

प्रदेश लोक सेवा आयोग, कर्णाली प्रदेश
 प्रदेश निजामती सेवाको स्वास्थ्य सेवा, रेडियोग्राफी समूह, रेडियो टेक्नोलोजी उपसमूह, अधिकृतस्तर सातौं तह, रेडियोग्राफी टेक्नोलोजिस्ट पदको खुला, अन्तर तह र आन्तरिक अन्तर समूह लिखित प्रतियोगितात्मक परीक्षाको पाठ्यक्रम र परीक्षा योजना
 पाठ्यक्रमको रूपरेखा:- परीक्षा योजना (Examination Scheme) निम्नानुसार छ ।

परीक्षाको चरण	परीक्षाको किसिम	पूर्णाङ्क
प्रथम	लिखित परीक्षा	२००
अन्तिम	सामुहिक परीक्षण र अन्तर्वार्ता	४०

१. प्रथम चरण: लिखित परीक्षा (Written Exam)

पत्र	विषय	पूर्णाङ्क	उत्तिर्णाङ्क	परीक्षा प्रणाली	प्रश्नसंख्या×अंक	समय
प्रथम	Basic Science सम्बन्धी	१००	४०	बस्तुगत बहुवैकल्पिक (Multiple Choice)	१००×१=१००	१ घन्टा ३० मिनेट
द्वितीय	सेवा समूह सम्बन्धी	१००	४०	विषयगत (Subjective)	१०×१०=१००	३ घन्टा

२. अन्तिम चरण: सामुहिक परीक्षण र अन्तर्वार्ता (Group Test & Interview)

विषय	पूर्णाङ्क	परीक्षा प्रणाली	समय
सामुहिक परीक्षण (Group Test)	१०	समुहमा व्यक्तिगत प्रस्तुती (Individual Presentation in Group)	३० मिनेट
व्यक्तिगत अन्तर्वार्ता (Individual Interview)	३०	मौखिक (Oral)	

द्रष्टव्य:

- यस पाठ्यक्रम योजनालाई प्रथम चरण र अन्तिम चरणमा विभाजन गरिएको छ।
- खुला र समावेशी समूहको एउटै प्रश्नपत्रबाट परीक्षा सञ्चालन हुनेछ।
- प्रथम चरणको प्रथम तथा द्वितीय पत्रका पाठ्यक्रमका एकाईहरूबाट सोधिने प्रश्नहरूको संख्या निम्नानुसार हुनेछ।

एकाई	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11
प्रश्नसंख्या	3	7	5	7	4	6	7	6	6	4	5
एकाई	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10	
प्रश्नसंख्या	3	2	3	4	5	8	5	3	4	3	
द्वितीय पत्र खण्ड	A			B			C			D	

द्वितीय पत्र एकाई	1	2	3	4
प्रश्नसंख्या	3	3	2	2

४. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ।
५. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ। तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन।
६. बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा क्याल्कुलेटर प्रयोग गर्न पाइने छैन।
७. विषयगत प्रश्नहरूको हकमा तोकिएको अङ्कमा एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिनेछ।
८. परीक्षा हलमा मोबाइल फोन, स्मार्ट वाच, हेड फोन वा यस्तै प्रकारका विद्युतीय उपकरण, पुस्तक, नोटबुक, झोला लगायतका बस्तुहरू लैजान पाइने छैन।
९. परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा दिईए अनुसार हुनेछ।
१०. विषयगत प्रश्न हुने पत्र/विषयका प्रत्येक भाग/खण्डका लागि छुट्टाछुट्टै उत्तर पुस्तिकाहरू हुनेछन्। परीक्षार्थीले प्रत्येक भाग/खण्डका प्रश्नहरूको उत्तर सोही भाग/खण्डको उत्तर पुस्तिकामा लेख्नुपर्नेछ।
११. यस पाठ्यक्रम अनुसारका पत्र/विषयका विषयवस्तुमा जुनसुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगावै संशोधन भई कायम रहेका विषयवस्तुलाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ।
१२. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र अन्तिम चरणको परीक्षामा सम्मिलित गराइनेछ।
१३. लिखित परीक्षा र अन्तिम चरणको सामूहिक परीक्षण र अन्तर्वार्ताको कुल प्राप्ताङ्कको आधारमा अन्तिम परीक्षाफल प्रकाशित गरिनेछ।
१४. पाठ्यक्रम अध्यावधिक भई लागू हुने मिति: २०८१।०८।२४

प्रदेश लोक सेवा आयोग, कर्णाली प्रदेश
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रेडियोग्राफी टेक्नोलोजिस्ट पदको खुला, अन्तर तह र आन्तरिक अन्तर समूह लिखित प्रतियोगितात्मक परीक्षाको
पाठ्यक्रम

प्रथम पत्र: Basic Science सम्बन्धी

1. Anatomy & Physiology

1.1. Introduction

1.1.1. General anatomical terms

1.1.2. Human cell and tissues: structure and function

1.2. Musculo-Skeletal System

1.2.1. Formation, growth and development of bones. Centre of ossification

1.2.2. Function of bone according to the size and shape of bone

1.2.3. Classification of bone and joints and their functions

1.2.4. Different groups of muscle responsible for joint movement

1.3. Nervous System

1.3.1. Neuron and nerve cells

1.3.2. Central nervous system and structure of brain

1.3.3. Parts of ventricles of the brain and their extent

1.3.4. The cerebrospinal fluid.

1.3.5. Peripheral nervous system

1.3.6. Autonomic nervous system

1.3.7. Cranial nerves, spinal nerves

1.4. Cardio-Vascular System

1.4.1. Blood vessels- arteries, veins, and capillaries

1.4.2. Different parts of heart and its function

1.4.3. Cardiac cycle

1.4.4. Systemic circulation

1.4.5. Pulmonary circulation

1.4.6. Coronary circulation

1.4.7. Aorta

1.4.8. Inferior venacava (IVC) & Superior venacava (SVC)

1.5. The Lymphatic System

1.5.1. Lymphatic System

1.5.2. Lymph nodes

1.5.3. Spleen

1.5.4. Thymus gland

1.6. The Respiratory System

1.6.1. Respiration, Alveolar respiration

1.6.2. Lungs and Pleura

1.6.3. Organs of the respiratory system, Respiratory passages (Nose, Pharynx, Larynx, Trachea, Bronchioles, Alveoli)

1.7. The Digestive System

1.7.1. Organs of the digestive system: Mouth, Pharynx, Esophagus, Stomach, Small intestine, Large intestine, Rectum and Anal canal Salivary glands

1.7.2. Function of alimentary tract

1.7.3. Pancreas, Liver, Biliary tract and their functions

1.7.4. Metabolism of Carbohydrates, Protein and Fat

1.8. The Urinary System

- 1.8.1. Organs of urinary system: Kidneys, Ureters, Bladder, and Urethra
- 1.8.2. Kidneys: Position, Gross structure, Cortex, Medulla, Pelvis, Function of kidney
- 1.8.3. Functional unit of kidney: Nephron and its function
- 1.8.4. Formation of urine, water-electrolyte balance in body
- 1.8.5. Micturation-reflex control
- 1.8.6. Structure and function of the ureters, urinary bladder and urethra
- 1.8.7. Supra-renal glands, prostate gland
- 1.9. The Reproductive System
 - 1.9.1. Female Reproductive System & Breast
 - 1.9.1.1. External genitalia, Uterus, Ovaries: Position, structure and function
 - 1.9.1.2. Menstrual cycle
 - 1.9.1.3. Puberty, Reproduction & Menopause
 - 1.9.1.4. Breast-Position, structure and its functions
 - 1.9.2. Male Reproductive System:
 - 1.9.2.1. Position structure and functions of scrotum, testes, epididymes, deferent ducts, seminal vesicles, ejaculatory ducts and penis
 - 1.9.2.2. Puberty
- 1.10. Special Senses
 - 1.10.1. Skin- structure and functions
 - 1.10.2. The ear (external, middle & internal ear)-structure and functions
 - 1.10.3. The Eyes- structure & functions
 - 1.10.4. Nose- structure and functions
 - 1.10.5. Tongue-structure, functions
 - 1.10.6. Taste buds and Sense of taste
- 1.11. The Endocrine System
 - 1.11.1. Endocrine glands: Position, structure, functions and hormone secretion (Pituitary gland, Thyroid gland, Parathyroid glands, Adrenal gland, Islets of langerhans, Pineal gland, Testis, Ovaries, Thymus)
2. Basic Radiation Physics
 - 2.1. Review of Electricity
 - 2.1.1. Electromagnetic induction and its laws
 - 2.1.2. Self and mutual induction
 - 2.1.3. AC generator, Peak and effective values of AC
 - 2.1.4. Concept of Reactance, Impedance & Phase angle
 - 2.2. Transformer
 - 2.2.1. Theory, Construction, Losses & Efficiency, Transformer ratings
 - 2.2.2. Filament transformer
 - 2.2.3. High-tension transformer
 - 2.2.4. Auto transformer or Variac transformer
 - 2.3. Thermionic Emission and Rectifiers
 - 2.3.1. Diode: Construction, Principle & Characteristics
 - 2.3.2. Rectifiers: Self-rectification, Half-wave, Full-wave (two valves and four valves) and constant voltage rectifiers
 - 2.3.3. The cold cathode gas filled diode and its uses
 - 2.4. Atomic Structure and Electromagnetic Radiation
 - 2.4.1. Electron, proton, neutron, mass number and atomic number
 - 2.4.2. Isotopes, isobars and isomers
 - 2.4.3. Electron shells & energy levels
 - 2.4.4. Excitation and ionization

- 2.4.5. Emission of electromagnetic waves, spectra
- 2.4.6. Properties of electromagnetic waves
- 2.4.7. Concept of photon and quanta
- 2.4.8. Photoelectric effect, photocell
- 2.5. Radioactivity
 - 2.5.1. Introduction
 - 2.5.2. Radioactive elements, radioactive disintegration
 - 2.5.3. Properties of radioactive particles
 - 2.5.4. Radioactive decay law, half-life, mean life
 - 2.5.5. Artificial radioactivity: Radioactivity induced by neutron bombardment and proton bombardment.
 - 2.5.6. Nuclear binding energy, nuclear stability
 - 2.5.7. Alpha, beta and gamma disintegration
 - 2.5.8. Introduction to fission and fusion
- 2.6. X-Rays
 - 2.6.1. Historical background
 - 2.6.2. X-ray tube
 - 2.6.3. Mechanism of X-ray production
 - 2.6.4. Properties of X-rays, Intensity & quality of X-rays, continuous and characteristic spectra
 - 2.6.5. Effects of variation of tube current and voltage, Brag's law for wavelength determination
 - 2.6.6. X-ray control and indicating equipment: simple circuit diagram as illustration of sequence from mains supply to exposure control
 - 2.6.7. Main voltage circuit, main cables, switches and fuses
 - 2.6.8. Main voltage compensation, earthing, insulation, voltage drops in cables
 - 2.6.9. X-ray tube voltage control and indication
 - 2.6.10. Exposure controls, contactors and timers
 - 2.6.11. X-ray tube current control and filament supply, mA compensation, Generator regulation
 - 2.6.12. Computed Radiography (CR): History, introduction, principles, components, advantages and disadvantages
 - 2.6.13. Digital Radiography (DR): history, introduction, principles, components, types, procedural steps, advantages and disadvantages
 - 2.6.14. Difference between CR and DR, comparison of DR with film based radiography
- 2.7. Interaction of Radiation with Matter
 - 2.7.1. Thomson scattering
 - 2.7.2. Photoelectric interaction
 - 2.7.3. Compton scattering
 - 2.7.4. Pair production
 - 2.7.5. Transmission of homogenous and heterogeneous X-ray beam through matter
 - 2.7.6. Effects of filtration
 - 2.7.7. Relative amount of scatter from an X-ray beam during the passage through matter
 - 2.7.8. Effects of collimation
- 2.8. Radiation Detection and Measurement
 - 2.8.1. Principle of measurement
 - 2.8.2. Ionization chamber, electrometer
 - 2.8.3. Scintillation counter
 - 2.8.4. Gieger-muller counter
 - 2.8.5. Thimble chamber

- 2.8.6. Condenser chamber
- 2.9. Radiation Protection
 - 2.9.1. Introduction
 - 2.9.2. Objective and principle of radiation protection
 - 2.9.3. Radiation and radiation units
 - 2.9.4. Personnel monitoring
 - 2.9.5. Protective materials
 - 2.9.6. ICRP recommendations on dose limits
- 2.10. Ultrasound
 - 2.10.1. Longitudinal waves
 - 2.10.2. Principles of ultrasound, intensity, power and fields
 - 2.10.3. Transmission of ultrasound
 - 2.10.4. Velocity of ultrasound in different media
 - 2.10.5. Ultrasonic interactions, absorption and scattering mechanism in tissue, refraction and reflection of ultrasound
 - 2.10.6. Damping of ultrasound in media
 - 2.10.7. Doppler effect

--The End--

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रेडियोग्राफी टेक्नोलोजिस्ट पदको खुला, अन्तर तह र आन्तरिक अन्तर समूह लिखित प्रतियोगितात्मक
परीक्षाको पाठ्यक्रम

द्वितीय पत्र: सेवा समूह सम्बन्धी

Section A- 30 Marks

1. Radiographic Techniques

1.1.Upper Limb

- 1.1.1. Techniques for whole hand, fingers, thumb, wrist joint and elbow joint
- 1.1.2. Supplementary techniques: carpal tunnel, scaphoid, ulnar groove, head of radius
- 1.1.3. Supplementary views of elbow, humerus and supra-condylar projection

1.2.Shoulder Girdle and Thorax

- 1.2.1. Technique for shoulder joint acromio-clavicular joint and scapula
- 1.2.2. Supplementary views: projection to show recurrent dislocation of shoulder, infero-superior projection of clavicle, sterno-clavicular joint, sternum, ribs

1.3.Lower Limb

- 1.3.1. Techniques for whole foot, toes, calcaneum, talo-calcaneal joint, ankle joint, lower leg with ankle joint
- 1.3.2. Knee joint, patella, tibio-fibular joints
- 1.3.3. Supplementary techniques for torn ligaments, flat feet, axial view of calcaneum, skyline view of patella, intercondylar notch view

1.4.Vertebra Column

- 1.4.1. Techniques for cranio-vertebral joint, atlanto-occipital joint, first three cervical vertebra, odontoid peg view
- 1.4.2. Cervical spine for intervertebral joints and foramina, cervico thoracic vertebrae
- 1.4.3. Thoracic spine, thoraco-lumbar vertebrae
- 1.4.4. Lumbar spine, intervertebral joints and foramina, lumbo-sacral joint, sacrum, coccyx
- 1.4.5. Supplementary techniques to demonstrate scoliosis, kyphosis, spondylolisthesis.

1.5.Pelvic Girdle and Hip Region

- 1.5.1. Techniques for whole pelvis, ileum, ischium and pubic bones
- 1.5.2. Sacroiliac joints, symphysis pubis, hip joints, acetabulum, neck of femur
- 1.5.3. Supplementary projections: acetabular view, judet view, Von-Rosen view and frog leg view for hip joint (CDH)

1.6.Skull

- 1.6.1. Routine views of Skull, Towne's view, SMV, Emergency Skull radiography
- 1.6.2. Techniques for mastoids, styloid process, IAM
- 1.6.3. Routine views for facial bones, mandible, zygomatic arches, nasal bone, maxilla, temporo-mandibular joints
- 1.6.4. Optic foramina, macroradiography for optic foramina
- 1.6.5. Routine and special views for paranasal sinuses

1.7.Dental Radiography

- 1.7.1. Intra-oral and extra-oral projections, occlusal projection
- 1.7.2. Orthopantomography (OPG)

1.8.Chest Radiography

- 1.8.1. Routine radiography of chest, High kV technique for Chest

- 1.8.2. Supplementary views: apicogram, lordotic and oblique views, lateral decubitus, diaphragmatic excursions double exposure technique

1.9. Pelvimetry

- 1.9.1. Consideration of radiation hazards
- 1.9.2. Techniques for evaluation of foetal maturity, abnormalities, position and multiplicity
- 1.9.3. Erect lateral projection and antero-posterior projection for CPD

1.10. Ward and Operation Theatre Radiography

- 1.10.1. Knowledge of electrical supply, radiation protection
- 1.10.2. Radiography of bed-ridden patients
- 1.10.3. Radiography in operation theatre

1.11. Mammography

- 1.11.1. Soft tissue radiography
- 1.11.2. Principle, indication and technique of mammography

1.12. Macro-Radiography

- 1.12.1. Definition, principles and its applications
- 1.12.2. Magnification factors and uses of magnification radiography

Section B- 30 Marks

2. Special Radiological Procedures

2.1. First Aids and Emergency Care

- 2.1.1. Introduction to shock, emergency treatment, Cardio-Pulmonary Resuscitation (CPR)
- 2.1.2. Introduction to haemorrhage, primary management of haemorrhage

2.2. Contrast Media

- 2.2.1. Introduction, definition, properties, types and uses of contrast media
- 2.2.2. Adverse effects of contrast media and their management
- 2.2.3. Emergency trolley setting
- 2.2.4. Life saving drugs and emergency trays

2.3. Alimentary Tract

- 2.3.1. Definition, indications, contraindications, equipments required, contrast media, preparation of the patient, techniques/procedures, filming & post procedure care for following investigations:
 - 2.3.1.1. Barium swallow
 - 2.3.1.2. Barium meal
 - 2.3.1.3. Barium follow -through
 - 2.3.1.4. Small bowel enema
 - 2.3.1.5. Barium enema -single contrast, -double contrast
 - 2.3.1.6. Loopogram

2.4. Biliary Tract

- 2.4.1. Definition, indications, contraindications, equipment required contrast media, preparation of the patient, techniques/procedures, filming, post procedure care for following investigations:
 - 2.4.1.1. Oral cholecystography (OCG)
 - 2.4.1.2. Intravenous choledochography (IVC)
 - 2.4.1.3. Percutaneous transhepatic cholangiography (PTC)
 - 2.4.1.4. Endoscopic retrograde cholangio-pancreatography (ERCP)
 - 2.4.1.5. Per operative cholangiography (POC)
 - 2.4.1.6. T-tube cholangiography

2.5. Urinary Tract

2.5.1. Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, techniques/procedures, filming, post procedure care for following investigations:

2.5.1.1. Intravenous urography (IVU), Modification of IVU and additional techniques

2.5.1.2. Percutaneous renal puncture (PCRP)

2.5.1.3. Percutaneous nephrostomy (PCN)

2.5.1.4. Retrograde pyelography (RGP)

2.5.1.5. Micturating cysto-urethrography (MCUG)

2.6. Reproductive System

2.6.1. Definition, indications, contraindications, equipment required contrast media, preparation of the patient, techniques/procedures, filming, post procedure care for Hysterosalpingography (HSG)

2.7. Cardio-Vascular System

2.7.1. Definition, indications, contraindications, equipment required, contrast media, preparation of the patient, techniques/procedures, filming, post procedure care for following investigations:

2.7.1.1. Carotid angiography

2.7.1.2. Abdominal aortography

2.7.1.3. Portal venography

2.7.1.4. Peripheral and lower limb venography

2.8. Myelography

2.8.1. Definition, indications, contraindications, equipments required, contrast media, preparation of the patient, techniques/procedures, filming, post procedure care for following investigations:

2.8.1.1. Lumbar, Thoracic and Cervical Myelography

2.8.1.2. Post Myelo-CT (CT Myelography)

2.9. Arthrography

2.9.1. Definition, indications, contraindications, equipments required, contrast media, preparation of the patient, techniques/procedures, filming, post procedure care for following investigations:

2.9.1.1. Knee Arthrography

2.9.1.2. Hip Arthrography

2.10. Sinography

2.10.1. Definition, indications, contraindications, equipments required, contrast media, preparation of the patient, techniques/procedures, filming, post procedure care for Sinography

2.11. Sialography

2.11.1. Definition, indications, contraindications, equipments required, contrast media, preparation of the patient, techniques/procedures, filming, post procedure care for following investigations:

2.11.1.1. Parotid sialography

2.11.1.2. Sub-mandibular sialography

2.12. Dacryocystography

2.12.1. Definition, indications, contraindications, equipments required, contrast media, preparation of the patient, techniques/procedures, filming, post procedure care for Dacryocystography

Section C- 20 Marks

3. Equipment for Diagnostic Radiology

3.1. X-Ray Tubes

- 3.1.1. Overview of production of X-rays, historical background
- 3.1.2. Components of an X-ray tube: Cathode assembly, anode assembly
- 3.1.3. Stationary and rotating anodes
- 3.1.4. Line focus principle, anode heel effect, off-focus radiation
- 3.1.5. Glass envelope, tube shielding, care of X-ray tubes
- 3.1.6. X-ray tube faults
- 3.1.7. Modification and recent advances in X-ray tube

3.2. Radiographic Couches, Stands and Tube Supports

- 3.2.1. X-ray tube supports
- 3.2.2. Radiographic couches
- 3.2.3. Chest stands and vertical bucky
- 3.2.4. Modern basic radiographic units

3.3. Exposure Timers

- 3.3.1. Introduction
- 3.3.2. Clockwork timer, synchronous motor and impulse timers
- 3.3.3. Electronic timers
- 3.3.4. Autotimers (photoelectric timer and ionization chamber timer)

3.4. Beam Centering & Beam Limiting Devices

- 3.4.1. Cones and cylinders, aperture diaphragms
- 3.4.2. Light beam diaphragms, positive beam limitation

3.5. Portable and Mobile Radiographic Equipments

- 3.5.1. Main features of portable and mobile equipment
- 3.5.2. Main dependent mobile equipment
- 3.5.3. Capacitor discharge equipment
- 3.5.4. Battery powered generators

3.6. Control of Scattered Radiation

- 3.6.1. Significance of scattered radiation
- 3.6.2. Reduction in the amount of scatter radiation produced (field size, use of appropriate exposure factors, compression band)
- 3.6.3. Reduction in the amount of scatter radiation reaching to the film (metal backing of cassettes, filters, air-gap technique, cones and diaphragms)
- 3.6.4. Grid: construction, function, grid characteristics, grid types and patterns, grid movement
- 3.6.5. Reduction in the effect of scatter (use of intensifying screens)

3.7. Fluoroscopic Equipment

- 3.7.1. Introduction
- 3.7.2. Conventional fluoroscopy
- 3.7.3. Mobile and specialized fluoroscopic units
- 3.7.4. Image intensified fluoroscopy
- 3.7.5. Image intensifier-construction and working principle
- 3.7.6. TV camera and TV monitor

3.8. Tomography

- 3.8.1. Introduction to tomography
- 3.8.2. Main features of tomographic equipment

- 3.8.3. Wide angle and narrow angle tomography, different types of tomographic movement
- 3.8.4. Multi-section tomography
- 3.9. Equipment for Dental Radiography
 - 3.9.1. A simple dental radiographic unit
 - 3.9.2. Orthopantomography (OPG)
- 3.10. Vascular Imaging Equipments
 - 3.10.1. Generators and X-ray tubes
 - 3.10.2. C-Arm/U-Arm assembly
 - 3.10.3. Automatic film changers (roll and cut film changers)
 - 3.10.4. Angiographic tables
 - 3.10.5. Automatic pressure injectors
 - 3.10.6. Program selector, cine cameras
- 3.11. Mammographic Equipments
 - 3.11.1. Introduction
 - 3.11.2. Mammography X-ray tube
 - 3.11.3. Image receptors in mammography
 - 3.11.4. Apparatus for magnification radiography in mammography
- 3.12. Digital Imaging
 - 3.12.1. Introduction to digital imaging concepts and advantages of image digitization
 - 3.12.2. Digital image structure
 - 3.12.3. Digital radiography:
 - 3.12.3.1. Scanned projection radiography (SPR)
 - 3.12.3.2. Computed radiography (CR)
 - 3.12.3.3. Direct digital radiography (DR)
- 3.13. Computed Tomography (CT)
 - 3.13.1. Introduction.
 - 3.13.2. Basic principles of CT
 - 3.13.3. Generations of CT
 - 3.13.4. System components
 - 3.13.5. Image characteristics & Image quality in CT
 - 3.13.6. Artefacts in CT
- 3.14. Magnetic Resonance Imaging (MRI)
 - 3.14.1. Fundamental concepts: magnetic moments, precession, resonance, nuclear magnetic resonance (NMR)
 - 3.14.2. Introduction to MR Scanners: imaging magnets, RF transmitter and receiver coils, shim coils and gradient coils
 - 3.14.3. Principal parameters of MRI: spin density, T1 relaxation time, T2 relaxation time
 - 3.14.4. Basic principles of MR imaging and related parameters
 - 3.14.5. Spin echo pulse sequence
 - 3.14.6. Gradient echo pulse sequence
 - 3.14.7. Artefacts in MRI

Section D- 20 Marks

- 4. Radiographic Photography
 - 4.1. Photographic Principle
 - 4.1.1. Photographic effect
 - 4.1.2. Photosensitive materials

- 4.1.3. Photographic emulsion
 - 4.1.4. Characteristic curve
 - 4.1.5. Spectral sensitivity
 - 4.1.6. Direct exposure film (X-ray sensitive)
 - 4.1.7. Gurney-Mott theory of latent image formation
- 4.2. Film Materials
 - 4.2.1. Construction of X-ray film
 - 4.2.2. Film for medical imaging
 - 4.2.3. Comparison between single coated and double coated X-ray films
- 4.3. Film Storage
 - 4.3.1. Different storage areas
 - 4.3.2. Ideal storage condition
 - 4.3.3. Stock control and film ordering methods
- 4.4. Intensifying Screens
 - 4.4.1. Luminescence: fluorescence and phosphorescence
 - 4.4.2. Construction of Intensifying screen and their types
 - 4.4.3. Types of phosphors: calcium tungsten, rare earth and their comparison
 - 4.4.4. Detective Quantum Efficiency (DQE)
 - 4.4.5. Quantum mottle
 - 4.4.6. Care, monitoring and cleaning of IF screen
 - 4.4.7. X-ray film cassettes
 - 4.4.8. Cassette function, construction, materials used, types and care of cassettes
- 4.5. Radiographic Processing
 - 4.5.1. Manual and automatic processing
 - 4.5.2. Processing cycles
 - 4.5.3. Processing chemical
 - 4.5.4. Care and maintenance of automatic processors
 - 4.5.5. The principle of dry silver imager
 - 4.5.6. Silver recovery
 - 4.5.7. Daylight processing
- 4.6. Design and Construction of Darkroom
 - 4.6.1. The layout of an ideal darkroom
 - 4.6.2. Darkroom location, size, radiation protection, floor, walls/ceiling, ventilation and heating, entrance, white lighting and safe light and its test, film hoppers, loading bench and wet bench
- 4.7. The Radiographic Image
 - 4.7.1. Radiographic image quality
 - 4.7.2. Factors affecting radiographic image quality
 - 4.7.3. Image artifacts
- 4.8. Identification and Viewing of Radiographs
 - 4.8.1. Methods of film identification: opaque letters and legends, actinic marking and perforating device
 - 4.8.2. Viewing equipment

सामूहिक परीक्षण

सामूहिक परीक्षण व्यक्तित्व परीक्षणको एक अंश हो। निजामती सेवाको क्षेत्र विस्तार तथा कार्य पद्धति परिवर्तन समेत भैरहेको सन्दर्भमा कर्णाली प्रदेश सरकारको नीति, योजना, कार्यक्रम लगायत शासन व्यवस्था सम्बन्धी समसामयिक विषय माथि विचार-विमर्श, छलफल गरी तिनको अझै बढी प्रभावकारी तथा कार्यान्वयन योग्य समाधान पहिल्याउने सम्बन्धमा उम्मेदवारहरुको क्षमता पहिचान गर्नु यस परीक्षणको मूल मर्म हो। यसको लागि छलफल, विचार-विमर्श गरी परिस्थिति बुझ्न सक्ने, निर्णय दिने, जनतालाई क्रियाशील बनाउने, चित्त बुझाउने, निर्धारित लक्ष्य अनुसार काम गर्ने/गराउने, जस्ता कामका लागि लेखन क्षमताका साथसाथै समस्यालाई यथार्थपरक ढंगले पहिचान गर्नसक्ने, वाक्पटुता, शिष्टता, तर्कशक्तिको पनि आवश्यकता पर्दछ।

त्यसैले यस परीक्षणमा उम्मेदवारहरुको बौद्धिक क्षमता, संचार सीप, समूह गतिशिलता, व्यवहार, व्यक्तित्व, मनोवृत्ति, क्रियाशीलता, निर्णयशक्ति, समस्या समाधान क्षमता, नेतृत्व क्षमता, समय व्यवस्थापन तथा व्यक्तित्वमा भएका अन्य गुणहरुको आंकलन अर्थात परीक्षण र मूल्याङ्कन गर्नको लागि उम्मेदवारहरुलाई कुनै समसामयिक विषय/सवाल/समस्यामा सामूहिक छलफल गरी समस्या समाधान केन्द्रीत प्रभावकारी र कार्यान्वयन योग्य समाधान निकाल्न दिइन्छ।

यस प्रयोजनको लागि गरिने परीक्षण १० पूर्णाङ्क र ३० मिनेट अवधिको हुनेछ जुन नेताविहिन सामूहिक छलफलको रूपमा अवलम्बन गरिनेछ। दिइएको प्रश्न वा Topic का विषयमा पालैपालोसँग निर्दिष्ट समयभित्र समूहबीच छलफल गर्दै प्रत्येक उम्मेदवारले व्यक्तिगत प्रस्तुति गर्नुपर्नेछ। यस परीक्षणमा मूल्याङ्कनको लागि देहाय अनुसार कम्तीमा तीन जनाको समिति रहनेछ।

आयोगका अध्यक्ष वा अध्यक्षले तोकेको सदस्य – अध्यक्ष

आयोगका सदस्य – सदस्य

मनोविज्ञानवेत्ता – सदस्य

दक्ष/विज्ञ (१ जना) – सदस्य