लोक सेवा आयोग

नेपाल स्वास्थ्य सेवा, रेडियोग्राफी समूह र रेडियोग्राफी समूह, रेडियोथेरापी उपसमूह, सातौँ तहको खुला र आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

पाठ्यक्रमको रुपरेखा :– यस पाठ्यक्रमको आधारमा निम्नानुसार दुई चरणमा परीक्षा लिइने छ :

प्रथम चरण :– लिखित परीक्षा पूर्णाङ्क :– २००

द्वितीय चरण :– सामूहिक परीक्षण र अन्तर्वार्ता पूर्णाङ्क :– ४०

प्रथम चरण – लिखित परीक्षा योजना (Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उत्तीर्णाङ्क	परीक्षा प्रणाली	प्रश्न संख्या X अङ्कभार	समय
प्रथम	Basic Science सम्बन्धी	१००	४०	वस्तुगत बहुवैकल्पिक (MCQs)	१०० X १ = १००	१ घण्टा १५ मिनेट
द्वितीय	समूह सम्बन्धी	१००	४०	विषयगत (Subjective)	१० X १० = १००	३ घण्टा

द्वितीय चरण

विषय	पूर्णाङ्क	परीक्षा प्रणाली	समय
सामूहिक परीक्षण (Group Test)	१०	सामूहिक छलफल (Group Discussion)	३० मिनेट
व्यक्तिगत अन्तर्वार्ता	३०	मौखिक	-

१. लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ ।

२. पाठ्यक्रमको प्रथम र द्वितीय पत्रको विषयवस्तु फरक फरक हुनेछन ।

३. माथि उल्लिखित समूहको पाठ्यक्रमको प्रथम पत्रको विषयवस्तु एउटै हुनेछ । द्वितीय पत्रका विषयवस्तु समुह अनुसार फरक फरक हुनेछन् ।

४. प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।

५. प्रथम पत्रका पाठ्यक्रमका एकाईहरुबाट सोधिने प्रश्नहरुको संख्या निम्नानुसार हुनेछ । द्वितीय पत्रको पाठ्यक्रमका एकाईहरुबाट सोधिने प्रश्नहरुको संख्या द्वितीय पत्रको पाठ्यक्रम उल्लेख भएअनुसार हुनेछ ।

प्रथम पत्रका एकाई	1.1	1.2	1.3	1.4	1.5	1.6	1.7	1.8	1.9	1.10	1.11
प्रश्न संख्या	4	7	5	7	4	6	6	6	5	5	5
प्रथम पत्रका एकाई	2.1	2.2	2.3	2.4	2.5	2.6	2.7	2.8	2.9	2.10	
प्रश्न संख्या	3	3	3	4	5	6	5	3	5	3	

६. वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरुको 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 ।

७. बहुवैकल्पिक प्रश्नहरु हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।

८. विषयगत प्रश्नका लागि तोकिएका १० अङ्कका प्रश्नहरुको हकमा १० अङ्कको 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 टिप्पणीहरु (Short notes) सोध्न सकिने छ ।

९. द्वितीय पत्रमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरु हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरुको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ ।

१०. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरु परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्क्रममा परेको सम्झनु पर्दछ ।

११. प्रथम चरणको लिखित परीक्षाबाट छनौट भएका उम्मेदवारहरुलाई मात्र द्वितीय चरणको अन्तर्वार्तामा सम्मिलित गराइनेछ ।

१२. यस भन्दा अगाडि लागू भएको माथि उल्लिखित समूहको पाठ्यक्रम खारेज गरिएको छ ।

१३. पाठ्यक्रम लागू मिति :– २०६६/२/२१ देखि (**२०७२/०७/२४ को निर्णय अनुसार सामूहिक परीक्षण समावेश**)

१४. मिति २०७०/२/९ मा सातौँ तहमा कायम गर्ने निर्णय ।

प्रथम पत्र - Basic Science

1. ANATOMY & PHYSIOLOGY

1.1 INTRODUCTION
- 1.1.1 General anatomical terms
- 1.1.2 Human cell structure and function
- 1.1.3 The tissues

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
- 1.2.4 Classification of joints and their function
- 1.2.5 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 brain
- 1.3.3 Parts of ventricles of the brain and their extent
- 1.3.4 The cerebrospinal fluid.
- 1.3.5 Midbrain and brain stem
- 1.3.6 Peripheral nervous system
- 1.3.7 Autonomic nervous system
- 1.3.8 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 function
- 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
1.8.3 Functional unit of kidney: nephron, function of kidneys
1.8.4 Formation of urine, water-electrolyte balances in body, etc.
1.8.5 Ureters: Position structure and function
1.8.6 Micturation-reflex control
1.8.7 Structure and function of the urinary bladder and urethra
1.8.8 Supra-renal glands, prostate gland.

1.9 THE REPRODUCTIVE SYSTEM

1.9.1 Female Reproductive System & Breast

1.9.1.1External genitalia, Uterus, Ovaries: Position, structure functions
1.9.1.2 Menstrual cycle, Reproduction & menopause
1.9.1.3 Breast-Position, structure and its functions
1.9.1.4 Puberty

1.9.2 Male Reproductive System:

1.9.2.1 Position structure and functions of scrotum, testes, epididymis, deferent ducts, seminal vesicles, ejaculatory ducts and penis
1.9.2.2 Puberty

1.10 SPECIAL SENSES

1.10.1 Skin- structure and function
1.10.2 The ear (external, middle & internal ear)-structure and function
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 - pituitary gland, thyroid gland, parathyroid glands, adrenal gland, islets of langerhans, pineal gland, testis, ovaries, thymus etc.
1.11.2 Endocrine glands - Position, structure, functions and hormone secretion,

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 A.C 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 Autotransformer 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 use

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 Mains voltage circuit
2.6.8 Mains cables, Switches and fuses
2.6.9 Mains voltage compensation, earthing, insulation, Voltage drops in cables.
2.6.10 X-ray tube voltage control and indication,
2.6.11 Exposure controls. Contactors and timers
2.6.12 X-ray tube current control and filament supply, mA compensation, Generator regulation

2.7 INTERACTION OF RADIATION WITH MATTER

2.7.1 Thompson scattering
2.7.2 Photoelectric interaction
2.7.3 Compton scattering
2.7.4 Pair production
2.7.5 Transmission of a 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---

Model Questions

1. In which bone Sella Turcica or Pituitary fossa is situated:
   a) Temporal b) Frontal
   b) Sphenoid c) Ethmoid

   Correct Ans (B)
2. The suture which unites two parietal bones is:
   a) Sagittal b) Coronal
   c) Frontal d) Lambdoid

   Correct Ans (A)
3. The largest sesamoid bone in the human body is:
   a) Talus b) Patella
   c) Scaphoid d) Fabella

   Correct Ans (B)
4. The valve separating the right atrium and the right ventricle is named as:
   a) Mitral b) Tricuspid
   c) Aortic d) Pulmonary

   Correct Ans (B)
5. The parietal lobe of the brain lies in:
   a) Anterior cranial fossa b) Posterior cranial fossa
   c) Mid cranial fossa d) Pituitary fossa

   Correct Ans (C)
6. The electrical energy can be converted into mechanical energy by means of a:
   a) Motor b) Generator
   c) Transformer d) Rectifier

   Correct Ans (A)
7. Elements having same atomic number but different mass number are called:
   a) Isomers b) Isotopes
   c) Isobars d) Nucleons

   Correct Ans (B)
8. The only difference between x-rays and gamma rays is their:
   a) Energy b) Wavelength
   c) Origin d) Speed

   Correct Ans (C)
9. An electronic device which allows current only in one direction is called as:
   a) Stabilizer b) Rectifier
   c) Transformer d) Generator

   Correct Ans (B)
10. The unit of measurement of electron energy as well as x-ray energy is:
    a) Kilovoltage b) Milliampere
    c) Electron volt d) Coulomb

    Correct Ans (C)