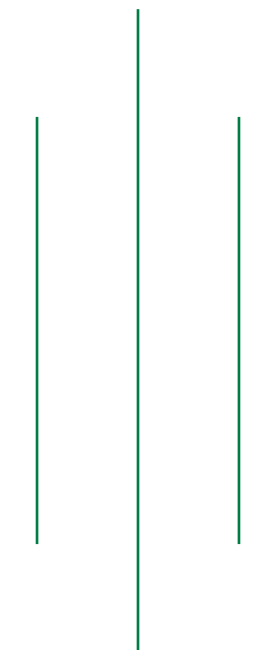


Syllabus for Licensing Examination of Bachelor in Perfusion Technology (B. Perf. Tech.) 2021



Nepal Health Professional Council

Bansbari, Kathmandu

Table of Content

S.N.	Topic	Marks
1	Basic Medical Science (Human Anatomy, Clinical Physiology, Biochemistry, Pathology, Microbiology, Pharmacology)	15 %
2	Basic of Perfusion Technology	10 %
3	Medicine relevant to Perfusion Technology	5 %
4	Introduction to Perfusion Technology	10 %
5	Perfusion Technology- Clinical, Applied, Advance	45 %
6	Introduction of Cardiac surgery, Cardiology & Cardiac Anesthesia , Trauma life support and Cardiac Life support	15 %
	Total	100 %

1. Basic Medical Science (Human Anatomy, Clinical Physiology, Biochemistry, Pathology, Microbiology, Pharmacology)

Anatomy

Introduction: human body as a whole: Cells, Epithelium, Glands, tissues

Locomotion and support: Cartilage, Bone, Joints, Muscles

Cardiovascular system: Heart, Blood supply, Circulation, Branches of Aorta, common carotid artery, subclavian artery, axillary artery, brachial artery, superficial palmar arch, femoral artery, internal iliac artery, Peripheral pulse, Inferior vena cava, portal vein, Porto systemic anastomosis Great saphenous vein, Dural venous sinuses, Internal & external jugular veins, circle of willis, Lymphatic system- cisternachyli & thoracic duct

Respiratory system: Parts of RS, Nose, Nasal Cavity, Larynx, Trachea, Lungs,

Bronchopulmonary Segments, Pleura & Pleural Cavity

Digestive system, Nervous system, Urinary system, Reproductive system, Skeletal system, muscular system, Peritoneum, Sensory organ

Physiology

Cardiovascular system: Anatomy of Heart, properties of Cardiac Muscle, function of different parts of Heart, Pulmonary and Systemic circulation, Cardiac circulation, Neural and Humoral control mechanism, Cardiac Cycle, Heart Sounds, Pulse Rate and Heart Rate: factors affecting, Pressure and Volume changes in Cardiac Cycle, Blood Pressure and mechanism of Regulation, factors affecting Blood Pressure, cardiac output, stroke volume, Name factors affecting cardiac output, Shock, Different type of shock, Causes of shock, Jugular venous pressure, Electrocardiogram: Definition, importance, interpretation, Bradycardia, Tachycardia, Heart Block, Myocardial Infarction, Arrhythmia, Cardio respiratory Resuscitation

Respiratory system, General physiology, Blood physiology, Reproductive system, Endocrine system, Digestive, Musculoskeletal system, Urinary system

Biochemistry

Cells, Chemistry of Carbohydrates, Proteins, Lipids & Nucleotides, Enzymes, Vitamins & Minerals

Carbohydrate, Protein, Lipid, Calcium Phosphorus Homeostasis and Muscle

Metabolism, Liver and Bilirubin Metabolism

Acid base balance, Blood and coagulation pathway, Endocrine Chemistry, Renal and Electrolyte system, Nutrition and Biochemistry, Neurosensory System, Organ function test

Pathology

acute and chronic inflammation, wound healing, thrombosis, embolism, ischemia, infarction, shock and edema, tissue growth and enumerate predisposing factors of neoplasia, mechanism of spread and metastasis, antigen, antibody and complement, immunity and hypersensitivity, pathophysiology, sign, symptoms and diagnosis of AIDS

Basic of Hematology, Blood Bank,

Basic concepts of fracture, arthritis, osteomyelitis, pathophysiology, signs, symptoms and diagnosis

Microbiology

Bacteria, Eukaryotes and Prokaryote, Growth and nutrition,
Sterilization and Disinfection, Immunology, Systematic Bacteriology, Mycology, Virology
The Health care associated infections and Antimicrobial resistance
The Disease communicable to Healthcare workers in hospital set up and its preventive measure
The Microbiological surveillance and sampling
Importance of sterilization
Preparation of materials for autoclaving: Packing of different types of materials, loading, holding time and unloading

Applied Pharmacology

Autonomic Nerves System: Dose, route of administration, Mention indications, contraindications and adverse effects of alpha 1 antagonists and beta blockers
Cardiovascular System: Antihypertensive, Antiarrhythmic drugs, Drugs used for congestive heart failure, Inotropic agent's, Coronary vasodilators, Antianginal agents, Lipid lowering & anti atherosclerotic drugs.
Neurosensory System: General and local anesthetics, Classify general anesthetics, Pharmacokinetics and Pharmacodynamics of inhaled anesthetic agents, Intravenous general anesthetic agents, Classify Local anesthetics, mechanism of action, and duration of action and methods to prolong the duration of action.
CNS stimulants and depressants: Alcohol, Sedatives, hypnotics and narcotics, CNS stimulants
Overview of Neuromuscular blocking agents and Muscle relaxant, Pharmacotherapy of respiratory disorders, Diuretics, Endocrine and Metabolic, GI system, Chemotherapy of infections

2. Basic of Perfusion Technology

History of Cardiac surgery and Perfusion Technology: Gibbon, Lillehei, Carrel, Pre CPB surgery, Azygous Flow principle, controlled cross circulation, early oxygenators and developments.
Components of Cardiopulmonary Bypass: Heart - Lung machine, Heater Cooler Machine, Inline Blood Monitor, Anticoagulation measurement Machine, Blood gas analyzer
Various types of oxygenators: Bubble oxygenators, rotating spiral/cylinder/disc oxygenators, Membrane oxygenators, Mechanism of action components defoaming, rated flow.
Theory of blood pumps: Ideal blood pump, Pulsatile versus non-pulsatile flow,
Occlusive and non-occlusive pumps, Various types of pumps roller, Bellow, Sigmamotor, Diaphragm, Ventricular, Centrifugal pumps
Element of extracorporeal circulation/hazards: Use of Bubble trap, Flow meters, type of Temperatures, different type of Heat exchanger, use of Regulating devices, Blood failure during Cardiopulmonary Bypass.
Connection of the vascular system with extracorporeal circulation: Different types of Arterial and Venous Cannula, Different types of Connecting tubes and connectors, pediatric and adult Vents, pediatric and adult Suckers, types of Cardioplegia delivery system

3. Medicine Relevant to Perfusion Technology

Cardiovascular System: Ischemic heart diseases, Rheumatic heart disease,
Congenital heart disease, Hypertension, Aortic Aneurysms and Cardiomyopathy,
Peripheral vascular disease, Pulmonary edema and LV failure

Hematology: Anemia, Bleeding disorders, Laboratory tests used to diagnose bleeding disorders (in brief)

Respiratory System: Chronic obstructive airway diseases (COPD), Obstructive versus restrictive pulmonary disease, PFT and its interpretation

Renal System: Acute renal failure (ARF) & chronic renal failure (CRF), End stage renal disease,

Role of dialysis and renal transplantation in its management 10.5) Central Nervous System: Automatic nervous system. (Sympathetic & Parasympathetic system), Brief mention of CNS disorders & their etiology

4. Introduction of Perfusion Technology

Basics of diagnostic techniques: Basic of Chest of X-ray, ECG, ECHO, Angiography, Nuclear Cardiology, Laboratory investigations in relation to perfusion technology.

Monitoring and instrumentation: Basic concepts of monitoring – Instrumentation technology of ECG machine, Pressure Transducer, Syringe and Peristaltic Pumps, Monitors, Ventilators, Pulse Oximeters, Temperature Probes and Thermo Regulatory Monitoring, Defibrillators and Fibrillators. Piped and non-piped gas delivery systems and connections. Basic physics related to medically used gases, Hemodynamic monitoring., Hemostatic monitoring, Hematologic monitoring, Management of oxygen, carbon dioxide and acid-base status and their monitoring, Neurological monitoring (SSPE, EEG and cerebral function monitor), Aseptic technique, communicate Cardiac surgery team, profession and terminology, scope of perfusion technology.

Circuits and Tubing: Design consideration, Designing the circuit, Circuit components, Tubing characteristics, Types of tubing

Physiology of Extracorporeal circulation: Principles of Extracorporeal Circulation Technology, the materials used in Extracorporeal Circuit, Principles of Extracorporeal gas exchange, Principal of heat transfer- heat exchanger performance evaluation

Assembling and monitoring in extracorporeal circulation: Introduce extra corporeal circulation, Prepare extracorporeal circuit for assemble, Assemble the extracorporeal circuit, Monitoring during cardiac surgery, Temperature monitoring, Blood pressure monitoring, Flow monitoring, Monitoring blood variables, Perfusion circuit safety devices, Hemodynamic of arterial return, venous drainage, cardioplegia delivery and venting, Blood banking, handling of blood products and their management, Blood components and their use.

Conduct of Cardio pulmonary bypass- Basic Concept: Ascending Aortic

Cannulation, Right Atrio caval Cannulation, Special operative Cannulation consideration, left ventricular decompression, complications of cannulation, Initiation and maintenance of CPB

During Cardiopulmonary Bypass Monitoring: Describe about acute complications,

Interpretation blood-gas analysis , Explain about Oxygenation, blood pressure during Cardiopulmonary Bypass, Anticoagulation related to CPB, Potassium during Cardiac arrest, de-airing procedures before CPB, Termination of CPB, Preparing heart for CPB weaning, technique of preparing the lungs for CPB weaning, technique of preparing the patient for CPB weaning, pharmacologic considerations during weaning of CPB, choice of inotropic/vasodilator drug therapies during weaning of CPB, failure to wean from CPB.

5. Perfusion Technology- Clinical

Pharmacokinetics and Pharmacodynamics of Cardiopulmonary bypass 13.2) Drugs (including anesthetic drugs) used in cardiopulmonary bypass 13.3) Conduct and monitoring of Cardiopulmonary bypass.

Adequacy of perfusion – General considerations, specific aspects of perfusion, monitoring, other concomitants which may affect its adequacy

Pulsatile perfusion – Introduction, theory & physiology of pulsatile flow, hemodynamic, metabolic effects, Clinical use, hematological effects.

Cannulation techniques during cardiopulmonary bypass.

Termination of cardiopulmonary bypass – principles and methodology.

Myocardial protection and cardioplegia-pretreatment of the Myocardium, cardioplegia, hypothermia, controlled reperfusion, myocardial protection for specific clinical problems, Complications of cardioplegia. Non- cardioplegic methods during cardiac surgery on cardiopulmonary bypass.

Oxygenation – general consideration, bubble & membrane (including assessment and comparison of oxygenator function)

Heat exchangers-principles function of heat exchangers & their assessment.

Complications related to heat exchange and their management.

Priming fluids and hemodilution.

Perfusion Technology Applied

Blood cell trauma – analysis of forces of fluid motion, effects of physical forces of blood cell, clinical effect. Complications of blood transfusion.

Anticoagulation on bypass, its monitoring, its reversal and complications. Heparin less bypass.

Platelet aggregation and platelet dysfunction. Coagulopathies due to cardiopulmonary bypass and its management.

Inflammatory response to cardiopulmonary bypass & its clinical effects. Methods to minimize the same.

Immune response, neuroendocrine, renal, metabolic splanchnic response, pulmonary response and electrolyte response to cardiopulmonary bypass.

Blood conservation hemofiltration & dialysis during cardiopulmonary bypass including modified ultra-filtration reverse autologous priming and other methods.

Micro emboli- gaseous and particulate, filters used in cardiopulmonary bypass circuit.

Micro pore filtration during cardiopulmonary bypass.

Counter pulsation techniques and assist devices.

Perfusion Technology – Advanced

Perfusion techniques for Pediatric cardiac surgery

ECMO- special perfusion techniques for special cardiac surgeries and medical conditions (including thoracic aortic surgeries deep hypothermia and circulatory arr 18.3) Perfusion for non-cardiac surgery, invasive cardiology and outside the operation suite.

Perfusion as a method of cardiopulmonary bypass.

Left and Right Ventricular Assist Devices.

Thoracic aortic surgery and Intra Cranial Surgery with CPB

- a. Thoracic aortic surgery -Ascending aorta – Cannulation – CPB management
- b. Aortic arch – CPB management-
- c. Descending and Thoracic -Abdominal aorta – CPB management,
- d. Intra cranial surgery- Introduction –Technique – Hemostasis and Coagulation.
- e. Pregnancy, chest trauma and emergency CPB-Pregnancy and CPB
- f. Introduction – preoperative considerations – conduct of perfusion in the gravid patients
- g. selection of cardiovascular drugs and therapeutics in the gravid patients
- h. effects of cardiovascular drugs during pregnancy and CPB

- i. chest trauma and emergency CPB,
- j. Cardiac wounds, aortic wounds, major airway injuries.

Complications and safety during cardiopulmonary bypass

Bypass safety, Organizational aspects , Accidents , Coagulopathies , Mechanical and, electrical failures , Perfusion management , Perfusion systems , Safety for the perfusionist and surgical team management of perfusion accidents

Artificial Hearts, Minimally invasive surgery and the perfusionist, Recent advances in perfusion techniques, Basic knowledge of Transplantation- Heart, Heart and Lung, Liver.

Medical legal aspects of CPB – Introduction, Tort Liability, Negligence, Vicarious liability, strict liability, Avoid litigation.

6. Introduction of Cardiac Surgery, Cardiology & Cardiac anesthesia

The Electrical Activity of the Heart: The Electrocardiogram: The cardiac action potential, the electrocardiogram, Diseases of the Coronary Arteries

Heart Failure, Disorders of Rate, Rhythm and Conduction

Rheumatic Fever and its Sequelae, Disorders of the Cardiac Valves

Congenital Heart Disease, Diseases of the thoracic aorta, Minimal access surgery

Complications of cardiac surgery

Cardiac Anesthesia: Basic Principles of anesthesia, Conduct of anesthesia, Prebypass anesthetic management, Anesthetic management of bypass, Anesthesia management post – bypass, Anesthesia for off – pump surgery.

Trauma Life (Part 1): Basic life support (BLS), Airway & Ventilator management Define Shock, Central & peripheral venous access, Thoracic trauma – Tension pneumothorax, other thoracic injuries, abdominal trauma – Blunt injuries, abdominal trauma – Penetrating injuries

Trauma Life (Part 2): Spine and spinal cord trauma, Head trauma, Musculoskeletal trauma, Electrical injuries, Thermal burns, Cold injury

Trauma Life (Part 3): Pediatric trauma, Trauma in pregnant women, Workshop

BLS, Workshop cervical spine immobilization, Imaging studies in trauma

Cardiac Life Support (Part 1): • Describe the BLS, universal algorithm for adult ECC, Ventricular fibrillation/Pulseless ventricular tachycardia algorithm, Pulseless electrical activity (PEA) / asystole algorithm, Bradycardia treatment algorithm,

Tachycardia Treatment algorithm

Cardiac Life Support (Part 2): Hypotension / Shock, Acute myocardial infarction,

Pediatric Advanced life support, Airway management, Defibrillation, Drugs used in ACLS, Emergency cardiac pacing, (automated external defibrillator) AED, Techniques for oxygenation and ventilation