

Faculty of Allied Health Sciences

Public Health

PART A – RESEARCH METHODOLOGY (Q.1–35) (COMMON - AHS)

1. Foundations & Ethics

- Nature, objectives, and scope of research; scientific method
- Research ethics: privacy, confidentiality, consent; plagiarism and integrity

2. Research Problems, Hypotheses & Variables

- Problem identification and formulation
- Hypotheses – null, alternate; simple, composite
- Type I/II errors, p-values, confidence intervals
- Variables: independent, dependent, confounders

3. Study Designs & Sampling

- Observational designs: cross-sectional, case-control, cohort
- Experimental designs: RCTs, longitudinal, comparative surveys
- Randomization, control/blinding
- Sampling methods – random, stratified, cluster, purposive
- Sample size, bias, error control

4. Measurement, Tools & Data Quality

- Scales – nominal, ordinal, interval, ratio
- Tools – questionnaires, interviews, observations
- Standardization, reliability, validity

5. Descriptive Statistics

- Central tendency – mean, median, mode
- Dispersion – range, variance, SD, IQR
- Normal distribution, skewness, kurtosis; graphical summaries

6. Inferential Statistics

- Parametric tests – t-test, ANOVA, chi-square
- Non-parametric tests – Mann-Whitney, Kruskal-Wallis, Friedman
- Correlation & regression
- Evidence hierarchy – systematic reviews, meta-analysis

7. Epidemiology & Public Health Metrics

- Incidence, prevalence
- Screening – sensitivity, specificity, predictive values
- Measures of mortality & morbidity
- Health indices – NFHS wealth index, SDGs, HDI, PQLI
- Herd immunity, ice-berg phenomenon

8. Referencing & Reporting

- Proposal/thesis/report structure
- Referencing styles – Vancouver, APA, Chicago
- Annotated bibliography and citation practice

PART B – PUBLIC HEALTH SUBJECT (Q.36–70)

1. Concepts, Systems & Policies

- Determinants and dimensions of health
- Primary Health Care principles
- Health planning cycle – situation analysis, objectives, resources, plan
- Health systems – national programs, WHO, UHC, SDGs

2. Epidemiology & Disease Control

- Natural history of disease, levels of prevention
- Communicable & non-communicable diseases
- Outbreak investigations and epidemic measures
- Vector-borne diseases and control strategies

3. Biostatistics for Public Health

- Descriptive statistics – measures of central tendency & dispersion
- Normal distribution, probability concepts
- Tests of significance, ROC curves, Kaplan–Meier methods

4. Maternal & Child Health / Immunization

- National MCH indicators and targets
- Vaccination schedules, cold chain (2–8 °C)
- Catch-up vaccinations, IFA supplementation, and anemia control

5. Nutrition & Environmental/Occupational Health

- Nutrition – macro and micronutrients, biological value of proteins
- Hypokinetic diseases – obesity, arthritis, cardiovascular diseases
- Environmental health – water, sanitation, waste management
- Occupational health – silicosis, byssinosis, other industrial diseases

6. Health Economics & Management

- Economic evaluation – cost-effectiveness, cost-benefit, cost-minimization
- Health Management Information Systems (HMIS)
- Vital statistics – census, registration systems, proportional mortality

7. Demography & Population Studies

- Fertility and mortality measures
- Demographic transition and population policies
- NFHS surveys and methodology

8. Geriatrics, Mental Health & Social Medicine

- Gerontology vs geriatrics
- Community approaches to substance-use prevention
- Mental health promotion and policies
- Social medicine – social stress, social pathology

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Radiology and Imaging Technology

PART B – RADIOLOGY AND IMAGING TECHNOLOGY (Q.36–70)

1. Fundamentals of Radiological Sciences

- Basic principles of radiology and imaging modalities,
- Radiation physics – X-ray generation, interaction with matter, attenuation,
- Image formation principles – spatial resolution, contrast, noise,
- Radiological instrumentation – X-ray tubes, detectors, image intensifiers.

2. Advanced Imaging Modalities

- Computed Tomography (CT) – principles, image reconstruction, artifacts, dose optimization,
- Magnetic Resonance Imaging (MRI) – physics, pulse sequences, contrast mechanisms,
- Ultrasound Imaging – physics of sound, Doppler principles, image optimization,
- Nuclear Medicine Imaging – SPECT, PET, radiopharmaceuticals, hybrid imaging (PET-CT, PET-MRI).

3. Image Processing & Analysis

- Digital image acquisition, digitization, and storage,
- Image enhancement, filtering, segmentation, and reconstruction algorithms,
- 3D and 4D imaging concepts,
- Artificial intelligence and machine learning in medical imaging,
- PACS, DICOM standards, and data interoperability.

4. Radiation Biology & Safety

- Biological effects of ionizing radiation,
- Radiation dosimetry and measurement,
- ALARA principle and dose optimization techniques,
- Quality assurance and quality control in radiology,
- National and international radiation protection regulations (ICRP, AERB, IAEA).

5. Diagnostic & Interventional Radiology

- Principles of diagnostic radiology – chest, musculoskeletal, neuro, abdominal, and cardiovascular imaging,
- Contrast media – types, mechanisms, and adverse effects,
- Interventional radiology – image-guided procedures, vascular and non-vascular interventions,
- Cross-sectional anatomy and radiological correlations.

6. Emerging Trends & Innovations in Imaging

- Functional imaging – fMRI, diffusion, perfusion, and spectroscopy,
- Molecular imaging – biomarkers and theranostics,
- Hybrid and multimodal imaging advances.



Faculty of Allied Health Sciences

Perfusion Technology

PART B – PERFUSION TECHNOLOGY (Q.36–70)

Unit 1: Advanced Cardiopulmonary Bypass (CPB) Systems

- Design and working principles of modern Heart–Lung Machines
- Blood pumps: Roller vs Centrifugal, pulsatile systems, calibration, and flow optimization
- Oxygenators: Membrane, hollow fiber, polymethylpentene-based; selection and efficiency
- Heat exchangers: Integrated/external systems, thermoregulation, temperature management
- Heater–Cooler Units (HCU): Mechanism, safety, and contamination prevention
- Thermal management systems: Blankets, surface and core control
- Filters and air traps: Microbubble elimination, air management systems
- Circuit considerations: Pediatric, neonatal, adult circuits, MiECC, sensor integration

Unit 2: Myocardial Protection

- Principles of myocardial protection and energy metabolism
- Cardioplegia: Blood vs Crystalloid, Warm vs Cold, Microplegia, Del Nido, Custodial, HTK
- Delivery methods: Antegrade, Retrograde, Selective
- Additives, buffers, and temperature management during cross-clamping
- Controlled hypothermia, rewarming, and myocardial injury prevention
- Emerging strategies: Controlled reperfusion, pharmacologic protection, normothermic perfusion

Unit 3: Mechanical Circulatory Support Devices

- ECMO (VV, VA, Hybrid): Setup, initiation, weaning, anticoagulation.
- IABP: Indications, timing, complications, troubleshooting.
- Ventricular Assist Devices (VADs): LVAD, RVAD, BiVAD - principles and monitoring.
- Total Artificial Heart (TAH): Design, physiology, outcomes.

- Impella Systems: Micro-axial flow and hemodynamic support.
- Emerging technologies: AI integration, portable ECMO, wearable assist systems, ECCO ₂ R.

Unit 4: Special Situations in Perfusion

- Perfusion management in:
 - ✓ Jehovah's Witness patients
 - ✓ Sickle cell anemia
 - ✓ Methemoglobinemia
 - ✓ Cold agglutinins
 - ✓ Blood and coagulation disorders

Unit 5: Minimally Invasive and Robotic Cardiac Surgery

- Endovascular catheter systems and femoral cannulation.
- Direct vision and video-assisted MICS.
- Micro-port, robotic surgeries: Port access, perfusion challenges.
- CO ₂ airtight techniques

Unit 6: Pharmacology in Cardiopulmonary Bypass

- Drugs used in CPB: Inotropes, vasodilators, vasoconstrictors, antiarrhythmic, anesthetics, antihypertensive, anticoagulants.
- Pharmacokinetic changes during hypothermia and CPB
- Circuit-drug interactions and binding effects
- Perfusionist's role in intraoperative drug titration and documentation

Unit 7: Blood Conservation Strategies

- Ultrafiltration: Conventional, Modified, Z-BUF, P-BUF
- Cell Saver techniques
- Miniaturized Extracorporeal Circuits (MiECC)
- Acute Normovolemic Hemodilution (ANH)
- Autologous priming: Antegrade and Retrograde techniques



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Medical Lab Technology

PART B – MEDICAL LAB TECHNOLOGY (Q.36–70)

SUB: PATHOLOGY

GENERAL PATHOLOGY

- Cell injury
- Apoptosis and subcellular responses to cell injury
- Cell cycle and pathological calcification
- Inflammation
- Hemodynamics
- Neoplasia
- Infectious diseases

SYSTEMIC PATHOLOGY

- Respiratory system
 - Pneumonia
 - Tuberculosis
- Kidney and lower urinary tract
 - Nephrotic syndrome
 - Nephritic syndrome
- Immunohistochemistry
 - Immunohistochemical tumor markers of various systems

HEMATOPATHOLOGY

- Hematopoiesis Red Blood Cells : Normal erythropoiesis, morphology
Red cell disorders – inherited and acquired
- Anemia's – classification, pathophysiology and diagnosis
- Hemolytic disorders
- White Cells – Normal myelopoiesis,
- White cell disorders – inherited and acquired
- Malignant hematopoietic disorders – classification, pathophysiology and diagnosis

- Platelet disorders—classification, diagnosis and pathophysiology
- Bone marrow examination
- Flow cytometry

IMMUNOLOGY & IMMUNODIAGNOSTICS; GENETICS & MOLECULAR GENETICS

- Immunopathology
- Hypersensitivity reactions
- Autoimmune diseases
- Genetics (molecular basis of human diseases)
- Biochemical and molecular basis of single gene disorders.
- Disorders with multifactorial inheritance, normal karyotype, fluorescence in situ hybridization, and Cytogenetic disorders involving sex chromosomes.
- Diagnosis of genetic diseases. Direct gene diagnosis, indirect gene diagnosis, and linkage analysis.

TRANSFUSION MEDICINE AND CHEMICAL PATHOLOGY

- ABO and Rh blood group systems
- Other major blood group systems – clinical significance of Compatibility testing, Antibody screening and identification, clinical significance of Choice of reagents and Quality control of the same.
- Donor Screening
- Blood bags, Anticoagulant and preservative solutions
- Examination of fluids
- Renal function tests
- Disorders of Lipids
- Biochemical cardiac markers

SUBJECT -BIOCHEMISTRY

1. Structure of Cell and intracellular organelles

- Carbohydrates,
- lipids,
- Proteins and nucleic acids—Membrane structure, glycoproteins

- Nutritional requirements of carbohydrates, proteins and lipids. Deficiency states of carbohydrates, proteins and lipid. RDA, Nutritional requirements of vitamins (fat and water soluble)- Structure, functions, deficiency states, dietary source, Nutritional requirements of macro and micro elements functions, deficiency states, dietary source, RDA.

2. Enzymes:

- Classification, factors that alter enzyme catalyzed reaction
- Competitive and noncompetitive inhibition of enzyme reactions
regulation of enzyme activity,
- Isoenzymes—separation and identification, Plasma enzymes in clinical diagnosis.
- Coenzymes.

3. Bioenergetics and Oxidative phosphorylation;

free energy-
exergonic and endergonic reaction, high energy phosphates,
components of electron transport chain-mechanism of ATP production,
Chemiosmotic theory, inhibitor of respiratory chain

4. Metabolism:

Carbohydrate Metabolism: Glycolysis, TCA cycle, glycogen, gluconeogenesis,
diabetes mellitus

- **Lipid Metabolism:** Synthesis and breakdown of fatty acids,
ketone bodies, DKA, Cholesterol, bile acids, Lipoproteins.
- **Protein Metabolism:** Synthesis and breakdown of amino acids, urea cycle,
Specialized products from amino acids
- Disorders of carbohydrate metabolism:
- Disorders of Lipid Metabolism
- Disorders of protein metabolism

5. Molecular Biology: Structure and functions DNA, organization and replication, transcription, Protein synthesis, Recombinant DNA technology, PCR, FISH

6. Clinical Enzymology: Enzymes in plasma and their origin, general principles of assay, clinical significance of enzymes and isoenzymes, Measurement of serum enzymes in diagnosis—cardiac and skeletal muscle enzymes, liver and biliary tract enzymes digestive, bone and GI disorders.

7. Disease related to organs: Liver- LFT, Jaundice, hepatitis, cholestasis Kidney- RFT, renal failure, uremia, nephritic syndrome, renal calculi, renal tubular acidosis,

diabetes insipidus, dialysis. Early makers of renal pathology –
microalbuminuria, albumin:creatinine ratio

8. **Electrolytes and blood gas analysis** – specimens for electrolyte determination – sodium, potassium, chloride, bicarbonate, determination of pCO₂, O₂ and pH.
9. **General concepts of endocrinology** – the endocrine system, hormones – chemical nature, classification, hormonal action – receptors, hormone receptor interaction, regulation of gene expression by hormones, second messengers (cAMP, GMP, Ca⁺⁺)
Protein kinase cascade. Concepts of hormones assay.
10. **Hypothalamus and pituitary** – anatomy, chemistry, functions, regulation.
Diseases related to the hormones of these glands. Assessment of anterior and posterior pituitary.
11. Thyroid hormones, synthesis, functions, thyroid function test in various abnormal conditions, parathyroid – hormones, synthesis, functions, diseases of parathyroid glands. Hormones involved in calcium and phosphate metabolism. Diseases related to its metabolism. **Calcium chemistry and functions.**
12. **Adrenal cortex and medulla** – chemistry, synthesis, metabolic effects, pathophysiology of the adrenal cortex. Assessment of adrenal functions, Gonadal hormones – chemistry, functions, regulations and diseases related to these glands. Endocrinology of male and female infertility, pregnancy and lactation.
13. **Gastrointestinal and pancreatic hormones** – chemistry, synthesis, metabolic effects, regulation, diseases related to the hormones of these glands. Detection of anomalies.

SUBJECT-MICROBIOLOGY

GENERAL BACTERIOLOGY

- History of Microbiology
- Morphology and physiology of Bacteria
- Classification and growth requirement of Bacteria
- principles and different kinds of Microscopes
- Sterilization and Disinfection procedures
- Bacterial genetics
- Culture methods
- Antibiotic sensitivity testing
- Hospital acquired infection and its prevention
- Virulence factors of Bacteria

IMMUNOLOGY

- Antigen and antibody – Definition
- Antigen and Antibody reaction – Its principles and their application in the diagnosis of infective diseases
- Immunity
- Hypersensitivity
- Tumor and transplantation immunity

SYSTEMIC BACTERIOLOGY

- 1) Gram positive cocci – Staphylococcus, Pneumonia, Streptococcus
- 2) Gram negative cocci – N. gonorrhea, N. meningitidis
- 3) Gram positive bacilli – Corynebacterium, Mycobacteria, Clostridium, Actinomyces, Bacillus and anaerobes
- 4) Gram negative Bacilli – Enterobacteriaceae, Pseudomonas, Vibrio, Brucella, Bordetella, Hemophilus, Yersinia
- 5) Spirochetes – Treponema, Leptospira, Borrelia
- 6) Rickettsiae, Chlamydia, Miscellaneous Bacteria

MYCOLOGY, VIROLOGY AND PARASITOLOGY

Mycology

1. General properties of fungi
2. Cultivation methods
3. Laboratory methods for diagnosing fungal infection
4. Superficial and deep fungal infection
5. Opportunistic Fungal infection

Virology

1. Classification and general properties of viruses – interferon, inclusion bodies
2. Cultivation of viruses and laboratory diagnostic methods of viral diseases
3. Poxvirus, Herpesvirus, Myxoviruses, enteroviruses
4. Rabies, Arbo viruses, Hepatitis, HIV, Viruses causing gastroenteritis, miscellaneous viruses

Parasitology

1. Classification-Protozoa–amoeba, flagellates, sporozoa, ciliates
2. Opportunistic Parasitic infection
3. Helminthes

CLINICAL MICROBIOLOGY AND RECENT ADVANCES

1. Diagnosis of various infective agents
2. Automated Methods in diagnosis of infective agents
3. Host body response in vaccination
4. Prophylaxis



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Cardiac Technology

PART B – CARDIAC TECHNOLOGY (Q.36–70)

Unit 1: Cardiac / Cardiovascular Fundamentals

- Anatomy & histology of heart and vessels
- Cardiac electrophysiology
- Hemodynamic, blood flow, pressure relationships
- Coronary circulation & micro-circulation
- Cardiac cycle, valves, conduction system
- Pathophysiology of major cardiac diseases (ischemic heart disease, heart failure, valvular disease)

Unit 2: Diagnostics in Cardiology

- Abnormal ECG diagnosis / Holter Analysis / TMT
- Echocardiography (2D, Doppler, TEE, strain imaging)
 - 2D, M-mode, Doppler principles (PW, CW, Color flow)
 - Tissue Doppler and strain imaging
 - Trans-esophageal echocardiography and stress echo integration
 - Quantification of LV function, valvular hemodynamic, wall motion scoring
 - Artifacts and pitfalls in contrast and stress echo
 - Comparison of contrast echo vs. TEE vs. CT/MRI for shunt detection
- Fetal echocardiography.

Unit 3: Interventional & Therapeutic Cardiac Technology

Basic Intervention:

- Cardiac catheterization techniques in CAD.
- Intravascular ultrasound & OCT.
- Hemodynamic monitoring (Catheter based pressure study, cardiac output determination). -Pacemaker implantation.
- Electrophysiology & Radio-frequency ablation technologies.
- Advanced Intervention: -

- ✓ LVADs,
- ✓ ECMO,
- ✓ IABP.

- Device safety & complications, instrumentation and documentation.

Unit 4: Imaging Modalities in Cardiology

- Basics of MRI/CT/SPECT in ruling out abnormalities.
- Nuclear cardiology
- X-ray findings in ruling out CAD, CHD, RHD.

Unit 5: Medical Instrumentation & Signal Processing

- Transducers selection and its artifacts
- Protocols used in ECG & TMT.
- Signal acquisition & Data acquisition systems.
- Image processing & basic calibration
- Safety, standards in medical instruments.

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Physician Assistant

PART B – PHYSICIAN ASSISTANT (Q.36–70)

Unit 1: Applied Basic Sciences

- **Anatomy:** Surface anatomy, organ systems, neuroanatomy, congenital anomalies.
- **Physiology & Pathophysiology:** Major organs, vital functions, clinical correlations.
- **Biochemistry:** Electrolytes, acid-base disorders.
- **Microbiology & Immunology:** Pathogenic organisms, tropic infections, immune response basics.
- **Pharmacology:** Drug kinetics/dynamics, dose adjustment, rational drug use.
- **Toxicology:** Common poisons and management.
- **Genetics:** Single-gene and chromosomal disorders.

Unit 2: Clinical Medicine – System-Based Approach

Cardiovascular, Respiratory, Renal, Gastro-hepatobiliary, Hematology, Endocrine, Rheumatology, Neurology, Psychiatry, Infectious Diseases, Dermatology systems covering diagnosis and management of major conditions like CHF, asthma, CKD, GI bleeding, diabetes, arthritis, stroke, and skin infections.

Unit 3: Surgery & Perioperative Medicine

Wound healing, asepsis, sutures, drains, pre/post-operative care, nutrition, shock & burns management, surgical emergencies, and organ-specific surgeries including GI, breast, thyroid, and urology with exposure to laparoscopic and advanced procedures.

Unit 4: Emergency Medicine and Intensive Care

BLS, ACLS, PALS, airway management, shock and sepsis, trauma triage, disaster management, and management of acute organ crises.

Unit 5: Diagnostics and Clinical Decision-Making

Bedside procedures, imaging (X-ray, USG, CT, MRI), laboratory diagnostics, symptom-based differential diagnosis, telemedicine, virtual care, and digital record management.

Unit 6: Advanced and Specialized Clinical Medicine

Geriatric medicine, pediatrics, surgical oncology, organ transplantation, and disease prevention with immunization principles.

Unit 7: Professional Skills and Communication

Patient assessment, communication, ethics, teamwork, leadership, infection control, clinical governance, and audit frameworks.

Faculty of Allied Health Sciences
Emergency care (Advanced Care Paramedic)

PART B – EMERGENCY CARE (ADVANCED CARE PARAMEDIC) (Q.36–70)

UNIT I – Principles & Practice of Emergency Medicine

- Foundations and evolution of emergency medicine
- Triage systems and emergency room (ER) setup
- Patient flow and stabilization protocols
- Emergency diagnosis and clinical decision-making
- Documentation, medico-legal, and ethical issues

UNIT II – Cardiovascular & Respiratory Emergencies

- Acute coronary syndrome, cardiac arrest, arrhythmias
- Hypertensive crisis, heart failure emergencies
- Pulmonary embolism, pneumothorax, respiratory failure
- Mechanical ventilation and airway management
- Advanced cardiac life support (ACLS) and critical interventions

UNIT III – Trauma & Orthopedic Emergencies

- Polytrauma and major injury assessment (ATLS)
- Head, chest, abdominal, and spinal injuries
- Fractures, dislocations, and compartment syndromes
- Wound care, hemorrhage control, and splinting
- Emergency imaging and surgical coordination

UNIT IV – Neurological & Neurosurgical Emergencies

- Stroke, TIA, and intracranial hemorrhage management
- Seizure and status epilepticus protocols
- Head injury and raised intracranial pressure
- CNS infections and toxic encephalopathies
- Neuromonitoring and neurological triage

UNIT V – Toxicology & Environmental Emergencies

- Poisoning and overdose management
- Snake bite, insect sting, and envenomation protocols
- Burns and electrical injuries

- Hypo/hyperthermia and environmental exposure
- Chemical, biological, and radiation emergencies

UNIT VI – Pediatric, Obstetric & Geriatric Emergencies

- Pediatric resuscitation (PALS) and trauma care
- Neonatal emergencies: birth asphyxia, sepsis, convulsions
- Obstetric emergencies: eclampsia, hemorrhage, shock
- Elderly emergencies: falls, delirium, polypharmacy issues
- Family-centered emergency care principles

UNIT VII – Critical Care & Procedural Skills

- Shock management: septic, hypovolemic, cardiogenic, neurogenic
- Sepsis protocols and multi-organ failure
- Airway procedures: intubation, tracheostomy
- Central line, arterial line, lumbar puncture, thoracentesis
- Bedside ultrasound and emergency imaging interpretation

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Anesthesia & Operation Theatre Technology

PART B – ANESTHESIA & OPERATION THEATRE TECHNOLOGY (Q.36–70)

1. Applied Anatomy and Physiology

- Gross and microscopic anatomy of all main body systems
- Electrophysiology of heart and nerves
- Acid-base balance, electrolyte balance, blood gas analysis
- Respiratory mechanics and control of respiration

2. Microbiology, Pathology & Infection Control

- Classification of bacteria, viruses, fungi, and parasites
- Sterilisation methods: autoclaving, filtration, chemical disinfectants
- Pathology relevant to anaesthesia practice
- Antibiotic resistance and stewardship
- Infection prevention in Operating Theatre (OT) and Intensive Care Unit (ICU)
- Biomedical waste management

3. Pharmacology and Drug Management

- Mechanism of action of anaesthetic drugs and antagonists
- Use of cardiovascular drugs, including vasopressors and inotropes
- Neuromuscular blocking agents and their reversal
- Pharmacogenomics and individualized drug therapy

4. Types of Anesthesia

- **General Anesthesia:** Induced unconsciousness using inhalational agents and intravenous drugs, with full monitoring
- **Regional Anesthesia:** Techniques such as spinal, epidural, and peripheral nerve blocks are used for regional sensory block
- **Local Anesthesia:** Local infiltration or topical application for numbness without loss of consciousness
- **Sedation/Monitored Anesthesia Care (MAC):** Minimal to deep sedation to reduce anxiety and pain for minor procedures.

5. Anesthesia Technology and Equipment

- Detailed understanding and maintenance of anesthesia machines
- Advanced airway management: fiberoptic and video laryngoscopy
- Monitoring techniques: ECG, pulse oximetry, capnography, invasive monitoring
- Delivery systems and vaporizers for anaesthetic agents

6. Clinical Medicine Relevant to Anesthesia

- Preoperative evaluation and risk stratification
- Anesthesia considerations in common comorbidities like diabetes, hypertension, and renal disease
- Fluid and electrolyte management perioperatively
- Recognition and management of postoperative complications

7. Operation Theatre Technology and Management

- OT environment: air conditioning, laminar flow and ventilation systems
- Sterilization and maintenance of surgical instruments
- OT layout, patient transport, and positioning
- OT safety: fire hazards, electrical safety, and emergency protocols

8. Advanced Monitoring and Critical Care

- Haemodynamic monitoring: pulmonary artery catheter, central venous catheter, cardiac output measurement
- Depth of anesthesia monitoring, including EEG basics
- Ventilator management and complications
- Management of sepsis and multi-organ support

9. Recent Advances and Innovations

- Ultrasound-guided regional anesthesia techniques
- Closed-loop and automated anesthesia delivery systems
- Enhanced Recovery After Surgery (ERAS) protocols
- Use of telemedicine and simulation in anesthesia education and safety

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Renal Dialysis Technology

PART B – RENAL DIALYSIS TECHNOLOGY(Q.36–70)

Unit 1: ADVANCED RENAL REPLACEMENT THERAPY

- VascularAccess
- Principles of Hemodialysis
- Components of the ExtracorporealCircuit
- The DialysisPrescription
- HemodialysisAdequacy
- Complications of Hemodialysis

UNIT 2: Peritoneal DialysisTherapy

- Components of the peritoneal dialysissystem
- Peritoneal CatheterImplantation
- Peritoneum as a dialysissystem
- Clinical observations of peritoneal membrane function
- Clinical use of peritonealDialysis
- Adequacy of peritonealdialysis
- Writing the dialysisprescription
- Complications of peritoneal dialysis

UNIT 3: Clinical considerations in the Evaluation of DialysisPatients

UNIT 4: Pediatric Dialysis

- Indication for Dialysis, principles of Dialysis inARF, Methods of Pediatric Dialysis, vascular access, AV fistula, bridge grafts, catheters, complication of vascular access, HDequipment
- PediatricPD, Nutritional Management of Pediatric patients on chronicDialysis, Psychosocial problems related to dialysis in pediatricpatients, Pediatric CAVHemofiltration, Management of common Electrolyte Disorders inchildren, Clinical Care Coordinator:

UNIT 5: Other Extracorporeal therapies

- Molecular adsorbent Recirculating system(MARS)
- Single pass albumindialysis
- Therapeutic Plasmaexchange
- Double filtrationPlasmapheresis
- Continuous renal replacement therapy(CRRT)
- Sustained low efficiency dialysis(SLED)
- Immunoabsorptiontherapy
- Hemoperfusion
- Newer Sorbenttechnologies

UNIT 6: Current Research in Dialysistechnology

- Wearable artificial kidney –Hemodialysis
- Wearable artificial kidney- Peritoneal dialysis
- Bio-artificialkidney
- Human nephronfilter
- Newer extra corporealtherapies

UNIT 7: RENAL TRANSPLANTATION

- Basics ofTransplantation
- TransplantImmunology
- Transplant Immunosuppression andrejection
- Donor and Recipient Evaluation
- Organ Donation and Preservation
- Complications ofTransplantation

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Respiratory Care Technology

PART B – RESPIRATORY CARE TECHNOLOGY (Q.36–70)

1. Advanced Respiratory Physiology and Pathophysiology

- Pulmonary gas exchange
- Ventilation-perfusion relationships
- Pathogenesis of respiratory failure

2. Mechanical Ventilation: Concepts and Management

- Modes of ventilation: invasive and non-invasive
- Troubleshooting and complications
- Weaning protocols and strategies

3. Research Methodology in Respiratory Care

- Study design and critical appraisal of literature
- Data analysis and biostatistics
- Evidence-based practice in respiratory therapy

4. Critical Care Skills and Multidisciplinary Collaboration

- Role of the respiratory therapist in ICU
- Teamwork with physicians and nurses
- Case-based high-acuity patient management

5. Pulmonary Diagnostics and Monitoring

- Arterial blood gas interpretation
- Pulmonary function tests and sleep studies
- Advanced monitoring technology

6. Therapeutic Interventions and Protocol Development

- Aerosol therapy and airway clearance techniques
- Protocolized asthma and COPD management
- Patient safety and infection control

7. Patient Communication, Education, and Counseling

- Educating patients and families about respiratory disease
- Motivational interviewing strategies
- Cultural competency in respiratory care

8. Professionalism and Ethical Issues in Respiratory Therapy

- Patient confidentiality and informed consent practices
- Navigating ethical dilemmas in end-of-life care
- Advocacy and leadership in healthcare

9. Advances in Respiratory Equipment and Technology

- High-flow nasal cannula, ECMO, and transport ventilation
- Digital health, telemedicine, and remote monitoring
- Familiarity and adaptation to emerging devices

10. Pulmonary rehabilitation

- Role of Respiratory therapist in rehabilitation
- Patient counselling
- Palliative care

Faculty of Allied Health Sciences

Forensic Science Technology

PART B – FORENSIC SCIENCE TECHNOLOGY

(Q.36–70)

UNIT 1: Foundational Principles, Legal Context, and Quality Management:

- **Forensic Science Context & Ethics:** Definition, Historical Development, Scope, and Ethical practices in Forensic Science.
- **Evidence Management & Crime Scene:** Nature, Types, and Chain of Custody protocols, Search methodologies, Preservation, Packing, and Forwarding of Physical & Trace evidence, Preservation of the Scene of Crime.
- **Legal Status of Evidence and Experts:** Admissibility of evidence in Courts, Definition and provisions relating to Experts (CrPC., 1973 & Indian Evidence Act), Court Procedures related to Expert Testimony
- **Organization and Quality:** Structure and function of Central and State Forensic Science Laboratories, NCRB, and NICFS, Concept of quality control management in Forensic institutions.
- **Investigative Psychology:** Criminal Profiling (victim and culprit profiles), Scope and limitations of Lie detection (Polygraphy), Narco analysis, and Brain mapping.

UNIT 2: Advanced Analytical Chemistry and Instrumentation

- **Spectroscopy and Microscopy:** Principles and application of advanced microscopy (Electron, Polarizing, Comparison, Fluorescent). Detailed analysis using UV, Visible, IR, Raman, Atomic absorption, and Emission Spectrophotometry.
- **Separation and Identification Techniques:** Principles of Chromatography (TLC, GLC, HPLC, HPTLC). Hyphenated Techniques including GC-MS, LC-MS, IR-MS, and ICP-MS. Use of Mass Spectroscopy and Immunoelectrophoresis.
- **Trace Elemental and Nuclear Analysis:** X-rays and X-ray based techniques (XRD, XRF). Principles of Neutron Activation Analysis.
- **Forensic Toxicology (Analysis):** Detailed Extraction, Isolation & Clean-up procedures for identifying common poisons from viscera, tissues, and body fluids. Chemical examination of specific poisons (Metallic Poisons, Plant poisons).
- **Volatile and Special Chemistry:** Analysis of Ethyl alcohol (in beverages, biological



fluids, breath). Analysis of Methanol and Denaturants. Chemical analysis for Trap Cases.

UNIT 3: Biological, Molecular, and Medical-Legal Sciences

- **Forensic Genetics and DNA:** DNA Structure, its role as a genetic marker. Advanced DNA Extraction and Profiling Techniques. Applications of DNA Phenotyping and RNA Profiling. Challenges in Disputed Paternity & Maternity.
- **Serology and Body Fluids:** Detection, Identification, and Blood Group Systems analysis of Blood stains. Detection and Blood Grouping of Seminal and other body fluids. Use of Red cell Enzymes and Serum Proteins.
- **Toxicology (Metabolism and Effect):** Metabolism and Chemical examination of narcotics, opiates, stimulants, hypnotics, tranquilizers, sedatives, and drugs of abuse. Toxicity and analysis of these compounds. Analysis of Insecticides & Pesticides.
- **Forensic Medicine and Death Investigation:** Modes and Manner of deaths. Estimation of time since death through Post-mortem examination and changes. Medicolegal importance of Injuries & Wounds, including Gunshot wounds.
- **Forensic Anthropology and Entomology:** Determination of Species of Origin, Sex, Age, Stature, and individual identification through skeletal remains. Identification techniques like Skull superimposition and facial reconstruction. Applications of Forensic Entomology.

UNIT 4: Applied Physical Evidence, Pattern Recognition, and Digital Forensics

- **Ballistics and Firearm Examination:** Basics of Internal, External and Terminal Ballistics. Forensic examination of all components (ammunition, projectiles, shell cases). Analysis of Gunshot residues. Determination of Range, Ricochet, and Accidental Discharge.
- **Explosives and Arson:** Definition, Types, and Analyses of Explosives. Examination of Improvised Explosive Devices (IEDs) and country-made bombs. Investigation protocols for Explosion and Arson cases.
- **Pattern and Biometric Analysis:** Principles of Fingerprint identification (Classification, AFIS, Examination of Chance Prints). Track Marks (Foot Prints, Tire Marks, Gait pattern). Relevance and application of Biometric Systems of Identification.
- **Questioned Documents:** Scientific examination of Inks, Papers, and the determination of the Age of documents. Examination of Alterations (Erasures, Obliterations,

Additions). Identification of handwriting, detection of forged signatures, and analysis of anonymous or disguised writings.

- **Trace and Material Evidence:** Examination of Hair & Fibers. Forensic analysis of Glass (fractures), and construction materials (Cement, Mortar, Concrete). Application of Pollens and Diatoms in investigation.
- **Digital Evidence:** Introduction to Computer Forensics and Types of Computer crimes. Protocols for the Seizure, Acquisition, and Forensic examination of Digital evidence. Specialized techniques in Mobile Phone Forensics.

Faculty of Allied Health Sciences
Neuro Science Technology

PART B – NEURO SCIENCE TECHNOLOGY-(Q.36–70)

Unit I – Advanced Neuroanatomy and Neurophysiology

- Organization of the CNS and PNS: structural and functional integration, resting and action potentials, ionic mechanisms, and neuronal excitability, Synaptic physiology, neurotransmission, and plasticity, motor control pathways, sensory integration, and cortical mapping, neural oscillations, brain rhythms, and network synchronization, autonomic nervous system electrophysiology, neurochemical basis of cognition, emotion, and behaviour

Unit II – Principles and Techniques of Neuroelectrophysiology

- Bioelectric potentials: origin, propagation, and measurement, instrumentation: amplifiers, filters, impedance, electrodes, and grounding, EEG systems (10–20, 10–10, high-density) and data acquisition methods, EMG, Nerve Conduction Studies, Evoked Potentials (VEP, BAEP, SSEP, MEP), artefact detection, noise reduction, and data integrity, intraoperative Neurophysiological Monitoring (IONM) – techniques and safety, calibration, maintenance, and troubleshooting of electrophysiological equipment

Unit III – Clinical and Cognitive Neuroelectrophysiology

- EEG in epilepsy, coma, encephalopathies, and brain death
- Polysomnography: sleep architecture and disorders
- Event-Related Potentials (ERP): cognitive, sensory, and motor paradigms
- Electrophysiological biomarkers in psychiatric and neurodegenerative diseases
- Brain–computer interface (BCI) and neurofeedback applications
- Cortical stimulation mapping and neuroplasticity research
- Case interpretation and clinical report writing

Unit IV – Neuropharmacology and Neuropathology

- **Neuropharmacology:**
 - Mechanisms of drug action on CNS and PNS, neurotransmitter systems: cholinergic, dopaminergic, serotonergic, GABAergic, glutamatergic, pharmacodynamics and pharmacokinetics in neurotherapeutics, drugs used in epilepsy, Parkinson's, Alzheimer's, and psychiatric disorders, neurotoxicity and drug-induced neuropathies, pharmacological modulation of electrophysiological responses.
- **Neuropathology:**

- Cellular injury and neurodegeneration mechanisms, demyelination, axonal damage, and synaptic pathology, pathophysiology of stroke, tumors, infections, and trauma, and histopathological correlates of EEG/EMG abnormalities, molecular pathology of neurodegenerative diseases (AD, PD, ALS), neuropathological basis of seizures and epileptogenesis

Unit V – Translational Neurotechnology's and Innovations

- Integration of electrophysiology with neuroimaging (EEG-fMRI, MEG, PET), Advanced neuroprosthetics and brain-machine interfaces, neuromodulator techniques: TMS, tDCS, DBS, and vagus nerve stimulation, neural signal decoding and real-time monitoring, neurorehabilitation and assistive technologies, computational neuroscience and AI applications in neurodiagnostics, emerging trends: closed-loop systems, wearable EEG, and implantable sensors

Faculty of Allied Health Sciences

Optometry

PART B – OPTOMETRY-(Q.36–70)

Part B: Optometry and Vision Sciences (Q. 36 to Q. 70)

1. Ocular Diseases and Diagnostics

- a. Disease of anterior and posterior segment structures
- b. Glaucoma, its diagnostics and management
- c. Anterior segment and posterior segment diagnostics

2. Advanced Contact Lenses

- a. Anatomy and physiology of the cornea and related structures
- b. Contact lens materials and designs
- c. Pre-fitting and Soft, corneal GP and scleral lens fitting
- d. Complications of soft and RGP contact lens use
- e. Care regimen and after-care procedures

3. Binocular Vision and Vision Therapy

- a. Development and components of binocular vision
- b. Clinical conditions related to binocular vision
- c. Perception and information processing – intersensory, sensorimotor integration and performance indicators

4. Pediatric and Geriatric Optometry

- a. Refractive development
- b. Pediatric clinical practices – spectacle and contact lens
- c. Special conditions – autism, ADHD, motor disability, developmental and learning disabilities
- d. Age-related ocular changes and visual disorders

5. Visual Perception and Psychophysics

- a. Visual physiology
- b. Psychophysics principles, threshold and noise estimations
- c. Spatial and temporal aspects of vision
- d. Color perception

6. Low Vision Rehabilitation

- a. Functional vision assessment
- b. Optical and non-optical aids
- c. Recent advancements in assistive devices

7. Occupational, Ethics, and Community Optometry

- a. Health care for workers in organized and unorganized sectors
- b. Visual task analysis and optical management for various occupations
- c. Occupational hazards and PPE
- d. Medical ethics in Optometry
- e. Screening protocol for different ocular diseases