

SCHEME AND SYLLABUS OF EXAMINATION FOR THE PURPOSE OF FILLING UP THE POST OF RADIOGRAPHER/ CT SCAN RADIOGRAPHER UNDER THE SIKKIM STATE SUBORDINATE ALLIED AND HEALTHCARE SERVICE.

The examination will consist of 2 papers :-

PAPERS	SUBJECT	FULL MARKS	TIME ALLOWED
PAPER - I	GENERAL ENGLISH & GENERAL KNOWLEDGE	80 MCQ & CONVENTIONAL	02 : 00 HOURS
PAPER - II	MAIN PAPER	120 MCQ & CONVENTIONAL	03 : 00 HOURS
TOTAL 200 MARKS			

Paper - I & Paper - II will be objective type (OMR) and Conventional Mode.

1. PAPER - I : (a) GENERAL ENGLISH (MCQ/ CONVENTIONAL MODE)

The question will be designed to test the candidate's understanding and command of the English language. The pattern of questions would be broadly as follows:-

1. Comprehension of given passage
2. Grammar
3. Usages and vocabulary
4. Essay writing
5. Reporting writing

(b) GENERAL KNOWLEDGE :-

- i. Current events of local, national and international importance
- ii. National level schemes & projects undertaken by government of India/ State Government.

PAPER - II : MAIN PAPER (MCQ/ CONVENTIONAL MODE)

III. SYLLABUS FOR WRITTEN EXAMINATION FOR RADIOGRAPHER/ CT SCAN RADIOGRAPHER :-

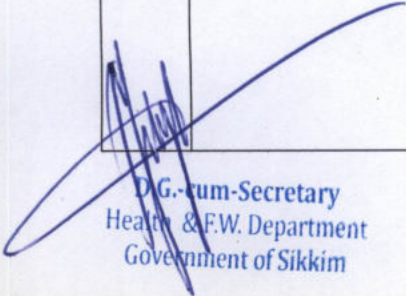
Sl. No.	Course	
01	02	03
01	Preliminary Course	Anatomy: General Anatomical terms, Regions of the body. Bones and Joints. General structures and forms; Important ligaments and muscular attachments; skull, spine, pelvis, bones of upper and lower extremities. Bones of hand and foot to be learnt with articulated only without detail, except Os calcis, Talus and scaphoid. Structure of a typical joint and general descriptions of main joints, Synovial fluid; movements in joints and their limitation, chief relation, group movements of joints.
		Thorax and abdomen: Structure of thoracic cage; abdominal cavity; Diaphragm and Mediastinum
		Heart and vessels : Structure and function of heart. Names of main arteries and veins.
		Respiratory System: Accessory nasal sinuses; Larynx; trachea; bronchi; lungs; pleura.

D.G.-cum-Secretary
Health & F.W. Department
Government of Sikkim

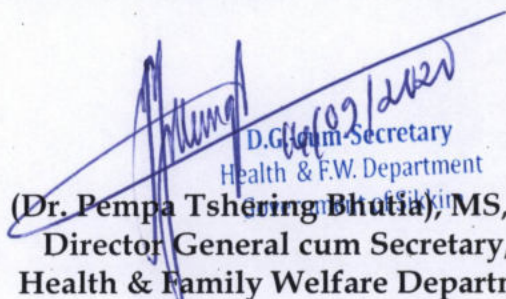
		Alimentary system: Mouth, tongue, salivary glands, pharynx, tonsils, oesophagus, stomach, small and large intestine, liver and biliary tract, spleen, pancreas, mesentery, omentum. Urinary tract: Kidney, ureters, bladder and urethra.
		Reproductive system: Male genital tract, fallopian tubes, ovaries, uterus, mammary gland.
		Nervous system: Bones of the skull – general features. Names and position of bones of vault and base [articulatedony], Vertebral column – structure of a typical vertebra, Atlas Axis, Sacrum and coccyx. Brain – main sub-divisions and lobes ventricles, spinal cord. Surface anatomy in relation to Radiography. Ductless glands.
		Physics: Basic ideas of measurement and units. Graphical representation of data. Elementary explanation of exponential law. Radiation spectrum. Photo-electric effect. Compton effect. Fluorescence, photo-rescence. Atomic structure. Solenoids. Electromagnets. Electromagnetic induction – Generation and transmission of alternating current. RMS and peak values of current and coltage. Principles of construction of transformer – step up, step down, auto, Rectilinear propagation of light. Umbra and penumbra. Inverse square law.
		Electronics: Theremionic emission. Construction and function of diode and triode valves and their uses. Rectifier (Solid State).
02	Production of X-Rays, X-Rays tubes : Design	Diagnostic H.T. circuits, high tension generators, Half-wave, Full-wave, three phase, Condenser discharge, constant voltage, H.T. switches, control table, measuring instruments, voltmeters, ammeters, milliammeter. Focal spot, inherent filtration, tube holders. mAs meter, mains compensator, exposure timer, Inter-lock and safety devices. Grid: Ratio in relation to KV. Reciprocating and oscillating, Potter bucky diaphragms, stationary grids.
		Scattered radiation: Control of Scattered radiation, cones, Diaphragms and filters.
		Special equipments: Tomography, Magnification technique, Mobile units, portable units, image intensifier, Tele-radiography. Spot film devices. Stereoscopy
		Interaction of X-ray with matters, Energy absorption from X-rays. Measurement of Xrays. Rontgen and Rad, Simple principle of dosimeters, fluorescent effect, photographic effect.
		Protection: Code of practice for the protection of persons against ionizing radiation, protective materials, Lead, lead equivalent. Building material, personnel monitoring, International recommendations against hazards of ionizing radiation.
03	Radiographic Technique and Radiographic Anatomy	Contrast media: Barium preparation, Iodine preparation, Air-Oxygen.
		Skeletal system: Upper limb, lower limb, shoulder, girdle and thorax, vertebral column, pelvic girdle and hip region. Teeth jaw.
		Accessory nasal sinuses. Lachrymal system
		Cardiovascular system: Upper respiratory passage, lungs, pleura, diaphragmatic excursion, Mediastinum, bronchography, artificial pneumothorax.

		Genito-urinary system: Straight X-ray of abdomen, pyelography, cystography, urethrography, gas insufflation, pneumo-peritonium.
		Obstetrics and Gynaecology: Radiation protection, pregnancy, pelvimetry, hysteron salpingography, placentography.
		Central nervous system: Routine and special projections of skull, ventriculography and encephalography, cerebral angiography, myelograph.
		Alimentary system: Barium suspension, Barium-meal and follow through Barium emena.
		Biliary system: Cholecystography, Oral and I V Cholangiography - Direct and Indirect.
		Liver and spleen: Spleno-portal venography.
		Silvaryglands: Sialography. Arthrography, singraphy, Lymnhpangiography, Operation theatre technique and ward radiography. Sterioscopy, Magnification, High and Low K.V. technique and Mammography.
04	Radiographic photography and Dark-room technique	X-Ray materials: Types of emulsion - characteristic and control, screen and non-screen films, dental films, X-ray paper under and over exposure, speed contrast.
		Intensifying screens: Fluorescence, application of fluorescence in Radiography, type of intensifying screens, intensifying factors, cleaning and general care of screens - after glow.
		X-ray cassettes: Testing and proving good screen contract, general care.
		X-Ray developers: Characteristics, Detail and contrast freedom from chemical fog and staining, function and constituent of developer, standardization by time and temperature, exhaustion of developer, Replenishers. Types - Powder and liquid solution, medium and high contrast developer, ultra-rapid development methods. Automatic processing.
		X-ray fixers and fixing: Fixing agents, acid and preservative in fixer, inclusion of hardner, time of fixation, silver recovery.
		Rinsing, washing and drying: Object, methods employed, method of drying films.
		Processing: Preparation of solution, suitable water supply, nature of mixing vessels, order mixing solutions, filtrations, making of stock solutions, storage of dry chemicals, storage of solution.
		Processing apparatus: Processing units, hangers, care of hangers, refrigeration and use of ice.
		Operation theatre processing : Dish units.
		Technical and processing faults: Chemical reduction. Chemistry and characteristics of Farmer's reducer, local and general application.
		X-ray dark room: Size, light proof entrancer, hatches, construction of walls for protection against chemicals and radiation, ceiling, colour schemes, water proofing of floors, loading bench design, disposition of processing and accessory equipment for efficient working, arrangement of drying cabinets in dark-room or in adjacent rooms, dark-room illumination and testing for safety, ventilation.

		The Radiographic image: Radiographic factors affecting image contrast and sharpness, variation in exposure time in accordance with quality of radiation filters, distance, intensifying screens, grids, film speed, developer and development.
		Presentation of radiograph: Identification of film, aspect for direct and stereo [univeraprismatic] viewing, mounting dental films.
		Accessories: Viewing boxes, spot-light, illuminators, projectors and viewing screens for miniature and cine-radiography, magnifiers, film identification, lead letters and numbers, actinic makers, embossing machine, film trimmers, corner-cutters, dental mounts and cutter, filling units.
05	Care and maintenance of equipment	General principles and routine use of charts supplied by manufacturer, Radiographic calibration procedure, Tube rating chart.
06	First Aid	Shock, convulsion, asphyxia, artificial respiration, Administration of Oxygen, Burns and scalds. Electric shock and burns. Wound, haemorrhage, pressure points, Tourniquet, Injuries to Bones, Joints and muscles, Dressing of Bandages, Plaster of Paris technique, Splints, Drug reaction, Poisons, Basic Nursing.
		Drug in Department: Storage labeling. Checking, Regulation regarding dangerous drugs, Units of measurement.
		Medical Ethics: Ethical law and professional etiquettes applied to members of profession associated with medicine.
		Nursing and Handling of patients: Hospital and Departmental procedure, Hospital staffing and organization. Records and departmental statistics. Medico-legal aspects. Appoints. Stock taking and stock keeping.
		Care of patients: Reception, Elementary hygiene.
		Nursing Care: Temperature, pulses and respiration. Application of sterile dressings.
		Preparation of patients for General X-ray examination: Departmental instructions to out-patients or ward-staff. Instructions for various special investigations. Nursing care before and after special X-ray. Drug allergy.
		Principles of asepsis: Methods of sterilization. Care and identification of instruments. Setting of trays and trolleys. Elementary operating theatre procedure.
		Computed Tomography- More classes should be allotted for CT & MRI History: Basic principle and data acquisition/C.T. generations, Gantry and patient table - Travel Speed, Load capacity, X-ray tubes. Rotating anode; cooling system; Collimeter; Pencil beam; Fan beam Anode heat storage capacity; Detector system : Type, number, Efficiency Rectifier Scan parameters; Scan time, Number of views per second, Reconstruction time, scan cycle time, Acquisition matrix, Display matrix, Slice thickness.


D.G.-cum-Secretary
Health & F.W. Department
Government of Sikkim

		<p>Image reconstruction; Pixel & Voxel; C.T. Number & Hounsfield Number. Image display; matrix, pixel, voxel, Window level, Window width, Double Window, Partial Volume phenomenon.</p> <p>Image quality: Patient exposure; Resolution</p> <p>Ultrafast C.T., Dynamic C.T. & C.T. angiography, C.T. guided FNAC.</p> <p>3D C.T./ Artefacts</p> <p>Radiation dose aspects.</p> <p>Clinical application – Scan planes specially in Cranial C.T. [Gross anatomy of conventional planes] Indication and contra-indication; Patient preparation and positioning</p> <p>Contrast enhanced C.T.</p>
		<p>Magnetic Resonance Imaging</p> <p>BASIC PHYSICS WITH PRACTICAL APPLICATIONS:</p> <p>Magnets – types, powers, magnetism Radio Frequency (RF) pulse T1 (longitudinal relaxation time) T2 (transverse relaxation time) Basic sequences, basic parameters and basic tissue (like fat and water) Different types of coils. Contrast agents, MR angiography and dynamic MR. Spectroscopy. Hazards, safety and limitations.</p>
		<p>Ultrasonography –</p> <p>Basic Physics : Characteristic of sound; Propagation of sound; Interaction between ultrasound and matter attenuation and reflection; Transducers; Ultrasound display, A, TM, B-mode Grayscale imaging; Scanning methods; Doppler techniques; Artefacts Safety Application.</p>


 D. G. cum Secretary
 Health & F.W. Department
 (Dr. Pempa Tshering Bhutia), MS,
 Director General cum Secretary,
 Health & Family Welfare Department.