

नेपाल सरकार  
गृह मन्त्रालय  
प्रहरी प्रधान कार्यालय  
(मानवश्रोत विकास विभाग, भर्ना तथा छनौट शाखा )

प्राविधिक प्रहरी नायव निरीक्षक ( रेडियोग्राफर ) को खुल्ला प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रमको रूपरेखा :- यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइने छ :  
प्रथम चरण :- लिखित परीक्षा पूर्णाङ्क :- १५०  
द्वितीय चरण :- अन्तर्वार्ता पूर्णाङ्क :- २५

प्रथम चरण – लिखित परीक्षा योजना (Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या र अङ्कभार	समय
प्रथम	सम्बन्धित विषय सम्बन्धी	१००	४०	वस्तुगत बहुउत्तर (Multiple Choice)	५०X२ = १००	४५ मिनेट
द्वितीय	नेपाल प्रहरी सेवा सम्बन्धी	५०	२०	वस्तुगत बहुउत्तर	१५X२ = ३०	१ घण्टा
				विषयगत	४X५ = २०	

द्वितीय चरण

विषय	पूर्णाङ्क	परीक्षा प्रणाली
व्यक्तिगत अन्तर्वार्ता	२५	मौखिक

- लिखित परीक्षाको माध्यम भाषा अंग्रेजी वा नेपाली अथवा अंग्रेजी र नेपाली दुवै हुन सक्नेछ ।
- पाठ्यक्रमको पहिलो पत्रका एकाइहरूबाट सोधिने प्रश्नसंख्या निम्नानुसार हुनेछ भने द्वितीय पत्रको प्रश्न संख्या र विषयवस्तु द्वितीयपत्रमा उल्लेख गरिएको छ ।

पाठ्यक्रमका एकाइ	१	२	३	४	५	६	७
प्रश्न संख्या	१०	१२	३	८	१०	५	२

- वस्तुगत बहुउत्तर (Multiple Choice) प्रश्नहरूको उत्तर सही दिएमा प्रत्येक सही उत्तर बापत पुरा अङ्क प्रदान गरिनेछ भने 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 ।
- 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 ।
- अन्तर्वार्ताको अंकभार सम्बन्धमा प्रहरी सेवाको पदमा नियुक्ति र बहुवा गर्दा अपनाउनु पर्ने सामान्य सिद्धान्त, २०६९ को अनुसूची-१९ मा व्यवस्था भए बमोजिम हुनेछ ।
- पाठ्यक्रम लागु मिति :-

## **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
- 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
- 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 Techniques**

### **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 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 humerus & 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 excursion, 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-illiac joints, ilium, acetabulum, pelvimetry, skeleton survey)
- 2.1.10 The supplementary views for the skull (towne's view, submento vertical, sella turcica, temporomandibular 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, filing 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 swallows
  - 2.2.2.2 Barium meal
  - 2.2.2.3 Barium follows through
  - 2.2.2.4 Examination of GI tract
  - 2.2.2.5 Ba-enema
  - 2.2.2.6 Small bowel enema
  - 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 Dacryccystogram
  - 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
- 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
  - 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**

##### 5.5.1 X-ray tube construction

##### 5.5.2 Stationary and rotating x-ray tube

##### 5.5.3 Recent advancement of an x-ray tube

##### 5.5.4 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

##### 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



11. Non screen films are used for?

- A) Mammography
- B) Duplication
- C) Subtraction
- D) All of the above

**Correct Answer:- (D)**

12. The developing chemicals used in processing is ..... in nature?

- A) Acidic
- B) Neutral
- C) Alkaline
- D) Salty

**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)**