

शहीद धर्मभक्त राष्ट्रिय प्रत्यारोपण केन्द्र
नेपाल स्वास्थ्य सेवा, विविध समूह, सातौं (७) तहको परफुजनिष्ट पदको प्रतियोगितात्मक परीक्षाको लागि पाठ्यक्रम
एवं परीक्षा योजना

यस पाठ्यक्रम योजनालाई दुई चरणमा विभाजन गरिएको छ :

प्रथम चरण :- लिखित परीक्षा (Written Examination) पूर्णाङ्क :- २००

द्वितीय चरण :- अन्तर्वार्ता (Interview) पूर्णाङ्क :- ३०

प्रथम चरण (First Phase) : लिखित परीक्षा योजना (Written Examination Scheme)

पत्र	विषय	पूर्णाङ्क	उतीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या X अङ्क	समय
प्रथम	Technical Subject	१००	४०	वस्तुगत	बहुवैकल्पिक प्रश्न	५० प्रश्न x २ अङ्क	४५ मिनेट
द्वितीय		१००	४०	विषयगत		१० प्रश्न X १० अङ्क	३ घण्टा

द्वितीय चरण (Second Phase)

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता	३०	मौखिक

द्रष्टव्य :

- यो परीक्षा योजनालाई प्रथम चरण (लिखित परीक्षा) र द्वितीय चरण (अन्तर्वार्ता) गरी दुई चरणमा विभाजन गरिएको छ ।
- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुनेछ ।
- प्रथम र द्वितीय पत्रको पत्रको विषयवस्तु एउटै हुनेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- परीक्षामा सोधिने प्रश्नसंख्या, अङ्क र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा तोकिए अनुसार हुनेछ ।
- वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरूको गलत उत्तर दिएमा प्रत्येक गलत उत्तर बापत २० प्रतिशत अङ्क कट्टा गरिनेछ । तर उत्तर नदिएमा त्यस बापत अङ्क दिइने छैन र अङ्क कट्टा पनि गरिने छैन ।
- बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- विषयगत प्रश्नका लागि तोकिएका १० अङ्कका प्रश्नहरूको हकमा १० अङ्कको एउटा लामो प्रश्न वा एउटै प्रश्नका दुई वा दुई भन्दा बढी भाग (Two or more parts of a single question) वा एउटा प्रश्न अन्तर्गत दुई वा बढी टिप्पणीहरू (Short notes) सोध्न सकिने छ ।
- विषयगत प्रश्नमा प्रत्येक पत्र/विषयका प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परिक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम तथा नीतिहरू परीक्षाको मिति भन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
- प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
- पाठ्यक्रम लागू मिति :-

Paper I and II: Technical subject

Section (A): 30 %

1. ANATOMY

- 1.1 Introduction to Anatomy
- 1.2 Basic Anatomical Terms
- 1.3 Chest:
 - 1.3.1 Chest Wall – Inter-costal space, pleura, bony thoracic cage, ribs sternum and thoracic vertebrae
 - 1.3.2 Lungs – Trachea, bronchial tree
 - 1.3.3 Heart – Surface anatomy of heart, chambers of the heart, valves of the heart, major blood vessels of heart, pericardium, coronary arteries and Cardiac Veins
- 1.4 Surface anatomy of the chest
- 1.5 Abdominal Cavity
 - 1.5.1 Introduction and salient features
 - 1.5.2 Excretory system – Kidneys, ureters, bladder
 - 1.5.3 Anatomy of Liver, Biliary system and Gut
- 1.6 Vascular System
 - 1.6.1 Introduction
 - 1.6.2 Arrangement of the Vascular System
 - 1.6.3 Landmark for vascular access
- 1.7 Radiology, X-ray Chest PA View

2. PHYSIOLOGY

- 2.1 The Cell:
 - 2.1.1 Cell Structure and functions of the varies organelles
 - 2.1.2 Endocytosis and exocytosis
 - 2.1.3 Acid base balance and disturbances of acid base balances (Alkalosis, Acidosis)
- 2.2 The Blood:
 - 2.2.1 Composition of Blood, functions of the blood and plasma proteins, classification and protein.
 - 2.2.2 Pathological and Physiological variation of the RBC.
 - 2.2.3 Function of hemoglobin
 - 2.2.4 Erythrocyte Sedimentation Rate
 - 2.2.5 Detailed description about WBC – Total count (TC), Differential count (DC) and functions.
 - 2.2.6 Platelets- formation and normal level and functions
 - 2.2.7 Blood groups and Rh Factor
 - 2.2.8 Clotting cascade- Physiology of hemostasis
- 2.3 Cardio- Vascular System:
 - 2.3.1 Physiology of the heart
 - 2.3.2 Heart sounds
 - 2.3.3 Cardiac cycle, Cardiac output
 - 2.3.4 Auscultatory areas
 - 2.3.5 Arterial pressures, blood pressure
 - 2.3.6 Hypertension
 - 2.3.7 Electrocardiogram
- 2.4 Respiratory System:

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- 2.4.1 Respiratory movement
 - 2.4.2 Definitions and normal values of Lung Volumes and Capacities
 - 2.5 Excretory System
 - 2.5.1 Formation of urine
 - 2.5.2 Normal Urinary Output
 - 2.5.3 Renal Function Tests and Renal disorders
 - 2.6 Central Nervous System:
 - 2.6.1 Introduction to CNS:
 - 2.6.2 Arrangement of the Nervous System
 - 2.6.3 Action Potential
 - 2.6.4 Thermoregulation system
 - 2.6.5 Glasgow Coma Scale
 - 2.7 Endocrine Systems:
 - 2.7.1 Basis of Endocrine System
- 3. BIOCHEMISTRY**
- 3.1 Glucose and glycogen metabolism
 - 3.2 Classification of proteins and functions
 - 3.3 Classification of lipids and functions
 - 3.4 Enzymes:
 - 3.4.1 Definition
 - 3.4.2 Nomenclature
 - 3.4.3 Classification
 - 3.4.4 Factors affecting enzyme activity
 - 3.4.5 Active sites
 - 3.4.6 Co-enzyme
 - 3.4.7 Enzyme inhibition
 - 3.4.8 Units of enzyme
 - 3.4.9 Isoenzymes
 - 3.4.10 Enzyme patterns in disease
 - 3.5 Acid Base:
 - 3.5.1 Henderson-Hasselbach
 - 3.5.2 Buffers
 - 3.5.3 Indicators
 - 3.5.4 Normality
 - 3.5.5 Molarity
 - 3.5.6 Molality
 - 3.6 Serum Electrolytes
- 4. PATHOLOGY**
- 4.1 General:
 - 4.1.1 Cellular adaptation, Cell Injury and Cell death
 - 4.1.1.1 Introduction to pathology
 - 4.1.1.2 Overview: Cellular response to stress and noxious stimuli
 - 4.1.1.3 Cellular adaptations of growth and differentiation
 - 4.1.1.4 Overview of cell injury and death
 - 4.1.1.5 Causes of cell injury
 - 4.1.1.6 Mechanism of cell injury'
 - 4.1.1.7 Reversible and irreversible cell injury
 - 4.1.1.8 Examples of cell injury and necrosis

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- 4.1.2 Inflammation:
 - 4.1.2.1 General Features of inflammation
 - 4.1.2.2 Acute inflammation
 - 4.1.2.3 Chemical mediators of inflammation
 - 4.1.2.4 Outcomes of inflammation
 - 4.1.2.5 Morphologic patterns of acute inflammation
 - 4.1.2.6 Summary of Acute inflammation
 - 4.1.2.7 Chronic Inflammation: Introduction
- 4.1.3 Immunity Disorders:
 - 4.1.3.1 General features of immune system
 - 4.1.3.2 Disorders of immune system
- 4.2 Infectious Diseases:
 - 4.2.1 General principles of microbial pathogenesis
 - 4.2.2 Viral Infections
 - 4.2.3 Bacterial Infections
 - 4.2.4 Parasitic Infections
- 4.3 Systemic:
 - 4.3.1 Heart
 - 4.3.1.1 Congenital Heart Disease
 - 4.3.1.2 Acquired Heart Disease
 - Coronary Artery Disease
 - Degenerative Heart Valve Disease
 - Rheumatic Heart Disease
 - Neoplasms of the heart
 - Pericardial Diseases
 - Aortic Diseases
 - 4.3.2 Lungs:
 - 4.3.2.1 Infections of the lungs
 - 4.3.2.2 Neoplasms of the lungs
 - 4.3.2.3 Chronic Obstructive Airway Diseases
 - 4.3.2.4 Misc.
 - 4.3.3 Kidneys:
 - 4.3.3.1 Acute Renal Failure
 - 4.3.3.2 Chronic Renal failure
 - 4.3.4 Blood
 - 4.3.4.1 Coagulation Cascade
 - 4.3.4.2 Disorders of coagulation
 - 4.3.4.3 Inflammatory pathway
 - 4.3.4.4 Component therapy
 - 4.3.5 Brain:
 - 4.3.5.1 Ischemic Injury to brain
 - 4.3.5.2 Intra- cranial Bleed

5. PHARMACOLOGY

- 5.1 Drugs affecting Blood and Respiratory system
- 5.2 Hormones of pituitary and thyroid
- 5.3 Insulin and oral hypoglycemic drugs
- 5.4 Anti-inflammatory drugs
- 5.5 Drug interactions
- 5.6 Inotropes, vasoactive agents including Calcium

- 5.7 Diuretics
- 5.8 Anti-coagulants; Antiplatelet medications and NOACs
- 5.9 Anti-fibrinolytic drugs
- 5.10 Coagulants
- 5.11 parasympathetic system
- 5.12 Alpha-blockers
- 5.13 Beta-blockers
- 5.14 Anti-arrhythmic Drugs
- 5.15 Anesthetic Drugs
- 5.16 Cardioplegia solutions and Potassium homeostasis
- 5.17 Management of Acid-Base dysbalance
- 5.18 Crystalloid and Colloid Solutions
6. **Clinical Microbiology- Pathology**
 - 6.1 Introduction
 - 6.2 Morphology of bacteria
 - 6.3 Stains used in identifying bacteria
 - 6.4 Sterilization Techniques
 - 6.4.1 Decontamination
 - 6.4.2 Dry and moist heat
 - 6.4.3 Sterilization
 - 6.4.3.1 Chemical Method
 - 6.4.3.2 Gas sterilization
 - 6.4.3.3 Filtration
 - 6.5 Bacterial Drug Resistance
 - 6.6 Basic Principles in Immunology
 - 6.7 Antibody Reactions
 - 6.8 Wound Infections
 - 6.9 Gram negative Infections
 - 6.10 Gram Positive Infections
 - 6.11 Viral infections: HIV; Hepatitis
 - 6.12 Blood stream Infections
 - 6.12.1 Nosocomial Infections and Preventions
7. **CSSD**
 - 7.1 The development of CSSD, Aim and Objectives of CSSD
 - 7.1.1 CSSD Work Practice, Return of equipment and initial processing
 - 7.1.2 Assembly and Packaging
 - 7.2 Sterilization Process
 - 7.2.1 Moist Heat Sterilization
 - 7.2.2 Dry Heat Sterilization
 - 7.2.3 Gas sterilization: Ethylene Oxide; H₂O₂ Plasma Vapour: Absorption by natural and synthetic materials, toxicity. Mechanism of biocidal activity. Testing efficiency of sterilization
 - 7.2.4 Ionizing Radiation:
 - 7.3 Aseptic filtration of Liquids and Gases
 - 7.4 Chemical Disinfection:
 - 7.4.1 Mechanism of microbicidal action. Factors affecting in use effectiveness. Number of Organisms present. Conditions of Growth. Concentration of disinfectant, temperature. Temperature Contact Time, presence of organic matter, surface of contact, Cellulose and synthetic materials. Contaminated disinfectants in the test. Evaluation of disinfectants, expressions of

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disinfectant concentration. Bactericidate test. Test organisms Policy for disinfection in hospitals. Disinfection of hospital equipment. Disinfection of hospital environment. Disinfection of Skin and mucous membrane. Administration of disinfection policy; selection of disinfectants. Types of products.

7.4.2 Responsibility of CSSD for equipment used, for collection and issue

7.4.3 Infection Control

Section (B): 40 %

8. Principles of Perfusion Technology

- 8.1 Physiology of Extra-corporeal circulations
- 8.2 Heart Lung Machine Basics
- 8.3 Principles of Extra-corporeal Circulation
- 8.4 History of evolution of Blood Pump
- 8.5 Principles of Extra-corporeal Gas exchange
- 8.6 Various types of Oxygenators:
 - 8.6.1 Bubble
 - 8.6.2 Membrane/Micro Hollow fiber
 - 8.6.3 Specifications of various proprietary oxygenators
- 8.7 Theory of Blood Pump:
 - 8.7.1 Pulsatile Flow
 - 8.7.2 Continuous Flow
- 8.8 Occlusive and Non- Occlusive Pumps
- 8.9 Types of Pumps
 - 8.9.1 Rotary pumps
 - 8.9.2 Roller Pumps
 - 8.9.3 Centrifugal pumps
 - 8.9.4 Others
 - 8.9.4.1 Bellow Pumps
 - 8.9.4.2 Compression Pumps
 - 8.9.4.3 Diaphragm Pumps
 - 8.9.4.4 Ventricle Pumps
- 8.10 Elements of Extra-corporeal Circulation and its hazards
- 8.11 Blood filters
- 8.12 Blood Trap
- 8.13 Flow meter
- 8.14 Temperature probes
- 8.15 Heat Exchanger
- 8.16 Regulating Devices
- 8.17 Connections of vascular System and Extra-corporeal Circulation:
 - 8.17.1 Venous Drainage
 - 8.17.2 Suction Pump
 - 8.17.3 Hemodynamics of Arterial Re-entry
 - 8.17.4 Arterial Infusion
- 8.18 Cardiomy Blood Return

9. Cardio-Pulmonary Bypass and Perfusion Technology

- 9.1 Hemodynamic Aspects of Total Heart-Lung Bypass

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- 9.1.1 Perfusion flow pressure and resistant distribution of blood flow among various vascular beds
- 9.1.2 Metabolic aspects of total heart and lung bypass. Oxygen need and perfusion flow requirements
- 9.1.3 perfusion flow and oxygen uptake
- 9.1.4 Electrolyte and water balance in reference to extra-corporeal bypass
- 9.1.5 Oxygen toxicity
- 9.2 Effects of perfusion on organs: Brain, Heart, Lungs, kidneys, Liver, and Spleen, Hematologic Effects
- 9.3 Control of adequacy of perfusion
 - 9.3.1 The ideal perfusion
 - 9.3.2 Monitoring devices: Pressures, Cardiac Output, Brain Protection, Temperature, In line Monitoring
 - 9.3.3 Technique of Control
- 9.4 Hematologic Problems:
 - 9.4.1 Blood Prime
 - 9.4.2 Priming Solutions
 - 9.4.3 Control of hematologic problems during CPB
 - 9.4.4 Effects of various priming solutions on RBC trauma
- 9.5 Induced cardiac arrest and Myocardial Protection
 - 9.5.1 Physiological principles of inducing cardiac arrest, morphology, function and metabolism of the arrested heart
 - 9.5.2 Cardioplegia : Principles, composition, modification of Cardioplegia, Types of Cardioplegias
- 9.6 Hypothermia
 - 9.6.1 Blood Stream Cooling versus peripheral cooling
 - 9.6.2 Effect of cooling on the circulation and organ metabolism
- 9.7 Assisted Circulation
 - 9.7.1 Circulatory and metabolic support by partial heart lung bypass and its effect on various organs
- 9.8 Centrifugal pump: Principal, effect, advantages and disadvantages
- 9.9 Pulsatile versus Non-pulsatile circulatory support
- 9.10 Circulatory arrest and organ protection
- 9.11 IABP
- 9.12 Cardiac Arrest Devices: LVAD, RVAD, BiVAD
- 9.13 ECMO
- 9.14 Auto-transfusion; Cell Saver; Blood Conservation in Open Heart Surgery
- 9.15 Blood Component Therapy
- 9.16 Complications and management of cardio-pulmonary Bypass:
 - 9.16.1 Complications while initiating during and at termination of CPB
 - 9.16.2 Hemolysis during CPB
 - 9.16.3 Air lock and Air Embolism
 - 9.16.4 Re-warming and Cooling
 - 9.16.5 Loss of Electrical Power and running the pump with hand crack
- 9.17 Recent advances in Perfusion Technology and Cardio Pulmonary Support
 - 9.17.1 Advances in Oxygenators
 - 9.17.2 Advances in CPB Circuits
 - 9.17.3 Advances in Heart Lung Machine Design
 - 9.17.4 Advances in pharmacotherapy during CPB
 - 9.17.5 Advances in myocardial protection

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- 9.17.6 Advances in Brain Protection
- 9.17.7 Other organ protection
- 9.17.8 Advances in artificial Life support

10. Cardiac Surgery

- 10.1 Introduction to Cardiac Surgery
- 10.2 Congenital Heart Disease
- 10.3 Acyanotic Congenital Heart Disease
- 10.4 Cyanotic Congenital Heart Disease
- 10.5 Palliative Surgery for Congenital Heart Disease
- 10.6 Shunts
- 10.7 Physiological Corrections
- 10.8 Anatomical correction for Congenital Heart Disease
- 10.9 Acquired Heart Diseases
- 10.10 Valvular Heart Disease
- 10.11 Coronary Artery Disease
- 10.12 Diseases of the Aorta
- 10.13 Cardiac Neoplasms
- 10.14 Pericardial Diseases
- 10.15 Off Pump CABG

Section (C): 30 %

11. Human Organ Donation and Transplantation

- 11.1 Basic concept of solid organ donation and transplantation
- 11.2 Role of a Perfusionist in cardio-vascular surgeries and heart transplantation
- 11.3 Concept of Transplant immunology and commonly used drugs in heart transplant

12. Human Organ Transplant Act and Regulations

- 12.1 Human Organ Transplantation (Regulation and Prohibition) Act- 2055
- 12.2 Human Organ Transplantation (Regulation and Prohibition) Act- 2072
- 12.3 Human Organ Transplantation Regulations- 2073

13. General knowledge on Shahid Dharmabhakta National Transplant Center

14. Computer applications:

- 14.1 Classes to make the candidates aware regarding the functioning of a computer, data entry, data/information retrieval, data storage and basic analytics
- 14.2 Familiarity with Microsoft Office or similar software and SPSS

15. Biostatistics

- 15.1 Introduction to basic statistical concepts: methods of statistical analysis; and interpretation of data
 - 15.1.1 Introduction
 - 15.1.2 Meaning, definition, characteristics of statistics
 - 15.1.3 Importance of the study of statistics
 - 15.1.4 Branches of statistics
 - 15.1.5 Statistics and Health science including Nursing
 - 15.1.6 Parameters and Estimates
 - 15.1.7 Descriptive and inferential statistics
 - 15.1.8 Variables and their types
 - 15.1.9 Measurement Scales