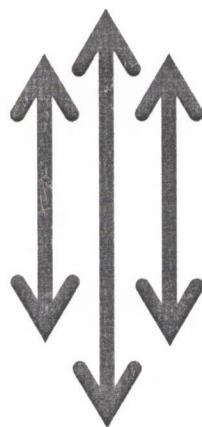


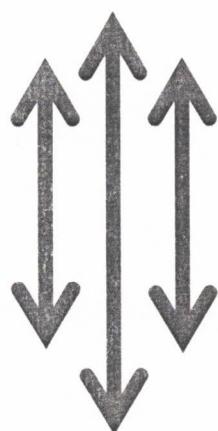
नेपाली सेना

श्री भर्ना छनौट निर्देशनालय, कार्यरथी विभाग,

जंगी अड्डा



प्रा.उ.से. Radiographer (खुला तथा आन्तरिक) पदको  
लिखित परीक्षाको पाठ्यक्रम



२०७८

### नेपाली सेना

#### प्रा.उ.से. Radiographer (खुला तथा आन्तरिक) पदको लिखित परीक्षाको पाठ्यक्रम

समय: ४ घण्टा १५ मिनेट

पूर्णाङ्क : १५०

उत्तीर्णाङ्क : ६०

यो पाठ्यक्रम नेपाली सेनाको प्रा.उ.से. Radiographer (खुला तथा आन्तरिक) पदका उम्मेदवार छनौट परीक्षाको लागि निर्धारण गरिएको हो । लिखित परीक्षामा सरिक हुने उम्मेदवारहरूको पेशा सम्बन्धी विषयलाई आधारमानी प्रश्नहरू सोधिने छ ।

- (क) लिखित परीक्षाको माध्यम नेपाली/अंग्रेजी वा दुवै भाषा हुनेछ ।
- (ख) लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र अर्को चरणको परीक्षामा सम्मिलित गराईनेछ ।
- (ग) प्रश्नपत्र निर्माण गर्दा पाठ्यक्रममा समावेश भएका सबै विषयहरूलाई यथासंभव समिटनेछ ।
- (घ) बस्तुगत र विषयगत संयुक्त रूपमा पूर्णाङ्क र उत्तीर्णाङ्क कायम गरिनेछ ।
- (ड) बस्तुगत र विषयगत परीक्षाको पाठ्यक्रम एउटै हुनेछ ।
- (च) बस्तुगत र विषयगत विषयको लिखित परीक्षा एकैपटक वा छुट्टाछुट्टै गरी लिन सकिनेछ ।
- (छ) यो पाठ्यक्रम मिति २०७८/११/२२ गतेबाट लागु हुनेछ ।

#### लिखित परीक्षाको योजना र पाठ्यक्रम

विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली		प्रश्न संख्या अङ्क	समय
पेशा	७५	६०	बस्तुगत (Objective)	बहु वैकल्पिक प्रश्न (MCQs)	७५ प्रश्न x १ अङ्क = ७५	१ घण्टा
	७५		विषयगत (Subjective)	छोटो उत्तर लामो उत्तर	९ प्रश्न x ५ अङ्क = ४५	३ घण्टा
					३ प्रश्न x १० अङ्क = ३०	

  .  

## नेपाली सेना

### प्रा.उ.से. Radiographer (खुला तथा आन्तरिक) पदको लिखित परीक्षाको पाठ्यक्रम

#### Part One-Basic Science

##### 1. ANATOMY & PHYSIOLOGY

###### **1.1 INTRODUCTION**

- 1.1.1 General anatomical terms
- 1.1.2 Human cell structure and function
- 1.1.3 The tissues

###### **1.2 MUSCULO-SKELETAL SYSTEM**

- 1.2.1 Formation, growth and development of bones. Centre of ossification
- 1.2.2 Anatomy, Function and classification of bone according to the size and shape of bone.
- 1.2.3 Classification of joints and their function
- 1.2.5 Different groups of muscle responsible for joint movement

###### **1.3 NERVOUSSYSTEM**

- 1.3.1 Neuron and nerve cells
- 1.3.2 Central nervous system
- 1.3.3 Parts of ventricles of the brain and their extent and Cerebral Spinal Fluid.
- 1.3.4 Peripheral nervous system
- 1.3.5 Autonomic nervous system
- 1.3.6 Cranial nerves, spinal nerves

###### **1.4 CARDIO-VASCULAR SYSTEM**

- 1.4.1 Blood vessels- arteries, veins, and capillaries
- 1.4.2 Different parts of heart and its function
- 1.4.3 Different circulationof body

###### **1.5 THE LYMPHATIC SYSTEM**

- 1.5.1 Anatomy and function of lymphatic system organs.

###### **1.6 THE RESPIRATORY SYSTEM**

- 1.6.1 Anatomy and Function of the organs of respiratory system, Respiratory passages (Nose, Pharynx, Larynx, Trachea,Bronchioles, Alveoli)

###### **1.7 THE DIGESTIVE SYSTEM**

- 1.7.1 Anatomy and Function of organs of the digestive system, Mouth, Pharynx, Esophagus, Stomach, Small intestine, largeintestine, rectum and anal canal Salivary gland
- 1.7.2 Pancreas, Liver, biliary tract and their function
- 1.7.3 Metabolism of Carbohydrates, Protein and fat.

###### **1.8 THE URINARY SYSTEM**

- 1.8.1 Anatomy and Function of organs of urinary system: Kidneys, ureters, bladder, and urethra
- 1.8.6 Micturition-reflex control
- 1.8.7 Structure and function of the urinary bladder and urethra
- 1.8.8 Anatomy and Function of Supra-renal glands, prostate gland.

 A. B. M. A. P. M. 

## 1.9 THE REPRODUCTIVE SYSTEM

### 1.9.1 Female Reproductive System & Breast

- 1.9.1.1 External genitalia, Uterus, Ovaries: Position, structure and functions
- 1.9.1.2 Menstrual cycle, Reproduction & menopause
- 1.9.1.3 Breast-Position, structure and its functions
- 1.9.1.4 Puberty

### 1.9.2 Male Reproductive System:

- 1.9.2.1 Position, structure and functions of scrotum, testes, epididymis, deferent ducts, seminal vesicles, ejaculatory ducts and penis
- 1.9.2.2 Puberty

## 1.10 SPECIAL SENSES

- 1.10.1 Skin- structure and function
- 1.10.2 The ear (external, middle & internal ear)-structure and function
- 1.10.3 The Eyes- structure & functions.
- 1.10.4 Nose- structure and functions
- 1.10.5 Tongue-structure, functions,
- 1.10.6 Taste buds and Sense of taste

## 1.11 THE ENDOCRINE SYSTEM

- 1.11.1 Endocrine glands - pituitary gland, thyroid gland, parathyroid glands, adrenal gland, islets of Langerhans, pineal gland, testis, ovaries, thymus etc.
- 1.11.2 Endocrine glands - Position, structure, functions and hormone secretion,

## 2. BASIC RADIATION PHYSICS

### 2.1 ELECTRICITY

- 2.1.1 Electromagnetic induction and its laws,
- 2.1.2 Self and mutual induction,
- 2.1.3 A.C generator, Peak and effective values of AC
- 2.1.4 Concept of Reactance, Impedance & phase angle.

### 2.2 TRANSFORMER

- 2.2.1 Theory, construction, Losses & Efficiency, Transformer ratings,
- 2.2.2 Filament transformer,
- 2.2.3 High-tension transformer,
- 2.2.4 Autotransformer

### 2.3 THERMIONIC EMISSION AND RECTIFIERS

- 2.3.1 Diode - construction, principle & characteristics
- 2.3.2 Rectifiers: Self-rectification, Half-wave, Full-wave (two valves and four valves) and constant voltage rectifiers.
- 2.3.3 The cold cathode gas filled diode and its use.

### 2.4 ATOMIC STRUCTURE AND ELECTROMAGNETIC RADIATION

- 2.4.1 Electron, proton, neutron, mass number, and atomic number,
- 2.4.2 Isotopes, isobars and isomers
- 2.4.3 Electron shells & energy levels
- 2.4.4 Excitation and ionization
- 2.4.5 Emission of electromagnetic waves, spectra
- 2.4.6 Properties of electromagnetic waves
- 2.4.7 Concept of photon and quanta
- 2.4.8 Photoelectric effect, photocell


 A handwritten signature consisting of stylized letters and numbers, appearing to read "J. B. 2021" followed by a signature.

## 2.5 RADIOACTIVITY

- 2.5.1 Introduction.
- 2.5.2 Radioactive elements, radioactive disintegration
- 2.5.3 Properties of radioactive particles
- 2.5.4 Radioactive decay law, Half-life, mean life.
- 2.5.5 Artificial radioactivity: Radioactivity induced by neutron bombardment and proton bombardment.
- 2.5.6 Nuclear binding energy, nuclear stability
- 2.5.7 Alpha, beta and gamma disintegration
- 2.5.8 Introduction to fission and fusion

## 2.6 X-RAYS

- 2.6.1 Historical background
- 2.6.2 X-ray tube,
- 2.6.3 Mechanism of x-ray production
- 2.6.4 Properties of x-rays, Intensity & quality of x-rays, continuous and characteristic spectra,
- 2.6.5 Effects of variation of tube current and voltage, Brag's law for wavelength determination.
- 2.6.6 X-ray control and indicating equipment: simple circuit diagram as illustration of sequence from mains supply to exposure control.
- 2.6.7 Mains voltage circuit
- 2.6.8 Mains cables, Switches and fuses
- 2.6.9 Mains voltage compensation, earthing, insulation, Voltage drops in cables.
- 2.6.10 X-ray tube voltage control and indication,
- 2.6.11 Exposure controls. Contactors and timers
- 2.6.12 X-ray tube current control and filament supply, mA compensation, Generator regulation

## 2.7 INTERACTION OF RADIATION WITH MATTER

- 2.7.1 Thompson scattering
- 2.7.2 Photoelectric interaction
- 2.7.3 Compton scattering
- 2.7.4 Pair production
- 2.7.5 Transmission of a homogenous and heterogeneous x-ray beam through matter
- 2.7.6 Effects of filtration
- 2.7.7 Relative amount of scatter from an x-ray beam during the passage through matter
- 2.7.8 Effects of collimation

## 2.8 RADIATION DETECTION AND MEASUREMENT

- 2.8.1 Principle of measurement
- 2.8.2 Ionization chamber, Electrometer
- 2.8.3 Scintillation counter
- 2.8.4 Gieger-muller counter
- 2.8.5 Thimble chamber
- 2.8.6 Condenser chamber


## 2.9 RADIATION PROTECTION

- 2.9.1 Introduction.
- 2.9.2 Objective and principle of radiation protection
- 2.9.3 Radiation and Radiation units
- 2.9.4 Personnel monitoring
- 2.9.5 Protective materials
- 2.9.6 ICRP recommendations on dose limits

## 2.10 ULTRASOUND

- 2.10.1 Longitudinal waves
- 2.10.2 Principles of ultrasound, intensity, power and fields,
- 2.10.3 Transmission of ultrasound,
- 2.10.4 Velocity of ultrasound in different media,
- 2.10.5 Ultrasonic interactions, absorption and scattering mechanism in tissue, refraction and reflection of ultrasound,
- 2.10.6 Damping of ultrasound in media,
- 2.10.7 Doppler effect

## Part Two

### 3. RADIOGRAPHIC TECHNIQUE

#### 3.1 UPPER LIMB

- 3.1.1 Technique for whole hand, fingers, thumb, wrist joint, Radio ulnar joints
- 3.1.2 Supplementary technique: carpal tunnel, scaphoid, ulnar groove, head of radius
- 3.1.3 Supplementary views of elbow, humerus & Supra-condylar projection

#### 3.2 SHOULDER GIRDLE AND THORAX

- 3.2.1 Technique for shoulder joint, acromio-clavicular joint, and scapula
- 3.2.2 Supplementary views: projection to show recurrent dislocation of shoulder, infero-superior projection of clavicle, sterno- clavicular joint, sternum, ribs

#### 3.3 LOWER LIMB

- 3.3.1 Technique for whole foot, toes, great toe, calcaneum, talo-calcaneal joint, ankle joint, lower leg with ankle joint,
- 3.3.2 Knee joint, patella, tibio-fibular joints,
- 3.3.3 Supplementary technique for torn ligaments, flat feet, axial view of calcaneum, skyline view of patella, intercondylar notch view

#### 3.4 VERTEBRAL COLUMN

- 3.4.1 Technique for cranio-vertebral joint, atlanto-occipital joint, first three cervical vertebra, odontoid peg view
- 3.4.2 Cervical spine for intervertebral joints and foramina, cervico thoracic vertebrae,
- 3.4.3 Thoracic spine, thoraco-lumbar vertebrae
- 3.4.4 Lumbar spine, intervertebral joints and foramina, lumbo-sacral joint, sacrum, coccyx
- 3.4.5 Supplementary techniques, to demonstrate scoliosis, kyphosis, spondylolisthesis.

*S*

*J.*

*8.ii 26/11*

*J. H. M.*

### **3.5 PELVIC GIRDLE AND HIP REGION**

- 3.5.1 Technique for whole pelvis, ileum, ischium and pubic bones,
- 3.5.2 Sacroiliac joints, symphysis pubis, hip joints, acetabulum, neck of femur
- 3.5.3 Supplementary projections: acetabulum view, judet view, Von-Rosen view and frog leg view for hip joint (CDH)

### **3.6 SKULL**

- 3.6.1 Routine views of Skull, Towne's view, SMV, Emergency Skull radiography
- 3.6.2 Technique for mastoids, styloid process, IAM.
- 3.6.3 Routine views for facial bones, mandible, zygomatic arches, nasal bone, maxilla, temporomandibular joints,
- 3.6.4 Optic foramina, macroradiography for optic foramina
- 3.6.5 Routine and special views for Paranasal sinuses

### **3.7 DENTAL RADIOGRAPHY**

### **3.8 CHEST RADIOGRAPHY**

- 3.8.1 Routine radiography of chest, High kV technique for Chest
- 3.8.2 Supplementary views: apicogram, lordotic and oblique views, lateral decubitus, diaphragmatic excursions double exposure technique.

### **3.9 WARD AND OPERATION THEATRE RADIOGRAPHY**

- 3.10.1 Knowledge of Electrical supply, radiation protection,
- 3.10.2 Radiography of bed-ridden patients
- 3.10.3 Radiography in operation theatre

### **3.10 MAMMOGRAPHY**

- 3.11.1 Soft tissue radiography
- 3.11.2 Principle and technique of mammography

## **4. SPECIAL RADIOLOGICAL PROCEDURES**

### **4.1 FIRST AIDS AND EMERGENCY CARE**

- 4.1.1 Introduction to Shock, emergency treatment, Cardio-Pulmonary resuscitation (CPR)
- 4.1.2 Introduction to Haemorrhage, primary management of haemorrhage

### **4.2 CONTRAST MEDIA**

- 4.2.1 Introduction to contrast media
- 4.2.2 Definition, types and uses of contrast media
- 4.2.3 Properties of contrast media
- 4.2.4 Adverse effects of contrast media and their management
- 4.2.5 Emergency trolley setting
- 4.2.6 Life saving drugs and emergency trays

### **4.3 ALIMENTARY TRACT**

- 4.3.1 Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming & post procedure care for following investigations:
  - 4.3.1.1 Barium swallow
  - 4.3.1.2 Barium meal
  - 4.3.1.3 Barium follow -through
  - 4.3.1.4 Small bowel enema
  - 4.3.1.5 Barium enema -single contrast, -double contrast
  - 4.3.1.6 Loopogram

#### **4.4 BILIARY TRACT**

- 4.4.1 Definition, indications, contraindications, equipment required contrast media, preparation of the patient, technique / procedure, filming, post procedure care for following investigations:
- 4.4.1.1 Oral cholecystography
  - 4.4.1.2 Intravenous choledochography (IVC)
  - 4.4.1.3 Percutaneous transhepatic cholangiography (PTC)
  - 4.4.1.4 Endoscopic retrograde cholangio-pancreatography (ERCP)
  - 4.4.1.5 Per operative cholangiography (POC)
  - 4.4.2.6 T-tube cholangiography

#### **4.5 URINARY TRACT**

- 4.5.1 Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming, post procedure care for following investigations:
- 4.5.1.1 Intravenous urography IVU , Modification of IVU and additional techniques
  - 4.5.1.2 Percutaneous renal puncture
  - 4.5.1.3 Percutaneous nephrostomy
  - 4.5.1.4 Retrograde pyelography
  - 4.5.1.5 Micturatingcysto-urethrography

#### **4.6 REPRODUCTIVE SYSTEM**

- 4.6.1 Definition, indications, contraindications, equipment required contrast media, preparation of the patient, technique/procedure, filming, post procedure care for Hysterosalpingography

#### **4.7 CARDIO-VASCULAR SYSTEM**

- 4.7.1 Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming, post procedure care for following investigations:
- 4.7.1.1 Carotid angiography
  - 4.7.1.2 Abdominal aortography
  - 4.7.1.3 Portal venography
  - 4.7.4.4 Peripheral and lower limb venography

#### **4.8 MYELOGRAPHY**

- 4.8.1 Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming, post procedure care for following investigations:
- 4.8.1.1 Lumabr, Thoracic and Cervical Myelography

#### **4.9 ARTHROGRAPHY**

- 4.9.1 Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming, post procedure care for following investigations:<sup>7</sup>
- 4.9.1.1 Knee Arthrography
  - 4.9.1.2 Hip Arthrography

#### **4.10 SINOGRAPHY**

- 4.10.1 Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique /procedure, filming, post procedure care for Sinography

The image shows four distinct handwritten signatures or sets of initials in black and green ink. From left to right: 1) A stylized signature in black ink. 2) The letters 'J.' in a cursive script. 3) The letters 'J.' followed by '20/1' in a cursive script. 4) A signature in green ink.

#### **4.11 SIALOGRAPHY**

- 4.11.1 Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming, post procedure care for following investigations:
  - 4.11.1.1 Parotid sialography
  - 4.11.1.2 Sub-mandibular sialography

#### **4.12 DACYROCYSTOGRAPHY**

- 4.12.1 Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming, post procedure care for Dacryocystography

### **5. SPECIAL IMAGING TECHNIQUES**

Describe the routine protocols of CT and MRI for different organs of the body.

#### **5.1 COMPUTED TOMOGRAPHY**

- 5.1.1. Applications in CT system
- 5.1.1. Emergency CT of head and other organs
- 5.1.2. CT of brain, orbits, PNS and Temporal bones and CT of neck (trachea, pharynx and other soft tissues)
- 5.1.3. CT of thorax (mediastinum)
- 5.1.4. HRCT of lungs
- 5.1.5. CT of cervical spine, dorsal spine, lumbar spine, sacrum and SI joints
- 5.1.6. CT of upper abdomen (stomach, liver, spleen, pancreas, kidneys)
- 5.1.7. CT of whole abdomen
- 5.1.8. CT of pelvis/lower abdomen
- 5.1.9. CT of extremities
- 5.1.10. CT angiography of all parts.
- 5.1.11. Introduction and application of helical / spiral and multi-slice CT Scanning and 3D reconstruction.

#### **5.2 MRI (MAGNETIC RESONANCE IMAGING)**

Applications in MR system

- 5.2.1. MRI of brain
- 5.2.2. MRI of spinal column
- 5.2.3. MRI of extremities
- 5.2.4. MRI of different organs

### **6. EQUIPMENT FOR DIAGNOSTIC RADIOLOGY**

#### **6.1 X-RAY TUBES**

- 6.1.1 Overview of production of x-rays, Historical background,
- 6.1.2 Components of an x-ray tube: Cathode assembly, Anode assembly
- 6.1.3 Stationary and rotating anodes
- 6.1.4 Line focus principle, anode heel effect, Off-focus radiation
- 6.1.5 Glass envelope, tube shielding, care of x-ray tubes,
- 6.1.6 X-ray tube faults,
- 6.1.7 Modification and recent advances in x-ray tube

*f*

*J*

*fin 26/11*

*dw*

## **6.2 RADIOGRAPHIC COUCHES, STANDS AND TUBE SUPPORTS**

- 6.2.1 X-ray tube supports
- 6.2.2 Radiographic couches
- 6.2.3 Chest stands and vertical bucky
- 6.2.4 Modern basic radiographic units

## **6.3 EXPOSURE TIMERS**

- 6.3.1 Introduction
- 6.3.2 Clockwork timer, synchronous motor and impulse timers,
- 6.3.3 Electronic timers,
- 6.3.4 Autotimers (photoelectric timer and ionization chamber timer)

## **6.4 BEAM CENTERING & BEAM LIMITING DEVICES**

- 6.4.1 Cones and cylinders, Aperture diaphragms,
- 6.4.2 Light beam diaphragms, Positive beam limitation

## **6.5 PORTABLE AND MOBILE RADIOPHGRAPHIC EQUIPMENTS**

- 6.5.1 Main features of portable and mobile equipment
- 6.5.2 Mains dependent mobile equipment
- 6.5.3 Capacitor discharge equipment
- 6.5.4 Battery powered generators

## **6.6 CONTROL OF SCATTERED RADIATION**

- 6.6.1 Significance of scattered radiation
- 6.6.2 Reduction in the amount of scatter radiation produced (field size, use of appropriate exposure factors, compression band)
- 6.6.3 Reduction in the amount of scatter radiation reaching to the film (metal backing of cassettes, filters, air-gap technique, cones and diaphragms, Grids)
- 6.6.4 Grid: construction, function, grid characteristics, grid types and patterns. Grid movement
- 6.6.5 Reduction in the effect of scatter (use of intensifying screens)

## **6.7 FLUOROSCOPIC EQUIPMENT**

- 6.7.1 Introduction
- 6.7.2 Conventional fluoroscopy
- 6.7.3 Mobile and specialised fluoroscopic units,
- 6.7.4 Image intensified fluoroscopy,
- 6.7.5 Image intensifier- construction and working principle,
- 6.7.6 TV camera and TV monitor

## **6.8 TOMOGRAPHY**

- 6.8.1 Introduction to Tomography
- 6.8.2 Main features of tomographic equipment,
- 6.8.3 Wide angle and narrow angle Tomography, Different types of tomographic movement,
- 6.8.4 Multi-section Tomography

## **6.9 EQUIPMENT FOR DENTAL RADIOGRAPHY**

- 6.9.1 A simple dental radiographic unit
- 6.9.2 Orthopantomography (OPG)

## **6.10 VASCULAR IMAGING EQUIPMENT**

- 6.10.1 Generators and x-ray tubes
- 6.10.2 C-Arm/U-Arm assembly

   
  
 26/11/2011

6.10.3 Automatic film changers (roll and cut film changers)

6.10.4 Angiographic tables

6.10.5 Automatic pressure injectors

6.10.6 Program selector, cine cameras

### **6.11 MAMMOGRAPHIC EQUIPMENT**

6.11.1 Introduction

6.11.2 Mammography x-ray tube

6.11.3 Image receptors in mammography

6.11.4 Apparatus for magnification radiography in mammography

### **6.12 DIGITAL IMAGING**

6.12.1 Introduction to digital imaging concepts and advantages of image digitization,

6.12.2 Digital image structure

6.12.3 Digital radiography:

6.12.3.1 Scanned projection radiography (SPR)

6.12.3.2 Computed radiography (CR)

6.12.3.3 Direct digital radiography (DR)

### **6.13 COMPUTED TOMOGRAPHY (CT)**

6.13.1 Introduction.

6.13.2 Basic principles of CT

6.13.3 Generations of CT

6.13.4 System components

6.13.5 Image characteristics & Image quality in CT

6.13.6 Artefacts in CT

### **6.14 MAGNETIC RESONANCE IMAGING (MRI)**

6.14.1 Fundamental concepts: magnetic moments, precession, resonance, nuclear magnetic resonance (NMR)

6.14.2 Introduction to MR Scanners: imaging magnets, RF transmitter and receiver coils, shim coils and gradient coils

6.14.3 Principal parameters of MRI: spin density, T1 relaxation time, T2 relaxation time

6.14.4 Basic principles of MR imaging and related parameters

6.14.5 Spin echo pulse sequence

6.14.6 Gradient echo pulse sequence

6.14.7 Artefacts in MRI

## **7. RADIOGRAPHIC PHOTOGRAPHY**

### **7.1 PHOTOGRAPHIC PRINCIPLE**

7.1.1 Photographic effect

7.1.2 Photosensitive materials

7.1.3 Photographic emulsion

7.1.4 Characteristic curve

7.1.5 Spectral sensitivity

7.1.6 Direct exposure film (x-ray sensitive)

7.1.7 Gurney-Mott theory of latent image formation

The image shows four handwritten signatures or initials in black and green ink. From left to right: a stylized signature in black, a signature in black, a signature in black with the number '36' written above it, and a signature in green.

## 7.2 FILM MATERIALS

- 7.2.1 Construction of x-ray film
- 7.2.2 Film for medical imaging
- 7.2.3 Comparison between single coated and double coated x-ray films

## 7.3 FILM STORAGE

- 7.3.1 Different storage areas
- 7.3.2 Ideal storage condition
- 7.3.3 Stock control and film ordering methods

## 7.4 INTENSIFYING SCREENS

- 7.4.1 Luminescence: fluorescence and phosphorescence
- 7.4.2 Construction of Intensifying screen and their types
- 7.4.3 Types of phosphors: calcium tungsten, rare earth and their comparison
- 7.4.4 Care, monitoring and cleaning of IF screen
- 7.4.5 X-ray film cassettes and its function, construction, materials used, types and care of cassettes

## 7.5 RADIOGRAPHIC PROCESSING

- 7.5.1 Manual and Automatic processing principle and equipment
- 7.5.2 The principle of dry silver imager
- 7.5.3 Silver recovery
- 7.5.4 Daylight processing

## 7.6 DESIGN AND CONSTRUCTION OF DARKROOM

- 7.6.1 The layout of an ideal darkroom, location, size, radiation protection, floor, walls / ceiling, ventilation and heating, entrance, white lighting and safe light and its test, film hoppers loading bench and wet bench

## 7.7 THE RADIOGRAPHIC IMAGE

- 7.7.1 Radiographic image quality, factors affecting it and image artifacts.

## 7.8 IDENTIFICATION AND VIEWING OF RADIOGRAPHS

यस विषयको पाठ्यक्रमका एकाईहरुबाट सोधिने प्रश्नहरुको संख्या निम्नानुसार हुनेछ ।

Section No.	MCQs Number	Long answer question	Short answer question
1	10	$1 \times 10 = 10$	$3 \times 5 = 15$
2	10		
3	15	$1 \times 10 = 10$	$3 \times 5 = 15$
4	10		
5	10	$1 \times 10 = 10$	$3 \times 5 = 15$
6	10		
7	10	$1 \times 10 = 10$	$3 \times 5 = 15$
Total	$75 \times 1 = 75$		
		$3 \times 10 = 30$	$9 \times 5 = 45$

**प्रा.उ.से. Radiographer (खुला तथा आन्तरिक) पदको प्रयोगात्मक परीक्षाको पाठ्यक्रम**

समय: ६० मिनेट

पूर्णाङ्क: ५०

उत्तीर्णाङ्क: २५

S. No.	Topics	Marks	Time (minutes)
1.	Radiation physics, anatomy and physiology	10	10
2.	Radiographic Techniques	10	10
3.	Special radiological procedures and special imaging techniques	10	10
4.	Equipment	5	10
5.	Radiographic photography	10	10
6.	Radiation protection and hazards	5	10
	<b>TOTAL</b>	<b>50</b>	<b>60</b>

1. Radiation physics and relevant anatomy: Basic radiation physics, working principles of all radiological modalities and relevant basic anatomy.
2. Radiographic techniques: Positioning, basic and special views with demonstration.
3. Special radiological procedures: contrast media, first aid and emergency care, contrast studies of various system and spotter film of different procedures.
4. Special imaging techniques: patient preparation, planning protocol, aftercare in CT/MRI and radiation protection measures in CT.
5. Equipment: Identification of parts and handling of equipment.
6. Radiographic photography: photographic principle, film storage and processing.
7. Radiation protection and hazards: Possible radiation hazards and their protective measures. Recommended dose limits.

समाप्त