

Pokhara University Teaching Hospital
Curriculum for Radiography Officer Level Examination

For written examination
Full Marks: 65

There shall be 4 hrs. written examination based on the following syllabus:

Group A: Written Examination

65 Marks

1. Anatomy & Physiology (10)

Introduction: General anatomical terms, human cell, structure and function.

Musculoskeletal system: Formation, growth and development of bones. Centre of ossification, Function of bone according to the size and shape of bone, Classification of bone, Classification of joints and their function Different groups of muscle responsible for joint movement mechanism of skeletal muscle contraction and Neuromuscular transmission.

Nervous system: Neuron and nerve cells, Central nervous system and brain, Parts of ventricles of the brain and their extent, The cerebrospinal fluid, Midbrain and brain stem, Peripheral nervous system, Autonomic nervous system, Cranial nerves and spinal nerves.

Cardiovascular system: Blood vessels- arteries, veins, and capillaries, Different parts of heart and its function, Cardiac cycle, Systemic circulation, Pulmonary circulation and Coronary circulation.

Lymphatic system: Lymphatic System, Lymph nodes, Spleen and Thymus gland.

Respiratory system: Organs of the respiratory system, Respiratory (Nose, Pharynx, Larynx, Trachea, Bronchioles, Alveoli), Lung and pleura, physiology of breathing and respiration.

Digestive system: Organs of the digestive system, Mouth, Pharynx, Esophagus, Stomach, Small intestine, large intestine, rectum and anal canal Salivary glands, Function of alimentary tract Pancreas, Liver, biliary tract and their function Metabolism of Carbohydrates, Protein and fat.

Urinary system: Organs of urinary system (Kidneys, ureters, bladder and urethra) Kidneys-position, gross structure, cortex, medulla pelvis, Functional unit of kidney, nephron, function of kidneys, Formation of urine and water-electrolyte balances in body.

Reproductive system:

Male reproductive system: Position structure and functions of scrotum, testes, epididymis, deferent ducts, seminal vesicles, ejaculatory ducts and penis.

Female reproductive system: External genitalia, Uterus, Ovaries: Position, structure functions, Menstrual cycle, Reproduction & menopause.

Special senses and endocrine system: Structure and function of ear, nose, eye skin and tongue, Position, structure, functions and hormone secretion of different endocrine glands.

2. Radiation Physics (10)

Review of electricity and magnetism: electromagnetic induction and its laws, self and mutual induction, principle and construction of transformers.

X-radiation: properties of x-rays, production of x-rays, characteristic and bremsstrahlung radiation, factors affecting quality and quantity of x-rays, interaction of x-rays with matter

Radioactivity: Introduction, Radioactive elements, radioactive disintegration Properties of radioactive particles Radioactive decay law, Half-life, mean life. Artificial radioactivity, Alpha, beta and gamma disintegration, Introduction to fission and fusion.

Radiation detection and measurement: Principle of measurement, Ionization chamber, Electrometer, Scintillation counter, Geiger-muller counter, Thimble ionisation chamber, Condenser chamber, Film badge, OSL, TLD, pocket dosimeter.

Radiobiology and radiation protection: Target theory, Law of Bergonie and tribondeau, Radiation effect- direct (effect in DNA) and indirect (radiolysis of water), LET, RBE and OER, factors affecting radiosensitivity, Stochastic effect of radiation and Deterministic effect of radiation, Introduction and principle of radiation protection, Radiation and Radiation units, Personnel monitoring, Protective materials, ICRP recommendations on dose limits and ICRP recommendation for protection and WHO guidelines for protection and National Recommendations, Cardinal principle Radiation protection in Nuclear Medicine, Radiation protection in fluroscopy, CT, Angiography and ward radiograph, radiation dose descriptors in different imaging modalities

Physics of ultrasonography: Principles of ultrasound, intensity, power and fields, Transmission of ultrasound, Velocity of ultrasound in different media, Ultrasonic interactions, absorption and scattering mechanism in tissue, refraction and reflection of ultrasound, Damping of ultrasound in media, Doppler effect, Recent advances in USG equipment, Basic and recent advances in USG procedures.

3. Medical Imaging Equipment and Instrumentation (15)

The X-ray Imaging system: X-ray tube and its constituents, x-ray tube support system, exposure timer and its types, x-ray tube failure, digital radiography and its types, detectors used in digital radiography and quality control in general radiography.

The mammographic imaging system: target composition, grids, focal spot and compression in mammography, screen film mammography, digital mammography, mammographic quality control.

Fluoroscopic imaging system: construction and working principle of image intensifier tube, grid controlled fluoroscopy, digital fluoroscopy and image formation in digital fluoroscopy, digital subtraction angiography, roadmapping, fluoroscopic quality control.

Computed tomography: principle of operation, generations, helical and multislice computed tomography, detectors in computed tomography, slip ring technology, recent advances in computed tomography, Dual energy computed tomography, CT artifacts, quality control in computed tomography, CT dose descriptors.

Magnetic Resonance Imaging (Physics and instrumentation): nuclear magnetic resonance phenomenon, basic acquisition parameters, basic pulse sequences, signal localization, K-space, MR artifacts, different coils used in MRI, Basic principle of Magnetic resonance Spectroscopy, perfusion and angiography, diffusion imaging in MRI, functional MRI, contrast media in MRI.

Nuclear Medicine: Positron Emission Tomography (PET): Physics, principle, instrumentation, recent advances, application Gama camera/scintillation, Single Photon Emission Tomography (SPECT): physics, instrumentation, application Radioisotope generator, radiopharmaceuticals, radionuclides and radiation safety measure in nuclear medicine, PET-CT, PET-MRI: principle, application and advantages.

4. Radiographic Technique (10)

Upper limb: Basic and supplementary projections for hand, fingers, carpal bones, wrist, forearm, elbow, humerus.

Shoulder girdle and thorax: basic projection for shoulder, acromioclavicular joint, clavicle, scapula, ribs, sternum, chest, other alternative and supplementary projections

Lower limb: Technique for foot, toes, great toe, calcaneum, talo-calcaneal joint, ankle joint, lower leg with ankle joint, Knee joint, patella, tibio-fibular joints, Supplementary projections for torn ligaments, flat feet, axial view of calcaneum, skyline view of patella, intercondylar notch view.

Vertebral column: Technique for cranio-vertebral joint, atlanto-occipital joint, first three cervical vertebra, odontoid peg view, Cervical spine for intervertebral joints and foramina, cervico thoracic vertebrae, Thoracic spine, thoraco-lumbar vertebrae Lumbar spine, intervertebral joints and foramina, lumbo-sacral joint, sacrum, coccyx.

Pelvic girdle, hip and sacroiliac joint: basic, additional and supplementary projections of hip joint, acetabulum, pelvis and sacro-iliac joints.

Skull: basic and supplementary projections in radiography of skull and facial bones

Dental radiography: Intra-oral and extra-oral projections, occlusal projection, Orthopantomography (OPG).

5. Special Radiological procedures and interventional radiology (10)

Introduction and types of contrast media used in different imaging modalities, Properties of contrast media, Adverse effects of contrast media and their management, Emergency trolley setting, Lifesaving drugs and emergency trays.

Alimentary tract: Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming & post procedure care for Barium swallow, Barium meal, Barium follow-through, Small bowel enema, Barium enema -single contrast, -double contrast, Loopogram.

Hepatobiliary tract: Definition, indications, contraindications, equipment required contrast media, preparation of the patient, technique / procedure, filming, post procedure care for Oral cholecystography, Intravenous choledochography, Percutaneous transhepatic cholangiography, Endoscopic retrograde cholangio-pancreatography, Per operative cholangiography, T-tube cholangiography.

Urinary tract: Definition, Indication, contraindication, equipments required, contrast media, technique/procedure, filming, post procedure care for Intravenous urography, modification and additional techniques, Percutaneous renal puncture Percutaneous nephrostomy, Retrograde pyelography, Micturating cysto-urethrography.

Reproductive system: Definition, indication, contraindication, equipment required, contrast media, technique/procedure, filming, post procedure care for Hysterosalpingography.

Cardio-vascular system: Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming, post procedure care for Carotid angiography, Abdominal aortography, Portal venography, Peripheral and lower limb venography, Cath lab procedures.

Miscellaneous: Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, technique/procedure, filming, post procedure care for myelography, sialography, dacryocystography, sonography.

6. Advanced Imaging Protocols (10)

CT protocol: Definition, indications, contraindications, contrast media, preparation of the patient, technique/procedure, post procedure care for plain and enhanced CT of Head, PNS, Orbit, Temporal bone, Neck, Chest, Abdomen, Pelvis and Sequences for Trauma, CT Angiography of Circle of Willis, Carotid, Aorta, Pulmonary, Renal, Coronary, peripheral organs, HRCT Chest and Temporal bone, CT Portography, Cysternography, Myelography, Colonoscopy and CT guided Interventions.

MRI protocol: Definition, indications, contraindications, contrast media, preparation of the patient, technique/procedure, post procedure care for the MR Brain, Orbit, Neck, PNS, Upper and Lower Extremities, Spine, Male and Female pelvis, MR Angiography of Cerebral, Carotid, Abdomen and Peripheral, MR Perfusion, Spectroscopy, Whole Body diffusion, Breast imaging, MRCP, Dynamic sequences, fMRI, MR Arthrography.

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For Practical Examination
Full Marks: 35

Practical examination based on the following syllabus

Group B: Practical Examination

35 Marks

1. Perform basic x-ray examinations
2. Identification of Imaging Equipments and their parts
3. Identification of different anatomical structures in X-ray, CT and MR images
4. Identification of basic pathologies in x-ray images
5. Preparedness and efficiency in contrast reaction identification and management
6. Contrast Media delivery routes, rates and delivery devices
