Advertisement No. I-03/ 1 to 13/Rectt/2022-23

PART-A

The Common Recruitment Test (CRT) will be of 02 hours duration & will be of 100 marks. It will contain multiple choice questions (MCQs)

- 60 Marks from the core subject related to the post and of the level of the qualifications required.
- 10 Marks on General English.
- 10 Marks on general Knowledge.
- 10 Marks on Reasoning.
- 10 Marks on Mathematical Aptitude.

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, non verbal 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 scopwe of the test will be computation of whole numbers, decimals, fractions and relationship between numbers percentage, Ration & Proportion, Square roots, Averages, Intrest, Profit & Loss, Discount, Partnership, Elementry Surds, Graphs of Linear Equation, Triangle and its various kinds of centres, Congruence and similarity of triangles, Circle and its chords, tangents, angles substended 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 Parallelpiped, Regular right pyramid with triangular or square base, Trignometric ration, Degree and radian 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 thisa 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.

Syllabus for the Post of Perfusionist
(Advt No. I-/03/1/Rectt/2022-23)

Part - B

Core Subject

- General concepts of patient care and nursing
- Basics of human anatomy / physiology/ pathology/ microbiology / Biochemistry
- Basics of Central Sterilization Services
- Basics of Cardiopulmonary bypass, priming solutions, transducers, cannulation techniques, mechanics of pumps and oxygenators
- Effects on various organs during CPB and introduction to IABP (Intra-aortic balloon pump) and ECMO (Extra corporeal membrane oxygenation devices)
- Clinical Monitoring, problem detection and problem solving during bypass and understanding of complications.
- Basics of cardiac physiology, respiratory physiology in normal and diseased states, basics of ECG, fundamentals of Echocardiography, and Pulmonary function testing
- Knowledge about transfusion of blood and blood products and maintaining and monitoring anticoagulation during bypass.
- Applied Perfusion Technology, Introduction to Perfusion Technology, Perfusion Equipments, Biomedical Electronics

Syllabus for the Post of Junior Physiotherapist
(Advt No. I-/03/2/Rectt/2022-23)

Part - B

Core Subject

- Human Anatomy: Head and Neck / Chest /Abdomen / Upper and Lower Limbs / GenitoUrinary System Gastrointestinal System / Endocrine system
- Applied anatomy related to different systems
- Musculoskeletal system – Connective tissue & its modification, tendons, membranes, special connective tissue. Bone structure, blood supply, growth, ossification, and classification.
- Muscle classification, structure and functional aspect. Joints – classification, structures of joints, movements, range, limiting factors, stability, blood supply, nerve supply, dislocations and applied anatomy.
- Human Physiology related to CNS / Respiratory System. Cardiovascular System / Neuromuscular function
- Physiology of exercise
- Physiology of Acclimatization
- Fundamentals of Occupational Therapy
- Rehabilitation
- Occupational performance : Model Generalized & specific principles of therapeutic exercises
- Therapeutic modalities
- Principles & methods of testing range of motion & muscle strength. Testing methods of sensation, perception
- Coordination and muscle tone : relation to physiotherapy
- Human development and its Activities of daily living Occupational therapy as Diagnostic & prognostic procedure.
- Steps involved in preparing the client for return to work / Prevocational evaluation/ Evaluation of work capacity
- Evaluation of physical capacity/ Evaluation of functional capacity
- Different types of tools & equipments & their uses in Occupational Therapy
- Definition & classification of splints with their brief description, general principles of splinting and materials used.

Syllabus for Junior Occupational Therapist
(Advt No. I-/03/3/Rectt/2022-23)

Part - B

Core Subject

- Human Anatomy: Head and Neck / Chest /Abdomen / Upper and Lower Limbs / GenitoUrinary System Gastrointestinal System / Endocrine system
- Applied anatomy related to different systems
- Musculoskeletal system – Connective tissue & its modification, tendons, membranes, special connective tissue. Bone structure, blood supply, growth, ossification, and classification.
- Muscle classification, structure and functional aspect. Joints – classification, structures of joints, movements, range, limiting factors, stability, blood supply, nerve supply, dislocations and applied anatomy.
- Human Physiology related to CNS / Respiratory System. Cardiovascular System / Neuromuscular function
- Physiology of exercise
- Physiology of Acclimatization
- Fundamentals of Occupational Therapy
- History & development of Occupational Therapy
- Rehabilitation & specific principles of therapeutic exercises and Principles of Therapeutic modalities
- Principles & methods of testing range of motion & muscle strength. Testing methods of sensation, perception, coordination and muscle tone.
- Human development and its Activities of daily living Occupational therapy as Diagnostic & prognostic procedure.
- Steps involved in preparing the client for return to work / Prevocational evaluation/ Evaluation of work capacity
- Evaluation of physical capacity/ Evaluation of functional capacity
- Different types of tools & equipments & their uses in Occupational Therapy
- Define & classify splints with their brief description, state general principles of splinting, describe material used. Hand function & evaluation methods
- Physiology of Exercise & Work in relation to different organ functions

FUNDAMENTALS OF Occupational Therapy

1. History, Philosophy, Definition & Scope of O.T.
2. Theory of Occupation, Occupation as evolutionary Traits
    - Biological Dimension

- Social Dimension
- Psychological Dimension of Occupation
- Application of Theory to Occupational Therapy

3. Principles & techniques of Therapeutic Exercises and its relation with the development of appropriate therapeutic activities -
   - Classification
   - Techniques-Strength building Exs., Elasticity developing Exs., Coordination Exs. & activities
   - Specific & General Progression of Exs. & activities
   - Progressive Resistive Exs., Regressive Resistive Exs., Breathing Exs., Pelvic floor muscles Exs. & activities
   - Circuit Training
   - Prescription of Exs. & therapeutic activities
   - Principles & Application of Bio feedback in Occupational therapy
   - Yoga: Definition-History-Principles-Concepts, General effects of yoga posture on musculo skeletal system. Specific effects of individual yogic posture on musculo skeletal system. Yoga and Therapy - Rationale

DISABILITY PREVENTION AND REHABILITATION

1. Introduction
2. Definition concerned in the phases of disability process, explanation of its aims & principles, Scope of rehabilitation, (Impairment, Disability, Handicap)
3. Definition concerned with the causes of Impairment Functional limitation and Disability
4. Disability Prevention. Limitation & Rehabilitation.
5. Present Rehabilitation Services
6. Legislations for rehabilitation services for the Disabled, P.W.D.Act / Compensations and benefits available for disabled
7. Rehabilitation Team & its members, their role.
8. Contribution of Social Worker towards rehabilitation
9. Vocational evaluation & Goals for disabled, role of Vocational Counselor.
10. Principles of Communication & its problems: -
    - Speech Production
    - Communication disorders secondary to Brain Damage.
    - Aphasia & its treatment.
    - Evaluating Language.
    - Disarthria & its treatment
    - Non-Aphasic language disorders
11. Architectural barriers possible modifications in relation to different disabled conditions – namely Hemiplegia, Paraplegia, Amputees, Cerebral Palsy etc.
12. Community Health:

Introduction to community Health, Definition of Community and Health, Health Determinants

- Community and Rehabilitation – Definition, Concepts and Team , Community Health in relation to rural and urban health setup
- Community based rehabilitation Vs Institutional based rehabilitation – Merits and demerits
- Community Resources in rural and urban set up

Prosthesis and Orthosis

- Definition and Basic Principles
- Designing and Construction of Upper & Lower extremity Orthosis & Spinal Orthosis.
- Upper Extremity prosthesis: Prescription, fitting and checking
- Lower. Extremity prosthesis: Prescription, fitting and checking
- Prescription and design of footwear- & its modification
- Design and construction of adoptive devices
- Classification of Aids & Appliances
- Ambulatory Aids & Assistive Devices
- Measurement and P.O.P. cast techniques.
- Simple splint techniques
- Low cost thermo-labile material for construction of Orthosis.

Syllabus for the post of Dental Technician Gr.II

(Advt. I-/03/4/Rectt/2022-23)

Part - B

Core Subject

1. Applied Physics:

Specific gravity, density, properties of matter, including cohesion, capillarity, surface tension viscosity, elasticity, diffusion, and osmosis.
Heat: Temperature and its measurements Thermometers and Pyrometers. General account of expansion by heat of solids, liquids and gases, Thermostats, Pressure gas and hydraulic. Boyle's and Charles Laws. Unit of heat, thermal capacity and specific Heat, Change of State; Latent heat; Melting Point. Properties of vapours, conduction, convection and radiation.
Principles of electro-technology applied to dental work room, small motors, constructional features and characteristics, electric furnaces, heaters, thermostats, pyrometers, spot welders, electroplating, electroforming, and anodizing, Wiring regulations relating to low voltage supplies.

Exercises/ Demonstrations:

- Balance - weighing correctly to a milligram.
- Determination of specific gravity by the principle of Archimedes (Solids and liquids).
- Determination of surface tension of a liquid by capillary rise.
- Determination of Linear expansion of solids (level method).
- Determination of the specific heats of solids and liquids by the method of mixtures.
- Small motors-constructional features. and characteristics (Demonstration only)
- Determination of the electro-chemical - equivalent of copper.

2. Applied Mechanics:

Forces, Parallelogram and triangle of forces. Moments, Couples, Centre of gravity, Principles of lever and cantilever work, Energy; P-ower, Friction, Inclined plane, Screw Stress, Strain, Sheating Strain, Torsion, Bending movements, Strength. and stiffness of materials.

Exercises/Demonstrations:

- Verification of the parallelogram and triangle laws of forces.
- Inclined plane Determination of mechanical advantage.
- Determination of Young's Modulus by bending of beams.

3. Applied Chemistry:

Distinction between physical and chemical change; elements, mixtures, and compounds; composition of the atmosphere; Oxygen oxides, burning and rusting; water solvent properties and crystallization; action of water on metals; composition of water hydrogen; Laws of chemical combination; meaning of chemical symbols valency; simple chemical equations; acids, bases and salts.
Electrolysis, The ionic theory of solution. The electropotential series, electroplating, General characteristics of the metals including an elementary study of the common metals and their alloys with special reference to those used in the dental workroom.
Alcohol, ethers, aldehydes and ketones, fatty acids, and their more important derivatives, amines. Simple treatment of carbohydrates, fats, and proteins, Benzene and its homologs. General characteristics of aromatic substances. Synthetic resins and plastics used in Dentistry.

Exercises/Demonstrations:

- Tests for Acids and alkalis radicals.
- Acid-base titration- Neutralisation of acids with alkalis. Titration of N/ 10 NaOH with N/10 H2SO4 Phenolphthalein or Methyl red as indicator.
- Total Nitrogen determination in organic nitrogenous materials, digestion and distillation.
- Total Nitrogen determination in Inorganic (ammoniacal) solutions (or salts) by direct distillation with Mg.
- Determination of Phosphorus in inorganic materials by precipitation.
- Determination of Potassium in aqueous solution by perchlorate method.
- Electrolytic deposition (electrolysis and electroplating of metals).
  Deposition of Copper by electrolysis of copper Sulphate solution.
  Calculation of E.C.E.

4. Applied Oral Anatomy:

Elementary anatomy and structure of denture/bearing area.
Human dentition and occlusion.
Functions of teeth and morphology of Crowns of teeth.
Muscles of mastication and facial expression.
Mastication deglutition and phonation.
Movements of temporomandibular joint.

Exercise/Demonstrations:

- Tooth Carving in wax and plaster. (Crown and root, scale and enlarged models)

5. Dental Mechanics (Primary):

Infection control measures for impressions and models.
Impression Preservation and Boxing-in.
CastPreparation, Trimming, including Orthodontic casts.
Cast duplication - various methods.
Construction of special trays – spacers
Bite blocks- base plates and wax rims.
Articulators: Classification, daily uses, and care of articulators.
Adjustments, Mounting of casts.
Articulation, Occlusal plane, protrusive balance, working bite, balancing bite, curve of space, compensating curve, lateral curve.
Principles of selection of teeth.

- Setting of teeth and wax finishing.
- Flasking, Dewaxing, Packing, curing and deflasking.
- Finishing and polishing of dentures.

Additions, repairs, relining and revasing of dentures.
- Immediate denture construction.
- Making of acrylic teeth.
Kennedy's classification of partial dentures. •
- Principles of partial denture, design, clasp surveyor, surveying, path of insertion and removal. Establishment of clasp seat. Clasp's parts, classification, function and reciprocation.

- Principles of wire bending, Preparation of wrought clasps, occlusal rests, and lingual bars.

6. Dental Mechanics (Final):

Casting machines: Centrifugal and pressure casting machines, Furnaces,
Principles of casting.
Casting techniques of partial denture (Skeletal) Clasps, bars, occlusion rest.
Setting of teeth and completion of dentures on metal skeletons.
Mechanical principles of Orthodontic appliances, anchorage, force, tissue changes and retention.
• Stainless steel wire-preparation of clasps, springs and Arch wires for Orthodontic appliances.
Use of various types of expansion screws.
Designing –Implant-supported Prosthesis (if facilities available for Dental Implants
Ceramic, laminates and Veneers.
Fabricating—Maxillofacial prostheses such as eye, nose ear, cheek, obturator, and splint
-Indirect Resin Restoration preparation techniques.
-Porcelain firing techniques
Preparation of removable Orthodontic appliances, Activators, and Retention appliances and Oral screen.
Construction of fixed Orthodontic appliances, bands, tubes, and arches.
Soldering and spot welding-Soldering of clasps, tags, Straighteners, and lingual bars.
Inlays and Crowns-classification and construction facing & backings.
Casting Procedures.
Principles of bridge work-types of abutments - abutments and ponticsconstruction of bridges using porcelain and acrylic pontics.

7. Dental Materialsand Metallurgy

Dental Materials:
Composition, Properties, Uses, Advantages & Disadvantages of the following materials:-
Plaster of Paris; Dental Stone, Die Stone
Investment Materials,
All Impression Materials,
Tray Materials,
Denture Base Materials, both for cold curing and heat curing, Tooth Materials Waxes,
Base Plates,,
Zinc Oxide,
Dental Luting Cements
Dental Ceramics and indirect resin restoration materials.
Dental Metallurgy:
- Metallurgical Terms,
General
- Study of:
(a) Metals used in Dentistry, particularly Gold, Silver, Copper, Zinc,Tin, Lead and Aluminum.

(b) Alloys used in Dentistry particularly, Casting Gold Wrought Gold Silver Alloys, Stainless Steel, Chrome Cobalt Alloys.
- Heat treatment-annealing and tempering.
Solders, Fluxes, Anti Fluxes.
Tarnish and Corrosion.
Electric Deposition.
- Dental implant materials

8. BASIC KNOWLEDGE.OF COMPUTERS

General office routine economics, record-keeping services, Professional referrals and computing skills;
Record keeping of materials indented and Audit of use.
- Receipt and dispatch of work from clinicians

9. Anatomy, General & Dental :

General structure of mucous membrane (tongue, pharynx, lips), bones, muscles, blood vessels, lymphatics, glands & nerves. Blood and nerve supply in relation to the face in general andteeth and associated structures in particular.
Elementary knowledge of the development of the jaws and teeth.
Structure, nomenclature, and morphology of human teeth.
Eruption; resorption & occlusion of teeth.
Relationship of teeth with investing tissues.
Muscles of mastication and facial expression.
Temporomandibular Articulation.
Course and distribution of Vth and VIIth Cranial nerves.

10. Physiology &Histology, General& Dental :

Cell structure of the human body.
Brief description of the histology and function of various dental and oral tissues e.g. Gingiva, Periodontal membrane, Alveolar process, Cementum, Enamel, Dentine, Nasmyths membrane, Pulp, etc.
Salivary glands, ducts, and their functions.
Composition and function of Saliva.
Blood Composition&Functions.
Mastication, deglutition & Phonation.
General outlines of the physiological processes of the human body-particularly circulatory.

11. **Pharmacology, General & Dental**:

Brief description, nomenclature, derivation, dosage, pharmacological action and therapeutic uses of drugs commonly used in dentistry(Obtundent, astringent,mouth wash, antiseptics)

12. Pathology & Microbiology General & Dental:

General Principles of Pathology -
Inflammation, degeneration, and repair.
Application of general principles of pathology to tooth and surrounding tissues.
Dental Anomalies.
Attrition, Abrasion, and Erosion.

Oral manifestation of systemic diseases like diabetes, syphilis, anaemia, vitamin deficiencies, and infectious diseases like AIDS & Hepatitis B.
Infection Control in Dental Operatory and Bio-Medical Waste Management and Handling.
Neoplasm with reference to the oral cavity.
Elementary knowledge of Bacteriology, Asepsis, Infection, Immunity, Brief description of Pathology and Bacteriology of Dental Caries and Gingival Infections.

13. Dental Radiology:

Fundamental and elementary principle of Dental Radiology including X- Ray machine, its components and maintenance.
Basic knowledge of Radiovisiograpy technique &extra-oral radiographs including Panoramic (Ortho-pantographs and cephalograms).
Automatic Film processing
Cataloging & Indexing of IOPA Films.
Knowledge of occlusal, bitewing, and digital radiography.
Technical aspects of Dental Radiographs i.e. the taking, processing, and mounting of dental Radiographs.
Characteristics of an acceptable image, factors that influence finished radiographs, and rules of radiation protection. Radiation Hazards.

14. Food & Nutrition:

Basic 'food chemistry' in relation to general and Oral Health.
Physical nature of diet in the prevention of dental diseases.
Carbohydrates, fats, proteins, vitamins, minerals, and water in relation to dental and oral health.
General food requirements for growth, maintenance, and repair of the body.
Assessment & charting of individual diet &counseling.
Effect of malnutrition on oral health.
Special diet and its administration in maxillofacial injury cases.

15. Dental Hygiene & Oral Prophylaxis (Primary and Final)

Definition of Hygiene.
Objectives of Dental Hygiene.
Oral Prophylaxis - Various methods.
Oral Prophylaxis: treatment system
Stains on teeth - extrinsic, intrinsic and their management.
Dental plaque.
Brushing & Flossing Technique
Dental Calculus
Technical knowledge of ultrasonic scaling
Brief description and the role of Oral Prophylaxis in Gingivitis, Periodontitis, Periodontal and Alveolar abscess.

Clinical:
Instruments, technique of Oral Prophylaxis
Destaining and polishing of teeth.
Topical application of fluorides.

Care of oral cavity and appliances during treatment of maxillofacial cases.

16. Dental Health Education, Community Public Health Dentistry & Preventive Dentistry:

Definition of Health and Dental Health.
Aims and objectives of Dental Health Education.
Dental Health and Children.
Steps in the preventive program, patient counselling.
Dental Health Education-Parents, mothers (anti and post-natal), infants pre-school Children and grownup Handicapped children.
Dental caries- Prevalence and Prevention.
Prevention by fluoridation.
Periodontal Diseases.
Saliva in relation to dental health and disease.
Dietary habits and Dental Health.
Habits and Malocclusion.
Oral Cancer.
Brief outline of historical background of public Health, History of dentistry and Public Health Services. Dental Health Team in relation to community health.
Technical knowledge of Topical Fluoride Application.

Practical:

Preparation of models of jaws and teeth-normal and pathological dental conditions.
Designing, drawing and painting of posters on 'dental health education.
Procedure for arranging. Short talks, skits, and features on dental and oral health, and visual aids.
Collection of Oral Health-related statistics by conducting a small survey of an area.

17. DENTAL ETHICS, JURISPRUDENCE AND ORIENTATION IN DENTISTRY

Difference between ethics and law, types of law.
Legal impositions in relation to dental practice, code of ethics.
Unlicensed practice of dentistry.
Regulatory and professional organisation.
Place and function 'of dental profession in the society and discussion of economic problems involved therein.
Social factors in Dental Progress, income, and living standard of people.
Objective and scope of dentistry.
Dental specialties

18. BASIC KNOWLEDGE OF COMPUTER

General office routine economics, record-keeping services, Professional referrals and computing skills.

19. DENTAL MATERIALS

General knowledge of various materials used in Dentistry such as impression material, gypsum products, waxes, investing materials, and various filling materials, Temporary and Permanent cements, orthodontic materials and implant materials, materials used in maxillofacial and surgical prosthesis.
Recognition and knowledge of various dental equipment and stores used in dental establishment.
Organization of dental stores, storage and accounting, handling, and maintenance of dental items, assembly, and minor repair of dental equipment

Syllabus for Ophthalmic Technician Gr.I
(Advt No. I-/03/5/Rectt/2022-23)

Part - B

Core Subject

- Anatomy of eye
- Physiology of eye : Anterior chamber, Posterior chamber, Colour Vision & visual Field
- General consideration of different terms used in ophthalmology.
- Common diseases of eyelids
- Common diseases of conjunctiva
- Common diseases of sclera / Common diseases of iris & ciliary body
- Common diseases of Cornea
- Glaucoma & Cataract
- Anatomy and physiology of Orbit
- Examination of eye - General examination of eye including :
    - Visual acuity
    - Accommodation
    - Colour vision
    - visual Fields
- Principle of Retinoscopy & methods
- Refraction techniques including prescription of glasses,
- Errors of refraction (Computerized and Non-computerized techniques)
    - Myopia
    - Hypermetropia
    - Astigmatism
    - Presbyopia
    - Aphakia / Pseudophakia
    - Anisometropia
    - Anisokonia
- Physical optics
- Properties of light
- Principles of refraction
- Lenses and their combinations
- Spectacles designs & fitting
- Keratometry
- Cross Cylinder
- Contact lenses
    - Indications
    - Types
    - Uses

    - Fitting
- Ocular Pharmacology
- Orthoptics
- Ophthalmic Instruments & appliances
- Investigative Ophthalmology
- Eye Bank
- Community Ophthalmology
- Management Of Ophthalmic Operation Theater

Syllabus for the Post of Technical Assistant (Neuro-otology)
(Advt No. I-/03/6/Rectt/2022-23)

Part B
Core Subject

INTRODUCTION TO HUMAN COMMUNICATION:

History and development of the profession of Speech-Language Pathology (SLP) specifically in India

- Interdependency & interrelation between communication, hearing, speech, and language.
- Function of communication, speech and language
- Modes of communication (Verbal & Non-verbal)
- Characteristics of good speech
- Interactive bases of human communication :

Nervous system: Divisions and functions of the nervous system, nerve cell, receptors and synapse, types of nerve fibers. Peripheral nervous system. Brief description of spinal cord and CSF.

- Structure of the brain and divisions: general and lobes of cerebrum. Reticular formation, Basal ganglia and cerebellum. Reflex action and common reflexes. Cranial nerves, distribution and supply with the special reference to II , V, VII , IX, X , XII., Nerve tracts (motor and sensory), Brodmann's area, anatomy of the nervous system related to speech and language.

Basic Acoustics of speech

- Vibrating system – simple harmonic motion – simple vibrating system – system with two or more masses – system with many modes of vibrations – vibration spectra. Waves – What is a wave? Progressive waves – sound waves – wave propagation – Doppler effect – reflection, diffraction, interference, absorption. Resonance of a mass spring vibrator- standing waves – partials, harmonics and overtones – Acoustics impedance – Helmholtz resonator – sympathetic vibrations.
  Mechanism of speech and language production
- Anatomy and physiology of laryngeal system • Development of voice • Bases of pitch and loudness change mechanism

Mechanism of speech and language production

Semantics: A brief introduction to different types of meaning homonyms, synonyms and antonyms.

Morphology: Morpheme – bound and free, process of word formation, content and function words.

Syntax: grammatical and syntactic categories, sentence types, Syntactic analysis.

Pragmatics: Introduction to verbal and non-verbal communication and other indicators, intent of communication.

Theories and models of language Acquisition – Behavioral, Nativistic, Cognitive, Linguistic, Pragmatic, Biological and Information processing model.

Developmental issues in communicative development – genetic, neurological, medical, behavioural, social and psychological.

Bilingualism / multilingualism in children; Bilingual Language learning contexts at home and school situations, compound / coordinate context and others.

Definition, Etiology, Characteristics, Classification and Impact of Hearing Impairment,

Mental Retardation, Cerebral Palsy

Definition, Etiology, Characteristics and classification of Autism Spectrum Disorders/Pervasive Developmental

Definition, Etiology, Characteristics, Classification and Impact of Specific Language Impairment • Learning Disability • Acquired aphasias in childhood • Traumatic Brain Injury • Multiple disabilities Introduction to assessment procedures, differential diagnosis and management

INTRODUCTION TO HEARING & HEARING SCIENCES:

Origin of Audiology • Its growth in India • Scope of Audiology, Branches of Audiology • Audiovestibular system: Anatomy of the external, middle and internal ears.

Ascending and descending auditory and vestibular pathways. • Physiology of the external, middle & inner ear, central hearing mechanisms, cochlear microphonics, action potentials, theories of hearing (AC & BC) , Theory of bone conduction • Vestibular system: Functions of utricle, saccule and vestibular apparatus. Posture and equilibrium. Tests of posture and equilibrium • Causes of hearing loss Genetic (congenital, late onset, progressive, syndromic / non- syndromic), Non-Genetic (Congenital/acquired)

Role of hearing (threshold concept, binaural hearing, head shadow, pinna shadow effect, MAF, MAP – Curve for threshold of hearing) • Sound Pressure, Power and Loudness. Physical and psychophysical scales, Equal loudness contours, Frequency weighting curves, combined sources, Pitch and Timbre. Physical and psychophysical scales. Fourier analysis of complex Tones • dB concept: power and pressure formulae: zero dB reference for pressure and power calculation of actual SPL, reference and dB values with any to given values, calculation of overall dB when two signals are superimposed. • Phones and Sones: relation between phones and sones; use of phone and sonograph; computation of relative loudness of two given sounds using these graph. Frequency and intensity, their psychological correlates: dL for frequency and intensity

Calibration: Biological and instrumental for AC & BC transducers • Procedure • interpretation • precautions to be taken while testing • Audiometric room construction • Acoustics of Rooms. Sound propagation in outdoors and indoors. • Direct, early and reverberant sound. Calculation of reverberation time. • Air absorption. Background noise.

Basic concepts of AC & BC testing

- Pure Tone audiometery • Need and scope • Instrumentation, Different types of transducers • Standards • Permissible ambient noise levels for audiometric testing
- Classification of audiograms • Sound field & closed field testing • Factors affecting AC & BC testing
- Screening Vs Diagnostic pure tone testing • Extended high frequency testing & its interpretation • Masking: Definition, types of masking, types of noises, critical band concept, • Terminology related to masking: Test ear, non-test ear, masker, maskee, crossover, cross hearing and shadow curve • Interaural attenuation; Factors affecting IA; Criteria for masking during AC &BC • Factors determining amount of masking noise, AB gap in

masked ear, masking dilemma in bilateral symmetrical conduction hearing loss. • Fusion Inferred Test (FIT) • Types and degrees of hearing loss

Tuning fork tests : Tuning fork tests (Rinne, Weber, Bing, Schwabach), interpretation, merits & demerits. • Speech audiometry • Orientation to speech audiometry • Need for speech audiometry • Speech recognition threshold, speech identification score, UCL, MCL, dynamic range, articulation index • Tests developed in India and abroad • Factors affecting speech audiometry • Limitations of speech audiometry • Masking for speech audiometry • PI-PB function

MANAGEMENT OF THE HEARING IMPAIRED: Definitions and goals of rehabilitation & aural rehabilitation Early identification and its important in aural rehabilitation • Unisensory Vs Multisensory approach • Manual Vs oral form of communication for children with hearing impairment • Total communication Methods of teaching language to the hearing impaired o Natural method o Structured method o Computer aided method Educational problems, of children with hearing impairment in India • Educational placement of hearing impaired children • Criteria for recommending the various educational placements • Factors affecting their outcome • Counseling the parents and teachers regarding the education of the hearing handicapped • Parent Infant Training Programme (PIP) & Mother's Training Programme, Home training – need, preparation of lessons; correspondence programs (John Tracey Clinic,
SKI-HI), follow up

Introduction to hearing aid technology: Parts of hearing aids & its functions • Type of hearing aids: - Body level Vs ear level - Monaural Vs Binaural Vs Pseudobinaural - Directional hearing aids, modular hearing aids Classroom amplification devices; Group amplification systems– hard wired, induction loop, FM, infrared rays. • Setting up class rooms for the hearing handicapped • Classroom acoustics preferential seating and adequate illumination

Ear moulds: Importance, types (hard, soft), procedure of making each type of ear mould, styles of ear moulds, criteria for selection of one style over the other, ear mould modifications, EAC of hearing aid along with ear mould. • Importance of counseling for users & parents – importance of harness, BTE loops. Tips to facilitate acceptance of hearing aids, battery life, battery charger. Counseling for geriatric population, Trouble shooting of hearing aids

ENT:

- Anatomy & Physiology of external, middle & inner ear, auditory pathways, vestibular pathway. Diseases of the external middle and inner ear leading to hearing loss: Congenital malformations, traumatic lesions,infections, management of middle ear and Eustachian tube disorders. Other causes of hearing loss – Facial paralysis, Tumors of the cerebello-pontine angle, Acoustic neuroma. Infection and management of inner ear diseases. Cochleovestibular diseases and its management.
- Anatomy & Physiology of pharynx & oro-peripheral structures Causes of speech disorder, Disorders of the mouth, Diseases of tonsils and adenoids. Oesophageal conditions: Congenital abnormality – Atresia, Tracheo- oesophageal fistula, Stenosis, Short oesophagus. Neoplasm – Benign, Malignant, Lesions of the oral articulatory structures like cleft lip, cleft palate, submucosal cleft, Velopharyngeal incompetence.
- Anatomy & Physiology of larynx – physiology of phonation / physiology of respiration. Congenital diseases of the larynx – difference between an infant and an adult larynx. Stridor – causes of infantile stridor. Disorders of structure – Laryngomalacia, Bifid epiglottis, Laryngeal web, Atresia, fistula, Laryngeal cleft, Tumors and Cysts, Laryngitis, Laryngeal trauma and Stenosis. Neuromuscular

dysfunctions of the larynx – Vocal cord palsy, Spastic dysphonia, Hypothyroidism, gastro oesophageal reflux disorders, Laryngectomy, artificial larynx, oesophageal speech, tracheo oesophageal puncture.

PSYCHOLOGY RELATED TO SPEECH AND HEARING: Introduction to psychology- Definition, History and perspectives, Branches and scope, application of psychology in the field of speech and hearing. • Introduction to Clinical psychology – Definition, Perspectives and models of mental disorders

Psychology of learning – Introduction, Definition of learning, Theories of learning, Classical conditioning, Operant conditioning and Social learning. Application of learning theories in the field of speech and hearing (therapeutic, educational and rehabilitative applications).

Cognitive Psychology – Introduction, Definition and theoretical perspectives (David Rumelhart and David Mc Clelland, Noam Chomsky, George miller, Allan Newell). • Applications of cognitive psychology in the field of speech and hearing. • Neuropsychology – Introduction, definition, principles of neuropsychological assessment, diagnosis and rehabilitation. • Applications of neuropsychology in the field of speech and hearing. Psychodiagnositcs – Case history taking, Mental status examination, behavioural analysis, psychological testing. Counselling- Meaning and definition, types of counselling, Counselling in rehabilitation practice.

Developmental psychology: • Introduction, Definition, Principles, Motor development, Emotional development • Cognitive development- Definition, Piaget's theory • Play as a therapeutic tool • Personality development- Introduction, Stages,

- **SPEECH LANGUAGE DIAGNOSTICS AND THERAPEUTIC**: Speech language diagnostics Client history – definition, description, utility & need. Essential factors to be included in the client history form – comparison of adults vs. children's history – usefulness of the client history, Basic terminologies and concepts • Introduction to diagnostics • Terminologies in the diagnostic process • General principles of diagnosis • Diagnostic setup and tools

  Diagnostic approaches and methods • Approaches to diagnosis

  Diagnostic models

  – SLPM, Wepman, Bloom and Lahey • Types of diagnoses – Clinical diagnosis, direct diagnosis, differential diagnosis, diagnosis by observation, diagnosis by exclusion, diagnosis by treatment, instrumental diagnosis, provocative diagnosis, provisional diagnosis;

  advantage/disadvantages • Team approach to diagnosis • Characteristics of a good clinician as diagnostician

  Speech therapeutics

  Basic concepts of therapeutics • Terminologies in speech therapeutics • General principles of speech and language therapy • Speech therapy set-up • Individual and group therapy • Integrated and inclusive education, Procedures for speech-language therapy • Approaches to speech and language therapy – formal, informal and eclectic approaches • Types of speech and language therapy • Planning for speech and language therapy – goals, steps, procedures, activities Techniques for: Speech and language therapy for various disorders of speech and language Importance of reinforcement principles and strategies in speech and language therapy, types and schedules of rewards and punishment

  Clinical documentation and professional codes • Documentation of diagnostic, clinical and referral reports

  Introduction to parent counselling, facilitation of parent participation and transfer of skills, follow-up • Evaluation of therapy outcome • Ethics in diagnosis and speech language therapy • Self- assessment and characteristics of a clinician

ARTICULATION AND PHONOLOGICAL DISORDERS: Review of phonological development and

articulatory mechanism • Fundamentals of Articulatory phonetics

Definition and types of coarticulation • Transcription methods in perceptual analysis • Phonological processes – types, language specific issues, identification and classification of errors.

Distinctive features – types, language specific issues, identification of errors and analysis. • Acoustic aspects of production and perception of speech sounds; use of spectrograms • Factors related to articulation and phonological disorders: •Structural •Cognitive – Linguistic •Neurological •Psychosocial •Social •Metalinguistic

Assessment procedures: Types of assessment, sampling procedures, scoring procedures, criteria for selection of instruments for assessment. • Assessment of Oral peripheral mechanism • Speech sound discrimination, stimulability and oral stereognosis. • Analysis and interpretation of data: • Intelligibility and severity judgments • Normative data • Error patterns. • Characteristics of disordered phonology and differential diagnosis

Intervention: Stages of treatment and measuring improvement, long term goals, short term goals and activities for achieving goals in cases with misarticulation. • Issues in maintenance and generalization. • Team approach and

professional communication (inter, intra professional and client oriented) • Approaches totreatment: motokinesthetic, traditional approaches integral stimulation, phonological, distinctive feature, minimal contras therapy, learning theories, programmed, paired – stimuli. • Computerized intervention packages, metaphon therapy

Cleft Lip and Palate • Etiological factors • Embryology of the Face and Palate • Types of Cleft lip and Palate, Classification systems • Syndromes • Velopharyngeal mechanism- muscles and function; inadequacy, incompetency and insufficiency • Speech and Language problems of individuals with Cleft • Associated problems of individuals with Cleft • Diagnostic procedures and Instruments used in Assessment of speech in Cleft palate • Team Management: Composition, responsibilities and co-ordinator • Treatment concepts • Treatment procedures for speech • Prosthetic speech appliances for patients with Cleft palate Glossectomy and Mandibulectomy • Effect of partial and Total Glossectomy on speech Characteristics of Glossectomy speech • Rehabilitation of speech • Prosthetic fitting, design, assessment • Dysphagia specific to glossectomy and mandibulectomy: assessment and rehabilitation

MOTOR SPEECH DISORDERS:

- Introduction to neuromotor organization and sensorimotor control of speech - Motor areas in cerebral cortex, motor control by subcortical structures, brainstem, cerebellum and spinal cord. - Central nervous system and peripheral nervous system in speech motor control. - Centrifugal pathways and motor control - Neuromuscular organization and control - Sensorimotor integration - Introduction to motor speech disorders in children- Dysarthria and Developmental apraxia of Speech
- Definition, causes and classification - Neuromuscular development in normals and children with cerebral palsy - Reflex profile - Associated problems - Speech and language problems of children with cerebral palsy - Assessment of speech in cerebral palsy- objective and subjective methods - Differential diagnosis of cerebral palsy - Management: Introduction to different approaches to neuromuscular education (Bobath, Phelps and the others); Speech rehabiliatation in cerebral palsy- Verbal approaches: vegetative exercises, oral sensorimotor facilitation techniques, Compensatory techniques- correction of respiratory, phonatory, resonatory and articulatory errors; Team approach to rehabilitation; Neurosurgical techniques for children with cerebral palsy

- Different types of Cerebral palsy: - Disorders of muscle tone: Spasticity, rigidity, flaccidity, atonia - Disorders of movement: Hyperkinesias and dyskinesias- Ballismus, tremor, tic disorder, myoclons, athetosis, chorea, dystonia, hypokinesias – Disorders of coordination- Ataxia Syndromes with motor speech disorders- Examples: - Juvenile progressive bulbar palsy - Congenital supranuclear palsy - Guillain- Barre syndrome - Duchenne muscular dystrophy
- Apraxia of speech in children or developmental apraxia of speech - Definition - Description: verbal and non-verbal apraxia - Differential diagnosis- dysarthria and other developmental disorders of developmental apraxia of speech- Facilitation techniques for oral motor movements, speech therapy techniques, generalization of speech
- Definition - alternative and augmentative communication (AAC). Application of alternative and augmentative communication methods in developmental dysarthrias and developmental apraxia of speech- Symbol selection, techniques for communication, assessment for AAC candidacy, choosing an appropriate system and technique, training communication patterns, effective use of AAC

Adult Motor Speech Disorders

DYSARTHRIA AND APRAXIA: Definition and classification of dysarthria in adults. b) Types of dysarthria in adults. c) Neurogenic disorders learning to dysarthria in adults. • Vascular disorders – dysarthria following strokes, CVA, cranial nerve palsies and peripheral nerve palsies. • Infection condition of the nervous system – eg. Meningitis, polyneuritis and neuro syphilis. • Traumatic conditions – Traumatic brain injury and dysarthria • Toxic conditions – dysarthria due to exogenic and endogenic causes. • Degenerative and demyelinating conditions – multiple sclerosis, Parkinson's disease, motor neuron diseases, Amyotrophic lateral sclerosis. • Genetic conditions – Huntington's chorea, Guillian – Barre syndrome. • Others leading to dysarthria

– Anoxic conditions, metabolic conditions, idiopathic conditions and neoplasm.

Assessment of dysarthria Instrumental analysis • Physiological and Electrophysiological methods • Acoustics • Advantages and disadvantages of instrumental analysis of speech in dysarthria. Perceptual analysis – measures, standard tests and methods, speech intelligibility assessment scales, advantages and disadvantages of perceptual analysis of speech in dysarthria. e) Differential diagnosis of dysarthria from functional articulation disorders, apraxia of speech, aphasia and allied disorders.

Management of dysarthria - Medical, surgical and prosthetic approaches - Speech therapy • Vegetative exercises • Oral sensori motor facilitation techniques • Compensatory approaches

– correction of respiratory, phonatory, articulatory and prosodic errors. • Strategies to improve intelligibility of speech.

Apraxia of speech in adults • Definition of verbal and nonverbal apraxia of speech • Different types, characteristics and classification • Assessment of apraxia of speech – standard tests and scales, subjective methods and protocols

• Management of apraxia of speech – different approaches • Improving intelligibility of speech.

Dysphagia: • Definition • Phases of normal swallow • Etiology of swallowing disorders • Assessment and Intervention

DIAGNOSTIC AUDIOLOGY: Introduction to Diagnostic Audiology: - Need for test battery approach in auditory diagnosis & integration of results of audiological tests. - Indications for administering audiological tests to

identify Cochlear pathology, Retro-cochlear pathology, functional hearing loss, Central processing disorders. 2. Tests to differentiate between cochlear & retro-

cochlear pathology - ABLB, MLB -SISI - Test for adaptation - Bekesy Audiometry - Brief tone audiometry - PIPB function

Immittance Audiometry - Introduction - Principle of Immittance audiometry - Instrumentation - Tympanometry – Tympanometric peak pressure, static immittance, gradient/tympanometric width. - Reflexometry – Ipsilateral & contralateral acoustic reflexes, special tests - Clinical application of Immittance evaluation - Immittance evaluation in the pediatric population Unit 3 4. Auditory Brainstem Response

Central Auditory Disorders

Test findings in subjects with central auditory disorders

Operational characteristics, types and specifications.

Microphones as transducers.

Measuring Instruments

Multi-meter. Cathode ray oscilloscope. Sine wave generator. Function Generator, Frequency counter, Measuring microphones, Sound Level Meter, Integrated Sound Level Meter, Artificial ear, Artificial Mastoid, Couplers, Hearing aid test box, Measurement of different types of sound

Electroacoustic Characteristics & measurements for hearing aids

Syllabus of Technician (Dialysis)
(Advt No. I-/03/7/Rectt/2022-23

Part B
Core Subject

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 & 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; Ultrafilteration coefficient(Kuf); Mass transfer coefficient (KoA) and efficiency; Low and high flux; Clearance(K)]
  - Biocompactibility
  - Newer membranes.
  - High performance membranes.
- Physiology of peritoneal dialysis.
- Dialysis machines:
  Latest Hemodialysis machine:
  - Conventional and Portable Machines
  - Wearable artificial Kidney
  - 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 dialysa
- 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

- 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
- Nutrition management in dialysis patients

- Anticoagulation
- Hemodialysis machine specific technology:
  Repair techniques and procedures, fault diagnostics, computer aided maintenance and planned preventative maintenance.
- Complications of Haemodialysis– 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

Syllabus for the post of Nuclear Medicine Technologist
(Advt No. I-/03/8/Rectt/2022-23)

Part B
Core Subject

- 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, Haematology, Reticulo 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

I. Patient: As an individual, the reactions of patient and his family to illness.
- Qualities – Professional and Ethical behaviour expected
- Role and responsibilities of a laboratory technician in the health team

II Hospital staffing and organization

III. Inter personal relations and communications.

IV. PATIENTS RECORDS AND REPORTS AND LEGAL IMPLICATIONS

V. CARE OF THE PATIENT:
a) Maintaining therapeutic environment
- Temperature
- Lighting
- Noise and humidity
- Cleanliness

b) Psycho – social environment
- Meaning and its importance.

VI. BASIC CARE NEEDS OF THE PATIENT
a) Hygiene needs
b) Physical Comforts

VII. CARE OF THE PATIENT:
a) Vital signs: Temperature, pulse, respiration and
b) Blood pressure: Normal and abnormal factors causing the variation
c) Gastric lavage, Nasogastric aspiration

VIII. FIRST AID

IX. PRINCIPLES OF ASEPSIS: STERILISATION:
a) Methods of sterilization. Use of central Sterilization department

b) Care and identification of instruments

XI. DRUGS IN THE DEPARTMENT:

Storage, classification, Labeling and checking, regulations regarding dangerous and other drugs, units of measurement.

XII. CHEMICALS USED IN LABORATORY:

XIII. INSTRUMENTS USED IN VARIOUS SECTIONS:

Microscope, Colorimeter, Cell counter, Auto Analyzer, Flame, Photometer, Autoclave, Hot air oven Incubator, Centrifuge.

XVI. 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 on 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, trytophan, glutathione, albumin, hemoglobin, collagen)
3	Lipids: Fatty acids, saturated and unsaturated, cholesterol and triacyglycerol, 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)

No.	Topics
1	Hormones and their receptors basic concepts in metabolic regulation with examples, insulin, glucagons and thyroxine
2	Metabolism General whole body metabolism (carbohydrates, proteins, lipids)
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 equipments.

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, transister, 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. Mechanisms of radioactive decay, physical, biological and effective half life. Interaction of X-rays & ɤ-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 – lonization 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 lodide 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 l131, Tc99, Cr51, Cs137. Problems in radiation measurements with worked examples

Mathematical application and counting statistics

Basic mathematics covering integration, disintegration, vector, function, radioactivity calculations, use of various types of graphs to display or represent the radioactivity calculations (linear, semi log, logit-log, Log-Log etc). Types of measurement error, Precision and Accuracy, Nuclear counting statistics, Mean, Mode, Median, Poison, Normal (Gaussian) distribution, Standard deviation, coefficient of variation, Probable error, confidence limits, Percent standard deviation, Statistical tests. – Chi – square test, Figure of Merit test, students test.

Gamma camera: Camera head construction and principle of operation, Collimators – parallel multi hole, high resolution, high sensitivity, pin hole, diverging & converging hole, slant hole. Scintillation crystal, optical coupling, Photo multiplier tubes, per amplifiers. Pulse height analyzer, Timer, Data Processor and their function. Application of Cathode ray tube, persistence scope. Resolving time characteristics, Gamma camera Uniformity and intrinsic resolution, Sensitivity, Total – system resolution, Spatial volume resolution saturation.

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 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 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 radio active tracer for the study
   - 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 Hepatobiliry 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 equipments
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 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

Syllabus for Technician (Radiotherapy)
(Advt No. I-/03/9/Rectt/2022-23)

Part B
Core Subject

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

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 network (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

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
   - ✓ Calculation of percentage, Profit & Loss, Simple interest, compound interest, time & work ,Ratio & proportion, Surds, Indices, Logarithm, Inverse Square Law,
   - ✓ Geometry of triangles, similar triangles, Properties of Triangles.
   - ✓ Trigonometry: Height & Distance.
   - ✓ Graphical Representation of Exponential and Inverse exponential functions, Linear and semi log graphs.
2. Basic Physics, Electrostatics, Magnetism & Current Electricity
   - ✓ Units & Dimension, Newton's Laws of Motion, Velocity & Speed, Force, Momentum etc.
   - ✓ 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
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.

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, Information management35

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
- 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-arc-

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

- 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

Syllabus for OT Assistant
(Advt No. I-/03/10/Rectt/2022-23)

Part B
Core Subject

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

- 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 ionotropic 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, PREPRATION 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

Syllabus for the Post of Senior Administrative Assistant (SAA)
(Advt No. I-/03/11/Rectt/2022-23)

Part-B
Core Subject

A] Reasoning

B] General Knowledge

C] Mathematics Aptitude

D] General English

E] Computer literacy: Characteristics of computers, computer organization including RAM, ROM, File system, Input devices, Software understanding, Relationship between hardware and software, Operating system, MS office, Information technology and society Indian IT act, Digital signatures, Application of information technology in Government , E-office management

Syllabus for the Post of Receptionist
(Advt No. I-/03/12/Rectt/2022-23)

Part-B
Core Subject

Basic Computer Knowledge: Introduction to MS Windows, MS Office, Basics of Internet etc. (f): Subject Knowledge Principles of Communication and Public Relations.

COMMUNICATION:
Definitions – Elements of Communication, Nature, Role and Scope of Communication, Communications, Public opinion and Democracy, Communication mass media and Socio-economic development.
METHODS OF COMMUNICATION: Face to face Communication, Group Communication, Mass Communication- Spoken, Written, Un-Spoken and Unwritten, Present state of Communication in India.
MASS COMMUNICATIONS AND MASS MEDIA: Marshal McLuchan's theory-the Medium is the message, One-step, two- step, multi-step flow of Communication, Mass Media and its characteristics What is Communication research, The nature and task of Communication research.
PRINCIPLES OF PUBLIC RELATIONS: Meaning and Definitions, Basic elements of PR, Nature, role and scope, PR as a tool of modern management – PR role in the Indian Setting- Developing economy. PR as distinct from other forms of Communication, PR and Publicity, Lobbying, Propaganda, Sales Promotion, and Advertising, PR and Corporate Marketing Services. Historical Perspective-Industrial Page | 103 revolution-the beginnings of PR – Pioneers-Ivy Lee in America – Technological and media revolution in the Society- PR during First and Second World Wars – The Development of Indian PR, Early Phase, Professionalism, Genesis and Growth of PRSI – Present status and Future of PR in India. Public Opinion – Meaning and Definition- Opinion Leaders-Individuals Institution, Roots of public attitudes – Culture, the family, religion, Economic and Social Classes – Role of PR in opinion formation-persuasion. The Ethics of PR – Social Responsibility Code of Professional Standards for the practice of PR – IRSI – Code of Ethics. Public Relations Media
MEDIA CLASSIFICATION: Introduction to Mass Media, Functions of Mass Media, Characteristics, Limitations, advantage and relative appeal of different media.
NEWS-PAPERS AND MAGAZINES: Principal categories of newspapers and periodicals, News Agencies, Government and Press – Mass Media as Social Instruments.
RADIO BROADCASTING: Ratio in India, Relative coverage and appeal of Radio and Press. Impact of Radio on rural India and rural development.
TV IN INDIA: A brief history of Television – Coverage, present status and impact on masses, Role of Satellite Communication, TV for Socio- Economic change, The future of Television in India.
FILM IN INDIA: Film as a tool of PR, Impact of films, Documentaries, PR Films, Feature Films, Script writing of newsreel and documentaries.
PHOTOGRAPHS: The Camera as a tool of PR, Uses of Photos in PR, News-photos, Photo features-photo Editing, Caption writing.
EXHIBITIONS: Exhibition as a PR tool, Types of Exhibitions, Planning an Exhibition- Theme and Display.
MEDIA RELATIONS: Page | 104 -Strategy for good media relations, Inter-Media Publicity, Press Conference. -Traditional Media as a PR tool – Types – Advantages - Role of traditional Media in rural India. -Outdoor media as a PR tool – Hoardings – Posters – Transit media – Bus panels – Neon sings – Direct Mail – advantages. -The Art of News writing – What is News, Difference between newspapers

writing and Broadcast writing, Language, content and style. -Writing for Newspapers and House Journals - Reporting – How to write a press release, Press release – Its parts, headline, subhead lines, the lead, paragraphs, essentials of writing a press release. -Feature writing, Corporate features- Development-stories. -Editorial Writings: House Journal's Editorials, Writing for Radio & TV. Public Relations Practice

PUBLIC RELATIONS PRACTICE: Scope of the Practice ; Profile of the practitioner ; Planning for Public Relations ; Measuring Public Relations Objectives ; Organizing Public Relations department;- Organizing Public Relations Agency.

PUBLIC RELATIONS SPECIALISATION: Public Relations in Employee Relations ; Public Relations in Industrial Relations ; Public Relations and the Community ; Public Relations and the Govt. ; Public Relations in Promotion of causes and Ideas.

Syllabus for the Post of Store Keeper
(Advt No. I-/03/13/Rectt/2022-23)

Part – B
Core Subject:

General Skills

- Communication Skills
- Management Skills
- Leadership
- Ability to Interpret Data and Statistics handling
- Knowledge in quality standards and processes

Computer skills

- Basic computer knowledge : Parts /Accessories
- Knowledge in MS Office /Excel / Powerpoint
- Writing Skills/ Typing / Communication skills

Inventory Management

- Maintaining and updating records
- Counting materials, equipment
- Merchandise or supplies in stock
- Reporting discrepancies between physical counts and computer records
- Developing or improving upon inventory management procedures

Basic concepts of Material management

- Purchase management
- Logistic management
- Packaging etc.
- Latest Government initiatives in public procurement policy- GeM, GFR 2017 etc
- Chain supply management
- Warehouse management
- Financial Statements and cash flow system
- Economic indicators and measurement