

Kalyan Singh Super Specialty Cancer Institute

कल्याण सिंह अति विशिष्ट कैंसर संस्थान

C.G. City, Sultanpur Road, Lucknow-226002

सी.जी. सिटी, सुल्तानपुर रोड, लखनऊ-226002

(An Autonomous Institute of the Govt. of Uttar Pradesh)

(उत्तर प्रदेश सरकार का स्वायत्तशासी संस्थान)

Email: executiveregistrar.ksssci@gmail.com

Advt. No KSSSCI/ER-16/1-21/2023-24

PART (A) – General Aptitude

For all posts of Advt. No KSSSCI/ER-16/1-21/2023-24

(NOTE: EXAMINATION WILL BE CONDUCTED IN ENGLISH LANGUAGE ONLY)

(Syllabus is only indicative. The questions can assess any aspect of knowledge, aptitude, attitude and practical skills, which is expected from a trained person to work efficiently at the advertised post)

Indicative Syllabus: For General Aptitude

A] Reasoning: It would include questions of both verbal and nonverbal type. This component may include questions on analogies, similarities and differences, spatial orientation, problem solving, Analysis, judgement, decision making, discrimination, observation, relationship concepts, arithmetical reasoning and figural classification, arithmetic number series, nonverbal series, coding and decoding, statement conclusion, etc. the topics are, symbolic/ number analogy, figural analogy semantic classification, symbolic/Number Classification, Figural Classification, semantic series, number series, Figural series, problem solving, word building, coding & decoding, Numerical operations, symbolic operations Trends, space orientation, space Visualization, Venn diagrams, Drawing inferences, Punched hole/pattern-folding & unfolding. Figural pattern- Folding and completion, indexing. Address matching, Date & city matching, Classification of centre codes/roll numbers, small & capital letters/numbers coding, decoding and classification, Embedded Figures, Critical thing, Emotional Intelligence, Social Intelligence, Other sub topics, if any.

B] General Knowledge: Questions in this component will be aimed at testing the candidate's general awareness of the environment around him and its application to society. Questions will also be designed to test knowledge of current events and of such matters of everyday observations and experience in the scientific aspect as may be expected of any educated person. The test will also include questions relating to India and its neighboring countries especially pertaining history, culture geography, economic scene general policy & scientific research.

C] Mathematics Aptitude: The questions will be designed to test the ability of appropriate use of numbers and number sense of the candidate. The scope of the test will be computation of whole numbers, decimals, fractions and relationship between numbers percentage, Ration & Proportion, Square roots, Averages, Interest, Profit & Loss, Discount, Partnership, Elementary Surds, Graphs of Linear Equation, Triangle and its various kinds of centres, Congruence and similarity of triangles, Circle and its chords, tangents, angles subtended by chords of a circle common tangents to two or more circles, Triangle, Quadrilaterals, Regular polygons, Circle, Right Prism, Right circular cone, Right circular cylinder, Sphere, Hemispheres, Rectangular Parallelepiped, Regular right pyramid with triangular or square base, Trigonometric ratio, Degree and radian

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Measures, Standard Identities, Complementary Angles, Heights and Distances, Histogram, Frequency, polygon, Bar diagram & pie chart.

D] General English: Candidates ability to understand correct English, his basic comprehension and writing ability would be tested, Questions in this computer will be designed to test the candidates understanding and knowledge of English language and will be based on spot the error, fill in the blanks, synonyms, antonyms, spelling/detecting mis-spelt words, idioms and phrases. One word substitution, improvement of sentences, active/passive voice of verbs, conversion into direct/indirect narration, shuffling of sentence parts, shuffling of sentences in a passage, comprehension passage and any other English Language questions at the Level of Matriculation /Higher Secondary.

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Part – B (Core Subject)

Syllabus for the post of OT Technician

Advt. No KSSSCI/ER-16/01/2023-24

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ANATOMY & PHYSIOLOGY

1. Elementary Physics & Chemistry
2. Characteristics of Living Matter
3. Structure of Living Matter
4. Anatomy and Physiology related to cardiovascular system, Nervous system, respiratory system, circulatory system, digestive system, hepatobiliary system, endocrine glands and exocrine glands, urinary system, reproductive system, musculoskeletal system

SURGICAL INSTRUMENTS AND PROCEDURES

(Including Sterilization and Disinfection, Different Methods, Protection of Patients in Surgery. Preparation of Patients)

Preoperative Consideration Psychological Support of the Surgical Patient

Protection of the Patient in Surgery

- Transfer Procedure Position
- Environmental Controls
- Electro Surgery
- Operative Records
- Counting Procedure
- Sterilization
- Emergencies & Disaster management

Surgical Instruments

- Instruments for General Surgery
- Operation of Face & Neck
- Operation of Nose, Throat and accessory Nasal Sinuses
- Ophthalmic Surgery
- Sinuses, Ear and Throat
- Operations on the Chest

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- Operations on the Genito-Urinary Tract
- Gynaecological & Obstetric Operations
- Orthopedic Operations
- Neuro-Surgical Operations
- Operations on the Vascular System
- Radium Insertion
- Traumatic Surgery

Surgical procedures

- Neck Surgery
- Breast Procedures
- Abdominal Extra intestinal Surgery
- Gastrointestinal Surgery
- Gynaecological and Obstetric Surgery
- Genito-Urinary Surgery

- Thoracic Procedures
- Cardiovascular Surgery
- Orthopedic Surgery
- Neurological Surgery
- Plastic Surgery
- Otorhinolaryngologic (ENT) Surgery
- Ophthalmic Surgery
- Pediatric Procedures

ANAESTHESIA

1. General anaesthesia

2. Regional anaesthesia

- Spinal
- Epidural
- Caudal
- Local
- Topical

3. Methods for preparation of the patients for anaesthesia

4. Pharmacology and clinical use of intravenous and inhalational anesthetic agents, opioids, NSAIDS, neuromuscular blocking agents, reversal agents, autonomic nervous system, local anesthesia agents.

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5. Emergency resuscitation, ALS and BLS protocols
6. Emergency drugs
7. Vasopressor and inotropic drugs
8. Sterilisation & Maintenance of anesthesia equipment
9. Difficult airway management, laryngoscopes, bronchoscopes.
10. Instruments and tubes used in anesthesia practices

SURGICAL PROCEDURES AND MONITORING, OPERATION THEATRE ETHICS DISCIPLINE, SAFETY FOR OPERATING ROOM PERSONNEL, PREPARATION OF INSTRUMENTAL TRAYS

- Surgical Procedures & Monitoring
- Safety for operation room personnel
- Preparation of Instrumental Trays eg: Gynaecological And Obstetric Trays, Genito-Urinary Tray, Cardiovascular trays, Orthopaedic tray. Neurologic Procedures Tray, Otorhinolaryngologic (ENT) Tray, Ophthalmic Trays, Paediatric Tray

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Part – B (Core Subject)

Syllabus for the post of Anaesthesia Technician

Advt. No KSSSCI/ER-16/02/2023-24

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- Medicine Relevant to Anaesthesia Technology
- Anaesthesia Technology- Clinical
- Physiology
- Applied Pathology
- Anaesthesia Technology – Applied
- Biochemistry
- Applied Microbiology
- Anaesthesia Technology – Advanced
- Pathology – [Clinical Pathology, Haematology & Blood –Banking]
- Applied Pharmacology
- Microbiology
- Introduction to Anaesthesia Technology
- Sociology
- Ethics, Database Management
- Health-care
- Environmental Science and Health
- Research and Biostatistics
- Hospital Posting
- Constitution of India
- Computer Application
- Course Introduction and Overview
- Introduction to Emergency Medical Services and the Health Care System
- The Well-being of the EMT
- Lifting and Moving Patients
- Medical, Legal and Ethical Issues
- Medical Terminology
- Anatomy and Physiology
- Life Span Development
- Airway Management
- Respiration and Artificial Ventilation
- CPR/AED
- Scene Size Up

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- The Primary Assessment
- Vital Signs and Monitoring Devices
- History Taking
- Assessment of the Trauma Patient
- Assessment of the Medical Patient
- Reassessment
- Critical Thinking and Decision Making
- Communications and Documentation
- General Pharmacology
- Respiratory Emergencies
- Cardiac Emergencies
- Diabetic Emergencies
- Altered Mental Status
- Allergic Reaction
- Poisoning and Overdose Emergencies
- Abdominal Emergencies
- Behavioral and Psychiatric Emergencies and Suicide
- Hematologic and Renal Emergencies
- Bleeding and Shock
- Soft Tissue Trauma
- Chest and Abdominal Trauma
- Trauma to the Head, Neck and Spine
- Multisystem Trauma
- Environmental Emergencies
- Obstetric and Gynecological Emergencies
- Pediatric Emergencies
- Geriatric Emergencies
- Emergencies for Patients with Special Challenges
- EMS Operations
- Hazardous Materials, Multiple Casualty Incidents, and Incident Management
- Highway Safety and Vehicle Extrication
- EMS Response to Terrorism

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Part – B (Core Subject)

Syllabus for the post of Audio -Visual Technician

Advt. No KSSSCI/ER-16/03/2023-24

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1. Install hardware and software.
2. Make upgrades and repairs as needed.
3. Oversee digital security.
4. Perform maintenance that all systems are operating.
5. Collect and analyse data to optimize performance.
6. Train users on hardware and software.
7. Troubleshoot problems with the system.
8. "Analyse and monitor server security and make recommendations or implement patches/fixes to address potential security holes"
9. Research and recommend innovative, and where possible automated, approaches for system.
10. Installation, maintenance and Management of servers
11. Website development and management
12. Ability to create network diagrams and documentation for design and planning of data centre, server room etc.
13. Proven experience in IT System administration
14. Experience with databases, networks (LAN, WAN) and patch management
15. Knowledge of system security (e.g. intrusion detection systems) and data backup/recovery
16. Familiarity with various operating systems and platforms
17. Resourcefulness and problem-solving aptitude
18. Excellent communication and writing skills

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Part – B (Core Subject)

Syllabus for the post of ECG Technician

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Introduction to Anatomy

Definition and importance of anatomy. Historical overview of anatomical studies.

Branches of anatomy: Gross anatomy, Microscopic anatomy, and Developmental anatomy. Anatomical terminology: Anatomical position, planes, axes, and directional terms.

Osteology

Upper limb bones: Clavicle, scapula, humerus, radius, ulna. Lower limb bones: Femur, hip bone, sacrum, tibia, fibula. Vertebral column: Types of vertebrae and their characteristics.

Thoracic Anatomy

Thorax: Intercostal spaces, pleura, and bony thoracic cage. Ribs, sternum, and thoracic vertebrae.

Lungs: Trachea, bronchial tree, and pulmonary circulation.

Cardiovascular Anatomy

Heart: Surface and gross anatomy of the heart. Heart chambers: Atria and ventricles.

Valves of the heart: Atrioventricular valves and semilunar valves.

Major blood vessels of the heart: Aorta, pulmonary trunk, superior and inferior vena cava. Pericardium: Layers and function.

Coronary arteries: Supply to the heart muscle.

Pulmonary circulation: Blood flows to and from the lungs. Venous system: Venous drainage of the heart.

Myology

Muscles of the thorax.

Muscles of the upper limb: Arm and forearm muscles.

Flexor and extensor groups of muscles: Origin, insertion, nerve supply, and actions.

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Histology

Types of tissues: Epithelial tissue - Squamous, Glandular, Transitional. Cartilage: Types and characteristics.

Connective tissue: Bone, fibrous tissue, muscle.

Excretory system: Kidney, ureters, bladder, and structure of nephrons.

Overview of the Cardiovascular System

Functions of the cardiovascular system. Circulation of blood.

Central control of the cardiovascular system. Cardiac Cycle

Mechanical events in the cardiac cycle. Arterial cycle and central venous pressure cycle. Clinical aspects of the human cardiac cycle.

Cardiac Excitation and Contraction

Mechanism of cardiac muscle contraction.

Function of the sinoatrial node.

The cardiac conduction system: Atrioventricular node function. Autonomic regulation of heart rate.

Assessment of Cardiac Output

Fick principle.

Thermodilution and indicator dilution methods. Pulse Doppler methods.

Miscellaneous methods.

Hemodynamics

Relationship between pressure, flow, and resistance. Frank-Starling law.

Preload, afterload, and contractility.

Control of stroke volume and cardiac output.

Solute Transport between Blood and Tissues

Circulation of fluid between plasma, interstitium, and lymph.

Vascular Smooth Muscle

Mechanism of smooth muscle contraction. Pharmacomechanical coupling.

Automaticity.

Control of Blood Vessels Local control mechanisms. Nervous control.

Hormonal control.

Specialization in Individual Circulation

Coronary circulation. Cerebral circulation. Pulmonary circulation. Cutaneous circulation.

Cardiovascular Receptors, Reflexes, and Central Control Coordinated Cardiovascular Responses

Posture.

Valsalva maneuver. Exercise.

1. Valvular Heart Disease

Etiology of acquired valvular heart disease. Rheumatic fever and rheumatic heart

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disease.

Specific valvular conditions: Aortic stenosis, Aortic regurgitation, Mitral valve disease, Mitral stenosis, Mitral regurgitation, Combined valvular heart disease, Tricuspid valve disease. Infective endocarditis. Valvuloplasty and valve surgery.

2. Coronary Artery Disease

Pathophysiology and clinical recognition. Angina Pectoris.

Symptomatic and asymptomatic myocardial ischemia. Types and locations of myocardial infarction.

Thrombolytic therapy. Cardiac rehabilitation.

3. Systemic Hypertension

Essential and secondary hypertension.

4. Heart Failure

Surgical and medical treatment.

5. Myocardial Diseases Dilated cardiomyopathy. Hypertrophic cardiomyopathy. Restrictive cardiomyopathy. Myocarditis.

6. Pericardial Diseases Pericardial effusion. Constrictive pericarditis.

7. Electrical Disturbances of the Heart

Sinus node dysfunction. Arrhythmias and conduction disturbances.

8. Pulmonary Hypertension Primary pulmonary hypertension. Pulmonary thromboembolism.

9. Peripheral Vascular Disease Atherosclerotic peripheral vascular disease. Aortic aneurysms.

Aortic dissection. Takayasu arteritis.

10. Congenital Heart Disease

Theory Content:

1. Fundamental Principles of Electrocardiography

- Introduction to ECG and its significance in cardiology.
- Basics of electrical conduction in the heart.

2. Cardiac Electrical Field Generation

- Cardiac electrical activation during depolarization.
- Cardiac wavefronts and their propagation.

3. Cardiac Electrical Field Generation During Ventricular Recovery

- Electrical events during ventricular repolarization.
- The role of ion channels in repolarization.

4. Electrocardiographic Lead Systems

- Types of lead systems used in ECG recording.

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- Standard limb leads and their orientation.
 - Precordial leads and the Wisdom central terminal.
 - Augmented limb leads and their significance.
5. The Hexaxial Reference Frame and Electrical Axis
- Understanding the concept of electrical axis.
 - Interpretation of electrical axis deviations.
6. Recording Adult and Paediatric ECGs
- Technician and considerations for obtaining ECG recordings in both adult and pediatric patients.
 - Interpretation of a normal ECG tracing.
 - Identification of different ECG waves and intervals.
7. Atrial Activation
- Analysis of atrial depolarization and its representation on the ECG.
 - Normal P wave characteristics.
8. Atrial Repolarization
- Understanding atrial repolarization on the ECG.
 - Correlation with the T wave.
9. Atrioventricular Node Conduction and the PR Segment
- Overview of atrioventricular (AV) node conduction.
 - Interpretation of the PR segment.
10. Ventricular Activation and the QRS Complex
- Analysis of ventricular depolarization.
 - Identification of QRS complex components.
11. Ventricular Recovery and ST-T Wave
- Understanding ventricular repolarization.
 - Interpretation of the ST segment and T wave.
12. U Wave and Normal Variants
- Discussion of U wave morphology and its significance.
 - Recognition of normal ECG variants.
13. Rate and Rhythm
- Calculation of heart rate.
 - Interpretation of different cardiac rhythms.

Cyanotic heart disease: Atrial septal defect, Ventricular septal defect, Patent ductus arteriosus, Congenital valvular disease, Coarctation of aorta.

Cyanotic congenital heart disease: Pulmonary atresia, Transposition of great arteries, Total anomalous pulmonary venous connection.

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Diving reflex.

Cardiovascular Responses in Pathological Situations

Shock and hemorrhage. Syncope.

Essential hypertension. Chronic cardiac failure.

Respiratory Physiology Mechanics of respiration. Principles of gas exchange.

Regulation of respiration.

Hematology and Coagulation Physiology

Blood components.

Blood groups and blood transfusion. Hemostasis.

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Part – B (Core Subject)

Syllabus for the post of Echo Technician

Advt. No KSSSCI/ER-16/05/2023-24

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1. General Anatomy & Physiology (Cytology, Histology, Osteology and only basics of all organ systems of body).
2. Only basics of relevant Pathology, Pharmacology & Microbiology.
3. Basic Physics related to cardiology.
4. Detailed Cardiovascular system's Anatomy & Physiology (Heart & Blood vessels).
5. Basics of Vital monitoring, ECG, TMT, Echo- Cardiography.
6. Hand hygiene & prevention of cross infection.
7. Basic life support (BLS) & Cardio-pulmonary resuscitation (CPR).

Soft skills like - Interpersonal relationship skills & moral education.

- a. Only relevant surgical & medical conditions (relevant to cardiac tech but other than cardiology).
- b. Nursing Procedures like vital recording, IM/IV/SC injection, Oxygen therapy, Nebulization, IV infusion.
- c. Advanced cardiac life support (ACLS).
- d. Diseases related to Cardio-vascular system (CVS).
- e. Drugs used in Cardiology & BLS, ACLS.
- f. Details about BLS, ACLS, Cardiac- Catheterization, Coronary angiography and angioplasty.
- g. Basic biomedical engineering physics of ECG, ECHO, TMT, multipara monitors Cath lab etc.

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Part – B (Core Subject)

Syllabus for the post of Emergency Medical Technician

Advt. No KSSSCI/ER-16/06/2023-24

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1. Describe the roles of EMS in the health care system.
2. Demonstrate the professional attributes expected of EMTs.
3. Employ the roles and responsibilities of an EMT with regard to personal safety and wellness, as well as the safety of others.
4. Perform the duties of an EMT with regard for medical-legal and ethical issues, including functioning under medical direction and within the scope of practice.
5. Apply principles of anatomy, physiology, pathophysiology, life span development, and therapeutic communications to the assessment and management of patients.
6. Identify the need for and perform immediately life-saving interventions to manage a patient's airway, breathing and circulation.
7. Assess and manage patients of all ages with a variety of complaints, medical conditions, and traumatic injuries.
8. Apply principles of emergency medical services operations, including considerations in ambulance and air medical transportation, multiple-casualty incidents, gaining access to and extricating patients, hazardous materials incidents, and responding to situations involving weapons of mass destruction.

II. General Outline of Topics Covered:

- Course Introduction and Overview
- Introduction to Emergency Medical Services and the Health Care System
- The Well-being of the EMT
- Lifting and Moving Patients
- Medical, Legal and Ethical Issues
- Medical Terminology
- Anatomy and Physiology
- Life Span Development
- Airway Management
- Respiration and Artificial Ventilation
- CPR/AED
- Scene Size Up
- The Primary Assessment
- Vital Signs and Monitoring Devices
- History Taking
- Assessment of the Trauma Patient

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- Assessment of the Medical Patient
- Reassessment
- Critical Thinking and Decision Making
- Communications and Documentation
- General Pharmacology
- Respiratory Emergencies
- Cardiac Emergencies
- Diabetic Emergencies
- Altered Mental Status
- Allergic Reaction
- Poisoning and Overdose Emergencies
- Abdominal Emergencies
- Behavioral and Psychiatric Emergencies and Suicide
- Hematologic and Renal Emergencies
- Bleeding and Shock
- Soft Tissue Trauma
- Chest and Abdominal Trauma
- Trauma to the Head, Neck and Spine
- Multisystem Trauma
- Environmental Emergencies
- Obstetric and Gynecological Emergencies
- Pediatric Emergencies
- Geriatric Emergencies
- Emergencies for Patients with Special Challenges
- EMS Operations
- Hazardous Materials, Multiple Casualty Incidents, and Incident Management
- Highway Safety and Vehicle Extrication
- EMS Response to Terrorism

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Part – B (Core Subject)

Syllabus for the post of Blood Bank Technician

Advt. No KSSSCI/ER-16/07/2023-24

(Syllabus is only indicative. The questions can assess any aspect of knowledge, aptitude, attitude and practical skills, which is expected from a trained person to work efficiently at the advertised post)

1. Blood containers and anticoagulants
2. Blood collection and preservation
3. Blood component preparation and storage
 - Preparation of cellular components
 - Preparation of plasma components
 - Preparation of special products like washed cells, leucoreduced cellsetc.
4. ABO blood group system
5. Rh blood group system
6. Other Blood Group Systems
7. Basic hematology
8. Basic immunohematology
9. Direct Coomb's test
10. Indirect Coomb's test
11. Compatibility testing
12. Antibody detection and identification
13. Transfusion reactions
14. Microbiology
 - i) HIV
 - ii) HBV
 - iii) HCV
 - iv) Syphilis
 - v) Malaria
15. Hemolytic disease of newborn
16. Autoimmune hemolytic anemia
17. Transfusion practice in different clinical situations
18. Autologous transfusion
19. Apheresis
20. Newer Technologies
21. Quality control in blood banking
22. Documentation and record keeping.

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Part – B (Core Subject)

Syllabus for the post of Pathology Technician

Advt. No KSSSCI/ER-16/08/2023-24

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- The s-block elements.
- P-block elements-group 14 (carbon family).
- Organic chemistry
- Biomolecules.
- Solutions.
- Chemistry in everyday life.
- Polymers.
- Surface chemistry.
- Chemical equilibrium and acids-bases.
- Atomic structure.
- Classification of elements and periodicity in properties.
- Haloalkanes and haloarenes.
- Chemical bonding and molecular structure.
- States of matter: gasses and liquids.
- Stoichiometry.
- Organic compounds containing nitrogen.
- Organic compounds containing e, h, and o.
- Thermodynamics.
- P- block elements group 13 (boron family).
- Hydrogen and its Compounds.
- Environmental chemistry.
- D and f block elements & coordination compounds.
- P- block elements group 13 (boron family).
- Hydrogen and its Compounds.
- D and f block elements & coordination compounds.
- Environmental chemistry.
- Solid state.
- Electrochemistry and chemical kinetics.
- General principles of metallurgy.
- P-block elements.
- Laboratory Technician Syllabus - Biology
- Genetics, Cytogenetics & Plant Breeding.
- Ecology & Environment.
- Mycology & Plant Pathology.

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- Archegoniate.
- Viruses, Bacteria & Algae.
- Angiosperms Morphology Taxonomy & Embryology.
- Biochemistry & Plant Physiology.
- Biotechnology, etc.

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Part – B (Core Subject)

Syllabus for the post of PFT Technician

Advt. No KSSSCI/ER-16/09/2023-24

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INTRODUCTION TO HUMAN ANATOMY AND PHYSIOLOGY

- Basics of Anatomy and Physiology
- Structure of Respiratory System
- Functions of Respiratory System
- Anatomy and Physiology of Cardio Pulmonary System
- Medical Terminology

CLINICAL ASSESMENT OF CARDIO PULMONARY SYSTEM

- Cardiac Examination
- Pulmonary Examination

BASIC MODES OF RESPIRATORY CARE

- Basic Modes of Mechanical Ventilation
- Types of Ventilation
- A/C, VCV Assisted / Controlled Volume Cycle Ventilation
- A/C, PCV Assisted / Controlled Pressure-Controlled Ventilation
- SIMV- Synchronized Intermittent Mandatory Ventilation
- PSV- Pressure Support Ventilation

MICROBIOLOGY AND INFECTION CONTROL

- Definition and other Microbiology Terms
- Chain of Infection
- Main Groups of Micro-Organisms
- Basic Laboratory Diagnosis
- Multi Drug Resistant Organisms

RESPIRATORY DISEASES AND ABNORMALITIES

- Pulmonary Embolism
- Pneumonia
- Tuberculosis

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- COPD
- Chest Injuries
- Lung Abscess

RESPIRATORY THERAPY TECHNICIAN EQUIPMENTS AND SUPPLIES

- Spirometers
- Pulmonary Function Testing (PFT) Equipment's
- Ventilators
- Humidifiers
- Nebulizers
- PAP (Positive Airway Pressure)
- Manual Resuscitators
- Masks
- Oxygen Equipment and Circuits Disposals
- REP (Filtering devices)

AIR-WAY MANAGEMENT

- Basic Techniques
- Advanced Techniques

MECHANICAL VENTILATION

- Definition and Modes of Mechanical Ventilation
- Complications of Mechanical Ventilation
- Standard Safety Precautions

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Part – B (Core Subject)

Syllabus for the post of Biomedical Technician

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Electrical Circuits

Voltage and current sources: independent, dependent, ideal and practical; v-i relationships of resistor, inductor, mutual inductor and capacitor; transient analysis of RLC circuits with dc excitation. Kirchhoff's laws, mesh and nodal analysis, superposition, Thevenin, Norton, maximum power transfer and reciprocity theorems.

Signals and Systems

Continuous and Discrete Signal and Systems: Periodic, aperiodic and impulse signals; Laplace, Fourier and z-transforms; transfer function, frequency response of first and second order linear time invariant systems, impulse response of systems; convolution, correlation. Discrete time system: impulse response, frequency response, pulse transfer function; DFT; basics of IIR and FIR filters.

Analog and Digital Electronics

Characteristics and applications of diode, Zener diode, BJT and MOSFET; small

signal analysis of transistor circuits, feedback amplifiers. Characteristics of operational amplifiers; applications of opamps: difference amplifier, adder, subtractor, integrator, differentiator, instrumentation amplifier, buffer.

Combinational logic circuits, minimization of Boolean functions. IC families: TTL and CMOS.

Arithmetic circuits, comparators, Schmitt trigger, multi-vibrators, sequential circuits, flipflops, shift registers, timers and counters; sample-and-hold circuit, multiplexer. Characteristics of ADC and DAC (resolution, quantization, significant bits, conversion/settling time);

Sensors and Bioinstrumentation

Resistive-, capacitive-, inductive-, piezoelectric-, Hall Effect sensors and associated signal conditioning circuits; Optical sources and detectors: LED, Photo-diode, p-i-n and avalanche photo diode (APD), light dependent resistor and their characteristics; basics of magnetic sensing; Interferometer: applications in metrology; basics of fiber optic sensing. Basics of LASERS,

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Origin, nature, and types of Biosignals, Principles of sensing physiological parameters, types of transducers and their characteristics, Electrodes for bioelectric signals, Bioelectric signals and their characteristics. Biopotential Amplifiers, Noise and artefacts and their management, Electrical Isolation (optical and electrical) and Safety of Biomedical Instruments. Generation, Acquisition, and signal conditioning and analysis of biosignals: ECG, EMG, EEG, EOG, Blood ERG, PCG, GSR. Principles of measuring blood pressure, Core temperature, volume & flow in arteries, veins and tissues – Lung volumes, respiration and cardiac rate.

Medical Image Systems

Physics and Instrumentation of medical images in X-Ray, Ultrasound, CT, MRI, PET, and their characteristics.

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Part – B (Core Subject)

Syllabus for the post of Microbiology Technician

Advt. No KSSSCI/ER-16/11/2023-24

(Syllabus is only indicative. The questions can assess any aspect of knowledge, aptitude, attitude and practical skills, which is expected from a trained person to work efficiently at the advertised post)

1. General Microbiology (Introduction and History)
2. Microscopy
3. Morphology
4. Growth and nutrition of Bacteria
5. Sterilization-I
6. Sterilization –II
7. Demonstration of PPE
8. Biomedical waste management
9. Hospital Acquired Infection
10. Culture Media I
11. Culture Media II
12. Culture and Isolation of Bacteria I
13. Culture and Isolation of Bacteria II
14. Sample collection & Transport Method I
15. Sample collection & Transport Method II
16. Smear preparation & staining Method I
17. Smear preparation & staining Method II
18. Immunity
19. Antigen
20. Antibody
21. Antigen –Antibody Reactions I
22. Antigen –Antibody Reactions II
23. Structure & function of immune system
24. Immune response
25. Immunohematology
26. Antibiotic sensitivity testing
27. Antimicrobials & MOA
28. General properties of Viruses
29. HIV I
30. HIV II
31. Hepatitis (HBV & HCV) I

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32. Hepatitis (HBV & HCV) II

33. Orthomyxovirus

34. Paramyxovirus

35. Pox virus

36. General properties of fungi

37. Lab Diagnosis of Fungi

38. Dermatophytes

39. Candida

40. Cryptococcus

41. Opportunistic fungi

42. Vaccination

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Part – B (Core Subject)

Syllabus for the post of Medical Gas Pipe Line Technician

Advt. No KSSSCI/ER-16/12/2023-24

(Syllabus is only indicative. The questions can assess any aspect of knowledge, aptitude, attitude and practical skills, which is expected from a trained person to work efficiently at the advertised post)

- Gas Distribution Systems: Compressed gas cylinders, Colour coding, Cylinder valves; Pin index, Gas piping system, Recommendations for piping system, Alarms & safety devices.
- MGPS Design and Techniques: Statutory obligations and safe system operation, MGPS design and installation requirements, Basic fault-finding, Structure and management of the permit-to work system, MGPS equipment performance requirements (plant and pipeline); Technical reporting including system capacities/limitations, upgrading requirements/equipment replacement, system compliance.
- MGPS Policies and documentation: MGPS documentation; Emergency procedures; MGPS operational policy preparation, implementation and monitoring; MGPS testing and quality control requirements; Manifold systems; Cryogenic liquid cylinders; Bulk cryogenic (VIE) systems Alarm requirements.
- Piping materials and specification of W.I. & steel pipes, Pipe threads, Pipe fittings, Specifications of fittings, Brief description of different types of pipe joints, Pipe fittings, Flanges, Unions, Valves etc., Different types of pipes lay out systems, Different types of pipe joints.
- Working principals of valves and their description.
- Mechanical faults on terminal outlets, Line regulators, Zone valve boxes and faults on electrically controlled line, Pressure alarms.
- Oxygen acetylene welding procedure of medical gas pipeline using inert gas shielding
- Installation, maintenance and repair of liquid oxygen plant and high-pressure cylinder manifolds
- Types of many gas manifolds.
- Manifolds selection criteria.
- Manifolds assemblies.
- Semi- automatic manifolds.
- Manifolds accessories.
- Manifolds valves etc.

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Part – B (Core Subject)

Syllabus for the post of Radiology Technician

Advt. No KSSSCI/ER-16/13/2023-24

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1. Basic Anatomy & Physiology
2. Basic Bio-Chemistry, Microbiology and Pathology
3. General Physics
4. Radiation Physics, Radiation safety and protection
5. Darkroom Techniques
6. General Radiography Techniques
7. Special Radiography Techniques
8. Interventional Radiology Techniques
9. CT, MRI, USG Techniques and procedures
10. General Principles of Hospital Practice & Patient care
11. Computer and its applications in Radiology
12. Quality Assurance and Quality control
13. Knowledge of various regulatory bodies (like AERB, ICRP etc.) norms and regulation including PNDT Act.

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Part – B (Core Subject)

Syllabus for the post of Radiotherapy Technician

Advt. No KSSSCI/ER-16/14/2023-24

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1. Introduction to healthcare delivery system
 - a. Healthcare delivery system in India at primary, secondary and tertiary care
 - b. Community participation in healthcare delivery system
 - c. Health system in developed countries.
 - d. Private Sector
 - e. National Health Mission
 - f. National Health Policy
 - g. Issues in Health Care Delivery System in India
2. National Health Programmes
3. Introduction to AYUSH system of medicine
4. Health scenario of India- past, present and future
5. Demography & Vital Statistics
6. Epidemiology

Medical terminologies and record keeping

1. Derivation, prefixes, and suffixes.
2. Conventions for combined morphemes and the formation of plurals.
3. Form medical terms utilizing roots, suffixes, prefixes, and combining roots.
4. Interpret basic medical abbreviations/symbols.
5. Utilize diagnostic, surgical, and procedural terms and abbreviations related to the integumentary system, musculoskeletal system, respiratory system, cardiovascular system, nervous system, and endocrine system.
6. Interpret medical orders/reports.
7. Data entry and management on electronic health record system.

Basic computers and information science

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Introduction to computer: Introduction, characteristics of computer, block diagram of computer, generations of computer, computer languages.

Input output devices: Input devices (keyboard, point and draw devices, data scanning devices, digitizer, electronic card reader, voice recognition devices, vision-input devices), output devices (monitors, pointers, plotters, screen image projector, voice response systems). Processor and memory/ Storage Devices: Sequential and direct access devices, magnetic tape, magnetic disk, optical disk, mass storage devices. Introduction of windows / Introduction to MS-Word / Introduction to Excel/ Introduction to power-point: introduction, creating and manipulating presentation, Computer networks: introduction, types of networks (LAN, MAN, WAN, Internet, Intranet), network topologies (star, ring, bus, mesh, tree, hybrid), components of network.

Medical law and ethics

1. Medical ethics - Definition - Goal - Scope
2. Introduction to Code of conduct/ Confidentiality/ Malpractice and negligence / Autonomy and informed consent - Right of patients/ Care of the terminally ill- Euthanasia
3. Organ transplantation
4. Medico legal aspects of medical records
5. Professional Indemnity insurance policy
6. Development of standardized protocol to avoid near miss or sentinel events / obtaining an informed consent

Communication and soft skills

1. Basic Language Skills: Grammar and Usage.
2. Business Communication Skills/ Basic concepts & principles of good communication /Special characteristics of health communication/ Types & process of communication
3. Barriers of communication & how to overcome

Introduction to Quality and patient safety

1. Quality assurance and management -
 - a. Concepts of Quality of Care
 - b. Quality Improvement Approaches
 - c. Standards and Norms
 - d. Quality Improvement Tools
 - e. Introduction to NABH guidelines

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2. Basics of emergency care and life support skills - Basic life support (BLS) is the foundation for saving lives following cardiac arrest. Fundamental aspects of BLS include immediate recognition of sudden cardiac arrest (SCA) and activation of the emergency response system, early cardiopulmonary resuscitation (CPR), and rapid defibrillation with an automated external defibrillator (AED).
3. Bio medical waste management and environment safety:
 - a. Definition of Biomedical Waste
 - b. Waste minimization
 - c. BMW – Segregation, collection, transportation, treatment and disposal (including color coding)/ Liquid BMW, Radioactive waste, Metals / Chemicals / Drug waste
 - d. Modern technology for handling BMW / Use of Personal protective equipment (PPE)
 - e. Monitoring & controlling of cross infection (Protective devices)

Infection prevention and control - The objective of this section will be to provide a broad understanding of the core subject areas of infection prevention and control and to equip AHPs with the fundamental skills required to reduce the incidence of hospital acquired infections and improve health outcomes. Concepts taught should include –

- a. Evidence-based infection control principles and practices [such as sterilization, disinfection, effective hand hygiene and use of Personal protective equipment (PPE)],
 - b. Prevention & control of common healthcare associated infections,
 - c. Components of an effective infection control program, and
 - d. Guidelines (NABH and JCI) for Hospital Infection Control
4. Antibiotic Resistance and antibiotic stewardship
 5. Disaster preparedness and management- The objective of this section will be to provide knowledge on the principles of on-site disaster management

Professionalism and values

1. Professional values- Integrity, Objectivity, Professional competence and due care, Confidentiality

Research Methodology and Biostatistics: Basic concepts

Elementary mathematics & physics

1. Elementary Mathematics
 - a. Calculation of percentage, Profit & Loss, Simple interest, compound interest, time & work, Ratio & proportion, Surds, Indices, Logarithm, Inverse Square Law,
 - b. Geometry of triangles, similar triangles, Properties of Triangles.

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- c. Trigonometry: Height & Distance.
- d. Graphical Representation of Exponential and Inverse exponential functions, Linear and semi log graphs.

2. Basic Physics, Electrostatics, Magnetism & Current Electricity

- a. Units & Dimension, Newton's Laws of Motion, Velocity & Speed, Force, Momentum etc.
- b. Coulomb's Law, Electric field & potential, Capacitance, Ohm's Law, Heating effect of current, Biot-Savart law, Definition of Tesla and Gauss, Magnetic field due to circular coil. Elementary Principles of-Magnetization of Materials by electric current, Electromagnets. Lorentz force. Magnetic flux. Electromagnetic induction, mutual and self-inductance. Transformer, Eddy current. Alternating Current, RMS and Average Current. Variation of Voltage and current in AC circuit consisting only Resistor, Only Induction and Only Capacitor. Power factor of the AC circuit. Instruments: Electrometer, Galvanometer, Ammeter, & Voltmeter.

Human Anatomy and Physiology: Basic and Applied

Radiographic Anatomy

Emphasis on plain and cross-sectional radiographic anatomy

- 1. Surface anatomy
- 2. Plain film / conventional radiographs
- 3. Mammography
- 4. Computed Tomography (CT)
- 5. Magnetic Resonance Imaging (MRI)
- 6. Ultrasound
- 7. Nuclear medicine
- 8. Digitally Reconstructed Radiographs (DRR)
- 9. Portal imaging

Oncology Science

- 1. Pathology- general pathology of tumours
- 2. Malignancies- local and general effects of tumours and its spread
- 3. Carcinogenesis
- 4. Co-morbidities
- 5. Etiology and epidemiology
- 6. Genetics
- 7. Prevention
- 8. Early detection

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9. Signs and symptoms
10. Public awareness on early signs and symptoms
11. High risk groups
12. Staging of tumours

Principles of Radiation and Radiotherapy Techniques

1. Effects of various radiation on normal tissues and malignant tumor: Early and late reaction on Skin, Mucous membrane, GI tract, Genito urinary system, respiratory system, CNS
2. Application of radiotherapy in benign conditions
3. Application of radiotherapy in malignant condition
4. Single and multiple field techniques for all treatment sites (from Head to Feet) with appropriate immobilizing device(s).
5. Fix, Rotation, Arc and Skip therapy procedures.
6. Use of Rubber traction, POP, Orfit, Body Frame in treatment technique.
7. Evaluation of patient setup for simple techniques.
8. Use of Beam Modifying devices, such as wedges, Tissue compensators, Mid Line Block (MLB) in the treatment of respective sites.
9. Customized shielding blocks and its properties.
10. Asymmetric jaws
11. Motorized wedges
12. Simulation procedures including CT simulation

Radiation Quantities, Units and Detection/Measurement

1. Radioactivity, Flux, Fluence, Kerma, Exposure, Absorbed Dose, Equivalent Dose, Weighting Factors, Effective Dose, Natural Background Radiation, Occupational Exposure Limits, Dose limits to Public.
2. Detection and measurement of radiation - Ionisation of gases, Fluorescence and phosphorescence, Effect on photographic emulsion, Ionisation chambers, Proportional Counters, G.M. Counters, Scintillation Detectors, Liquid scintillator, Pocket Dosimeters, TL Dosimeters and their use in personnel monitoring badges. Advantages and disadvantages of various detectors, appropriateness of different types of detectors for different types of radiation measurement.

Basic Radiation physics

1. Atomic Structure, Nucleus, Atomic No., Mass No., Electron orbit and energy levels, Isotopes and isobars, Radioactivity, Radioactive decay, Half-life, Particle radiation, Electromagnetic Radiation, Production of X-rays, Continuous X-ray spectrum, Bremsstrahlung radiation Characteristic X-rays, Filters, Quality of X-rays, Effect of voltage and current on the intensity of X-rays, Properties of X-rays.

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2. Interaction of Radiation with Matter: Photoelectric effect, Compton Effect, Pair production, Ionisation of matter, Energy absorbed from X-rays, X-rays Scattering, X- rays transmission through the medium, linear and mass attenuation coefficient, HVT and TVT, Interaction of charged particle and neutrons with matter.

Radiotherapy Equipment

1. Brachytherapy- Design features, Radiation sources, Technique, High dose-rate (HDR), Low dose- rate (LDR), Pulsed dose-rate (PDR), various types of applicators.
2. Teletherapy Machines & Accessories:
 - Telecobalt Machines
 - Medical linear accelerators.
 - Tomotherapy
 - Machine properties.
 - Beam directing, modifying and defining devices.
 - Other accessories.

Radiation safety

- Radiation Hazard evaluation and control
- Radiation Emergency Preparedness
- Regulatory requirements

Patient care, positioning and immobilization

1. Principles of positioning and immobilization
 - Positioning aids-Breast boards, Lung boards, Belly boards, Head-and-neck fixation devices, Vacuum packs, Stereotactic systems
 - Internal organ motion control- Bite blocks, Gating systems, Active breathing control, Diaphragm compression, Prostate immobilization, Tracking systems. Laser/positioning systems
 - Marking systems
 - Isocentre determination
 - Reference points
 - Treatment couch
 - Image acquisition for planning (and/or verification)
 - Modalities for image acquisition for planning
 - Simulation- Conventional Simulation, CT Simulation, Virtual Simulation
 - Image processing and archiving
 - Treatment verification
 - Protocols- Imaging protocols: development and implementation, Non-action levels (NAL), On-line/off-line corrections, Matching/co-registration procedures, Geometric uncertainties, Documentation, Adaptive radiotherapy

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Radiotherapy Equipment

- Familiarization with treatment planning systems-external beam planning and brachytherapy
- Various types of phantoms including the water-phantoms, RFA
- Various types of dosimeters including in-vivo dosimeters
- EPID and other on-board imaging systems
- Record and Verify Systems, Oncology Information Systems, Image/Patient data archiving, storage and transfer.
- CT Simulator

Quality Assurance in Radiotherapy

Basic Radiotherapy Physics

Historical developments in Radiotherapy, Physical components of Telecobalt Unit / Linear Accelerator Unit/ Remote After Loading Brachytherapy Unit / Gamma Knife Unit / Simulator /Brachytherapy units and their descriptions, Various types of sources used in Radiotherapy and their properties, Physics of Photons, electrons, protons and neutrons in radiotherapy, Physical parameters of dosimetry such as Percentage Depth Dose, Tissue-Air Ratio, Tissue Maximum Ratio, Physics of Bolus and Phantom materials, Compensators, Wedges, Shielding Blocks, Patient immobilization devices, Port film, processing and development, Special techniques in Radiotherapy such as SRS, SRT, IMRT, IGRT and Tomotherapy.

Biological Effects of Radiation

The Cell, Effect of ionising radiation on Cell, Chromosomal aberration and its application for the biological dosimetry, Somatic effects and hereditary effects, stochastic and deterministic effects, Acute exposure and Chronic exposure, LD50/60. Role of RTT in managing the acute effects of radiation.

Clinical Radiobiology

- Cell kinetics
- Cell cycle control mechanisms
- Tumour biology
- The five 'R's of radiobiology
- Tissue structure and radiation effect
- The Linear Quadratic (LQ) model
- Tumour control probability (TCP), Normal Tissue Complications Probability (NTCP) models
- Acute and late side effects

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- Sensitizers/protectors/side effect reduction
- Fractionation
- Treatment combinations
- Treatment scheduling
- Mould Room /Motion Management Techniques

Mould room and motion management techniques are essential part of modern precision radiotherapy. An RTT has to be competent in designing various types of moulds for patient immobilization and applicator fixation (in brachytherapy) as well as in various motion management techniques:

- Historical evolution of the mould materials and techniques to make moulds
- Thermoplastic moulds
- Breath hold, motion reduction, tracking and gating techniques

Special RT Techniques and Recent advances

- Wedges-tissue compensator-irregular field-SSD&SAD technique-oblique field-are rotational and moving field
- Mantle field-irregular field-Hemi body irradiation-whole body irradiation-total body skin irradiation Special techniques in Radiation Therapy, (SRT) – Stereo tactic Radio surgery (SRS) –. Methods – BRW and CRW frames – angiographic localizer box – preparation of target sheets – Quality Assurance – Isocentric check – Treatment execution – care to be taken – check list.
- Conformal Radiotherapy: Principles of 3 D treatment.
- Recent developments in radiotherapy and treatment techniques

Radiological/Nuclear Medicine/Other Imaging Techniques in Radiotherapy Planning

- 2D (radiography, fluoroscopic, USG), 3D (CT, MRI) and functional (PET/SPECT) imaging and their application in radiotherapy planning
- Understand Gross Tumour Volume (GTV), Clinical Target Volume (CTV), Internal Target Volume (ITV), Planning Target Volume (PTV), Organs at Risk (OAR) delineation
- Conduct image fusion at the treatment machine console
- Do bony matching
- Do soft tissue matching for estimating the preliminary data for applying shifts
- Prepare documentation
- The RTT should understand the principles of: Four-dimensional (4D) planning and be familiarized with IMRT and IGRT planning.

Radiotherapy treatment delivery

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- Orthovoltage / superficial
- Supervoltage / Megavoltage
- Brachytherapy
- Stereotactic radiotherapy- Stereotactic radiosurgery, Stereotactic radiotherapy, Cranial Extra cranial (Stereotactic body radiotherapy SBRT), Total Body Irradiation (TBI), Total Skin Electron Irradiation (TSEI), Radiation therapy with neutrons, protons, and heavy ions

Operational Issues in Radiotherapy.

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Part – B (Core Subject)

Syllabus for the post of Clinical Psychologist

Advt. No KSSSCI/ER-16/15/2023-24

(Syllabus is only indicative. The questions can assess any aspect of knowledge, aptitude, attitude and practical skills, which is expected from a trained person to work efficiently at the advertised post)

- Systems and theories of psychology.
- Research and Statistics in psychology.
- Psychological Testing.
- Biological basis of behaviours.
- General psychology.
- Thinking language, Intelligence and creativity.
- Personality, motivation, emotion, stress and coping.
- Social psychology.
- Lifespan development or developmental psychology.
- Abnormal and Clinical psychology.
- Implication and therapy, case study.

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Part – B (Core Subject)

Syllabus for the post of Junior Engineer (Civil)

Advt. No KSSSCI/ER-16/16/2023-24

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Civil Engineering & Structural Engineering

Building Materials : Physical and Chemical properties, classification, standard tests, uses and manufacture/quarrying of materials e.g. building stones, silicate based materials, cement (Portland), asbestos products, timber and wood based products, laminates, bituminous materials, paints, varnishes.

Estimating, Costing and Valuation: estimate, glossary of technical terms, analysis of rates, methods and unit of measurement, Items of work – earthwork, Brick work (Modular & Traditional bricks), RCC work, Shuttering, Timber work, Painting, Flooring, Plastering. Boundary wall, Brick building, Water Tank, Septic tank, Bar bending schedule, Centre line method, Mid-section formula, Trapezoidal formula, Simpson's rule. Cost estimate of Septic tank, flexible pavements, Tube well, isolates and combined footings, Steel Truss, Piles and pile-caps. Valuation – Value and cost, scrap value, salvage value, assessed value, sinking fund, depreciation and obsolescence, methods of valuation.

Surveying : Principles of surveying, measurement of distance, chain surveying, working of prismatic compass, compass traversing, bearings, local attraction, plane table surveying, theodolite traversing, adjustment of theodolite, Levelling, Definition of terms used in levelling, contouring, curvature and refraction corrections, temporary and permanent adjustments of dumpy level, methods of contouring, uses of contour map, tachometric survey, curve setting, earth work calculation, advanced surveying equipment.

Soil Mechanics: Origin of soil, phase diagram, Definitions-void ratio, porosity, degree of saturation, water content, specific gravity of soil grains, unit weights, density index and interrelationship of different parameters, Grain size distribution curves and their uses. Index properties of soils, Atterberg's limits, ISI soil classification and plasticity chart. Permeability of soil, coefficient of permeability, determination of coefficient of permeability, Unconfined and confined aquifers, effective stress, quick sand, consolidation of soils, Principles of consolidation, degree of consolidation, pre-consolidation pressure,

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normally consolidated soil, e-log p curve, computation of ultimate settlement. Shear strength of soils, direct shear test, Vane shear test, Triaxial test. Soil compaction, Laboratory compaction test, Maximum dry density and optimum moisture content, earth pressure theories, active and passive earth pressures, Bearing capacity of soils, plate load test, standard penetration test.

Hydraulics: Fluid properties, hydrostatics, measurements of flow, Bernoulli's theorem and its

application, flow through pipes, flow in open channels, weirs, flumes, spillways, pumps and turbines.

Irrigation Engineering: Definition, necessity, benefits, 2II effects of irrigation, types and methods of irrigation, Hydrology – Measurement of rainfall, run off coefficient, rain gauge, losses from precipitation – evaporation, infiltration, etc. Water requirement of crops, duty, delta and base period, Kharif and Rabi Crops, Command area, Time factor, Crop ratio, Overlap allowance, Irrigation efficiencies. Different type of canals, types of canal irrigation, loss of water in canals. Canal lining – types and advantages. Shallow and deep to wells, yield from a well. Weir and barrage, Failure of weirs and permeable foundation, Slit and Scour, Kennedy's theory of critical velocity. Lacey's theory of uniform flow. Definition of flood, causes and effects, methods of flood control, water logging, preventive measure. Land reclamation, Characteristics of affecting fertility of soils, purposes, methods, description of land and reclamation processes. Major irrigation projects in India.

Transportation Engineering: Highway Engineering – cross sectional elements, geometric design, types of pavements, pavement materials – aggregates and bitumen, different tests, Design of flexible and rigid pavements – Water Bound Macadam (WBM) and Wet Mix Macadam (WMM), Gravel Road, Bituminous construction, Rigid pavement joint, pavement maintenance, Highway drainage, Railway Engineering- Components of permanent way – sleepers, ballast, fixtures and fastening, track geometry, points and crossings, track junction, stations and yards. Traffic Engineering – Different traffic survey, speed-flow-density and their interrelationships, intersections and interchanges, traffic signals, traffic operation, traffic signs and markings, road safety.

Environmental Engineering: Quality of water, source of water supply, purification of water, distribution of water, need of sanitation, sewerage systems, circular sewer, oval sewer, sewer appurtenances, sewage treatments. Surface water drainage. Solid waste management – types, effects, engineered management system. Air pollution – pollutants, causes, effects, control. Noise pollution –cause, health effects, control.

Structural Engineering

Theory of structures: Elasticity constants, types of beams – determinate and

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indeterminate, bending moment and shear force diagrams of simply supported, cantilever and over hanging beams. Moment of area and moment of inertia for rectangular & circular sections, bending moment and shear stress for tee, channel and compound sections, chimneys, dams and retaining walls, eccentric loads, slope deflection of simply supported and cantilever beams, critical load and columns, Torsion of circular section.

Concrete Technology: Properties, Advantages and uses of concrete, cement aggregates, importance of water quality, water cement ratio, workability, mix design, storage, batching, mixing, placement, compaction, finishing and curing of concrete, quality control of concrete, hot weather and cold weather concreting, repair and maintenance of concrete structures.

RCC Design: RCC beams-flexural strength, shear strength, bond strength, design of singly reinforced and double reinforced beams, cantilever beams. T-beams, lintels. One way and two way slabs, isolated footings. Reinforced brick works, columns, staircases, retaining wall, water tanks (RCC design questions may be based on both Limit State and Working Stress methods).

Steel Design: Steel design and construction of steel columns, beams roof trusses plate girders.

Fluid Statics : Pressure at a point.

Measurement of Fluid Pressure : Manometers, U-tube, Inclined tube.

Fluid Kinematics : Stream line, laminar & turbulent flow, external & internal flow, continuity equation.

Dynamics of ideal fluids : Bernoulli's equation, Total head; Velocity head; Pressure head; Application of Bernoulli's equation.

Measurement of Flow rate Basic Principles : Venturi meter, Pilot tube, Orifice meter.

Hydraulic Turbines : Classifications, Principles.

Centrifugal Pumps : Classifications, Principles, Performance.

Classification of Steels : mild steel & alloy steel, Heat treatment of steel, Welding – Arc Welding, Gas Welding, Resistance Welding, Special Welding Techniques i.e. TIG, MIG, etc. (Brazing & Soldering), Welding Defects & Testing; NDT, Foundry & Casting – methods, defects, different casting processes, Forging, Extrusion, etc, Metal cutting

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principles, cutting tools, Basic Principles of machining with (i) Lathe (ii) Milling (iii) Drilling (iv) Shaping (v) Grinding, Machines, tools & manufacturing processes.

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Part – B (Core Subject)

Syllabus for the post of Junior Engineer (Electrical)

Advt. No KSSSCI/ER-16/17/2023-24

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Electrical Engineering:

- **Basic concepts:** Concepts of resistance, inductance, capacitance, and various factors affecting them. Concepts of current, voltage, power, energy and their units.
- **Circuit law:** Kirchhoffs law, Simple Circuit solution using network theorems.
- **Magnetic Circuit:** Concepts of flux, mmf, reluctance, Different kinds of magnetic materials, Magnetic calculations for conductors of different configuration e.g. straight, circular, solenoidal, etc. Electromagnetic induction, self and mutual induction.
- **AC Fundamentals:** Instantaneous, peak, R.M.S. and average values of alternating waves, Representation of sinusoidal wave form, simple series and parallel AC Circuits consisting of R.L. and C, Resonance, Tank Circuit. Poly Phase system–star and delta connection, 3 phase power, DC and sinusoidal response of R-L and R-C circuit.
- **Measurement and measuring instruments:** Measurement of power (1 phase and 3 phase, both active and reactive) and energy, 2 wattmeter method of 3 phase power measurement. Measurement of frequency and phase angle. Ammeter and voltmeter (both moving coil and moving iron type), extension of range wattmeter, Multimeters, Megger, Energy meter AC Bridges. Use of CRO, Signal Generator, CT, PT and their uses. Earth Fault detection.
- **Electrical Machines:** (a) D.C. Machine–Construction, Basic Principles of D.C. motors and generators, their characteristics, speed control and starting of D.C. Motors. Method of braking motor, Losses and efficiency of D.C. Machines. (b) 1 phase and 3 phase transformers–Construction, Principles of operation, equivalent circuit, voltage regulation, O.C. and S.C. Tests, Losses and efficiency. Effect of voltage, frequency and wave form on losses. Parallel operation of 1 phase /3 phase transformers. Auto transformers. (c) 3 phase induction motors, rotating magnetic field, principle of operation, equivalent circuit, torque-speed characteristics, starting and speed control of 3 phase induction motors. Methods of braking, effect of voltage and frequency variation on torque speed characteristics. Fractional Kilowatt

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Motors and Single Phase

- **Induction Motors:** Characteristics and applications. Synchronous Machines-Generation of 3-phase e.m.f. armature reaction, voltage regulation, parallel operation of two alternators, synchronizing, control of active and reactive power. Starting and applications of synchronous motors. Generation, Transmission and Distribution-Different types of power stations, Load factor, diversity factor, demand factor, cost of generation, interconnection of power stations. Power factor improvement, various types of tariffs, types of faults, short circuit current for symmetrical faults. Switchgears-rating of circuit breakers, Principles of arc extinction by oil and air, H.R.C. Fuses, Protection against earth leakage / over current, etc. Buchholtz relay, Merz-Price system of protection of generators & transformers, protection of feeders and bus bars. Lightning arresters, various transmission and distribution system, comparison of conductor materials, efficiency of different system. Cable Different type of cables, cable rating and derating factor.
- **Estimation and costing:** Estimation of lighting scheme, electric installation of machines and relevant IE rules. Earthing practices and IE Rules.
- **Utilization of Electrical Energy:** Illumination, Electric heating, Electric welding, Electroplating, Electric drives and motors.
- **Basic Electronics:** Working of various electronic devices e.g. P N Junction diodes, Transistors (NPN and PNP type), BJT and JFET. Simple circuits using these devices.

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Part – B (Core Subject)

Syllabus for the post of Nursing Officer

Advt. No KSSSCI/ER-16/18/2023-24

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- **Basic Sciences**

1. Anatomical and Biochemical structures to explain the physiological functions on human body and factors. Which may disturb these and mechanism of such disturbances.
2. Various groups of micro-organisms of clinical importance.
3. Disinfection and Sterilization for the prevention of diseases in the Hospital and Community.
4. Collect and handle specimens of various diagnostic tests.
5. Enumerate weights and measures and demonstrate skill in calculation of dosage and preparation of solutions.
6. Read and Interpret prescriptions and care for drugs according to the regulations.
7. Describe various groups of Drugs acting on different systems of the body.
8. Recognize the toxic symptoms related to common drugs and poisons.

- **Nutrition & Dietetics**

1. Various Nutrients and their importance in the maintenance of health.
2. Plan diets suitable to socio economic status for different age groups and physiological conditions.
3. Nutritional deficiencies and their prevention and management.
4. Plan therapeutic diets for various disease conditions.

- **Psychology, Mental Health & Psychiatric Nursing**

1. Normal and deviations in behavior among various age groups and their cause.
2. Explain the principles of psychology and its application in health and diseases.

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3. Interpret behavior of self and others.
4. Recognize deviations from normal behavior and provide guidance and counseling.
5. Dynamics of patient's behavior and its application in providing nursing care.
6. Communication and maintain interpersonal relations.
7. Therapies utilized in psychiatry and the various roles of nurses in psychiatric nursing.

- **Fundamental Nursing**

1. Describe Nursing as a profession, its scope, etiquettes & ethics.
2. First aid Treatments.
3. Congenital and Safe Environment to the patient.
4. Carry out basic nursing procedures for the care of the patients with an understanding of the scientific principles involved.
5. Make observations and records
6. Administer prescribed medications and carry out treatments.
7. Maintain records of patients and nursing care.

- **Community Health Nursing**

1. Personal, environmental, Social and cultural factors contributing to health of individual, family and community.
2. Methods of control of spread of diseases.
3. Needs for health education and evaluate the effect of the same to patients, families and community.
4. Prepare and use appropriate audio-visual aids for imparting health education.
5. Symptoms of social disorganization and social pathology.
6. Demonstrate skills in medico-social work.
7. Principles of health care to mothers and children and the services available for them in urban and rural communities.
8. Deviations from normal amongst mother and children and take necessary action in clinics, health centres and homes.
9. Educate the community about need and methods of Family Planning.
10. Demonstrate skill in community diagnosis and in delivery of community nursing services in accordance with the national health care system.

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Email: executiveregistrar.ksssci@gmail.com

- **Medical & Surgical Nursing**

1. Causes, pathophysiology, symptoms, treatment and prophylactic measures in common medical and surgical conditions affecting various systems of the body.
2. Provide patient centered nursing care in patients with common medical and surgical conditions affecting various systems of the body.
3. Prepare operation theatre for surgery and assist in operative procedure.
4. Identify common equipment used in operation theatre.
5. Explain the anesthesia used, with their effects and dangers, and care for an anesthetized patient until such time as he recovers from the effect of anesthesia.
6. Recognize and provide first aid in case of common emergencies using the resuscitation equipment including intubation.
7. Care of critically ill patients who required support for maintaining vital functions.
8. Provide first aid in case of disaster, emergency and accidents and demonstrate skill in transporting the casualties.
9. Organize casualty emergency services.
10. Explain Infectious diseases, their transmission and barrier nursing in hospital and community.

- **Pediatric Nursing**

1. Describe Growth and development, nutritional and psychological needs of children at different age group.
2. Explain basic principles involved in pediatric nursing.
3. Provide nursing management to neonates and children with medical and surgical disorders.
4. Recognize emergencies in neonates and children and take appropriate first aid measures.
5. Manage normal newborn and low birth weight baby.
6. Describe various aspects of preventive pediatric nursing and be able to practice them while nursing care in a hospital or community.

- **Obstetrical Nursing**

1. Anatomy & Physiology of pregnancy, child birth and puerperium.

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2. Antenatal care to mothers.
 3. Episiotomy and suture a first and second-degree tear.
 4. Domiciliary services to mothers and children.
 5. Management of common obstetrical emergencies needing immediate treatment.
 6. Family welfare advice.
-
- **Principles of Administration and Supervision, Education and Trends in Nursing**
 1. Principles of administration and its application to health administration at different levels.
 2. Organizational pattern for nursing components of hospital and public health service.
 3. Effective human relations to improve efficiency of the staff.
 4. Principles of supervision and develop skill in supervisory techniques.
 5. Trends in Nursing and nursing education in India and Abroad.
 6. Nursing as a profession and the rights, responsibilities and adjustment in professional life.
 7. Methods of teaching applicable to nursing.

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Part – B (Core Subject)

Syllabus for the post of Technician (Dialysis)

Advt. No KSSSCI/ER-16/19/2023-24

(Syllabus is only indicative. The questions can assess any aspect of knowledge, aptitude, attitude and practical skills, which is expected from a trained person to work efficiently at the advertised post)

Anatomy: Introduction to the body as a whole – Definition of anatomy and its divisions. Terms of location, positions and planes /Cell / Tissue/ Muscles / Skeleton/ Bone Anatomy of head and Neck / Thorax / Abdomen / Genitourinary system / Endocrine System.

Physiology: Blood / Blood cells /Lymph / Plasma / Serum Proteins/ Clotting factors / blood bank and transfusion / Anaemias Muscle nerve physiology / respiratory physiology /Cardiovascular physiology / Digestive physiology / Endocrine system /Sensory organs / Excretory System / Skin Urine examination / Reproductive System.

Biochemistry: Carbohydrates / Protein /Fat metabolism Glucose and Glycogen Metabolism/ Classification of enzymes / Vitamins & Minerals: Fat soluble vitamins (A, D, E, K), water soluble vitamins / Acids and bases Definition, pH, Henderson – Hassel Balch equation, Buffers, Indicators, Normality.

Pharmacology:

- IV fluid therapy
- Diuretics: classification, actions, dosage, side effects & contraindications.
- Anti-hypertensives: classification, actions, dosage, side effects & contraindications, special reference during dialysis, vasopressors, drugs used in hypotension.
- Drugs & dialysis: dose & duration of administration of drugs.
- Dialyzable drugs:
- Vitamin D & its analogues, phosphate binders, iron, folic acid & other vitamins of therapeutic value.
- Iron
- Use of Iron therapy in dialysis; its metabolism, role in RBC formation and anemia; forms of iron therapy; indications for use; available forms and dosages
- Erythropoietin in detail.
- Heparin, low molecular weight heparin
- Alternative anticoagulants.
- Formalin, citrate, sodium hypochlorite, hydrogen peroxide: role as disinfectants

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- & adverse effects of residual particles applicable to formalin.
- Hemodialysis concentrates: composition & dilution (acetate & bicarbonates).
- Peritoneal dialysis fluid in particular hypertonic solutions: composition.
- Potassium exchange resins with special emphasis on mode of administration

Introduction to Kidney diseases: Assessment and Diagnostic studies of the Urinary system - Physical assessment of a person with kidney disease, basics of assessment, list various diagnostic tests done for kidney diseases, laboratory tests, imaging studies, normal values, interpretation of the tests including the roles and responsibilities of a technologist.

- Congenital abnormalities of urinary system.
- Classification of renal diseases.
- Glomerular diseases: Definition, etiology, pathophysiology of each type, medical and surgical management.
- Tubulo-interstitial diseases - Definition, etiology, pathophysiology of each type, medical and surgical management.
- Acute Kidney Injury - Definition, etiology, pathophysiology of each type, medical and surgical management
- Renal vascular disorders - Definition, etiology, pathophysiology of each type, medical and surgical management
- End stage renal diseases: Definition, etiology, pathophysiology, medical and surgical management

Principles and practice of Dialysis

- Indications of dialysis.
- History & types of dialysis.
- Dialysis Team – rights, responsibilities, patient-doctor relationship, responsibilities of a technologist, nurse and doctor in the dialysis setting; building effective working relationships; conflict management
- Principle of hemodialysis: diffusion, osmosis, ultra-filtration & solvent drag.
- Hemodialysis apparatus: types of dialyzer & membrane, dialysate. Dialysis Membrane:
 - Structure,
 - Characteristics [molecular weight cut off; Ultra filtration coefficient (Kuf); Mass transfer coefficient (KoA) and efficiency; Low and high flux; Clearance(K)
 - Biocompatibility
 - Newer membranes.
 - High performance membranes.
- Physiology of peritoneal dialysis.
- Dialysis machines.
 - Latest Hemodialysis machine:
 - Conventional and Portable Machines
 - Wearable artificial Kidney

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- The Bioartificial Kidney
- Home dialysis machines and patient training Mechanism of functioning & management:

Hemodialysis machine Peritoneal dialysis machine.

- Biochemical investigations required for renal dialysis.
- Adequacy of dialysis Hemodialysis. Peritoneal dialysis.
- Peritoneal equilibration test (PET). CRRT
- Anti-coagulation during dialysis
- Withdrawal of dialysis criteria
- Dialyzer reuse.
- Water treatment system, Dialysate delivery system, Composition of dialysis
- Vascular Access – Temporary & Permanent

Types of vascular access – Fistulae, Grafts, Catheters; pre-dialysis assessments for all types of vascular access; methods of needle insertion for AVFs and grafts; pre-dialysis assessment, accessing procedure, exit site care, and monitoring of catheters; understanding the role of a vascular access coordinator

- High flux / high efficiency dialysis

Definition of high flux / high efficiency dialysis, differences between high flux dialysis and hemodialysis, uses and indications for high flux dialysis, complications of high flux dialysis, precautions and contraindications, care during a high flux dialysis

- Computer applications in Dialysis
- Continuous Renal Replacement Therapy / Slow Low Efficiency Dialysis/ Other dialysis related therapies.

Definition, indications, uses, method of initiation of dialysis, contraindications of therapy; complications of therapy and ways to prevent complications

- Complications in dialysis patients
- Dialysis in Neonates, infants & children : Special considerations
- Renal data maintenance: maintenance of records and report; medico-legal aspects
- Infection control and sterilization techniques: Principles and practice of biomedical waste management
- Introduction to Kidney Transplantation:

Comprehending recipient evaluation, understanding pre-transplant care of patients on dialysis, understanding the role of a coordinator in kidney transplantation

- Prevention of Renal Disease: Methodologies.

Preparation and positioning of patient for dialysis

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- Patient Assessment – Pre, intra & post dialysis & Machine and patient monitoring during Hemodialysis Dialysate - Dialyzer and Bloodlines - Initiation of dialysis - Removing fluid- Replacing fluid - Drawing blood samples - Testing blood samples. Measuring dialysis adequately: Urea reduction ratio - Urea Kinetic Modeling. Pre – dialysis and post dialysis - BUN Measurement. Clinical complications - Technical Complications, Recording of the Treatment, recording changes in Patient's condition, Preparation of status and progress reports, Equipment clean up and Maintenance, Recording the dialysis procedure on the medical report/chart of the patient
- Lab data analysis Tests done for a patient on Hemodialysis, interpretation of tests and normal values.
- Acute and chronic dialysis prescription
- Medications in dialysis patients.
- Anticoagulation
- Hemodialysis machine specific technology
- Repair techniques and procedures, fault diagnostics, computer aided maintenance and planned preventative maintenance.
- Complications of Hemodialysis– Acute & chronic
- Peritoneal Dialysis
- Acute and Chronic Peritoneal Dialysis. History, access, physiology of Peritoneal Dialysis.
- Infection control and universal precautions
- Psychosocial aspects & patient education
- Recent advances in Nephrology
- ISO RO water standard for hemodialysis, Wearable Artificial Kidney, Novel markers of AKI, Current Research in Dialysis, ABO incompatible transplantation, Online Hemodiafiltration, Online Hemofiltration, Online Hemodialysis, Extracorporeal Therapies in Special Situations
- Nutrition management in dialysis patients

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Part – B (Core Subject)

Syllabus for the post of Nuclear Medicine Technologist)

Advt. No KSSSCI/ER-16/20/2023-24

(Syllabus is only indicative. The questions can assess any aspect of knowledge, aptitude, attitude and practical skills, which is expected from a trained person to work efficiently at the advertised post)

- Human anatomy including Nervous System, skeletal system, circulatory system, respiratory system, digestive system, excretory system, endocrine system and reproductive system.
- Human Physiology including Cell structure, Hematology, Reticule endothelial system, Nervous System, skeletal system, circulatory system, respiratory system, digestive system, excretory system, endocrine system and reproductive system, Blood and Environmental Physiology.

HOSPITAL PRACTICE AND PATIENT CARE

1. Patient: As an individual, the reactions of patient and his family to illness.
 - a) Qualities – Professional and Ethical behavior expected
 - b) Role and responsibilities of a laboratory technician in the health team
2. Hospital staffing and organization.
3. Inter personal relations and communications.
4. PATIENTS RECORDS AND REPORTS AND LEGAL IMPLICATIONS CARE OF THE PATIENT:
 - a) Maintaining therapeutic environment
 - i. Temperature
 - ii. Lighting
 - iii. Noise and humidity
 - iv. Cleanliness
 - b) Psycho – social environment -Meaning and its importance.
5. BASIC CARE NEEDS OF THE PATIENT
 - i. Hygiene needs
 - ii. Physical Comforts
6. CARE OF THE PATIENT:
 - i. Vital signs: Temperature, pulse, respiration and
 - ii. Blood pressure: Normal and abnormal factors causing the variation
 - iii. Gastric lavage, Nasogastric aspiration

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7. FIRST AID
8. PRINCIPLES OF ASEPSIS: STERILISATION:
 - i. Methods of sterilization. Use of central Sterilization department.
 - ii. Care and identification of instruments.
9. DRUGS IN THE DEPARTMENT: Storage, classification, Labeling and checking, regulations regarding dangerous and other drugs, units of measurement.
10. CHEMICALS USED IN LABORATORY
11. INSTRUMENTS USED IN VARIOUS SECTIONS: Microscope, Colorimeter, Cell counter, Auto Analyzer, Flame, Photometer, Autoclave, Hot air oven Incubator, Centrifuge.
12. LABORATORY PRINCIPLES: General Laboratory techniques and procedures. Specimen collection and processing. Basic Chemistry Concepts of Molecular Weight, Atomic Weight, Normality, Molarity, standards, Acids, bases, salts. Concepts of acid base reactions and hydrogen ion concentration.

BASIC BIOCHEMISTRY

Sr. No.	Topics
1.	Carbohydrates: Glucose; fructose; galactose; lactose; sucrose; starch and glycogen (properties and tests, Structure and function)
2.	Proteins: Amino acids, peptides, and proteins (general properties & tests with a few examples like glycine, tryptophan, glutathione, albumin, hemoglobin, collagen)
3.	Lipids: Fatty acids, saturated and unsaturated, cholesterol and triacylglycerol, phospholipids and plasma membrane
4.	Vitamins: General with emphasis on A, B2, C, E and inositol (requirements, assimilation and properties)
5.	Minerals: Na, K, Ca, P, Fe, Cu and Se.(requirements, availability and properties)

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Sr. No.	Topics
1.	Hormones and their receptors basic concepts in metabolic regulation with example, insulin, glucagons and thyroxine.
2.	Metabolism General whole body metabolism (carbohydrates, proteins, liquids)
3.	Clinical Biochemistry Blood sugar, urea, creatinine and Bilirubin, Cholesterol etc and significance of their estimation.

Basics of computer and image hard copies production in Nuclear Medicine, including X-Ray film image processing techniques.

Types of nuclear medicine image e.g. static image, dynamic, list mode, frame mode, gating, tomographic mode. Image and data processing: region of interest, time activity curve generation, effect of matrix size, pixel size, zooming and smoothing of image.

Nuclear Medicine image hard copies, glossy prints, paper prints etc., X-Ray films, types, basic film structure & quality, choosing films for different studies, film processing techniques: dry and wet processing, manual and automatic. Wet film, processing solutions. Film processing rooms, film processing equipment's.

Nuclear medicine physics

Basics Physics: Elementary introduction to structure of matter, elements, compounds and mixtures, molecules and atoms. Atomic & Nuclear structures, Atomic models, Periodic table, simple ideas of quantum mechanics, Mass energy equivalence, fluorescence, Phosphorescence, luminescence, electromagnetic spectrum. Electricity, Magnetism and Electro magnetic induction: Electricity in ionized gases-electric charges-electric induction- Coloumb law-unit of charge-resistance-ohms law-electric power-Joules law. Magnetism-magnetic properties-electromagnetic effect-electrical instruments like Voltmeter, Ammeter & Multimeter. Transformer, transistor, rectifier, pre amplifier, pulse amplifier, power supply, circuits. Filters and their types.

Radioactivity : Discovery of radioactivity, Natural & Artificial Radioactivity, Isotopes and nuclides, binding forces between nuclear particles, types of radiation, alpha, beta particles and gamma radiation.

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Mechanisms of radioactive decay, physical, biological and effective half life. Interaction of X-rays & γ -rays with matter - Radiation intensity & exposure - radiation dose - Radiation quality – law of exponential attenuation – half value thickness, tenth value thickness – linear attenuation coefficient – Scattering – photoelectric effect – Compton-scattering – pair production – particle interactions – total attenuation coefficient- relative clinical importance.

Physics of Nuclear Medicine Instrumentation

Radiation detectors: Construction and Principles of Operation – Ionization Chamber – Isotope calibrator – Proportional Counter – Geiger muller counter – Voltage calibration of a Geiger Mueller tube, optimum operating condition – Dead time correction – Uses of Gas – filled detectors – Semiconductor detectors.

Scintillation detector: Thallium activated Sodium Iodide crystal – Photo multiplier tube, electron multiplication, high voltage supply, Shielding, collimators, field of view. Well counter – construction, design of shielding. Signal output, Pre-amplifier – reasons for use – Voltage amplifier – liquid scintillation detector.

Spectrometer: Basic principles of Pulse – height analyzer single channel and Multi – channel analyzers. Optimum operating conditions, window settings – Determination of gamma energy spectrum, Integral and differential counting. Spectra of commonly used radio nuclides e.g I131, Tc99, Cr51, Cs137. Problems in radiation measurements with worked examples

Computerized Tomography: Basic principle of Computed Tomography, Generations of CT. X-ray tube, Filters, Collimators, CT detectors, Data Acquisition System (DAS), CT Image Quality, CT Dose Vs image quality. Image Formation in CT, Image Reconstruction, Hounsfield Unit, Windowing, image display, CT artifacts. Helical CT scan: Slip ring technology, Advantages, Multi Detector CT, Cone- beam geometry, Reconstruction of helical CT images, CT Fluoroscopy, HRCT,

Post Processing Techniques: MPR, MIP, Min IP, 3D rendering: SSD and VR. Contrast material, contrast reaction, contrast material doses and route of administration. Whole body CT acquisition.

Basic Radiation Physics

Atomic structure, atomic number, mass number, isotopes, radioisotopes, radioactivity, specific activity, types of radioactive disintegrations, electron capture, characteristics of alpha, beta and gamma rays, energy ionizing radiation, half-life (Physical, Biological), effective half life, isomeric transitions, secular, transient and no-equilibrium, production of radioisotopes

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and X-rays (characteristic and Bremsstrahlung), neutron sources.

Interaction of Radiation with Matter

Interaction of charged particulars with matter, interaction of neutrons with matter, range of charged particles, interaction of photons with matter (photoelectric, Compton and pair production), absorption and attenuation of photons, Half Value Thickness (HVT) and Tenth Value Thickness(TVT).

Radiation Quantities and Units

Radiation Detection

Principal of radiation detection, gas detector (ionizing chamber, proportional counter and GM counter), solid state detector (scintillator, semiconductor and Thermoluminescent Dosimeter {TLD}), liquid scintillation counting systems, radiation monitoring instruments, personnel monitoring, area monitoring, environmental monitoring, direct reading devices, calibration and response of radiation monitoring instruments.

RADIOPHARMACY

Basic principles involving the radio chemical reactions regarding the binding efficiencies and the working principles of various isotope generators used in Nuclear Medicine department.

Basics of radiation chemistry:

(a) Atomic and molecular structure (b) Bonding: Electrovalent, covalent, Dative covalent bond and hydrogen bonds (c) Valency, Atomic wt., - Molecular wt -Normality and molarity of solution, (d) Acids and Bases - Hydrogen Ion concentration - pH value - The role of pH in the preparations of radiopharmaceuticals -(e) chemical reaction - solute - Solvents - Solubility - crystallization - (f) The chemical elements which are necessary for life (carbon - Hydrogen, oxygen and nitrogen, Phosphorous, Iron etc.). (g) Fundamental chemistry of carbohydrates and carbonyl groups (h) - Oxidation and Reduction (i) proteins and amino acids. Lipids and profiles. Enzymes - vitamins, Hormones.

(b) Basic in Laboratory Techniques

(i) Laboratory glassware (ii) Washing and autoclaving of glassware for the use in Radio-pharmacy areas

(iii) Correct use of Pipettes, Balance, Centrifuge, gloves, syringes, vacuum vials, saline bottles, elution vials etc. (iv) hot lab tools for safe handling of active vials and syringes.

Isotope generators: Production of radio nuclides by artificial methods (b) Accelerator produced radio nuclide (c) Nuclear reactor produced radio nuclides, construction and Principles of generator systems - Ion Exchange system - Solvent extraction system - Parent - daughter relationship-growth of

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daughter product equilibrium with parent elements etc. Chemistry of Tc99m, Mo99-Tc99m generators Mo99 contamination check, Aluminum break through test etc (f) sterilization.

Radiopharmaceuticals: Principles of cold kits & lyophilisation, importance of lyophilisation in preparation of cold kits. Common pharmaceutical cold kits, contents, pharmacological properties, physiological principle in use of a particular cold kit, pediatric and adult doses, route of injection, route of excretion, radiation exposure, critical organ for DTPA, GHA, DMSA, MDP, macro aggregated albumin, sulphur colloid, MIBI, Tetrofosmin, Mebrofenin, etc. (c) Labeling procedure of cold kits with required radio isotopes, Quality control tests: RC purity, RN purity, sterility check, Chromatography (Various methods) pyrogen test, bio distribution studies.

Tracer methods - Behavior of radioactive tracers in biological process - characteristics of radio pharmaceuticals - Half life - (Physical and Biological)

Dispensing of radio pharmaceuticals - Specific activity, Tracer dose preparation - Tracer dose administration etc.

RADIATION BIOLOGY RADIATION SAFETY

Operational Limits Introduction to natural background radiation, concept of occupational risk, philosophy of radiation protection, system of dose limitation, ALARA, dose limits to radiation workers and general public, AERB/CRP/ national regulatory guidelines, dose constraints for comforters of patients.

Radiation Hazard Evaluation and Control

Radiation Accidents, Case Studies and Lessons Learned

Radiation accidents involving radioisotopes, orphan and vulnerable sources, handling of emergency situations resulting from spillage of radiopharmaceuticals / liquid radioisotopes, misadministration of radiopharmaceuticals and its consequences, general methods of prevention of accidents, loss of radioisotope, fire accidents and explosions; follow up actions through emergency response plans, case studies and mitigation, lessons learned.

Nuclear Medicine Techniques and procedures

TECHNIQUES

1. Ordering nuclear medicine procedure

- Preparation of the patients before the procedure
- Care of Patients During the Nuclear Medicine Procedure
- Care to be taken during the cardiac studies in the NM department
- Preparation of the radioactive tracer for the study

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- Preparation with resuscitation
- Specimen collection in a safe manner.

PROCEDURES

1. Diagnostic – In vitro techniques: Principles of Radio immunoassays (RIA) standard curve, data analysis, Quality Control (QC) and applications, Methods of receptor assays, hormones, drugs. IRMA Immuno-radiometric assay, ELISA, RIA, estimation, T3, T4, TSH, thyroid antibodies, and current applications using similar techniques.
2. In Vivo Techniques: Non imaging procedures.

Imaging considerations related to organs such as thyroid/ Parathyroid / Skeletal system /Respiratory System/ Cardiovascular system / Urinary Tract/ GIT / Liver and Hepatobiliary system.

Basic principle of SPECT, SPECT data acquisition, SPECT reconstruction, use of filters in SPECT data processing, software based/ CT based attenuation correction, SPECT CT / PET CT imaging, construction and principle of PET Scanner, PET scanner crystals, co-incidence circuit, attenuation correction techniques of PET images, PET image reconstruction, PET CT image QC, principle of MRI, PET MRI fusion imaging.

Nuclear Medicine probes: Thyroid probe, sentinel lymph node probe, H pylori probe, construction and principle of function.

Newer Computer applications in Nuclear Medicine, DICOM image format, PACS, LAN. Radiation Dosimetry:

Compartmental Model – in-vivo dosimetry using classical dosimetry mechanism, beta dosimetry, gamma dosimetry, geometrical factor, dosimetry of low energy electromagnetic radiation, MIRD formulation – cumulated activity, equilibrium absorbed dose constant, absorption factor, specific absorbed fraction and the dose reciprocity thereon, mean dose per cumulated activity, limitation of MIRD method; extremity dosimetry.

Quality Assurance of Nuclear Medicine equipment's Flood check – Techniques and methods

Record Keeping and Equipment maintenance Radiopharmaceutical preparation and QC of given test:

Lymphoscintigraphy, infection imaging, MUGA scan, brain SPECT and cardiac SPECT etc. Recent advances in SPECT and PET radiopharmaceuticals: DAT scan, newer cardiac SPECT and PET imaging procedures, 18 F FDG, 18 F Sodium fluoride in conventional and molecular imaging for oncology patients. Ultra short and short lived radionuclide

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(उत्तर प्रदेश सरकार का स्वायत्तशासी संस्थान)

Email: executiveregistrar.ksssci@gmail.com

generators.

RADIATION BIOLOGY: Principles

RADIATION SAFETY: Radionuclide Therapy - Radiation Safety Aspects /

Emergency Response Plans and Preparedness

Transport and Disposal of Radioactive Waste

Planning of Nuclear Medicine (NM) Laboratories / Regulatory Aspects for
Nuclear Medicine Laboratories.

Kalyan Singh Super Specialty Cancer Institute

कल्याण सिंह अति विशिष्ट कैंसर संस्थान

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Part – B (Core Subject)

Syllabus for the post of OT Assistant)

Advt. No KSSSCI/ER-16/21/2023-24

(Syllabus is only indicative. The questions can assess any aspect of knowledge, aptitude, attitude and practical skills, which is expected from a trained person to work efficiently at the advertised post)

ANATOMY & PHYSIOLOGY

1. Elementary Physics & Chemistry
2. Characteristics of Living Matter
3. Structure of Living Matter
4. Anatomy and Physiology related to cardiovascular system, Nervous system, respiratory system, circulatory system, digestive system, hepatobiliary system, endocrine glands and exocrine glands, urinary system, reproductive system, musculoskeletal system

SURGICAL INSTRUMENTS AND PROCEDURES

(Including Sterilization and Disinfection, Different Methods, Protection of Patients in Surgery. Preparation of Patients)
Preoperative Consideration Psychological Support of the Surgical Patient
Protection of the Patient in Surgery

- Transfer Procedure Position
- Environmental Controls
- Electro Surgery
- Operative Records
- Counting Procedure
- Sterilization
- Emergencies & Disaster management

Surgical Instruments

- Instruments for General Surgery
- Operation of Face & Neck
- Operation of Nose, Throat and accessory Nasal Sinuses
- Ophthalmic Surgery
- Sinuses, Ear and Throat
- Operations on the Chest
- Operations on the Genito-Urinary Tract
- Gynaecological & Obstetric Operations
- Orthopedic Operations
- Neuro-Surgical Operations
- Operations on the Vascular System
- Radium Insertion

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➤ Traumatic Surgery

Surgical procedures

- Neck Surgery
- Breast Procedures
- Abdominal Extra intestinal Surgery
- Gastrointestinal Surgery
- Gynaecological and Obstetric Surgery
- Genito-Urinary Surgery

- Thoracic Procedures
- Cardiovascular Surgery
- Orthopedic Surgery
- Neurological Surgery
- Plastic Surgery
- Otorhinolaryngologic (ENT) Surgery
- Ophthalmic Surgery
- Pediatric Procedures

ANAESTHESIA

1. General anaesthesia

2. Regional anaesthesia

- Spinal
- Epidural
- Caudal
- Local
- Topical

3. Methods for preparation of the patients for anaesthesia

4. Pharmacology and clinical use of intravenous and inhalational anesthetic agents, opioids, NSAIDS, neuromuscular blocking agents, reversal agents, autonomic nervous system, local anesthesia agents.

5. Emergency resuscitation, ALS and BLS protocols

6. Emergency drugs

7. Vasopressor and inotropic drugs

8. Sterilisation & Maintenance of anesthesia equipment

9. Difficult airway management, laryngoscopes, bronchoscopes.

10. Instruments and tubes used in anesthesia practices

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**SURGICAL PROCEDURES AND MONITORING, OPERATION THEATRE ETHICS
DISCIPLINE, SAFETY FOR OPERATING ROOM PERSONNEL, PREPARATION OF
INSTRUMENTAL TRAYS**

- Surgical Procedures & Monitoring
- Safety for operation room personnel
- Preparation of Instrumental Trays eg: Gynaecological And Obstetric Trays, Genito-Urinary Tray, Cardiovascular trays, Orthopaedic tray. Neurologic Procedures Tray, Otorhinolaryngologic (ENT) Tray, Ophthalmic Trays, Paediatric Tray

(NOTE: EXAMINATION WILL BE CONDUCTED IN ENGLISH LANGUAGE ONLY)