with reactions

2.2.2 Radiographic investigation of Gastro-intestinal tract using contrast media

2.2.2.1 Barium swallow

2.2.2.2 Barium meal

2.2.2.3 Barium follow through

2.2.2.4 Examination of GI tract

2.2.2.5 Ba-enema

2.2.2.6 Small bowel enema

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- 2.2.2.7 Loopogram
- 2.2.2.8 State the role of a radiographer during fluoroscopy
- 2.2.3 Investigation of urinary tract and hystero salpinogram
  - 2.2.3.1 Intravenous Urogram (IVU)
  - 2.2.3.2 Cystogram
  - 2.2.3.3 Micturating cystogram
  - 2.2.3.4 Urethrogram
  - 2.2.3.5 Retrograde pyelogram
  - 2.2.3.6 Hystero salpinogram (HSG)
- 2.2.4 Radiographic procedure of the Biliary tract
  - 2.2.4.1 Oral cholecystography (OCG)
  - 2.2.4.2 Intravenous cholangiography (IVC)
  - 2.2.4.3 Percutaneous transhepatic cholangiography and drainage (PTC and PTCD)
  - 2.2.4.4 Endoscopic retrograde cholangio pancreatography (ERCP)
  - 2.2.4.5 Operative cholangiography
  - 2.2.4.6 T. Tube cholangiography
- 2.2.5 Use of portable/mobile x-ray in ward and operation theatre
  - 2.2.5.1 The uses of mobile machine
  - 2.2.5.2 The technique of using ward radiography
  - 2.2.5.3 The technique of using operating theatre radiography
  - 2.2.5.4 Technique to help in Hip pinning
  - 2.2.5.5 The technique of operative-cholangiography
- 2.2.6 Vascular and Neurological examinations
  - 2.2.6.1 Carotid and vertebral angiogram
  - 2.2.6.2 Femoral angiogram
  - 2.2.6.3 Aortogram
  - 2.2.6.4 Phlebogram
  - 2.2.6.5 Encephalogram
  - 2.2.6.6 Ventriculogram
  - 2.2.6.7 Myelogram
- 2.2.7 Special examinations
  - 2.2.7.1 Arthrogram
  - 2.2.7.2 Dacryocystogram
  - 2.2.7.3 Sinogram/Fistulogram
  - 2.2.7.4 Sialogram
  - 2.2.7.5 Mammogram
  - 2.2.7.6 Macro-radiography
  - 2.2.7.7 Soft tissue radiography

### **3. Patient Care and Management**

#### **3.1 The hospital, the patient and the radiographer**

- 3.1.1 Clinical responsibility
- 3.1.2 Legal responsibility
- 3.1.3 The radiographer and the hospital

#### **3.2 Features of general patient care**

- 3.2.1 General preliminaries to the examination
- 3.2.2 Moving chair and stretcher patients
- 3.2.3 The anaesthetized patient

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3.2.4 Hygiene in the x-ray department

3.2.5 General comfort and reassurance for the patient

**3.3 Drugs in the x-ray department**

3.3.1 Poisons and dangerous drugs

3.3.2 Units of measurement

3.3.3 Drugs used in preparation of the patient

3.3.4 Contrast agents used in x-ray examinations

3.3.5 Drugs used in resuscitation

3.3.6 Labeling and issuing

**3.4 Sterilization and sterile techniques**

3.4.1 Methods of sterilization

3.4.2 Central sterile supply

3.4.3 Preparation of the hands for aseptic procedures

**3.5 Preparation of the patient**

3.5.1 General abdominal preparation

3.5.2 Clothing of the patient

**3.6 First aid in the x-ray department**

3.6.1 Radiological emergencies

3.6.2 Shock

3.6.3 Hemorrhage

3.6.4 Burns, scalds

3.6.5 Loss of consciousness

3.6.6 Asphyxia

3.6.7 Fractures

3.6.8 Electric shock

**3.7 Medico-legal aspects of the radiographer's work**

3.7.1 Breach of professional confidence

3.7.2 Negligence

3.7.3 Procedure in the event of an accident

3.7.4 The importance of records

**4. Radiographic Photography**

**4.1 Film**

4.1.1 Construction and composition of x-ray film

4.1.2 Types of x-ray film

4.1.3 Characteristic curve, special sensitivity & role of dyeing

4.1.4 Film speed, density, contrast, sensitometry

4.1.5 Artifacts and its causes

**4.2 Intensifying screen**

4.2.1 Construction and composition of I.S.

4.2.2 Screen speed, sharpness, coating weight

4.2.3 Fluorescent material and phosphorescence

4.2.4 Fluorescent material, new phosphors

**4.3 Image**

4.3.1 Production of radiographic image

4.3.2 Component of radiographic image

4.3.2.1 Contrast, sharpness, resolution

4.3.2.2 Exposure factors

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4.3.2.3 Absorption coefficient

**4.4 Film processing**

4.4.1 Manual film processing

4.4.1.1 The processing cycle

4.4.1.1.1 Development-constituents of developer, factors affecting control of development, developer replenishes maintenance of activity & level of developer

4.4.1.1.2 Rinsing

4.4.1.1.3 Fixation-constituents of fixer, factors affecting fixation and regeneration of the Fixer

4.4.1.1.4 Washing processing

4.4.1.1.5 Drying process

4.4.1.1.6 Tanks and containers for processing chemical, processing units

4.4.1.1.7 Mixing chemicals

4.4.1.1.8 storage of chemicals

4.4.1.1.9 Film hangers

4.4.2 Automatic processor

4.4.2.1 Basic principle & it's functioning

**4.5 Dark room planning**

4.5.1 Location, layout, radiation protection, safelight filter & sensitivity range

**4.6 Identification**

4.6.1 Methods

4.6.2 Importance

**4.7 Silver recovery**

4.7.1 General introduction

**5. Radiographic equipment**

**5.1 Historical background of x-ray and its production**

5.1.1 X-ray tube construction

5.1.2 Stationary and rotating x-ray tube

5.1.3 Recent advancement of an x-ray tube

5.1.4 Tube rating cooling and care of x-ray tube and its faults

**5.2 Control panel, x-ray table and tube column**

5.2.1 Type of x-ray table

5.2.2 Different metering equipment

5.2.3 X-ray tube support

**5.3 Fluoroscopic equipment**

5.3.1 Conventional fluoroscopy and image intensifier tube

**5.4 Control of scatter radiation & beam restricting devices**

5.4.1 Secondary radiation grids

5.4.2 Air gap technique

**5.5 Portable and mobile x-ray units**

5.5.1 Capacitor discharge and c-arm

**5.6 Conventional tomography**

**5.7 Introduction to modern modalities (CT, MRI, mammography)**

**6. Radiation Physics**

**6.1 Atomic structure**

6.1.1 The Nucleus



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6.1.2 Electron orbits and energy levels

**6.2 Production of x-ray, properties of x-rays**

6.2.1 General radiation (Bremsstrahlung),

6.2.2 Characteristic Radiation

6.2.3 Intensity of x-rays beams

6.2.4 Target material

6.2.5 voltage (kVp) applied

**6.3 Basic interactions between x-rays and matter**

6.3.1 Coherent scattering

6.3.2 Photoelectric effect

6.3.3 Compton scattering

6.3.4 Pair production

6.3.5 Photodisintegration

**6.4 Radiation measurement and units**

6.4.1 Construction & working of the free air ionization chamber

6.4.2 Thimble ionization chamber & condenser ionization chamber

**6.5 Radiation protection**

6.5.1 Historical introduction or why the protection is necessary against the radiation

6.5.2 Maximum permissible dose

6.5.3 Tabulation of the recommended maximum permissible doses for the different parts of the body

6.5.4 Following the code of practice

6.5.5 Identifying the protective materials

**6.6 Personnel monitoring**

6.6.1 The necessity of personnel monitoring & monitoring instruments (film badge, ionization chamber & thermoluminescent dosimeter)

**6.7 Safety requirements for operating a x-ray unit**

**7. Policies, laws and regulations**

7.1 Nepal Health Sector Programme

7.2 Nepal Health Service Act, 2053 and Regulation, 2055

7.3 Nepal Health Professional Council

**द. विविध**

द.१ नेपालको संविधानमा स्वास्थ्य सम्बन्धी व्यवस्था

द.२ व्यवस्थापिका, कार्यपालिका र न्यायपालिका

द.३ संघीय, प्रादेशिक तथा स्थानीय तहको संरचनात्मक व्यवस्था

द.४ खाद्य सुरक्षा र सम्पन्नता

द.५ जलवायु परिवर्तन, यसका कारण र प्रभावहरू

द.६ अस्पतालजन्य फोहोरमैला व्यवस्थापन

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**वस्तुगत बहुउत्तर नमूना प्रश्नहरू (Sample Questions)**

1. Blood is a ?

- A) Connective tissue B) Muscular tissue  
C) Epithelium tissue D) Nervous tissue

**Correct Answer:- (A)**

2. Axial skeleton is made up of ?

- A) Skull only B) Sternum only  
C) Complete vertebral column D) All of the above

**Correct Answer:- (D)**

3. Humerus is a bone of ?

- A) Ankle B) Fore arm  
C) Upper arm D) Thigh

**Correct Answer:- (C)**

4. Tendon is a structure, which connects?

- A) Bone to bone B) Muscle to a bone  
C) Nerve to muscle D) Skin to muscle

**Correct Answer:- (B)**

5. In which view of wrist joint the fracture of scaphoid is well demonstrated ? A) PA

- B) Lateral  
C) PA with ulnar deviation D) PA with radial deviation

**Correct Answer:- (C)**

6. To demonstrate muscle calcification, the two separate views of shoulder joint taken are ?

- A) Neutral and external rotation B) Weight bearing & now weight bearing C)  
Abduction & adduction D) Extension & flexion

**Correct Answer:- (A)**

7. The radiological investigation to demonstrate anatomy and physiology of urinary tract by means of an injection of contrast media is termed as ?

- A) Intravenous Cholangiography B) Cystourethrography C) Excretion  
urography D) Ascending pyelography

**Correct Answer:- (C)**

8. In case of suspected hydronephrosis, the following is observed ?

- A) maximum dose of contrast media is given  
B) Prone view and erect vies of kidney isrequired  
C) Films up to 48 hours are taken  
D) All of the above

**Correct Answer:- (D)**

9. Radiographic film basically consists of ?

- A) 2 parts B) 3parts  
C) 4 parts D) 5 pfarts

**Correct Answer:- (D)**

10. The ortocromatic films are those, which are sensitive ?

- A) Blue sensitive B) Green and yellow spectrum C) Reel spectrum D) None of  
the above

**Correct Answer:- (B)**

11. Non sereem films are used for ?

- A) Mammography B) Duplication  
C) Subs traction D) All of the avove

नेपाल स्वास्थ्य सेवा, रेडियोग्राफी समूह, सहायक पाँचौ तह, रेडियोग्राफर पद (प्रदेश/स्थानीय तह)को  
खुला प्रतियोगितात्मक लिखित परीक्षाको पाठ्यक्रम

**Correct Answer:- (D)**

12. The developing chemicals used in processing is ..... in nature ? A)  
Acidic B) Neutral

C) Alkaline D) Saltish

**Correct Answer:- (C)**

13. Tungsten is chosen for target materials due to ?

A) High atomic number B) High melting point

C) Reasonable thermal conductivity D) All of the above

**Correct Answer:- (A)**

14. A Potter Bucky diaphragm is used to ?

A) To limit size of x-ray beam B) To absorb the scattered radiation C) To absorb soft  
radiation D) None of the above

**Correct Answer:- (B)**

15. There are five basic mechanisms by which x-ray interacts with the structure of an atom but those  
used in diagnostic radiology are ?

A) Classical scattering B) Compton and photoelectric effects C) Pair production &  
scattering D) Classic scattering & photo disintegration

**Correct Answer:- (B)**