

Syllabus for Licensing Examination of M.Sc. Perfusion Technology 2021



Nepal Health Professional Council

Bansbari, Kathmandu

Table of Content

| S.No | Discipline Area | Marks |
|------|--|-------|
| 1 | Cardiology | 5% |
| 2 | Cardiac Surgery | 5% |
| 3 | Introduction to OT and Perfusion Technology | 15% |
| 4 | Equipment's used in Perfusion Technology & Physiology & Pathology of Perfusion | 20% |
| 5 | Pharmacology of Cardiovascular drugs | 5% |
| 6 | Clinical application of Perfusion Technology | 20% |
| 7 | Cardiac surgery without CPB, Mechanical circulatory support & Robotic cardiac surgery | 15% |
| 8 | Organ Transplantation | 5% |
| 9 | Hematology as Relevant to Perfusion Technology, Blood Transfusion and Blood Conservation | 5% |
| 10 | Biostatistics, Research methodology, Medical Ethics | 5% |
| | Total | 100% |

1. Cardiology

- 1.1 The Electrical Activity of the Heart: The Electrocardiogram: The cardiac action potential, the electrocardiogram.
- 1.2 Diseases of the Coronary Arteries: Causes, Pathology and Prevention, Coronary Heart Disease – Angina and Unstable Angina; Coronary Heart Disease – Myocardial Infarction: Treatment of acute infarction, complications of acute myocardial infarction and their management, late complications of infarction, risk stratification at hospital discharge, drug treatment at discharge, rehabilitation.
- 1.3 Heart Failure: The Pathophysiology of heart failure, clinical syndromes of heart failure, the management of cardiac failure, acute circulatory failure (shock), cardiac transplantation.
- 1.4 Disorders of Rate, Rhythm and Conduction: Mechanisms of arrhythmias, disturbances of rate and rhythm, disorders of conduction, investigation of arrhythmias, management of arrhythmias.
- 1.5 Rheumatic Fever and its Sequelae, Disorders of the Cardiac Valves: Mitral valve disease, aortic valve disease, tricuspid valve disease, pulmonary valve disease, infective endocarditis.
- 1.6 Congenital Heart Disease: The varieties of congenital heart disease.

2. Cardiac Surgery

- 2.1 Ischemic Heart Disease: Pathophysiology of ischemic disease: Indications for CABG, Contraindication to CABG, Planning coronary artery surgery, Conduit, selection, Principles of saphenous vein harvest, Saphenous vein harvest, LIMA harvest, RIMA harvest, Alternative conduits, Distal anastomoses on bypass, Jump or sequential grafts, Endarterectomy, Positioning the heart in OPCAB, Proximal anastomoses to aorta, Redo coronary artery bypass surgery, Problem scenarios in redo surgery, Left ventricular aneurysm, LV aneurysmectomy, Ischemic ventriculoseptal defect (VSD), Ischemic mitral regurgitation, Results of coronary artery bypass surgery.
- 2.2 Valvular Heart Disease: Pathophysiology of aortic stenosis, Pathophysiology of aortic regurgitation, Timing of surgery – aortic, Principles of aortic valve replacement, Aortic valve implantation, Stentless aortic valve replacement, Homograft aortic valve replacement, The Ross procedure, Aortic root replacement, Aortic root enlargement, Principles of valve sparing procedures, Results of aortic valve surgery, Pathophysiology of mitral stenosis, Pathophysiology of mitral regurgitation, Timing of surgery – mitral, Principles of mitral valve repair, Mitral Valvotomy, Principles of mitral valve repair, Mitral valve replacement, Tricuspid valve disease, Surgery for infective endocarditis, Combined Valvular procedures, Alternative approaches, Results of mitral and tricuspid valve surgery.
- 2.3 Congenital heart disease: Overview of congenital heart surgery, Patent ductus arteriosus, Anomalous pulmonary venous connection, Coarctation of the aorta, Atrial septal defects, Ventricular septal defects, Atrioventricular septal defects, Truncus arteriosus, AV alignment abnormalities, Transposition of the arteries, Ebstein's anomaly, Tetralogy of Fallot, Hypoplastic left heart syndrome, Basic operative technique, Arterial switch (Jatene), Rastelli operation, Damus-kaye-stansel operation, Norwood operation, Glenn

shunt and hemi – Fontan, Fontan operation , Pulmonary artery banding, Aortopulmonary shunts, Tetralogy of Fallot repair , Pulmonary valvotomy, Aortopulmonary window repair, Coarctation of the aorta repair, Interrupted aortic arch repair, LVOT obstruction repair.

- 2.4 Diseases of the thoracic aorta: Pathology of aortic dissection, Diagnosis of type A aortic dissection, Management of type A dissections, Set – up for repair of aortic dissection, Repair of DeBakey type II dissection, Repair of DeBakey type I dissection, Management of type B dissections, Other repair techniques, Pathology of aortic aneurysms, Diagnosis of aortic aneurysms, Management of aortic aneurysms, Surgery for ascending aneurysms, Valve sparing surgery techniques, Surgery for aortic arch aneurysms, Repair of descending aortic aneurysms , Bypass for descending aorta surgery, Traumatic aortic transection
- 2.5 Minimal access surgery: Incisions, Options for Cardiopulmonary bypass, LIMA harvest, Coronary artery bypass grafting (CABG), Valve surgery.
- 2.6 Complications of cardiac surgery: Normal postoperative course, Overview of complications, Hypotension and tamponade, Chest pain and ischemia, Late arrhythmias, Hypertension, Pericardial problems, Complications of valve surgery, Respiratory complications, Renal Complications, Gastrointestinal symptoms, Gastrointestinal complications, Hepatobiliary complications, Stroke, Management of stroke, Neurological complications, wound infections, wound complications, Haematological complications.
- 2.7 Cardiac Anaesthesia: Basic Principles of anaesthesia, Conduct of anaesthesia, Pre-bypass anaesthetic management, Anaesthetic management of bypass, Anaesthetic management post – bypass, Anaesthesia for off – pump surgery.

3. Introduction to OT and Perfusion Technology

- 3.1 Introduction to the operating room environment & protocols: General protocols followed in the operating room, Hand washing, Unsterile-sub sterile-sterile methods followed in the O R environment, Handling of Disposables in the O R, Handling & maintenance of equipments in the OR, Protocols followed in CCU
- 3.2 Introduction to the various components of Cardiopulmonary bypass system
- 3.3 Introduction to the basics of CPB procedures
- 3.4 Basics of electricity & functioning of electro medical equipments. Electric safety (Earthing) & care of apparatus. Electricity & electro medical equipments & safe guards Static electricity
- 3.5 Sterilization – material & methods
- 3.6 Cardiopulmonary resuscitation: Basic cardiac life support, Advanced cardiac life support
- 3.7 Intensive coronary unit & recovery room concepts
- 3.8 Biomedical waste & its management

4. Equipment's used in Perfusion Technology & Physiology & Pathology of Perfusion

EQUIPMENTS IN PERFUSION TECHNOLOGY

- 4.1 Blood Pumps, Principles of Oxygenator Function: Gas Exchange, Heat Transfer, and Operation

4.2 Circuitry and Cannulation Techniques, Cardiomy Suction and Venting

PHYSIOLOGY & PATHOLOGY OF PERFUSION

4.3 Blood – Surface Interface, Pulsatile Cardiopulmonary Bypass

4.4 Hemodilution and Priming Solutions, Hypothermia: Physiology and Clinical Use

4.5 Surgical Myocardial protection, Changes in the pharmacokinetics of Drugs Administered During Cardiopulmonary Bypass

4.6 Immune and Inflammatory responses after Cardiopulmonary Bypass, Embolic Events, Endocrine, Metabolic, and Electrolyte response

4.7 Cardiopulmonary Bypass and the Lung, Cardiopulmonary Bypass and the Kidney

4.8 Splanchnic, Hepatic, and Visceral effects, Neurologic Effects

4.9 Recent developments in equipment's in perfusion technology & physiology & pathology of perfusion

5. Pharmacology of Cardiovascular drugs

5.1 Anti-anginal agents: Beta-blocking agents, nitrates, calcium channel blockers

5.2 Anti-failure agents: Diuretics

5.3 Angiotensin – converting enzyme (ACE): inhibitors, angiotensin-II, Receptor Blockers (ARBs)

and aldosterone antagonism

5.4 Digitalis: acute inotropes and inotropic dilators

5.5 Antihypertensive drugs

5.6 Antiarrhythmic drugs

5.7 Antithrombotic agents: platelet inhibitors, anti-coagulants and fibrinolytics

5.8 Lipid –lowering and antiatherosclerotic drugs

5.9 Recent developments in pharmacology of cardiovascular drugs

6. Clinical Application of Perfusion Technology

6.1 Conduct of cardiopulmonary bypass & termination of bypass

6.2 Management of unusual problems encountered in initiating and maintaining cardiopulmonary bypass.

6.3 Cardiopulmonary bypass in infants and children

6.4 Extra corporeal membrane oxygenation for respiratory or cardiac support Extra corporeal cardiopulmonary support for resuscitation and invasive cardiology outside the suite

6.5 Non-cardiovascular applications of cardiopulmonary bypass

6.6 Perfusion for thoracic aortic surgery

6.7 Cardiopulmonary bypass for port – access cardiac surgery

6.8 Recent developments clinical applications of perfusion technology

7. Cardiac surgery without CPB, Mechanical circulatory support & Robotic cardiac surgery

- 7.1 Cardiac surgery without CPB Patients selection for less invasive operations (MID CAB, OP-CABG), technical considerations in off-pump surgery, stabilizing devices, intra coronary stunts, primary off- pump CABG in impaired left ventricular function, alternative approaches to coronary artery disease, beating heart surgery supported by assist devices.
- 7.2 Mechanical circulatory support
 - 7.2.1 IABP
 - 7.2.2 Cardiac assist devices
 - 7.2.3 General aspects of mechanical support
 - 7.2.4 Extracorporeal devices
 - 7.2.5 Intracorporeal devices
 - 7.2.6 Future devices
- 7.3 Devices used to bridge to transplantation
 - a. Thoratec VAD
 - b. Novacor LVAD
 - c. Heart mate
 - d. Totally artificial heart
- 7.4 Robotic cardiac surgery: Cardio pulmonary bypass during port – access surgery and robotic surgery: endovascular catheter system, minimally invasive cardiac surgery, directs vision, micro-incision and video-assisted, and robotic operations.
- 7.5 Recent developments issues in perfusion

8. Organ Transplantation

- 8.1 Heart transplantation: Basic transplant immunology, Patient and donor selection, Matching donor to recipient, Donor preparation, Orthotopic/heterotopic Cardiac transplantation, Intensive care management, Immunosuppression and rejection, Surgical complications and results.
- 8.2 Heart-lung transplantation: Recipient selection, donor selection and graft harvest, surgical procedure, Pathophysiology before / after transplantation, preoperative management.
- 8.3 Lung transplantation
- 8.4 Recipient selection, Donor selection and graft harvest, surgical procedures of lung transplantation (single-lung / double-lung transplantation) , Pathophysiology before / after transplantation , postoperative management
- 8.5 Liver transplantation: role of perfusionist
- 8.6 Renal transplantation: role of perfusionist
- 8.7 Prosthetic heart valves (mechanical/ bioprosthetic)

8.8 Homograts Grafts (Synthetic)

9. Hematology as Relevant to Perfusion Technology, Blood Transfusion and Blood Conservation

- 9.1 Hematology: Anticoagulation for cardiopulmonary bypass, Heparin neutralization, Hematologic effects of cardiopulmonary bypass, Management of coagulopathy associated with cardiopulmonary bypass.
- 9.2 Blood transfusion: Transfusion practices, Transfusion algorithms
- 9.3 Blood conservation: Autologous blood donation, acute perioperative normovolemic hemodilution or “blood pooling”, intraoperative blood salvage, postoperative autologous blood salvage, erythropoietin therapy to replace blood loss, Pathophysiology and epidemiology of hemostatic abnormalities, Topical agents for reducing blood loss.

10. Biostatistics, Research methodology and Medical Ethics

- 10.1 Statistics and its scope, functions, limitations and usefulness
- 10.2 Collect and record statistical information on medical and related fields from primary and secondary sources via census, vital registration, ad-hoc surveys, population registers, hospital records, medical journals and bulletins;
- 10.3 Frequency distribution, presentation of statistical data –diagrammatic and graphic
- 10.4 Measures of central tendencies- mean, mode, median.
- 10.5 Measures of location-quartiles, deciles and percentiles
- 10.6 Measures of dispersions-range, standard deviation, variance, co-efficient of variation
- 10.7 Concept of probability and chance in regard to biomedical; additive and multiplicative laws of probability; conditional probability
- 10.8 Binomial, Poisson and Normal probability distributions; Properties and uses of Normal Distribution.
- 10.9 Correlation and regression analysis; Scatter diagram, Cause and effect relationship between two variables; Least square method for estimating regression parameters and prediction
- 10.10 Hypothesis and tests of significance, Z test, t-test, Chi-square test
- 10.11 Sampling theory; Probability and non-probability; Selecting an appropriate sampling design; sampling errors and the sample size

Research Methodology

- 10.12 Description of research and its use in medicine and laboratory sciences types of research, describing the steps necessary for conducting a research
- 10.13 Writing a research protocol
- 10.14 Retrieving subject matter from CD Rom, internet, websites literature search, key words, Medline, PubMed, SCI, Current contents, Chemical Abstracts, Biological Abstracts
- 10.15 Farming research tools-questionnaire, checklist, guideline
- 10.16 Conducting a simple scientific research

- 10.17 writing a scientific report
- 10.18 interpretation of results\
- 10.19 Familiar with bioinformatics in term of
- 10.20 writing and presenting reports using computer
- 10.21 applying computer skills in data entry, processing and analysis: spreadsheet; EPI-INFO and SPSS

Dissemination of results

- 10.22 critique of a research article
- 10.23 writing research article for scientific journals
- 10.24 communication of research findings –short communication notes, rapid communications
- 10.25 participation in Conference, Congresses and Symposium
- 10.26 presenting reports in Workshops