

पाटन स्वास्थ्य विज्ञान प्रतिष्ठान, सेवा आयोग
 प्राविधिक सेवा, रेडियोलोजि समूह, सिनियर रेडियोलोजी टेक्निसियन पद, तह ६ को
 आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम
एवं परीक्षा योजना

१. प्रथम चरण : – लिखित परीक्षा						पूर्णाङ्क :- २००	
पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या X अङ्क	समय
प्रथम	प्राविधिक विषय, सामान्य ज्ञान र	१००	४०	वस्तुगत	बहुवैकल्पिक प्रश्न	५० प्रश्न x २ अङ्क	४५ मिनेट
द्वितीय	सम्बन्धित कानूनहरु	१००	४०	विषयगत	प्रश्नोत्तर	१० प्रश्न X १०अङ्क	३ घण्टा
२. द्वितीय चरण : – अन्तर्वार्ता							
विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली			समय	
अन्तर्वार्ता	३०	-	मौखिक				

द्रष्टव्य :

१. यो परीक्षा योजनालाई प्रथम चरण (लिखित परीक्षा) र द्वितीय चरण (अन्तर्वार्ता) गरी दुई चरणमा विभाजन गरिएको छ ।
२. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
३. लिखित परीक्षामा यथासम्भव पाठ्यक्रमका सबै एकाईबाट प्रश्नहरु सोधिनेछ ।
४. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको 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 ।
५. विषयगत प्रश्नमा प्रत्येक पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन् । परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरुको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
६. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्भन्नु पर्दछ ।
७. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
८. पाठ्यक्रम लागू मिति :- २०७९/१२/२१

नोट: प्रथम पत्र र द्वितीय पत्रको विषयवस्तु एउटै हुनेछ ।

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पत्र/विषय :-

प्राविधिक विषय, र सम्बन्धित कानूनहरु
(Technical Subject and Related Legislation)

खण्ड (A): 80 Marks

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, Connective, Skeletal, Muscular and 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 Head, Neck, Thorax, Abdomen and 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 the above and the below
 - 1.6.2 The skull viewed from the side and the front
 - 1.6.3 The interior of the skullcap
 - 1.6.4 The interior of the base of the skull
 - 1.6.5 The nasal cavity
 - 1.6.6 The accessory nasal sinuses
 - 1.6.7 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. Radiation Physics**
 - 2.1 Atomic structure
 - 2.1.1 The Nucleus
 - 2.1.2 Electron orbits and energy levels
 - 2.2 Production of x-ray, properties of x-rays
 - 2.2.1 General radiation (Bremsstrahlung)
 - 2.2.2 Characteristic Radiation
 - 2.2.3 Intensity of x-rays beams
 - 2.2.4 Target material
 - 2.2.5 Voltage (kVp) applied
 - 2.3 Basic interactions between x-rays and matter
 - 2.3.1 Coherent scattering
 - 2.3.2 Photoelectric effect
 - 2.3.3 Compton scattering
 - 2.3.4 Pair production
 - 2.3.5 Photodisintegration

- 2.4 Radiation measurement and units
 - 2.4.1 Construction & working of the free air ionization chamber
 - 2.4.2 Thimble ionization chamber & condenser ionization chamber
 - 2.5 Radiation protection
 - 2.5.1 Historical introduction or why the protection is necessary against the radiation
 - 2.5.2 Maximum permissible dose
 - 2.5.3 Tabulation of the recommended maximum permissible doses for the different parts of the body
 - 2.5.4 Following the code of practice
 - 2.5.5 Identifying the protective materials
 - 2.6 Personnel monitoring
 - 2.6.1 The necessity of personnel monitoring & monitoring instruments (film badge, ionization chamber & thermoluminescent dosimeter)
 - 2.7 Safety requirements for operating X-ray unit
- 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
 - 4.4.1.2 Tanks and containers for processing chemical, processing units
 - 4.4.1.3 Mixing chemicals
 - 4.4.1.4 Storage of chemicals
 - 4.4.1.5 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

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- 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, image intensifier tube and Digital fluoroscopy
 - 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 Computed and Direct Digital Radiography
 - 5.7 Introduction to modern modalities (CT, MRI, mammography)
- 6. Radiographic Technique**
- 6.1 **General radiography**
 - 6.1.1 Routine Radiography Technique for upper limb
(Fingers, thumb, hand, wrist forearm, elbow, humerus, shoulder, scapula, clavicle)
 - 6.1.2 Routine Radiography Technique for the lower limb,
(Toes, foot, calcaneum, ankle, tibia, fibula, knee, femur, hip joint, neck of femur, pelvis)
 - 6.1.3 Routine Radiographic technique for thoracic cage and its contents
(Chest, heart, ribs and sternum)
 - 6.1.4 Routine technique for the abdomen
Routine technique of plain & erect abdomen x-ray
 - 6.1.5 Routine technique for the spine
(Cervical, thoracic, lumbar, sacrum and coccyx, sacro-illac joint)
 - 6.1.6 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)
 - 6.1.7 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)
 - 6.1.8 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
 - 6.1.9 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)

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6.1.10 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)

6.1.11 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)

6.2 Radiographic examination with contrast media

Special examination with contrast media

6.2.1 Contrast media

- 6.2.1.1 Definition of the contrast media
- 6.2.1.2 Types of contrast media
- 6.2.1.3 Methods of introducing the contrast media
- 6.2.1.4 Reactions of contrast media
- 6.2.1.5 Name of the emergency equipments and drugs needed to cope with reactions

6.2.2 Radiographic investigation of Gastro-intestinal tract using contrast media

- 6.2.2.1 Barium swallow
- 6.2.2.2 Barium meal
- 6.2.2.3 Barium follow through
- 6.2.2.4 Examination of GI tract
- 6.2.2.5 Ba-enema
- 6.2.2.6 Small bowel enema
- 6.2.2.7 Loopogram
- 6.2.2.8 State the role of a radiographer during fluoroscopy

6.2.3 Investigation of urinary tract and hystero salpinogram

- 6.2.3.1 Intravenous Urogram (IVU)
- 6.2.3.2 Cystogram
- 6.2.3.3 Micturating cystogram
- 6.2.3.4 Urethrogram
- 6.2.3.5 Retrograde pyelogram
- 6.2.3.6 Hystero salpinogram (HSG)

6.2.4 Radiographic procedure of the Biliary tract

- 6.2.4.1 Percutaneous transhepatic cholangiography and drainage (PTC and PTCD)
- 6.2.4.2 Endoscopic retrograde cholangio pancreatography (ERCP)
- 6.2.4.3 Operative cholangiography
- 6.2.4.4 T. Tube cholangiography

6.2.5 Use of portable/mobile x-ray in ward and operation theatre

- 6.2.5.1 The uses of mobile machine
- 6.2.5.2 The technique of using ward radiography
- 6.2.5.3 The technique of using operating theatre radiography
- 6.2.5.4 Technique to help in Hip pinning
- 6.2.5.5 The technique of operative-cholangiography

6.2.6 Vascular and Neurological examinations

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- 6.2.6.1 Carotid and vertebral angiogram
- 6.2.6.2 Femoral angiogram
- 6.2.6.3 Aortogram
- 6.2.6.4 Phlebogram
- 6.2.6.5 Myelogram
- 6.2.7 Special examinations
 - 6.2.7.1 Arthrogram
 - 6.2.7.2 Dacryccystogram
 - 6.2.7.3 Sinogram/Fistulogram
 - 6.2.7.4 Sailogram
 - 6.2.7.5 Mammogram
 - 6.2.7.6 Macro-radiography
 - 6.2.7.7 Soft tissue radiography

खण्ड (B): 20 Marks

7. ऐन नियमहरू

- 7.1 पाटन स्वास्थ्य विज्ञान प्रतिष्ठान ऐन, २०६४
- 7.2 पाटन स्वास्थ्य विज्ञान प्रतिष्ठानको कर्मचारी सेवाका शर्त र सुविधा सम्बन्धी नियमावली, २०६७
- 7.3 पाटन स्वास्थ्य विज्ञान प्रतिष्ठान आर्थिक प्रशासन नियमावली, २०६७
- 7.4 पाटन अस्पताल संचालन विनियमावली, २०६७
- 7.5 नेपाल स्वास्थ्य सेवा ऐन, २०५३ र स्वास्थ्य सेवा नियमावली, २०५५
- 7.6 नेपाल मेडिकल काउन्सिल ऐन, २०२० र नियमावली
- 7.7 नेपाल नर्सिङ परिषद् ऐन, २०५२
- 7.8 नेपाल स्वास्थ्य व्यवसायी परिषद् ऐन, २०५३

8. INFORMATION TECHNOLOGY

- 8.1 Brief description and Operation of MS office tools (MS Word, MS Excel, MS PowerPoint), Computer virus and computer security.
- 8.2 Brief description about Information Technology, it's components and application in Radiology.
- 8.3 Meaning, structure and advantages of Digital image.
- 8.4 Film digitizers, Image Capture devices, Direct Film capture, Direct Video Capture or "Frame Grabbing".
- 8.5 The DICOM 3.0 Standard of Image, origin and structure of DICOM, Electronic communications of image
- 8.6 The need for data compression, Compression ratio, Lossy vs. Lossless Compression, Types of data compression: JPEG Compression, Wavelet Compression, JPEG 2000
- 8.7 Local Area Networks (LANs): Basic elements, Connecting Media, Network cabling, Wireless LANs, Common Network Topologies and Strategies (Bus, Ring and Star Topologies), Server based LANs and Peer to Peer LANs, Common Network Standards, Ethernet, Fibre Channel, Repeaters, Bridges and Routers, Network Security.

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प्राविधिक सेवा, रेडियोलोजि समूह, सिनियर रेडियोलोजी टेक्निसियन पद, तह ६ को आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

- 8.8 PACS (Picture Archiving And Communication System):Acquisition, Display/Output, Display system' Human vision, Colour , Work station, Hardcopy Output display, Storage / Archive/ Database, Storage Media , Storage Management, Database Management.
- 8.9 Teleradiology: types, Standards, ACR Standard, Interdisciplinary Telehealth Standards, Risk Management.

प्रथम तथा द्वितीय पत्रमा यथासम्भव निम्नानुसार प्रश्नहरू सोधिनेछ ।

प्रथम पत्र			
खण्ड	अङ्कभार	प्रश्न संख्या	
		वस्तुगत	विषयगत
A	८०	४० प्रश्न X २ अङ्क = ८०	-
B	२०	१० प्रश्न X २ अङ्क = २०	-
जम्मा		५० प्रश्न X २ अङ्क = १००	-
द्वितीय पत्र			
खण्ड	अङ्कभार	प्रश्न संख्या	
		वस्तुगत	विषयगत प्रश्नोत्तर
A	१००	-	१० प्रश्न x १० अङ्क = १००
B	-	-	-
जम्मा			१० प्रश्न x १० अङ्क = १००

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