

शहीद धर्मभक्त राष्ट्रिय प्रत्यारोपण केन्द्र
नेपाल स्वास्थ्य सेवा, रेडियोग्राफी समूह, सहायक पाँचौ तह रेडियोग्राफर पदको प्रतियोगितात्मक परीक्षाको लागि
पाठ्यक्रम
एवं परीक्षा योजना

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :- लिखित परीक्षा (Written Examination)

पूर्णाङ्क :- १००

द्वितीय चरण :- अन्तर्वार्ता (Interview)

पूर्णाङ्क :- २०

प्रथम चरण (First Phase) : लिखित परीक्षा योजना (Written Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या X अङ्क	समय
प्रथम	Technical Subject	१००	४०	वस्तुगत	बहुवैकल्पिक प्रश्न	५० प्रश्न x २ अङ्क	४५ मिनेट

द्वितीय चरण (Second Phase)

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	२०	मौखिक

द्रष्टव्य :

- यो परीक्षा योजनालाई प्रथम चरण (लिखित परीक्षा) र द्वितीय चरण (अन्तर्वार्ता) गरी दुई चरणमा विभाजन गरिएको छ ।
- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
- परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा तोकिए अनुसार हुनेछ ।
- 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 ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जसुकै 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 सम्भन्नु पर्दछ ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
- पाठ्यक्रम लागू मिति :-

Paper I: Technical subject

1. Anatomy and Physiology

- 1.1 Surface and regional anatomy
 - 1.1.1 The anatomical position
 - 1.1.2 The head , neck, thorax, abdomen
 - 1.1.3 The pelvic cavity
- 1.2 The skeleton
 - 1.2.1 The structure and function of bone
 - 1.2.2 The development and growth of bones
 - 1.2.3 The healing of fractures
- 1.3 The skull
 - 1.3.1 The skull viewed from above
 - 1.3.2 The skull viewed from the front
 - 1.3.3 The skull viewed from the side
 - 1.3.4 The skull viewed from the below
 - 1.3.5 The interior of the skullcap
 - 1.3.6 The interior of the base of the skull
 - 1.3.7 The nasal cavity
 - 1.3.8 The accessory nasal sinuses
 - 1.3.9 The individual bones of the skull
- 1.4 The vertebral column, ribs and sternum
 - 1.4.1 The vertebral column
 - 1.4.2 The ribs
 - 1.4.3 The sternum
- 1.5 The bones of the upper limb
 - 1.5.1 The clavicle
 - 1.5.2 The scapula
 - 1.5.3 The humerus
 - 1.5.4 The radius
 - 1.5.5 The ulna
 - 1.5.6 The carpal bones
 - 1.5.7 The metacarpal bones
 - 1.5.8 The phalanges
 - 1.5.9 Arteries and nerves related to the bones of the upper limb
 - 1.5.10 Ossification of the bones of the upper limb
- 1.6 The bones of the lower limb
 - 1.6.1 The hipbone
 - 1.6.2 The pelvis
 - 1.6.3 The femur
 - 1.6.4 The patella
 - 1.6.5 The tibia
 - 1.6.6 The fibula
 - 1.6.7 The tarsal bones
 - 1.6.8 The metatarsal bones
 - 1.6.9 The phalanges
 - 1.6.10 The arches of the foot
 - 1.6.11 Arteries and nerves related to the bone of the lower limb

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- 1.6.12 Ossification of the bones of the lower limb
- 1.7 The joints of the bones of the lower limb
 - 1.7.1 Types of joints
 - 1.7.2 The muscles and joints of the head
 - 1.7.3 The joints and muscles of the neck and trunk
 - 1.7.4 The joints and muscles of the upper limb
 - 1.7.5 The joint and muscles of the lower limb
- 1.8 The circulatory system
 - 1.8.1 The blood vessels
 - 1.8.2 The heart
 - 1.8.3 The pulmonary circulation
 - 1.8.4 The systemic circulation
 - 1.8.5 The veins
- 1.9 The respiratory system
 - 1.9.1 The nose
 - 1.9.2 The pharynx
 - 1.9.3 The larynx
 - 1.9.4 The trachea
 - 1.9.5 The bronchi
 - 1.9.6 The lungs
 - 1.9.7 The physiology of respiration
- 1.10 The digestive system
 - 1.10.1 The mouth
 - 1.10.2 The salivary glands
 - 1.10.3 The pharynx
 - 1.10.4 The oesophagus
 - 1.10.5 The stomach
 - 1.10.6 The small intestine
 - 1.10.7 The large intestine
 - 1.10.8 The pancreas
 - 1.10.9 The liver
 - 1.10.10 The biliary apparatus
 - 1.10.11 The function of the alimentary system
- 1.11 The urinary system
 - 1.11.1 The kidneys
 - 1.11.2 The ureters
 - 1.11.3 The urinary bladder
 - 1.11.4 The urethra
 - 1.11.5 The functions of kidneys
 - 1.11.6 The control of micturition
- 1.12 The nervous system
 - 1.12.1 Nervous tissue
 - 1.12.2 The central nervous system
 - 1.12.3 The brain
 - 1.12.4 The spinal cord
 - 1.12.5 The peripheral nervous system
 - 1.12.6 The autonomic nervous system
- 1.13 The endocrine system
 - 1.13.1 The pituitary gland

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- 1.13.2 The thyroid gland
- 1.13.3 The parathyroid gland
- 1.13.4 The adrenal glands
- 1.14 The reproductive system
 - 1.14.1 The male reproductive system
 - 1.14.2 The female reproductive system
- 1.15 The skin and the organs of special sense
 - 1.15.1 The ear
 - 1.15.2 The nose
 - 1.15.3 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
 - 2.1.5 Routine technique of plain & erect abdomen x-ray
 - 2.1.6 Routine technique for the spine (Cervical, thoracic, lumbar, sacrum and coccyx, sacro-illiac joint)
 - 2.1.7 Routine technique for the skull
 - 2.1.7.1 The radiograph anatomical landmarks of the skull
 - 2.1.7.2 The process of routine examination of the bones of skull (cranium, facial bone and mandible)
 - 2.1.8 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)
 - 2.1.8.1 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)
 - 2.1.8.2 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, temporo-mandibular joint, nasal bones, paranasal sinuses, mastoids, orbits, optic foramina, foreign body in the eye, dental radiography)
 - 2.1.11 Tomography
 - 2.1.11.1 Basic principle of tomogram

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- 2.1.11.2 Practical application of Tomography for the chest, kidney, gall bladder and skeletal system
- 2.1.12 Registration process
 - 2.1.12.1 The steps of registration of patients
 - 2.1.12.2 The importance of a monthly and annual record, filling system and preparing the Performa invoices
 - 2.1.12.3 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
 - 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 Intravenous cholangiography (IVC)
 - 2.2.4.2 Percutaneous transhepatic cholangiography and drainage (PTC and PTCD)
 - 2.2.4.3 Endoscopic retrograde cholangio pancreatography (ERCP)
 - 2.2.4.4 Operative cholangiography
 - 2.2.4.5 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

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- 2.2.6.3 Aortogram
- 2.2.6.4 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 Sailogram
 - 2.2.7.5 Mammogram
 - 2.2.7.6 Macro-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 **Preparation of the patient**
 - 3.4.1 General abdominal preparation
 - 3.4.2 Clothing of the patient
 - 3.5 **First aid in the x-ray department**
 - 3.5.1 Radiological emergencies
 - 3.5.2 Shock
 - 3.5.3 Hemorrhage
 - 3.5.4 Burns, scalds
 - 3.5.5 Loss of consciousness
 - 3.5.6 Asphyxia
 - 3.5.7 Fractures
 - 3.5.8 Electric shock
 - 3.6 **Medico-legal aspects of the radiographer's work**
 - 3.6.1 Breach of professional confidence
 - 3.6.2 Negligence
 - 3.6.3 Procedure in the event of an accident
 - 3.6.4 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

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- 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**
 - 5.1.1 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

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- 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)**
 - 5.7.1 Types of MRI, Strength of MRI scanner, Advantages and disadvantages of MRI over CT, uses of MRI, contrast used in MRI, Artifacts in MRI
- 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 Compton scattering
 - 6.3.2 Pair production
 - 6.3.3 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. **Human Organ donation and transplantation**
 - 7.1 Basic concept of solid organ donation and transplantation
 - 7.2 Role of X-ray, CT and MRI in kidney/ liver transplantation
 - 7.3 Role of special procedures in kidney (Angiogram, MRCP) and liver transplantation
 - 7.4 Role of nuclear medicine in kidney transplant (DTPA/DMSA)

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8. Human Organ Transplant Act and Regulations

- 8.1 Human Organ Transplant (Regulation and Prohibition) Act- 2055
- 8.2 Human Organ Transplant (Regulation and Prohibition) Act- 2072
- 8.3 Human Organ Transplant Regulations- 2073

9. General knowledge on Shahid Dharmabhakta National Transplant Center