

Syllabus for Licensing Examination of PCL in Radiotherapy / Diploma in Radiotherapy Technology 2023



Nepal Health Professional Council

Bansbari, Kathmandu

Table of contents

S.N.	Subject	Marks
1	Anatomy & Physiology and related Radiological and Cross-sectional Anatomy)	10%
2	Basics of Radiography, CT scan, MRI and FusionTechnology	10%
3	Radiation physics, Radiation biology, Radiation protection and Quality Assurance	20%
4	Immobilization devices, mould room technique, simulation technique	15%
5	Radiotherapy machines	20%
6	Principles and practice of radiotherapy delivery techniques (2D, 3D, IMRT, ARC therapy etc)	25%
	Total	100%

1. ANATOMY AND PHYSIOLOGY

ANATOMY

- Cell: Cell structure, cell division, cell types
- Tissue: structure, function and types
- Structure and function of major organs of human body
- Basic concept of cancer genetics

Radiological Anatomy of (in brief)

- Bones and joints
- Axial and appendicular skeleton
- Thorax and abdomen
- Pelvis

Cross-sectional anatomy

- Cross-sectional anatomy of brain in axial, sagittal and coronal plane
- Cross-sectional anatomy of Head, Neck & Chest in axial, sagittal and coronal plane
- Cross-sectional anatomy of Abdomen and pelvis in axial, sagittal and coronal plane

PHYSIOLOGY

- Body fluids: distribution of total body water, ionic composition of body fluids
- Nervous system: Neuron, reflex, differences in structure and function of myelinated and unmyelinated nerve fibers
- Cardiovascular system: structure of heart and blood vessels, Cardiac cycle
- Respiratory system: mechanism of breathing, inspiration, expiration,
- Urinary system: Renal physiology, glomerular filtration
- Digestive system: Digestion of carbohydrate, fat and protein
- Basic physiology of reproductive and endocrine system

2. BASICS OF RADIOGRAPHY, CT, MRI AND & FUSION TECHNOLOGY

- Different types of x-ray equipment
- X-ray tubes and their types

- Digital radiography systems
- Basic principles of CT
- Working principle of Spiral/helical CT
- Common CT protocols
- Working principle of Multi-detector (MD) CT and its advantages
- Basic principle of MRI
- MRI magnets
- Basic MRI protocols
- Introduction to PET-CT

3. RADIATION PHYSICS, RADIATION BIOLOGY, PROTECTION AND QUALITY ASSURANCE

Radiation Physics

- Atomic structure
- Electromagnetic radiation
- X-ray: production and properties of x-rays, types of x-rays
- Interaction of X-rays and gamma rays with matter
- Radioactivity
- Radiation quantities and units
- Units of activity: Curie, Becquerel, specific activity, gamma-ray constant
- 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
- Relative biological effectiveness, radiation weighting factors, absorbed dose, equivalent dose, tissue weighting factor, effective dose.

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,
- 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 equipment

4. IMMOBILIZATION DEVICES, MOULD ROOM AND SIMULATION TECHNIQUE

- Immobilization devices: thermoplastic mask, bite block, 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 thermoplastic cast, shield (use of Styrofoam cutter), tissue compensators, electron lead cutout, mouth bite
- Simulation technique: CT simulation procedure

5. RADIOTHERAPY MACHINES

Basic design, construction and principles of operation of:

- Telegamma Unit (Cobalt-60 machine)
- Linear accelerator
 - types
 - accessories
 - beam direction devices
 - control console
- Brachytherapy
- CT Simulator

6. PRINCIPLES AND PRACTICE OF DIFFERENT RADIOTHERAPY DELIVERY TECHNIQUES

- Principles of radiotherapy treatment planning
- Conventional (2D) radiation therapy
- 3D radiation therapy
- Intensity Modulated Radiation Therapy (IMRT)
- Image Guided Radiation Therapy (IGRT)