

शहीद धर्मभक्त राष्ट्रिय प्रत्यारोपण केन्द्र

मानव अङ्ग प्रत्यारोपण विकास समिति, प्रविधिक सेवा, माइक्रोवाइलोजी समूह, सातौं तह, माइक्रोवाइलोजिष्ट पदको खुला
प्रतियोगितात्मक परीक्षाको 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	उत्तीर्णाङ्क	परीक्षा प्रणाली		प्रश्नसंख्या X अङ्क	समय
प्रथम	Technical Subject I	१००	४०	वस्तुगत	बहुवैकल्पिक प्रश्न	१०० प्रश्न x १ अङ्क	१ घण्टा ३० मिनेट
द्वितीय	Technical Subject II	१००	४०	विषयगत	छोटो उत्तर आउने प्रश्न	४ प्रश्न x ५ अङ्क	३ घण्टा
					लामो उत्तर आउने प्रश्न	८ प्रश्न x १० अङ्क	

द्वितीय चरण (Second Phase) : अन्तर्वार्ता (Interview)

विषय	पूर्णाङ्क	परीक्षा प्रणाली
अन्तर्वार्ता (Interview)	३०	मैखिक (Oral)

द्रष्टव्य :

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ ।
- लिखित परीक्षामा सोधिने प्रश्नसंख्या र अङ्कभार यथासम्भव सम्बन्धित पत्र/विषयमा दिईए अनुसार हुनेछ ।
- वस्तुगत बहुवैकल्पिक (Multiple Choice) प्रश्नहरू को 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 ।
- वस्तुगत बहुवैकल्पिक हुने परीक्षामा परीक्षार्थीले उत्तर लेख्दा अंग्रेजी ठूलो अक्षर (Capital letter) A,B,C,D मा लेख्नुपर्नेछ । सानो अक्षर (Small letter) a,b,c,d लेखेको वा अन्य कुनै सङ्केत गरेको भए सबै उत्तरपुस्तिका रद्द हुनेछ ।
- बहुवैकल्पिक प्रश्नहरू हुने परीक्षामा कुनै प्रकारको क्याल्कुलेटर (Calculator) प्रयोग गर्न पाइने छैन ।
- विषयगत प्रश्नहरू को हकमा 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 प्रश्न हुने पत्रमा प्रत्येक खण्डका लागि छुट्टाछुट्टै उत्तरपुस्तिकाहरू हुनेछन् । परीक्षार्थीले प्रत्येक खण्डको प्रश्नको उत्तर सोही खण्डको उत्तरपुस्तिकामा लेख्नुपर्नेछ ।
- यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जुन सुकै कुरा लेखिएको भए तापनि पाठ्यक्रममा परेका कानून, ऐन, नियम, विनियम 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 उम्मेदवारहरू लाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
- पाठ्यक्रम स्वीकृत मिति :- २०८१/०८/०४

**Paper I:
Technical Subject I**

1. General Microbiology (35 Marks)

- 1.1. Historical development of Microbiology
 - 1.1.1. Modern concept of classification of microorganisms (nomenclature).
 - 1.1.2. Prokaryotic and Eukaryotic organisms.
 - 1.1.3. Germ theory of diseases, Spontaneous generation theory.
 - 1.1.4. Opportunistic and pathogenic organisms.
 - 1.1.5. Host Parasite interaction, Microbial interactions, and mechanism of infection
- 1.2. Biohazards and Bio-safety in Microbiology
 - 1.2.1. Basic concept on biohazard and biosafety
 - 1.2.2. Universal precaution
 - 1.2.3. Laboratory waste products and disposal.
- 1.3. Sterilization Techniques
 - 1.3.1. Principle and procedure of various sterilization methods -Physical and mechanical (dry heat, moist heat, radiation and filtration, and incineration), Chemical sterilizer, Biological indicator
- 1.4. Staining Techniques
 - 1.4.1. Various staining principle, techniques and uses
 - 1.4.2. Preparation and use of different stains in bacteriology laboratory: Grams stain, Ziehl-Neelsen stain, Albert stain, Spore stain, Capsule stain, Flagella stain
- 1.5. Preparation and use of different media for bacterial and fungal isolation & Identification
- 1.6. Types and Classification of antibiotics: Antimicrobial susceptibility testing, Disc diffusion technique, Mechanisms of Action of Antibiotics and Bacterial Resistance to Antibiotics

2. Laboratory Organization and Management (20 Marks)

- 2.1. Role & responsibilities of different personals in Laboratory Terms of Reference (TOR), Standard Operating Procedure (SOP), Standard Safety Procedures (SSP), Good Laboratory Practice (GLP), Quality control of microbial laboratory, Laboratory safety,
- 2.2. Laboratory Quality Assessment, Internal quality control and External quality control, Maintaining Reference Bacteria and their Culture

3. Clinical Research (10 Marks)

- 3.1. Study Design
- 3.2. Types of Studies
- 3.3. Ethics in Clinical Research
- 3.4. Data Collection Method
- 3.5. Data Management
- 3.6. Basic Statistical Concepts: Mean, median, variance, standard deviation

4. Organ donation and transplantation (25 Marks)

- 4.1. Concept of organ donation, transplantation and immunology in organ transplantation

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- 4.2. Laboratory tests, principle and interpretation of immunological tests for transplantation
 - 4.2.1. Donor specific antibodies (DSA)/ Panel reactive antibodies (PRA)
 - 4.2.2. Complement dependent cytotoxicity (CDC) Cross match
 - 4.2.3. Human leucocyte antigen (HLA) typing
 - 4.2.4. Laboratory screening methods for organ donors and recipients
 - 4.2.5. Infection pattern in transplant patient

5. Human Organ Transplant Act and Regulations (10 Marks)

- 5.1. Human Organ Transplantation (Regulation and Prohibition) Act, 2055 with amendment.
- 5.2. Human Organ Transplantation Regulations, 2073
- 5.3. Guidelines on medical treatment of deprived citizens program, 2080
- 5.4. Human Organ Transplant Development Committee Personnel Administration Rules, 2069
(मानव अंग प्रत्यारोपण विकास समिति कर्मचारी प्रशासन नियमवाली, २०६९)
- 5.5. Human Organ Transplant Development Committee Formation Order, 2068 (मानव अंग प्रत्यारोपण विकास समिति गठन आदेश, २०६८)
- 5.6. General knowledge about Shahid Dharmabhakta National Transplant Center
- 5.7. Brain death donation: Brain death Declaration Criteria

Paper II:
Technical Subject II

Section A

Short Question	2 Question × 5 Marks = 10 Marks	50 Marks
Long Question	4 Question × 10 Marks = 40 Marks	

1. Bacteriology (20 Marks)

- 1.1 Classification, nomenclature and characteristic of major groups of bacteria.
- 1.2 Pathogenic, nonpathogenic [Normal bacterial flora (Commensal)]/opportunistic bacteria
- 1.3 Physiology and Growth of Medically Important Bacteria: Bacterial reproduction, Growth of microorganism, Bacterial physiology and factors affecting the microbial growth: Nutrition (source of carbon, nitrogen, mineral and other sources of vitamin), Temperature, Water activity, Salinity (osmotic effect and electrolytes), pH, Gases (aerobic, anaerobic, facultative anaerobic, micro-aerophilic, carbon dioxide), Growth curve. Various culture media (types, forms, composition, selection and uses), Various culture techniques
- 1.4 Anaerobic Culture: Factors affecting anaerobic culture, various media and techniques of anaerobic culture. Inoculation, isolation and identification of anaerobic microorganisms
- 1.5 Metabolism and Metabolic Product of Medically Important Microorganisms.
Nutritional types. Carbon metabolism-general concept of glycolysis and TCA cycle.
Biochemical properties of microorganisms.
- 1.6 Morphology, Metabolism, Isolation, Identification of:
 - 1.6.1 Gram Positive cocci: Aerobic: Micrococcus spp, Staphylococcus spp.
 - 1.6.2 Streptococcus spp; Anaerobic: Peptococcus spp., Peptostreptococcus spp.
 - 1.6.3 Gram Negative Aerobic cocci: Neisseria spp.
 - 1.6.4 Aerobic non-spore forming gram positive bacilli: Bacillus spp.,
 - 1.6.5 Corynebacterium spp., Actinomyces pyogenes, Nocardia spp.,
 - 1.6.6 Mycobacterium spp: pathogenic Tubercle bacilli and MOTT bacilli (Atypicalmycobacterium) and Hansen's bacilli
 - 1.6.7 Anaerobic bacilli: Actinomyces spp., Propionibacterium spp, Clostridium spp, Bacteriodes spp.
 - 1.6.8 Aerobic Gram Negative Bacilli: Enterobacteriaceae
 - 1.6.9 Non Fermentative bacilli and cocco-bacili Pseudomonas spp., Acinetobacter spp., Moraxella spp.
 - 1.6.10 Aerobic Facultative Spore Forming Bacilli: Bacillus spp.
- 1.7 Terminology, mechanism of infection, etiology, laboratory diagnosis, conventional and rapid diagnostic methods for: Enteric fever, Infective endocarditis, Bacteraemia, Septicemia, Pyrexia of unknown origin (PUO). Lower RTI, Upper RTI, Urinary Tract Infection, Mycobacterium tuberculosis, Atypical mycobacterium infection, Peptic ulcer caused by Helicobacter pylori

2. Mycology (10 Marks)

- 2.1 Classification and characteristic of major groups of fungi: Morphology and structure of

mould and yeast. Definition: Mycology, Medical Mycology, Mycetes, Mycosis, Thallus, Hypha, Mycelium, Coenocyte, Rhizoids. Classification, Structure and Physiology of fungi: Eumycetes (True fungi), Ascomycetes (Histoplasma, Candida, Blastomycosis), Basidiomycetes (Cryptococcus, Rhizopus), Phycomycetes Mucor, Epidermophyton, Fungi imperfecti: (Trichophyton)

2.2 Pathogenic Group of Fungi Opportunistic pathogens, True pathogens, Blastomyces dermatitidis, Cooccidioides immitis, Paracoccidioides brasiliensis, Histoplasma capsulatum, Dermatophytes, Aspergillus spp.; Dermatomycosis (Candida albicans, Cryptococcus neoformans).

2.2.1 Classification, general characteristics and pathogenesis of medically important fungi: Zygomycetes, Deuteromycetes, Dematiaceous and Hyaline (Rhizopus, Mucor, Aspergillus and Penicillium; Microsporium, Trichophyton, Epidermophyton), Dimorphic molds (Blastomyces, Histoplasma, Coccidioides, Paracoccidioides) Yeasts (Candida, Cryptococcus, Rhodotorula)

2.2.2 Isolation and Identification of Fungi (Laboratory Diagnosis): Selection, collection and transportation of specimen: Pus, Blood, Biopsy, Sputum, Urine, Vaginal and Cervical swab, Plural and peritoneal fluid, samples from Mucous membranes, Ear, Eye, Corneal ulcer; Superficial, sub-cutaneous and cutaneous samples. Microscopy: KOH Preparation, 20 Marks KOH with 20 Marks Glycerol, KOH DMSO (Dimethyl Sulphoxide) 100 Marks, Lactophenol Cotton Blue, India ink preparation. Isolation of Fungi from different samples; Macroscopic Morphology of Fungi, Microscopic (Structure examination on slide culture) Germ tube test, Nutrition deficiency culture method Identification, Antifungal Sensitivity Test

3. Virology (15 Marks)

3.1 General Properties of Viruses

3.1.1 Nature, shape, structure and composition of viruses.

3.1.2 Classification of Medically Important Viruses: Genetic material, Organ

3.1.3 System involved

3.1.4 Replication of Viruses

3.1.5 Virus Host Interaction

3.1.6 Bacteriophage

3.1.7 Anti-viral drugs

3.2 Epidemiology, Pathogenesis, Treatment, Prevention and Control of Viral Diseases:

3.2.1 Common viruses that can infect transplant patients include:

3.2.2 DNA Viruses: Cytomegalovirus (CMV), Epstein - Barr virus (EBV), Human Herpesvirus 6 (HHV-6), Human Papillomavirus (HPV), Hepatitis B Virus (HBV).

3.2.3 RNA Viruses Hepatitis C Virus (HCV), Varicella-Zoster Virus (VZV), Influenza Virus, Respiratory Syncytial Virus (RSV), Adenoviridae.

3.2.4 Laboratory Diagnosis of Viral Infections:

3.2.5 Sampling in Diagnostic Virology: Selection, collection, storage, transportation and processing of samples

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3.2.6 Identification of virus, Neutralization. Haemagglutination – inhibition (HAI).

3.2.7 Serological tests: Principle and methods of serological procedure for HCV, HIV, HBsAg and HEV

4. Parasitology (5 Marks)

4.1 Definition and classification of host and parasites (protozoa, helminthes intestinal, blood and tissue parasites). Host parasite relationship.

4.1.1 Habitat, epidemiology, pathogenesis, and treatment, and prevention, control and laboratory diagnosis (Selection, Collection, Perseveration and Transportation of Samples; Laboratory Diagnosis of:

4.1.1.1 Intestinal Protozoa

4.1.1.2 Intestinal Helminthes

4.1.1.3 Blood and Tissue Parasites

Section B

Short Question	2 Question × 5 Marks = 10 Marks	50 Marks
Long Question	4 Question × 10 Marks = 40 Marks	

5. Public Health Microbiology (5 Marks)

5.1 Air borne diseases

5.1.1 Transmission of pathogens, Sources of infection

5.1.2 Isolation and Identification of microorganisms from air

5.2 Water Borne Infections:

5.2.1 Transmission of pathogens, Sources of infection

5.2.2 Isolation and Identification of microorganisms from water

5.3 Food Borne Diseases:

5.3.1 Transmission of pathogens, Sources of infection

5.3.2 Isolation and Identification of microorganisms from food

5.4 Hospital-Acquired Infection: Disposal of infective hospital and laboratory materials, Technique used for the diagnosis of hospital acquired infection.

6. Molecular biology (5 Marks)

6.1 Cell and Tissue Culture: Cell and tissue culture techniques

6.2 Basic concept on DNA isolation and purification

6.3 Polymerase Chain reaction: Basic concept of PCR, Conventional and Real time PCR

6.4 Methods of separation and extraction of cell materials (antigens/ antibodies)

7. Immunology (10 Marks)

7.1 Development and Functions of Immune System

7.2 Antigens and Immunogenicity

7.3 Cells Involved in Immune System, Phagocytes, Natural killer cells, Mast cells and basophils, Dendritic cells, Lymphocytes; Lymphoid tissue,

7.4 Origin & maturation of immune cells, T-cells, B-cells,

7.5 Innate Immunity

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- 7.6 Acquired Immunity, T-Cell Mediated Immune Response, B-Cell Mediated (Humoral) Immune Response, Antibodies (Immunoglobulin): Structure, Classes, Types: Allotype, Isotype, Idiotype, Development: Polyclonal and Monoclonal
- 7.7 Complement System: Classical and Alternative pathways
- 7.8 Antigen-antibody reactions: Agglutination, Precipitation, Flocculation, ELISA, IHA, RIA, Western blot Immunosuppressant used in transplantation
- 7.9 Primary & Secondary Immune Responses
- 7.10 Hypersensitivity Reactions: Type I to Type V
- 7.11 Immunodeficiency Diseases & diagnosis, HIV/AIDS – ELISA, ICT, Western Blot,
- 7.12 CD4 cell count; Transplantation
- 7.13 Basic Concepts on Vaccines and Immunization: Types of vaccines, Immunization Schedules of common vaccines

8. Research (10 Marks)

- 8.1 Introduction to Research: Overview of health science research: health care research in Nepal, Importance of healthcare research, Types of research, qualitative research, quantitative research.
- 8.2 Research Process, Research designs, Research proposals
- 8.3 Sampling methods and sample size principle and calculation
- 8.4 Research ethics: Ethical issues in healthcare research.
- 8.5 Statistical Concepts: Types of data, descriptive statistics, types of data visualization
- 8.6 Writing and Publishing: Manuscript Preparation

9. Organ donation and transplantation (10 Marks)

- 9.1 Concept of organ donation, transplantation and immunology in organ transplantation
- 9.2 Laboratory tests, principle and interpretation of immunological tests for transplantation
- 9.3 Donor specific antibodies (DSA)/ Panel reactive antibodies (PRA)
- 9.4 Complement dependent cytotoxicity (CDC) Cross match
- 9.5 Human leucocyte antigen (HLA) typing
- 9.6 Laboratory screening methods for organ donors and recipients
- 9.7 Infection pattern in transplant patient
- 9.8 Brain Death Declaration Criteria

10. Human Organ Transplant Act and Regulations (10 Marks)

- 10.1 Human Organ Transplantation (Regulation and Prohibition) Act, 2055 with amendment.
- 10.2 Human Organ Transplantation Regulations, 2073
- 10.3 Guidelines on medical treatment of deprived citizens program, 2080
- 10.4 Human Organ Transplant Development Committee Personnel Administration Rules, 2069 (मानव अंग प्रत्यारोपण विकास समिति कर्मचारी प्रशासन नियमवाली, २०६९)
- 10.5 Human Organ Transplant Development Committee Formation Order, 2068 (मानव अंग प्रत्यारोपण विकास समिति गठन आदेश, २०६८)
- 10.6 General knowledge about Shahid Dharmabhakta National Transplant Center