

वी.पी. कोइराला मेमोरियल क्यान्सर अस्पताल
प्राविधिक (स्वास्थ्य) सेवा, मेडिकल (एलाइड हेल्थ) समुह, रेडियोथेरापि टेक्नोलोजी उपसमुह, सहायक पाँचौं तह,
रेडियोथेरापि टेक्निसियन पदको खुला र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :- लिखित परीक्षा (Written Examination)

पूर्णाङ्क :- २००

द्वितीय चरण :- अन्तर्वार्ता (Interview)

पूर्णाङ्क :- ३०

परीक्षा योजना (Examination Scheme)

प्रथम चरण (First Phase) : लिखित परीक्षा

Paper	Subject	Full Marks	Pass Marks	No. Questions & Weightage	Time Allowed
I	Technical Subject & Organizational Knowledge	100	40	50× 2= 100 (Objective Multiple Choice Questions)	45 minutes
II		100	40	12× 5 = 60 4 × 10 = 40 (Subjective Descriptive Type)	2.30 hrs

द्वितीय चरण (Second Phase)

Subject	Full Marks	Examination
Interview	30	Oral

द्रष्टव्य :

- यो पाठ्यक्रमको योजनालाई प्रथम चरण र द्वितीय चरण गरी दुई भागमा विभाजन गरिएको छ ।
- प्रथम र द्वितीय पत्रको पत्रको विषयवस्तु एउटै हुनेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
- वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कटौत गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कटौत पनि गरिने छैन ।
- वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षर (Capital letter) A,B,C,D मा लेख्नुपर्नेछ । सानो अक्षर (Small letter) a,b,c,d लेखेको वा अन्य कुनै सङ्केत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।
- बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र /विषयमा दिइए अनुसार हुनेछ ।
- परीक्षामा परीक्षार्थीले मोबाइल वा यस्तै प्रकारका विद्युतीय उपकरण परीक्षा हलमा लैजान पाइने छैन ।
- विषयगत प्रश्न हुने पत्रका हकमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नुपर्ने छ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
- पाठ्यक्रम लागू मिति :- २०७८/०९/१८

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Paper I & II : - Technical Subject & Organizational Knowledge
Section (A): 45 % Marks

1. Anatomy and Physiology

- 1.1 Cell and Tissues (Epithelial, Connective, Skeletal, Muscular and Nervous)
- 1.2 General pathology : Bacteria, Viruses, Tumours
- 1.3 Surface and regional anatomy
 - 1.3.1 The anatomical position
 - 1.3.2 Head, Neck, Thorax, Abdomen and Pelvic cavity
- 1.4 Skeleton System
 - 1.4.1 Structure and function of bones
 - 1.4.2 Development and growth of bones, and healing of fractures
 - 1.4.3 The skull
 - 1.4.3.1 The skull viewed from the above and the below
 - 1.4.3.2 The skull viewed from the side and the front
 - 1.4.3.3 The interior of the skullcap
 - 1.4.3.4 The interior of the base of the skull
 - 1.4.3.5 The nasal cavity
 - 1.4.3.6 The accessory nasal sinuses
 - 1.4.3.7 The individual bones of the skull
 - 1.4.4 The vertebral column, ribs and sternum
 - 1.4.5 The bones of the upper limb
 - 1.4.5.1 The clavicle
 - 1.4.5.2 The scapula
 - 1.4.5.3 The humerus
 - 1.4.5.4 The radius
 - 1.4.5.5 The ulna
 - 1.4.5.6 The carpal bones
 - 1.4.5.7 The metacarpal bones
 - 1.4.5.8 The phalanges
 - 1.4.5.9 Arteries and nerves related to the bones of the upper limb
 - 1.4.5.10 Ossification of the bones of the upper limb
 - 1.4.6 The bones of the lower limb
 - 1.4.6.1 The hipbone
 - 1.4.6.2 The pelvis
 - 1.4.6.3 The femur
 - 1.4.6.4 The patella
 - 1.4.6.5 The tibia
 - 1.4.6.6 The fibula
 - 1.4.6.7 The tarsal bones
 - 1.4.6.8 The metatarsal bones
 - 1.4.6.9 The phalanges
 - 1.4.6.10 The arches of the foot
 - 1.4.6.11 Arteries and nerves related to the bone of the lower limb
 - 1.4.6.12 Ossification of the bones of the lower limb
 - 1.4.7 The joints of the bones of the lower limb
 - 1.4.7.1 Types of joints
 - 1.4.7.2 The muscles and joints of the head
 - 1.4.7.3 The joints and muscles of the neck and trunk
 - 1.4.7.4 The joints and muscles of the upper limb

1.4.7.5 The joint and muscles of the lower limb

- 1.5 Circulatory System
 - 1.5.1 The blood
 - 1.5.2 The blood vessels
 - 1.5.3 The heart
 - 1.5.4 The pulmonary circulation
 - 1.5.5 The systemic circulation
 - 1.5.6 The veins
- 1.6 Lymphatic System
 - 1.6.1 Lymph
 - 1.6.2 The lymphatic vessels
 - 1.6.3 The lymph nodes
 - 1.6.4 The lymphatic drainage of the body
 - 1.6.5 Lymphatic tissue
 - 1.6.6 The spleen
- 1.7 Respiratory System
 - 1.7.1 The nose
 - 1.7.2 The pharynx
 - 1.7.3 The larynx
 - 1.7.4 The trachea
 - 1.7.5 The bronchi
 - 1.7.6 The lungs
 - 1.7.7 The physiology of respiration
- 1.8 Digestive System
 - 1.8.1 The mouth
 - 1.8.2 The salivary glands
 - 1.8.3 The pharynx
 - 1.8.4 The oesophagus
 - 1.8.5 The stomach
 - 1.8.6 The small intestine
 - 1.8.7 The large intestine
 - 1.8.8 The pancreas
 - 1.8.9 The liver
 - 1.8.10 The biliary apparatus
 - 1.8.11 The function of the alimentary system
- 1.9 Urinary System
 - 1.9.1 The kidneys
 - 1.9.2 The ureters
 - 1.9.3 The urinary bladder
 - 1.9.4 The urethra
 - 1.9.5 The functions of kidneys
 - 1.9.6 The control of micturition
- 1.10 Nervous System
 - 1.10.1 Nervous tissue
 - 1.10.2 Central nervous system, brain and spinal cord
 - 1.10.3 Peripheral nervous system
 - 1.10.4 Autonomic nervous system
- 1.11 Endocrine System
 - 1.11.1 The pituitary gland

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- 1.11.2 The thyroid gland
- 1.11.3 The parathyroid gland
- 1.11.4 The adrenal glands
- 1.12 Reproductive System : Male and Female
- 1.13 Skin and the organs of special sense (eye, ear, nose and tongue)
- 2. **Radiation Physics**
 - 2.1 **Atomic structure**
 - 2.1.1 General introduction
 - 2.1.2 Electron shells & energy levels
 - 2.1.3 Mass number, atomic number, atomic mass unit, binding energy
 - 2.1.4 Properties of electromagnetic waves
 - 2.1.5 Concept of photon and quanta
 - 2.1.6 Nuclear fission and fusion
 - 2.2 **Radioactivity**
 - 2.2.1 Radioactive elements
 - 2.2.2 Radioactive series, different types of radioactive disintegration
 - 2.2.3 Properties of radioactive particles
 - 2.2.4 Radioactive decay law
 - 2.2.5 Alpha, beta and gamma disintegration
 - 2.3 **X-rays and Gamma rays**
 - 2.3.1 Historical background of x-rays
 - 2.3.2 Mechanism and production of x-rays
 - 2.3.3 Properties of x-rays
 - 2.3.4 Continuous and characteristic spectra
 - 2.3.5 Gamma rays
 - 2.3.6 Properties of gamma rays
 - 2.4 **Basic interactions between x-rays and matter**
 - 2.4.1 Coherent scattering
 - 2.4.2 Photoelectric effect
 - 2.4.3 Compton scattering
 - 2.4.4 Pair production
 - 2.4.5 Photodisintegration
 - 2.5 **Radiation measurement and units**
 - 2.5.1 Construction & working of the free air ionization chamber
 - 2.5.2 Thimble ionization chamber & condenser ionization chamber
 - 2.6 **Radiation protection**
 - 2.6.1 Historical introduction or why the protection is necessary against the radiation
 - 2.6.2 Maximum permissible dose
 - 2.6.3 Tabulation of the recommended maximum permissible doses for the different parts of the body
 - 2.6.4 Following the code of practice
 - 2.6.5 Identifying the protective materials
- 3. **Clinical Oncology**
 - 3.1 Tumors
 - 3.1.1 Tumor definition
 - 3.1.2 Benign tumors and malignant tumors
 - 3.1.3 Spread of tumors
 - 3.2 Clinical Presentation

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- 3.2.1 Symptoms and signs
- 3.2.2 Diagnostic procedure
 - 3.2.2.1 Hemogram
 - 3.2.2.2 Biochemical
 - 3.2.2.3 Tumor marker
 - 3.2.2.4 Radiological- X-ray, U.S.G., C.T, M.R.I
 - 3.2.2.5 Pathological – FNAC, FNAB, Incision biopsy, excision biopsy
 - 3.2.2.6 Surgery
- 3.3 Staging
 - 3.3.1 TNM Classification
- 3.4 Malignancies and Treatment
 - 3.4.1 Ca- Brain
 - 3.4.2 Ca-Larynx
 - 3.4.3 Ca-Tongue
 - 3.4.4 Ca-Breast
 - 3.4.5 Ca-Lung
 - 3.4.6 Ca-Cervix
 - 3.4.7 Ca-Oesophagus

Section (B): 45 % Marks

- 4. **Radiotherapy Technique**
 - 4.1 Principle of Radiotherapy
 - 4.1.1 Tumor histology
 - 4.1.2 Grade, sensitivity,
 - 4.1.3 Anatomical site, critical organs
 - 4.1.4 General condition of the patient, extent of tumor, previous treatments
 - 4.1.5 Radical/Palliative and prophylaxis
 - 4.2 Types and Methods of Radiotherapy
 - 4.2.1 Tele-therapy Technique
 - 4.2.2 Brachytherapy Technique
 - 4.3 Radiotherapy Resources
 - 4.3.1 Low energy beams
 - 4.3.2 High energy beams
 - 4.3.3 Electron beams
 - 4.4 Treatment Planning
 - 4.4.1 Tumor localization and verification
 - 4.4.2 Isodose Curves
 - 4.4.3 Single field, parallel opposed field, multiple field
 - 4.4.4 Rotation therapy
 - 4.4.5 Beam Modification
- 5. **Radiotherapy Equipment and Quality Assurance**
 - 5.1 Teletherapy Equipments
 - 5.1.1 Superficial and orthovoltage equipment
 - 5.1.2 Cobalt-60 tele therapy equipment
 - 5.1.3 Linear accelerator
 - 5.1.4 Simulator
 - 5.1.5 Brachytherapy equipment
 - 5.1.5.1 Low dose rate (LDR)
 - 5.1.5.2 Medium dose rate (MDR)

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5.1.5.3 High dose rate (HDR)

- 5.2 Quality Control
 - 5.2.1 Cobalt-60
 - 5.2.2 Linear Accelerator
 - 5.2.3 Brachytherapy
 - 5.2.4 Simulator
- 5.3 Radiation Protection
 - 5.3.1 Concept of radiation protection
 - 5.3.2 Justification, Optimization and Limitation
 - 5.3.3 Units, Maximum Permissible Dose
 - 5.3.4 Personnel monitoring
 - 5.3.5 Protective materials
- 6. **Radiographic equipment**
 - 6.1 Historical background of x-ray and its production
 - 5.5.1 X-ray tube construction
 - 5.5.2 Stationary and rotating x-ray tube
 - 5.5.3 Recent advancement of an x-ray tube
 - 5.5.4 Tube rating cooling and care of x-ray tube and its faults
 - 6.2 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
 - 6.3 Fluoroscopic equipment
 - 5.3.1 Conventional fluoroscopy, image intensifier tube and Digital fluoroscopy
 - 6.4 Control of scatter radiation & beam restricting devices
 - 5.4.1 Secondary radiation grids
 - 5.4.2 Air gap technique
 - 6.5 Portable and mobile x-ray units
 - 5.5.1 Capacitor discharge and c-arm
 - 6.6 Computed and Direct Digital Radiography
 - 6.7 Introduction to modern modalities (CT, MRI, mammography)

Section (C): 10 % Marks

- 7. **Organizational Knowledge and General Health Issues**
 - 7.1 B.P.Koirala Memorial Cancer Hospital : History, organizational structure, functions, roles, services, problems and challenges
 - 7.2 National Health Policy
 - 7.3 B.P.Koirala Memorial Cancer Hospital related act and regulations
 - 7.4 Health Service Act, 2053 and Health Service Regulation, 2055
 - 7.5 Professional council related acts and regulations
 - 7.6 NMC and National Health Agencies
 - 7.7 Professional and medical ethics