

लोक सेवा आयोग
नेपाल स्वास्थ्य सेवा, रेडियोग्राफी समूह, पाँचौ तह, रेडियोग्राफर/वरिष्ठ डार्करूम असिष्टेण्ट पदको खुला र
आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :-	लिखित परीक्षा (Written Examination)	पूर्णाङ्क :- २००
द्वितीय चरण :-	अन्तर्वार्ता (Interview)	पूर्णाङ्क :- ३०

परीक्षा योजना (Examination Scheme)

प्रथम चरण : लिखित परीक्षा (Written Examination)

पूर्णाङ्क :- २००

पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या × अङ्क	समय
प्रथम	सामान्य ज्ञान र सामान्य अभिज्ञता परीक्षण (General Awareness & General Aptitude Test)	१००	४०	वस्तुगत (Objective)	बहुवैकल्पिक प्रश्न (MCQs)	२५ प्रश्न × २ अङ्क	४५ मिनेट
	सेवा सम्बन्धित कार्य-ज्ञान (Job Based - knowledge)					२५ प्रश्न × २ अङ्क	
द्वितीय	सेवा सम्बन्धित कार्य-ज्ञान (Job Based - knowledge)	१००	४०	विषयगत (Subjective)	छोटो उत्तर (Short Answer) लामो उत्तर (Long Answer)	१२ प्रश्न × ५ अङ्क ४ प्रश्न × १० अङ्क	२ घण्टा १५ मिनेट

द्वितीय चरण : अन्तर्वार्ता (Interview)

पूर्णाङ्क :- ३०

पत्र / विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली	समय
अन्तर्वार्ता (Interview)	३०		बोर्ड अन्तर्वार्ता (Board Interview)	-

द्रष्टव्य :

- यो पाठ्यक्रमको योजनालाई प्रथम चरण र द्वितीय चरण गरी दुई भागमा विभाजन गरिएको छ ।
- लिखित परीक्षाको प्रश्नपत्रको माध्यम भाषा पाठ्यक्रमको विषयवस्तु जुन भाषामा दिइएको छ सोही भाषाको आधारमा नेपाली वा अंग्रेजी मध्ये कुनै एक मात्र भाषा हुनेछ । तर विषयवस्तुलाई स्पष्ट गर्नुपर्ने अवस्थामा दुवै भाषा समेत प्रयोग सकिने छ ।
- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
- प्रथम पत्र र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ । तर एकैदिनमा परीक्षा लिइनेछ ।
- 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 ।
- वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षरहरू (Capital letters): A, B, C, D मा लेख्नुपर्नेछ । सानो अक्षरहरू (Small letters): a, b, c, d लेखेको वा अन्य कुनै सङ्केत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।
- बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- परीक्षामा परीक्षार्थीले मोबाइल वा यस्तै प्रकारका विद्युतीय उपकरण परीक्षा हलमा लैजान पाइने छैन ।
- विषयगत प्रश्नहरूको हकमा तोकिएको अंकको एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिने छ ।
- विषयगत प्रश्न हुनेका हकमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोहीखण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ ।

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११. परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा दिइए अनुसार हुनेछ ।
१२. 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 ।
१३. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
१४. यस भन्दा अगाडि लागु भएका माथि उल्लेखित सेवा, समूहको पाठ्यक्रम खारेज गरिएको छ ।
१५. पाठ्यक्रम लागू मिति : - २०७८/१०/२४

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प्रथम पत्र (Paper I) :-

सामान्य ज्ञान र सामान्य अभिक्षमता परीक्षण तथा सेवा सम्बन्धित कार्य-ज्ञान

भाग (Part I) :

सामान्य ज्ञान र सामान्य अभिक्षमता परीक्षण

(General Awareness and General Aptitude Test)

खण्ड (Section - A) : (१५ प्रश्न × २ अङ्क = ३० अङ्क)

1. सामान्य ज्ञान (General Awareness) (१६ अङ्क)

- 1.1 नेपालको भौगोलिक अवस्था, प्राकृतिक स्रोत र साधनहरू
- 1.2 नेपालको ऐतिहासिक, सांस्कृतिक र सामाजिक अवस्था सम्बन्धी जानकारी
- 1.3 नेपालको आर्थिक अवस्था र चालु आवधिक योजना सम्बन्धी जानकारी
- 1.4 जैविक विविधता, दिगो विकास, वातावरण, प्रदुषण, जलवायु परिवर्तन र जनसंख्या व्यवस्थापन
- 1.5 मानव जीवनमा प्रत्यक्ष प्रभाव पार्ने विज्ञान र प्रविधिका महत्वपूर्ण उपलब्धिहरू
- 1.6 जनस्वास्थ्य, रोग, खाद्य र पोषण सम्बन्धी सामान्य जानकारी
- 1.7 नेपालको संविधान (भाग १ देखि ५ सम्म र अनुसूचीहरू)
- 1.8 संयुक्त राष्ट्रसंघ र यसका विशिष्टीकृत संस्था सम्बन्धी जानकारी
- 1.9 क्षेत्रीय संगठन (सार्क, विमस्टेक, आसियान र युरोपियन संघ) सम्बन्धी जानकारी
- 1.10 राष्ट्रिय र अन्तर्राष्ट्रिय महत्वका समसामयिक गतिविधिहरू

2. सार्वजनिक व्यवस्थापन (Public Management) (१४ अङ्क)

- 2.1 कार्यालय व्यवस्थापन (Office Management)
 - 2.1.1 कार्यालय (Office) : परिचय, महत्व, कार्य र प्रकार
 - 2.1.2 सहायक कर्मचारीका कार्य र गुणहरू
 - 2.1.3 कार्यालय स्रोत साधन (Office Resources): परिचय र प्रकार
 - 2.1.4 कार्यालयमा सञ्चारको महत्व, किसिम र साधन
 - 2.1.5 कार्यालय कार्यविधि (Office Procedure) : पत्र व्यवहार (Correspondence), दर्ता र चलानी (Registration & Dispatch), परिपत्र (Circular), तोक आदेश (Order), टिप्पणी लेखन र टिप्पणी तयार पार्दा ध्यान दिनुपर्ने कुराहरू
 - 2.1.6 अभिलेख व्यवस्थापन (Record Management)
- 2.2 निजामती सेवा ऐन र नियमावलीमा भएका देहायका व्यवस्थाहरू
 - 2.2.1 निजामती सेवाको गठन, संगठन संरचना, पदपूर्ति गर्ने तरिका र प्रक्रियाहरू
 - 2.2.2 कर्मचारीको नियुक्ति, सरुवा, बढुवा, विदा, विभागीय सजाय र अवकाश
 - 2.2.3 कर्मचारीले पालन गर्नुपर्ने आचरण र कर्तव्यहरू
- 2.3 सरकारी बजेट, लेखा र लेखापरीक्षण प्रणाली सम्बन्धी सामान्य जानकारी
- 2.4 सार्वजनिक सेवा प्रवाहको अर्थ, सेवा प्रवाह गर्ने निकाय, तरिका र माध्यमहरू
- 2.5 सार्वजनिक बडापत्र (Public Charter) : महत्व र आवश्यकता
- 2.6 व्यवस्थापनको अवधारणा तथा सार्वजनिक व्यवस्थापनमा निर्देशन, नियन्त्रण, समन्वय, निर्णय प्रक्रिया, उत्प्रेरणा र नेतृत्व सम्बन्धी जानकारी
- 2.7 मानवीय मूल्य मान्यता (Human Values), नागरिक कर्तव्य र दायित्व तथा अनुशासन

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खण्ड (Section - B) : (१० प्रश्न× २ अङ्क = २० अङ्क)

3. **सामान्य अभिक्षमता परीक्षण (General Aptitude Test)**
- 3.1 **शाब्दिक अभिक्षमता परीक्षण (Verbal Aptitude Test) :** यस परीक्षणमा शब्दज्ञान, अनुक्रम, समरूपता, वर्गीकरण, कोडिङ-डिकोडिङ, दिशा र दुरी ज्ञान परीक्षण (direction & distance sense test), तर्क विचार सम्बन्धी (logical reasoning), पंक्तिक्रम (ranking order) आदि विषयवस्तुबाट प्रश्नहरू समावेश गरिनेछ ।
- 3.2 **संख्यात्मक अभिक्षमता परीक्षण (Numerical Aptitude Test) :** यस परीक्षणमा अनुक्रम, समरूपता, वर्गीकरण, कोडिङ, मेट्रिक्स, अंकगणितीय तर्क /क्रिया सम्बन्धी, प्रतिशत, भिन्न, अनुपात, औसत, समय र काम, आदि विषयवस्तुबाट प्रश्नहरू समावेश गरिनेछ ।
- 3.3 **अशाब्दिक अभिक्षमता परीक्षण (Non-Verbal/Abstract Aptitude Test) :** यस परीक्षणमा अनुक्रम, समरूपता, वर्गीकरण, भेन चित्र, मेट्रिक्स, त्रिभुज र वर्गहरूको रचना, चित्र वा आकृति बनावट र विश्लेषण, आदि विषयवस्तुबाट प्रश्नहरू समावेश गरिनेछ ।
- 3.4 **रजु गर्ने (Verification test) र फाइलिङ अभिरुचि परीक्षण (Filing aptitude test):** रजु गर्ने (Verification test) परीक्षणमा तथ्यांक, संख्या वा शाब्दिक सूचनालाई जाँच गर्ने वा त्रुटी पत्ता लगाउने अथवा समानता वा भिन्नता पत्ता लगाउने किसिमका प्रश्नहरू समावेश हुनेछन । फाइलिङ अभिरुचि परीक्षण (Filing aptitude test) मा शाब्दिक र संख्यात्मक फाइलिङ वस्तु वा प्रक्रियालाई वर्णमालाक्रम, संख्यात्मकक्रम वा कालक्रम अनुसार समाधान गर्ने किसिमका प्रश्नहरू समावेश हुनेछन ।
- 3.5 **निर्देशन अनुसरण गर्ने (Follows the instructions) र विश्लेषणात्मक तार्किकता परीक्षण (Analytical reasoning test):** निर्देशन अनुसरण गर्ने (Follows the instructions) परीक्षणमा दिइएको लिखित निर्देशनलाई हुबहु अनुसरण गरी समाधान गर्ने किसिमका प्रश्नहरू समावेश हुनेछन । विश्लेषणात्मक तार्किकता परीक्षण (Analytical reasoning test) मा शाब्दिक वा संख्यात्मक वा अशाब्दिक (चित्रात्मक) किसिमका विश्लेषणात्मक तार्किकता सम्बन्धी प्रश्नहरू समावेश हुनेछन ।

भाग (Part II) :-

सेवा सम्बन्धित कार्य-ज्ञान (Job Based - Knowledge)

(२५ प्रश्न× २ अङ्क = ५० अङ्क)

1. **Anatomy and Physiology**
- 1.1 **General introduction**
- 1.1.1 Cell & Reproduction of the individual
- 1.2 **Tissues**
- 1.2.1 Epithelial, Connective, Skeletal, Muscular & Nervous tissues
- 1.3 **General pathology**
- 1.3.1 Bacteria, Viruses & Tumours
- 1.4 **Surface and regional anatomy**
- 1.4.1 Anatomical position, head, neck, thorax, abdomen, pelvic cavity
- 1.5 **Skeleton**
- 1.5.1 Structure and function of bone
- 1.5.2 Development and growth of bones
- 1.5.3 Healing of fractures

1.6 Skull

- 1.6.1 Skull viewed from above, skull viewed from the front, skull viewed from the side, skull viewed from the below
- 1.6.2 Interior of the skullcap, interior of the base of the skull
- 1.6.3 Nasal cavity, accessory nasal sinuses
- 1.6.4 Individual bones of the skull

1.7 Vertebral column, ribs and sternum

- 1.7.1 Vertebral column, ribs and sternum

1.8 Bones of the upper limb

- 1.8.1 Clavicle, scapula, humerus, radius, ulna
- 1.8.2 Carpal bones, metacarpal bones, phalanges
- 1.8.3 Arteries and nerves related to the bones of the upper limb
- 1.8.4 Ossification of the bones of the upper limb

1.9 Bones of the lower limb

- 1.9.1 Hipbone, pelvis, femur, patella, tibia, fibula
- 1.9.2 Tarsal bones, metatarsal bones, phalanges
- 1.9.3 Arches of the foot
- 1.9.4 Arteries and nerves related to the bone of the lower limb
- 1.9.5 Ossification of the bones of the lower limb

1.10 Joints of the bones

- 1.10.1 Types of joints
- 1.10.2 Muscles and joints of the head
- 1.10.3 Joints and muscles of the neck and trunk
- 1.10.4 Joints and muscles of the upper limb
- 1.10.5 Joint and muscles of the lower limb

1.11 Circulatory system

- 1.11.1 Blood and blood vessels
- 1.11.2 Heart, pulmonary circulation, systemic circulation
- 1.11.3 Veins

1.12 Lymphatic system

- 1.12.1 Lymph, lymphatic vessels, lymph nodes, lymphatic drainage of the body
- 1.12.2 Lymphatic tissue
- 1.12.3 Spleen

1.13 Respiratory system

- 1.13.1 Nose, pharynx, larynx, trachea, bronchi, lungs
- 1.13.2 Physiology of respiration

1.14 Digestive system

- 1.14.1 Mouth, salivary glands, pharynx, oesophagus, stomach, small intestine, large intestine, pancreas, liver, biliary apparatus
- 1.14.2 Function of the alimentary system

1.15 Urinary system

- 1.15.1 Kidneys, ureters, urinary bladder, urethra
- 1.15.2 Functions of kidneys
- 1.15.3 Control of micturition

1.16 Nervous system

- 1.16.1 Nervous tissue
- 1.16.2 Central nervous system, brain, spinal cord
- 1.16.3 Peripheral nervous system
- 1.16.4 Autonomic nervous system

- 1.17 **Endocrine system**
 - 1.17.1 Pituitary gland, thyroid gland, parathyroid gland
 - 1.17.2 Adrenal glands
 - 1.18 **Reproductive system**
 - 1.18.1 Male reproductive system
 - 1.18.2 Female reproductive system
 - 1.19 **Skin and the organs of special senses**
 - 1.19.1 Skin, Eye, Ear, Nose, 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 : Routine technique of plain & erect abdomen x-ray
 - 2.1.5 Routine technique for the spine (Cervical, thoracic, lumbar, sacrum and coccyx, sacro-illiac joint)
 - 2.1.6 Routine technique for the skull
 - 2.1.5.1 The radiograph anatomical landmarks of the skull
 - 2.1.5.2 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 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); The purposes of these views
 - 2.1.9 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 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
 - 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

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- 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 and types of the contrast media
- 2.2.1.2 Methods of introducing the contrast media
- 2.2.1.3 Reactions of contrast media
- 2.2.1.4 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 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 Uses of mobile machine
- 2.2.5.2 Technique of using ward radiography
- 2.2.5.3 Technique of using operating theatre radiography
- 2.2.5.4 Technique to help in Hip pinning
- 2.2.5.5 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

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- 2.2.6.6 Ventriculogram
- 2.2.6.7 Myelogram
- 2.2.7 Special examinations
 - 2.2.7.1 Arthrogram
 - 2.2.7.2 Dacrycystogram
 - 2.2.7.3 Sinogram/Fistulogram
 - 2.2.7.4 Sailogram
 - 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
 - 4.1.1.1 Contrast, sharpness, resolution
 - 4.1.1.2 Exposure factors
 - 4.1.1.3 Absorption coefficient

4.4 **Film processing**

- 4.4.1 Manual film processing
 - 4.1.1.1 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
 - 4.1.1.2 Basic principle & its 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

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- 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
 - 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**

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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

प्रथम पत्रको लागि यथासम्भव निम्नानुसार प्रश्नहरू सोधिने छ ।

प्रथम पत्र (वस्तुगत)					
भाग	खण्ड	विषयबस्तु	परीक्षा प्रणाली	अङ्कभार	प्रश्न संख्या × अङ्क
I	(A)	सामान्य ज्ञान (General Awareness)	बहुवैकल्पिक प्रश्न (MCQs)	३०	१५ प्रश्न × २ अङ्क = ३०
	(B)	सामान्य अभिक्षमता परीक्षण (General Aptitude Test)		२०	१० प्रश्न × २ अङ्क = २०
II	-	सेवा सम्बन्धित कार्य-ज्ञान (Job Based -knowledge)		५०	२५ प्रश्न × २ अङ्क = ५०

प्रथम पत्रको **भाग (Part II)** सेवा सम्बन्धित कार्य-ज्ञान (Job based -knowledge) को पाठ्यक्रमका एकाइबाट परीक्षामा यथासम्भव देहाय बमोजिम प्रश्नहरू सोधिने छ ।

पाठ्यक्रमका एकाइ	1	2	3	4	5	6	7
प्रश्न संख्या	5	6	2	4	5	2	1

द्वितीय पत्र (Paper II) :-
सेवा सम्बन्धित कार्य-ज्ञान (Job based -knowledge)

खण्ड (Section) (A) : - ५० अङ्क

1. **Anatomy and Physiology**
 - 1.1 **General introduction**
 - 1.1.1 Cell & Reproduction of the individual
 - 1.2 **Tissues**
 - 1.2.1 Epithelial, Connective, Skeletal, Muscular & Nervous tissues
 - 1.3 **General pathology**
 - 1.3.1 Bacteria, Viruses & Tumours
 - 1.4 **Surface and regional anatomy**
 - 1.4.1 Anatomical position, head, neck, thorax, abdomen, pelvic cavity
 - 1.5 **Skeleton**
 - 1.5.1 Structure and function of bone
 - 1.5.2 Development and growth of bones
 - 1.5.3 Healing of fractures
 - 1.6 **Skull**
 - 1.6.1 Skull viewed from above, skull viewed from the front, skull viewed from the side, skull viewed from the below
 - 1.6.2 Interior of the skullcap, interior of the base of the skull
 - 1.6.3 Nasal cavity, accessory nasal sinuses
 - 1.6.4 Individual bones of the skull
 - 1.7 **Vertebral column, ribs and sternum**
 - 1.7.1 Vertebral column, ribs and sternum
 - 1.8 **Bones of the upper limb**
 - 1.8.1 Clavicle, scapula, humerus, radius, ulna
 - 1.8.2 Carpal bones, metacarpal bones, phalanges
 - 1.8.3 Arteries and nerves related to the bones of the upper limb
 - 1.8.4 Ossification of the bones of the upper limb
 - 1.9 **Bones of the lower limb**
 - 1.9.1 Hipbone, pelvis, femur, patella, tibia, fibula
 - 1.9.2 Tarsal bones, metatarsal bones, phalanges
 - 1.9.3 Arches of the foot
 - 1.9.4 Arteries and nerves related to the bone of the lower limb
 - 1.9.5 Ossification of the bones of the lower limb
 - 1.10 **Joints of the bones**
 - 1.10.1 Types of joints
 - 1.10.2 Muscles and joints of the head
 - 1.10.3 Joints and muscles of the neck and trunk
 - 1.10.4 Joints and muscles of the upper limb
 - 1.10.5 Joint and muscles of the lower limb
 - 1.11 **Circulatory system**
 - 1.11.1 Blood and blood vessels
 - 1.11.2 Heart, pulmonary circulation, systemic circulation
 - 1.11.3 Veins
 - 1.12 **Lymphatic system**
 - 1.12.1 Lymph, lymphatic vessels, lymph nodes, lymphatic drainage of the body

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- 1.12.2 Lymphatic tissue
 - 1.12.3 Spleen
 - 1.13 **Respiratory system**
 - 1.13.1 Nose, pharynx, larynx, trachea, bronchi, lungs
 - 1.13.2 Physiology of respiration
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 - 1.15 **Urinary system**
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- 2.1.8 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); The purposes of these views
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 - Special examination with contrast media
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 - 2.2.3.5 Retrograde pyelogram
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- 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)
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 - 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

खण्ड (Section) (B) : - ५० अङ्क

- 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
 - 4.1.1.1 Contrast, sharpness, resolution
 - 4.1.1.2 Exposure factors
 - 4.1.1.3 Absorption coefficient
 - 4.4 **Film processing**
 - 4.4.1 Manual film processing
 - 4.1.1.1 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

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आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

- 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
 - 4.1.1.2 Basic principle & its 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
 - 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

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- 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

द्वितीय पत्रको लागि यथासम्भव निम्नानुसार प्रश्नहरू सोधिनेछ ।

द्वितीय पत्र (विषयगत)					
पत्र	विषय	खण्ड	अङ्कभार	छोटो उत्तर	लामो उत्तर
द्वितीय	सेवा सम्बन्धित कार्य-ज्ञान (Job Based-Knowledge)	(A)	५०	६ प्रश्न × ५ अङ्क = ३०	२ प्रश्न × १० अङ्क = २०
		(B)	५०	६ प्रश्न × ५ अङ्क = ३०	२ प्रश्न × १० अङ्क = २०