

मेचीनगर नगरपालिकाद्वारा सञ्चालन गरिने रेडियोग्राफर (सहायकस्तर पाचौं)

पदको लिखित परीक्षाको पाठ्यक्रम

परीक्षाको प्रकार: वस्तुगत बहुवैकल्पिक

पूर्णाङ्क: ५०

पत्र संख्या २५

अंकभार: २ (गलत उत्तरमा ०.२ प्रतिशत अंक कट्टा गरिनेछ)

समय: ४५ मिनेट

## 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

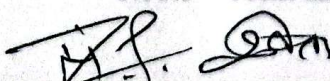
1.10.1 Types of joints

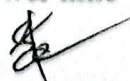
1.10.2 Muscles and joints of the head

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-illac 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 humerues & 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 exursion, 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-illac joints, illum, 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
  - 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
  - 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 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



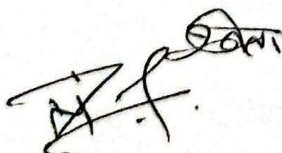


- 3.2 **Features of general patient care**
  - 3.2.1 General preliminaries to the examination
  - 3.2.2 Moving chair and stretcher patients
  - 3.2.3 The anaesthetized patient
  - 3.2.4 Hygiene in the x-ray department
  - 3.2.5 General comfort and reassurance for the patient
- 3.3 **Drugs in the x-ray 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

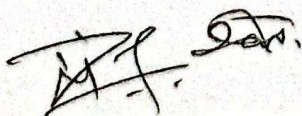
3.7.4 The importance of records

#### 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
    - 4.1.1.1 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
    - 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**

## 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

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