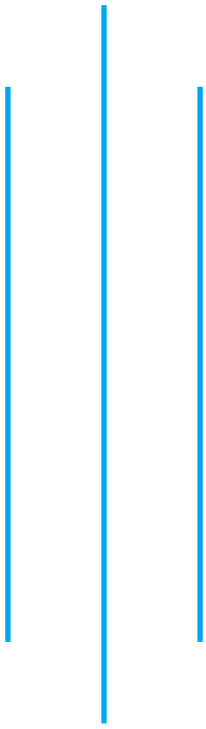
Syllabus For Licensing Examination of B.Sc. Radioterapy Technology 2023



Nepal Health Professional Council

Bansbari, Kathmandu

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1. Anatomy (Radiological Anatomy/Cross-sectional Anatomy);

Physiology

ANATOMY

Radiological Anatomy

Introduction

Cell: prokaryotic and eukaryotic cells

Cancer genetics: basic concept

Radiological Anatomy of (in brief)

- Skull
- Spine
- Chest
- Abdomen
- Pelvis
- Upper Limb
- Lower Limb

Cross-sectional anatomy (in detail)

Brain

- Cross-sectional anatomy of brain in axial, sagittal and coronal plane
- Correlate with CT & MRI Images

Head, Neck & Chest

- Cross-sectional anatomy of Head, Neck & Chest in axial, sagittal and coronal plane
- Correlate with CT & MRI Images

Abdomen and pelvis

- Cross-sectional anatomy of Abdomen and pelvis in axial, sagittal and coronal plane
- Correlate with CT & MRI Images

PHYSIOLOGY

- Body fluids: distribution of total body water, ionic composition of body fluids
- Neuron: differences in structure and function of myelinated and unmyelinated nerve fibers; Resting membrane potential and action potential
- Cardiovascular system: structure of heart and blood vessels
  - Cardiac cycle
  - Cardiac output
  - Blood pressure
  - Respiratory system: mechanism of breathing: inspiration, expiration, pulmonary

ventilation, alveolar ventilation
  - Graphical representation of pressure changes during respiration
- Central nervous system: reflex
  Autonomic nervous system: organization and function

- Renal physiology: glomerular filtration
  - Renal threshold, tubular/transport maximum
  - Reabsorption and secretion in renal tubules
  - Concentration of urine
- Gastrointestinal physiology:
  - salivary secretion
  - Deglutition
  - Stomach: functions, gastric juice, gastric motility
  - Pancreatic function
  - Liver function
  - Gall bladder function
  - Small intestine, large intestine: function

2. Basics of X-ray, CT, MRI and PET scan; Fusion Technology Physics and Equipment /Technique & Protocols

BASICS OF X-RAY

- Basic principles of x-ray
- X-ray tubes
- Exposure timers and factors
- Beam centering & beam limiting devices
- Control of scattered radiation Grids
- Digital imaging Technology
- Computed Radiography, Direct Radiography, DICOM & PACS

BASICS OF CT, MRI AND & FUSION TECHNOLOGY

Physics & Equipment

- Basic principles of CT, Generations of CT, Image reconstruction in CT
- Working principle of Spiral/helical CT Explain slip-ring technology
- Working principle of Multi-detector (MD) CT and its advantages
- Basic principles of MRI, Image Weighted in MRI
- MRI system components(Magnet and Coils)
- Fusion Technology
- Basic principle of PET CT,SPECT CT,PET MRI
- Instrumentation of PET CT,SPECT CT,PET MRI

- Image formation on fusion technology

Technique & Protocols

- Patient preparation for CT examination
- Routine Protocol for CT Head, PNS, Temporal bone, Orbits, Neck
- CT of Thorax: Routine Thorax, HRCT
- Routine Whole Abdomen, Triple phase CT

3. Radiation physics, Radiation biology, Radiation protection and Quality Assurance

RADIATION PHYSICS

- structure of atom
- Electromagnetic radiation: electromagnetic waves and their properties, inverse square law, the quantum theory of radiation, the electromagnetic spectrum, photoelectric emission, intensity, and quality of electromagnetic radiation
- Radioactivity
- X-ray: production and properties of x-rays, types of x-rays, factors influencing the intensity and quality of x-rays, spectrum of radiation from an x-ray tube, soft and hard x-rays, attenuation coefficients and half value layer
- Mechanism of interaction of electromagnetic radiation
- Radiation quantities and units of activity: Curie Becquerel, specific activity, gamma-ray constant
- Exposure and its measurement
- Relative biological effectiveness, radiation weighting factors, absorbed dose, equivalent dose, tissue weighting tissue, effective dose.
- Principles of radiation detection and measurement: ionization of gases, fluorescence and phosphorescence, effects on photographic emulsion, gas field detectors (ion chambers, proportional counters, and Geiger Muller counters), Roentgen and Rad. Simple principles of dosimeters. Thimble chamber

RADIATION BIOLOGY, PROTECTION AND QUALITY ASSURANCE

- Radiation biology, biological effect of radiation, 4 R of radiobiology, LET, RBE, lethal dose, Stochastic and deterministic effect. Cell survival curve, Gonad dose, Radiation units
- Principle of radiation protection, Cardinal principle, Radiation Protection requirement and organizations, radiation protection for patient, professionals and public, and pregnancy. Dose limit.
- Quality Assurance control for general radiotherapy: basic principles
- Different types of immobilization devices, mould room technique, simulation technique

4.Different types of immobilization devices, mould room technique, simulation technique

IMMOBILIZATION DEVICES, MOULD ROOM AND SIMULATION TECHNIQUE

- Immobilization devices: thermoplastic mask, treatment chair, shoulder retractors, bite block, foam wedge, prone pillow, head rests, base plate, indexing bar, wing board, breast boards, lung board, vacuum cushion, hip fix, belly board, all-in-one (AIO) board.
- Mould room technique: preparation of - Plaster of Paris cast, Perspex cast, thermoplastic cast, shield (use of Styrofoam cutter), tissue compensators, electron lead cutout, mouth bite
- Simulation technique: CT simulation procedure

5. Cobalt-60 machine, Gamma knife, Linear accelerator, helical linear accelerator, Robotic linear accelerator, Brachytherapy

RADIOTHERAPY MACHINES

Cobalt 60, Gamma Knife, Linear accelerators: conventional, helical, and robotic; and Brachytherapy

- various parts
- accessories
- beam direction devices
- control console

5. Principles and practice of radiotherapy including different technique of radiation delivery (2D, 3D, IMRT, ARC therapy, SRS, SBRT, IGRT, SGRT etc)

PRINCIPLES AND PRACTICE OF DIFFERENT RADIOTHERAPY DELIVERY TECHNIQUES

- 2D
- 3D
- IMRT
- Arc therapy
- SRS, SRT
- SBRT
- IGRT
- SGRT