

Syllabus for Licensing examination of B.Sc. Operation Theatre Technology 2022



Nepal Health Professional Council

Bansbari, Kathmandu

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S.N.	Topics	Marks
1	Anatomy and Physiology	10%
2	Biochemistry, Microbiology, Pathology & Pharmacology	10%
3	Research Methodology and Biostatistics	5%
4	Basic and Advance Techniques of Anesthesia	10%
5	Basics of Surgical procedures	20%
6	Basic Intensive care, CSSD procedures	10%
7	Specialized surgery and anaesthesia	25%
8	OT Equipment, Handling and care of equipment	10%
	Total	100%

1. Anatomy and Physiology

- ◆ Structure and function of cell; cell division; tissue: definition and classification (Gross outline).
- ◆ General Anatomical terms and topography of the body-planes regions, positions, movements.
- ◆ Skeleton & joints- Long bones, vertebrae, pelvic and shoulder girdles, hands and feet, skull, face and teeth; parts of classical long bone; outline of different joints and type of movements.
- ◆ Muscles; Classification, structure and function (Gross outline).
- ◆ Brain & spinal cord with its coverings and cavities including cerebrospinal fluids and pituitary gland (Macroscopic anatomy and surface anatomy only).
- ◆ Head & Neck; Oral cavity & lips, Pharynx, Larynx, Nasal Cavity and Para Nasal sinuses, Salivary Glands, Ear; Orbit & its content; Thyroid Gland and Nodal Areas (Macroscopic Anatomy only).
- ◆ Thorax: Structure of Thoracic cage, Oesophagus, Trachea, Lungs & Pleura, The Mediastinum including Thymus, Heart and Great Vessels and Diaphragm (Macroscopic and Surface Anatomy).
- ◆ Abdomen: Structure of Abdomen & Peritoneum, Retro Peritoneal structures (including Kidney), Stomach, Small Intestine, Colon, Liver, Pancreas, Spleen (Macroscopic and Surface Anatomy).
- ◆ Pelvic and Perineum: Structure of Pelvis, Rectum & Anus, Bladder, Prostate, Female Genital Tract, Male Genital Tract and Inguinal Femoral Region (Macroscopic and surface Anatomy).
- ◆ Lymphatic system and Reticulo-endothelial system (Gross outline only)- Position and function of Lymph Nodal regions (Including Neck, Axilla, Mediastinum, para-aortic, Inguinal) Extra nodal Lymphatic Tissues (Waldeyer's Ring, Spleen and Liver, Malt, Bone Marrow, Thymus) and Re System; Lymphatic Drainage.
- ◆ Digestive System- Organs of digestion, histology of the digestive organs (stomach, small intestine, liver, pancreas), process of digestion, absorption and assimilation of food, Vitamins and minerals.
- ◆ Respiratory System- Organs of respiration and their histology (lungs and trachea), Respiration (Definition and Mechanism), gas exchange in the lungs, regulation of respiration, basal metabolic rate.
- ◆ The skin (Structure and functions).
- ◆ The excretory system- Organs of excretion (kidneys, ureter, bladder), histology of kidney and its functions, formation of urine and its composition, structure of nephron.
- ◆ Circulatory System- Composition and functions of blood, the heart anatomy and physiology, the chambers of heart, various vessels and valves present in heart, Circulation of blood, the cardiac cycle and heart sounds, blood pressure, arteries and veins.
- ◆ Nervous System- Central nervous system (Brain and Spinal cord), Peripheral nervous system (cranial and spinal nerves), The reflex action and reflex arc, The transmission of nerve impulse, sense organs (eye, ear, tongue and nose); structure and functions.
- ◆ Endocrine System- short description of various endocrine glands and their functions.
- ◆ Reproductive System- Male and female reproductive system, Histology of Gonads, ovarian cycle and ovulation, Fertilization, Fertility control.

2. Biochemistry, Microbiology, Pathology & Pharmacology

Biochemistry

- ◆ Carbohydrates - Glucose and Glycogen Metabolism.
- ◆ Proteins-Classification of proteins and functions.
- ◆ Lipids- Classification of lipids and functions.
- ◆ Enzymes- Definition, Nomenclature, Classification, Factors affecting enzyme activity, Active site. Coenzyme, Enzyme Inhibition, Units of enzymes, Isoenzymes and Enzyme pattern in diseases.
- ◆ Vitamins & Minerals- Fat soluble vitamins (A, D, E, K), water soluble vitamins, B- complex vitamins, principal elements (Calcium, Phosphorus, Magnesium, Sodium, Potassium, Chlorine and Sulphur), trace elements, calorific value of foods, Basal Metabolic Rate (BMR), Respiratory Quotient (RQ), Specific Dynamic Action (SDA), balanced diet, Marasmus and Kwashiorkor.
- ◆ Acids and bases-Definition, pH, Henderson – Hassel Balch equation, Buffers, Indicators, Normality, Molarity, Molality.
- ◆ Hormones.
- ◆ Applied Chemistry:
 - a. Nomenclature of compounds containing Halogen. Alcohols and Phenols. Ethane, Propane, Ether, Aldehydes, Ketones, Carboxylic acid, Cyanides, Isocyanides, Nitrogen compounds and amines.
 - b. Catalysis.
 - c. Hemoglobin, Blood and respiration.

Microbiology

1. Morphology

- a. Classification of microorganisms, size, shape and structure of bacteria. Use of microscope in the study of bacteria.

2. Growth and nutrition

- a. Nutrition, growth and multiplications of bacteria, use of culture media in diagnostic bacteriology.

3. Culture media

- a. Use of culture media in diagnostic bacteriology, antimicrobial sensitivity test.

4. Sterilization and Disinfection

- a. Principles and use of equipment of sterilization namely hot air oven, autoclave and serum inspissator, pasteurization, antiseptic and disinfectants.

5. Immunology

- a. Immunity, vaccines, types of vaccine and immunization schedule, principles and interpretation of common serological tests namely Widal, VDRL, ASLO, CRP, RF & ELISA.
- b. Rapid tests for HIV and HBsAg (excluding technical details).

6. Systematic Bacteriology

- a. Morphology, cultivation, diseases caused, laboratory diagnosis including specimen

collection of the following bacteria (excluding classification, antigenic structure and pathogenicity),

- b. Staphylococci, Streptococci, Pneumococci, Gonococci, Meningococci, C. diphtheriae, Mycobacteria, Clostridia, Bacillus, Shigella, Salmonella, E. coli, Klebsiella, Proteus, Vibrio cholerae, Pseudomonas & Spirochetes.

7. Parasitology

- a. Morphology, life cycle, laboratory diagnosis of following parasites: E. histolytica, Plasmodium, tape worms, Intestinal nematodes.

8. Mycology

- a. Morphology, diseases caused and lab diagnosis of following fungi. Candida, Cryptococcus, Dermatophytes, opportunistic fungi.

9. Virology

- a. General properties of viruses, diseases caused lab diagnosis and prevention of following viruses, Herpes, Hepatitis, HIV, Rabies and Poliomyelitis.

Pathology

- ◆ Cellular adaptation and cell death.
- ◆ Inflammation and repair, infection, circulatory disorders, immune defense.
- ◆ Genetics of disease.
- ◆ Neoplasia.
- ◆ Cell injury and adaptation.
- ◆ Atrophy, hypertrophy, metaphase, hyperplasia.
- ◆ Classification of tumors, premalignant lesion.
- ◆ Types of inflammation & system manifestations of inflammation.
- ◆ Disorders of vascular flow & shock (brief introduction).
- ◆ Oedema, hyperemia or congestion, thrombosis, embolism, infarction shock, ischemia, over hydration, dehydration.
- ◆ The response to infection.
- ◆ Categories of infectious agents, host barriers to infection.
- ◆ How disease is caused.
- ◆ Inflammatory response to infectious agents.
- ◆ Hematopoietic and lymphoid System.
- ◆ Hemorrhage, various types of anemia, leucopenia, leukocytosis, bleeding disorders coagulation mechanism.

Pharmacology

- ◆ Antisialagogues: Atropine, Glycopyrrolate.
- ◆ Sedatives / Anxiolytics: Diazepam, Midazolam, Phenergan, Lorazepam, Chlorpromazine, and Triclofos.
- ◆ Narcotics: Morphine, Pethidine, Fentanyl, Pentazocine, tramadol.
- ◆ Antiemetic's: Metoclopramide, Ondansetron, Dexamethasone.
- ◆ Induction Agent: Thiopentone, Diazepam, Midazolam, Ketamine, Propofol, Etomidate.
- ◆ Muscle Relaxants: Depolarizing - Suxamethonium, Non depolarizing - Vecuronium, Atracurium,

rocuranium.

- ◆ Inhalational Gases: Gases-O₂, N₂O, Air, Agents-Ether, Halothane, Isoflurane, Sevoflurane, Desflurane.
- ◆ Reversal Agents: Neostigmine, Glycopyrrolate, Atropine, Naloxone, Flumazenil (Diazepam).
- ◆ Local Anesthetics: Xylocaine, Bupivacaine - Topical, Prilocaine-jelly, Emla - Ointment, Etidocaine. Ropivacaine.
- ◆ Emergency Drugs : Mode or administration, dilution, dosage and effects.
 - a. Adrenaline, Atropine
 - b. Ephedrine, Mephentramine
 - c. Bicarbonate, calcium, potassium.
 - d. Inotropes: dopamine, dobutamine, amiodarone
 - e. Aminophylline, hydrocortisone, antihistaminic,
 - f. Antihypertensive –Beta-blockers, Ca-channel blockers.
 - g. Antiarrhythmic- xylocard
 - h. Vasodilators- nitroglycerin & sodium nitroprusside
 - i. Respiratory system- Bronchodilators
 - j. Renal system- Diuretics, frusemide, mannitol

3. Research Methodology and Biostatistics

- ◆ Introduction to research methods.
- ◆ Identifying research problem.
- ◆ Ethical issues in research.
- ◆ Research design.
- ◆ Basic Concepts of Biostatistics.
- ◆ Types of Data.
- ◆ Research tools and Data collection methods.
- ◆ Sampling methods.
- ◆ Developing a research proposal.

4. Basic and Advance Techniques of Anesthesia

- ◆ Resuscitation techniques:
 - a. Basic life support (Airway, breathing, circulation) and the equipment used for it.
 - b. Drugs used in CPR.
 - c. AED and Defibrillators.
- ◆ Anesthesia drugs and techniques:
 - a. Principles of anesthesia.
 - b. Basics of general anesthesia depth, mechanism and intubation.
 - c. Techniques of general anesthesia.
 - d. Various intravenous and inhalational agents.
 - e. Regional anesthesia, spinal and epidural, posture and drugs.
 - f. Local Anaesthetic agents.
 - g. Neuro muscular blocking agents.

- h. Principles of oxygen administration along with the apparatus.
 - i. Care of patient in the recovery room.
 - j. Post-operative pain: evaluation and management.
 - k. Types of fluid and therapy.
 - l. Blood and blood components transfusion.
 - m. Preparation of anesthesia machine, intubation kit, suction machine, anesthesia drugs.
 - n. Patient identification, marking, shifting to OT before surgery and out of OT to recovery room after surgery, complete takeover and handover of the patient with vital signs recording before and after surgical procedure to the nursing staff.
- ◆ Heart as a pump.
 - ◆ Cardiac cycle.
 - ◆ Cardiac contractility and stroke volume.
 - ◆ Cardiac output and its measurement.
 - ◆ Various ECG Leads, their placement and Normal ECG.
 - ◆ Cardiac Arrhythmias (atrial fibrillation, ventricular tachycardia, extra systoles)
 - ◆ Circulatory shock and its physiology.
 - ◆ Cardiac failure.
 - ◆ Physics of blood flow and pressure.
 - ◆ Measurement of blood flow.
 - ◆ Electromagnetic flow meter, ultrasonic flow meter, plethysmography.
 - ◆ Regulation of arterial pressure and hypertension (Drugs used for treatment of hypertension).
 - ◆ Arterial circulation including cardiopulmonary bypass.
 - ◆ Artificial ventilation and related equipment:
 - a. Physiology of IPPV (Intermittent positive pressure ventilation).
 - b. Principles of mechanical ventilation.
 - c. Various modes of IPPV.
 - d. Automatic pressure and time cycled ventilators.
 - e. Operating room ventilators.
 - f. Other types of ventilators (HFJV, NIV)
 - g. Complications in patients on ventilators.
 - h. General care of a patient on ventilator.
 - i. Disinfection and sterilization of ventilators.
 - j. Humidification.
 - k. Principles of oxygen administration and methods used to deliver oxygen.
 - l. Acid base balance.
 - m. Electrolyte imbalance and its relevance to anesthesia.

5. Basics of Surgical procedures

- ◆ Blood Transfusion.
 - a. History of discovery of blood groups and genetics of blood groups.
 - b. Types of blood groups and Rh factor.
 - c. Coombs test.

- d. Collection of blood, its preservation and standardization.
- e. Various types of blood and blood products(Packed cells, PRP, FFP)
- f. Pre-transfusion checks.
- g. Transfusion reactions.
- h. Fluids and electrolytes
- i. Body fluid compartments and the effect of fluid administration on them.
- j. Types of fluids (crystalloids and colloids) and their chemical composition.
- k. Indications of specific fluids and their complications.
- ◆ General surgical procedure and para-surgical equipment.
 - a. Operating tables: structure, material used, maintenance, control, Hydraulic system and Electrical system.
 - b. Different types of diathermy machine. Monopole, Bipolar, Ligasure, Harmonic Scalpel, CUSA- Principle, hazards, prevention, functioning and maintenance.
 - c. Types of operation lights and light sources: Features, Care, cleaning, sterilization and maintenance.
 - d. Operation Theatre sterilization- Different recent advances.
 - e. LAR/APR--Positioning of patient, care-Prevention of hazards.
 - f. Total thyroidectomy-with emphasis on proper positioning.
 - g. Transthoracic esophagectomy-Different approaches.
 - h. Venesection and Tracheostomy.
 - i. Laproscopic Cholecystectomy-Pneumoperitonium- Creation and removing, principles.
 - j. Nephrectomy.
 - k. Breast surgery.
 - l. Positioning of patient for different operations: Problems and hazards.
 - m. Hypothermia and hyperthermia.

6. Basic Intensive care & CSSD Procedures

Basic Intensive care

- ◆ Care and maintenance of ventilators, suction machine, monitoring devices.
- ◆ Sterilization and disinfection of ventilators.
- ◆ Care, maintenance and operational capabilities of beds, lights and other apparatus.
- ◆ Air conditioning and control of pollution in ICU.
- ◆ Attachment and intraoperative utility of ventilators and monitoring devices.
- ◆ Care of unconscious adult and pediatric patients.
- ◆ Physiotherapy techniques, feeding, Ryle's tube insertion and hyper alimentation.
- ◆ Suctioning and posturing of semiconscious and unconscious patients.
- ◆ Oxygen therapy, maintenance of clear Airway.
- ◆ Ventilation of patient in crisis:
 - ◆ Mouth to mouth.
 - ◆ Mouth to ET Tube.
 - ◆ Resuscitator/bag valve mask assembly.
 - ◆ Different types of Airways.

- ◆ Short term ventilation/Transport ventilators.
- ◆ ICU Laboratory; Detection of blood gases of the patient, Principles of ABG machines.
- ◆ Management of asepsis.
- ◆ Management of tetanus patient.
- ◆ Psychological aspects of the patient, relative and staff.
- ◆ Hemofiltration and hemodialysis.
- ◆ Ventilators: Principles of working of different ventilators:
 - a. Volume cycled/Time cycled/Pressure cycled ventilators.
 - b. High frequency ventilators and other types.
 - c. Methods of measuring the expired gases from the patient; Types of spirometers, Principles of working of spirometers. Clinical application of above apparatus.
 - d. Apparatus and techniques of measuring of blood pressure and temperature; Principle and working of direct/indirect blood pressure monitoring apparatus; structure, principle and working of the oscillotonometer. Principles and working of aneroid manometer type B.P. instrument.
 - e. Laryngeal sprays; Types, material, principle and mechanism.
 - f. Monitoring techniques and equipment; Cardiac monitors, Respiratory monitors, Spirometers, Temperature monitors.

CSSD Procedures

- ◆ Principles of sterilization and disinfection.
- ◆ Methods of sterilization.
- ◆ Dry Sterilization.
- ◆ Wet sterilization.
- ◆ Gaseous sterilization.
- ◆ Chemical sterilization.
- ◆ Sterilization by radiation (Gamma rays, ultraviolet rays)
- ◆ Techniques of sterilization of rubber articles. (LMA, FOB, ETT, Laryngoscopes, Anesthesia machines and circuits).
- ◆ Technique of sterilization of carbonized articles.
- ◆ Methods of disinfection.
- ◆ Boiling.
- ◆ Chemical disinfection.
- ◆ Hazards of sterilization.
- ◆ Prevention of hazards of sterilization.
- ◆ Precautions to be taken during sterilization.
- ◆ Recent advances in the methods of sterilization.

7. Specialized surgery and anaesthesia

- ◆ Cardiovascular and Respiratory System- Techniques, equipment, procedures and instruments.
 - a. Diseases of cardiovascular and respiratory systems.
 - b. Types of perfusion machines.

- c. Techniques of Perfusion and operational capabilities.
- d. Intra-aortic Balloon pump.
- e. Cell saver techniques.
- f. Care, maintenance and working of Heart Lung Machine.
- g. Patient's record keeping preoperatively, during anesthesia and post-operatively.
- h. Principles and techniques of temperature monitoring.
- i. Positioning during cardiothoracic surgical procedures.
- j. Positioning and techniques for:
 - ✓ Radial artery cannulation.
 - ✓ Central venous cannulation/pulmonary artery catheter.
 - ✓ Femoral artery/venous cannulation.
- ◆ Monitoring Techniques and Equipment:
 - a. Cardiac monitors, blood pressure and ECG monitoring.
 - b. Respiratory monitors, respiratory rate, Spirometers, SpO₂, and EtCO₂.
 - c. Temperature monitors.
 - d. TEE and echocardiography machine
 - e. Non- invasive cardiac output machine
- ◆ Positioning-
 - a. During various neurosurgical procedures including sitting, prone, lateral and position for trans-sphenoidal hypo-physectomy.
 - b. Fixation of head during various neurosurgical procedures.
 - c. Prone and Knee chest position for spine surgery.
- ◆ Requirements during intubation in a case of cervical spine fracture including fiber- optic laryngoscopy, awake intubation, LMA family especially ILMA.
- ◆ Anaesthetic and surgical requirements during aneurysm surgery.
- ◆ Surgical and Anaesthetic requirements during micro neurosurgery including types of microscopes, principle, structural features, microscopic photography and cameras used.
- ◆ Anaesthetic and surgical requirements during thyroid surgery, adrenal surgery.
- ◆ Anaesthetic and surgical requirements during abdominal surgery including Laproscopic surgery, genitourinary surgery including percutaneous nephrolithotomy, Endoscopic surgery, TURP, TURBT, Lithotripsy, ESWL (Extracorporeal shock wave therapy)
- ◆ Anaesthetic and surgical requirement during renal transplant donor and recipient surgery including care and precautions during operative procedures of hepatitis B & hepatitis C positive patients.
- ◆ Anaesthetic and surgical requirement during pediatric and Neonatal surgical procedures including emergency procedures like tracheo-esophageal fistula. Sub diaphragmatic hernia, major abdominal and thoracic procedures. Foreign body bronchus and esophagus.
- ◆ Apparatus and techniques for measuring blood pressure and temperature.
- ◆ Principle and working of direct/Indirect blood pressure monitoring apparatus.
- ◆ Intraoperative and postoperative problems and complications of general surgery.
- ◆ Management of emergency caesarean section.
- ◆ Management of massive obstetrical hemorrhage.
- ◆ Surgical management in major burns and craniofacial surgery.

- ◆ Surgical management of joint replacement and arthroscopy.
- ◆ Surgical management of endoscopies, laryngectomy with RND and cochlear implant.
- ◆ Management of PPV and perforating eye injury.
- ◆ Care and maintenance of Para-surgical equipment (Cautery, OT Lights, OT Table etc.)

8. OT Equipment, Handling and care of equipment

Equipment

- ◆ Medical gas supply
 - a. Compressed gas cylinders
 - b. Color coding
 - c. Cylinder valves; pin index.
 - d. Gas piping system
 - e. Recommendations for piping system
 - f. Alarms & safety devices.
 - g. Scavenging of waste anesthetic gases
- ◆ Anesthesia machine
 - a. Hanger and yoke system
 - b. Cylinder pressure gauge
 - c. Pressure regulator
 - d. Flow meter assembly
 - e. Vaporizers - types, hazards, maintenance, filling and draining, etc.
- ◆ Breathing system
 - a. General considerations: humidity & heat
 - b. Common components - connectors, adaptors, reservoir bags.
 - c. Capnography
 - d. Pulse oximetry
 - e. Methods of humidification.
 - f. Classification of breathing system
 - g. Mapleson system - a b c d e f
 - h. Jackson Rees system, Bain circuit
 - i. Non rebreathing valves - Ambu valves
 - j. The circle system
- ◆ Face masks & Airway laryngoscopes
 - a. Types, sizes
 - b. Endotracheal tubes - Types, sizes.
 - c. Cuff system
 - d. Fixing, removing and inflating cuff, checking tube position, complications.
- ◆ Anesthesia ventilator and working principles.
- ◆ Monitoring
 - a. Electrocardiography(ECG)
 - b. Pulse oximetry(SpO₂)

- c. Temperature- central and peripheral
- d. End tidal carbon dioxide (EtCO₂)
- e. Anesthesia gas monitoring
- f. Non-invasive blood pressure (NIPB) and Invasive blood pressure (IBP)
- g. Central venous pressure (CVP)
- h. PA Pressure, LA Pressure & cardiac output
- i. Anesthesia depth monitor
- j. Neuromuscular transmission monitor
- ◆ Operation tables:
Structure, material used in fabrication and advantages of the material, care, maintenance.
Controls – hydraulic system, electrical system.
- ◆ Diathermy/Cautery machines:
 - a. Different types of diathermy and cautery machines; monopolar, bipolar and underwater working.
 - b. structural features of diathermy and cautery machines.
 - c. Types of active and passive electrodes
 - d. Care, maintenance and uses
 - e. Prevention of hazards
- ◆ Operation lights;
Types of operation lights and other lights sources.
Structural features, care, cleaning, carbolisation, maintenance and uses
- ◆ Scopes
 - a. Types of scopes : bronchoscope, fibreoptic scope, esophageal scope, laproscope, cystoscope, nephroscope, etc.
 - b. Their structural features, care, maintenance and uses.
- ◆ Microscopes
 - a. Different types of microscopes
 - b. Principle structure and feature
 - c. Microscopic photography and camera used
 - d. Care, maintenance and uses
 - e. Glasses used and their property
- ◆ Cardioscopes
 - a. Types of cardioscopes and ECG machines and their applications
 - b. Repair and maintenance of cardioscopes
 - c. Types of patient electrodes and their application
 - d. Types of paper used for ECG
 - e. Recording of ECG and safety in use equipment
- ◆ Defibrillators
 - a. principle and mechanism of defibrillator and its type
 - b. Uses and safety precautions during use
 - c. Maintenance and its operational capabilities

Care of equipment

- ◆ Cleaning/disinfection and sterilization of equipment (operation tables, operation theatres lights, suction machines, diathermy and other OT equipment.)
- ◆ Maintenance of special surgical equipment, their care, preservation.
- ◆ Techniques of handling of laser based equipment, their care, preservation and maintenance.
- ◆ Running of equipment/machine and other job assigned from time to time .
- ◆ Book keeping and stock maintenance.
- ◆ Electronic in surgery and anaesthesia.
- ◆ Computer data processing, software information and data management.
- ◆ Ventilation of OT, air conditioning and control of pollution.
- ◆ Moral aspects and duties of OT technologists.
- ◆ Indenting, book keeping and storage procedures of different articles.
- ◆ Management of OT in routine.