

पाटन स्वास्थ्य विज्ञान प्रतिष्ठान सेवा आयोग
प्राज्ञिक सेवा, सुक्ष्म जीव तथा रोग प्रतिरोध विज्ञान समूह, सहायक प्राध्यापक पद नौ ख (९ख) तहको खुला र
आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

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)

Paper	Subject		Marks	Full Marks	Pass Marks	No. Questions & Weightage		Time Allowed
I	General Subject	Part I: Management, General Health Issues, Academic Research and Teaching-Learning Practices	50	100	40	10 × 5 = 50 (Subjective)	1.30 hrs	2.15 hrs
		Part II: Technical Subject (Relevant Subject)	50			50 × 1 = 50 (Objective Multiple Choice)	45 min	
II	Technical Subject (Relevant Subject)			100	40	7 × 10 = 70 (Long answer) 2 × 15 = 30 (Critical Analysis)		3.00 hrs
द्वितीय चरण (Second Phase)								
	Interview			30		Oral		

द्रष्टव्य :

- लिखित परीक्षाको माध्यम भाषा नेपाली वा अंग्रेजी अथवा नेपाली र अंग्रेजी दुवै हुन सक्नेछ ।
- प्रतिष्ठानको प्राज्ञिक सेवा अन्तर्गतका सबै समूह/सबै उपसमूहहरूको लागि प्रथमपत्रको Part I को पाठ्यक्रमको विषयवस्तु एउटै हुनेछ । तर प्रथम पत्रको Part II र द्वितीयपत्र Technical Subject को पाठ्यक्रम समूह/उपसमूह अनुरूप फरक फरक हुनेछ ।
- प्रथम र द्वितीय पत्रको लिखित परीक्षा छुट्टाछुट्टै हुनेछ । प्रथम पत्रको Part II र द्वितीय पत्रको विषयवस्तु एउटै समूहको हकमा समान हुनेछ । परीक्षामा सोधिने प्रश्नसंख्या र अङ्कभार यथासम्भव सम्बन्धित पत्र, विषयमा दिईए 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 ।
- 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 प्रश्नहरूको हकमा 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 । परीक्षार्थीले प्रत्येक खण्डका प्रश्नहरूको उत्तर सोही खण्डका उत्तरपुस्तिकामा लेख्नुपर्नेछ ।

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९. यस पाठ्यक्रम योजना अन्तर्गतका पत्र/विषयका विषयवस्तुमा जेसुकै लेखिएको भएतापनि पाठ्यक्रममा परेका कानून, ऐन, नियम, विनियम तथा नीतिहरू परीक्षाको मितिभन्दा ३ महिना अगाडि (संशोधन भएका वा संशोधन भई हटाईएका वा थप गरी संशोधन भई) कायम रहेकालाई यस पाठ्यक्रममा परेको सम्झनु पर्दछ ।
१०. प्रथम चरणको परीक्षाबाट छनौट भएका उम्मेदवारहरूलाई मात्र द्वितीय चरणको परीक्षामा सम्मिलित गराइनेछ ।
११. पाठ्यक्रम लागु मिति : २०८१/२/३१

पाटन स्वास्थ्य विज्ञान प्रतिष्ठान, सेवा आयोग

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Paper I: General Subject

Part I:

(Management, General Health Issues, Academic Research and Teaching - Learning Practices)

Section (A) - 25 Marks

1. Management

- 1.1. Health care management system in Nepal and other parts of the world
- 1.2. Fundamental principles of healthcare institution and hospital management.
- 1.3. Effective hospital management principles
- 1.4. Purpose of medical and non-medical data and records
- 1.5. Ethics and responsibility of management
- 1.6. Concept of management and its application in health care including hospital
 - 1.7.1 Management: Concept, principles, functions, scope and role, level and skills of manager
 - 1.7.2 Planning: Concept, principles, nature, types, instruments and steps
 - 1.7.3 Leadership: Concept, function, leadership styles, leadership and management
 - 1.7.4 Coordination: Concept, types, techniques of effective coordination
 - 1.7.5 Communication and counselling: Concept, communication processes and barrier to effective communication, techniques for improving communication
 - 1.7.6 Decision making: Importance, types, rational process of decision making, problem solving techniques, improving decision making
 - 1.7.7 Participative management: Concept, advantage and disadvantage, techniques of participation
 - 1.7.8 Time management: Concept, essential factors and strategies for effective time management
 - 1.7.9 Conflict management: Concept, approaches to conflict, levels of conflict, causes of conflict and strategies for conflict management
 - 1.7.10 Stress management: Concept, causes and sources of stress, techniques of stress management
 - 1.7.11 Change management: Concept, sources of organizational change, resistance to change, management of resistance to change
 - 1.7.12 Appreciative inquiry: Concept, basic principle and management
 - 1.7.13 Human resource management: Concept, functions and different aspects
 - 1.7.14 Health manpower recruitment and development
 - 1.7.15 Financial management: Concept, approaches, budget formulation and implementation, Auditing and topics related to fiscal administration

2. General Health Issues

- 2.1. Present constitution of federal republic of Nepal (including health and welfare issues)
- 2.2. Organizational structure of Ministry of Health at national/federal, regional/state, district (if applicable), municipal and village council level
- 2.3. Professional council and related regulations
- 2.4. National Health Policy
- 2.5. Health Service Act and Regulation
- 2.6. Second Long term health plan
- 2.7. Health Management Information System, forms, indicators, annual reports

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- 2.8. Human Development Indices, Sustainable Development Goals
- 2.9. Health volunteers in the national health system, its rationale, use and effectiveness
- 2.10. Local governance and community participation in health service delivery
- 2.11. Health Insurance and financing in health care
- 2.12. Alternative health care system: Ayurveda, homeopathy, Unani, Chinese etc.
- 2.13. Indigenous and traditional faith health and health practices
- 2.14. International Health Agencies: Roles and responsibilities of WHO, UNICEF, UNFPA, Inter-agency relationships, Government-agency coordination: Joint Annual Review meeting
- 2.15. Supervision, types and its usage in health sector
- 2.16. Monitoring and evaluation system in health sector
- 2.17. National Health Training Centre
- 2.18. National and International Disaster Plan, Coordination
- 2.19. Patan Academy of Health Sciences Act, Mission, Goals, Organogram
- 2.20. Scope and function of Patan Academy of Health Sciences executive bodies (senate, executive committee, academic council, faculty board, hospital management committee, subject committee), various other committees

Section (B) - 25 Marks

3. Academic Research

- 3.1 Ethics, Bio-ethics and Professionalism
- 3.2 Human dignity and Human Right
- 3.3 Benefit and Harm
- 3.4 Autonomy and Individual responsibility
- 3.5 Consent and capacity to consent
- 3.6 Privacy and confidentiality
- 3.7 Respect for humans and personal integrity
- 3.8 Non-discrimination and non-stigmatization
- 3.9 Respect for cultural diversity and pluralism
- 3.10 National Health Research Council (NHRC) and its guidelines
- 3.11 Research process: ethical research proposal development, research principles, methods and materials, conclusion/recommendation/lesson learnt, commonly used referencing styles
- 3.12 IRB/IRC forms, types, use, importance; getting IRB/IRC clearance
- 3.13 Ethics on research methodology: sample selection, sample size calculation, ensuring reliability and validity of the instruments as well as methods proposed for health research
- 3.14 Quantitative and Qualitative studies
- 3.15 Data analysis (data visualization, descriptive statistics, inferential statistics with statistical hypotheses and appropriate tools/methods for quantitative studies; theme and code generation, thematic analysis, content analysis, grounded theory for qualitative and triangulation for mixed method studies)
- 3.16 Research ethics on vulnerable and non-vulnerable population
- 3.17 Research proposal/protocol/publication:
- 3.18 Publication ethics, plagiarism including self-plagiarism

4. Teaching - Learning, Assessment and Evaluation

- 4.1 Lancet Commission Report on Education of Health Professionals

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- 4.2 Adult learning: Theories, principles, use, importance and outcomes, Andragogy vs. Pedagogy
- 4.3 Conventional teaching - learning: Didactic lectures, Teacher centred approaches, use and importance
- 4.4 Surface learning, deep learning and metacognition
- 4.5 Integrated teaching: Genesis, use, importance and outcomes
- 4.6 Problem-based learning: Genesis, use, importance and outcomes
- 4.7 SPICES model its use, importance and outcomes
- 4.8 Socialization, self-directed learning, mentoring, role model
- 4.9 Community orientation/community posting, re-orientation of medical education camp, community based learning and community engaged teaching-learning methods/models, use, importance and outcomes
- 4.10 Outcome Based Education (Competency-based Medical/Health Professions Education): Genesis, use, importance and outcomes
- 4.11 Experiential learning, Reflective practice, Feedback and feed-forward, Situated learning, Co-operative learning, Communities of practice
- 4.12 Assessment of students
 - 4.12.1 Blueprinting (Table and specification) : use, importance and outcomes
 - 4.12.2 Bloom's taxonomy of cognitive, psychomotor and affective domains, use and importance
 - 4.12.3 Diagnostic, Formative, Summative and Professional exams
- 4.13 Assessment of knowledge: Selection methods like Multiple Choice Questions, Extended Matching Items and supply methods like Short Answer Question, Problem Based Question, Long Answer Question with or without model answers and marking schemes, unstructured, semi-structured and structured viva-voce examination, advantages and limitations, use and importance, outcomes and its use in quality control
- 4.14 Assessment of performance (in-vitro): Direct observation of skills in the simulated setting, lab, ward etc. with or without checklist, Objective Structured Practical Examination, Objective Structured Clinical Examination, Standardized patients, use and importance, analysis, quality assurance, outcomes and its use in quality control
- 4.15 Assessment of performance (in-vivo): Mini-Clinical Evaluation Exercise (Mini-CEX), Direct Observation of Procedural Skills (DOPS), Case-Based Discussion (CbD), OSATS/ PBA, Multi-Source feedback (360 degree evaluation) use and importance for competency based health professions education, analysis, quality assurance, outcomes and its use in quality control
- 4.16 Assessment of observable behaviours in small groups e.g. Problem Based Learning sessions, Community Based Learning and Education sessions, Clinical clerkship rotations
- 4.17 Evaluation: Difference between assessment and evaluation, theory of change and its use in health professions education, process and outcome evaluation, qualitative, quantitative and mixed methods used in evaluation of health professions education

Paper I
Part II: Technical Subject
Section (C) - 25 Marks

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1. General Microbiology:

- 1.1 History and development of microbiology, Eukaryotes & Prokaryotes, Determinative characteristics of medically important bacteria, viruses, fungi and protozoan parasites, Bacterial growth
- 1.2 Prokaryotic genome, Genetic code, Plasmids, Concepts of Bacterial and Viral genetics and role of RNA & DNA, DNA structure and function, RNA types and function, Bacterial recombination i.e. transformation, conjugation & transduction
- 1.3 Nosocomial infections: Epidemiology, bacterial and viral infections, infections in pediatric patients, surveillance and control programmes, organizations and associations involved, role of microbiology lab in prevention and control, devices associated intravascular infections and its control
- 1.4 Different of instruments used in microbiology and their working principle
- 1.5 Different types of microscopes used in microbiology
- 1.6 Sterilization, disinfection and antiseptics, different ways of sterilization by physical, chemical, radiation and filtration and its applications, relationship between disinfectants and antiseptics, disinfection rate of microorganisms
- 1.7 Different types of routine and special stains, their working principle and Staining techniques used in microbiology
- 1.8 Hospitals and Laboratory infection and their diagnosis
- 1.9 Infectious waste management
- 1.10 Techniques of cultivation, isolation and preservation of various microorganisms
- 1.11 Microscopy, culture sensitivity, serological and molecular methods for identification of various microorganisms
- 1.12 Automated methods used in microbiology
- 1.13 Water bacteriology
- 1.14 Air sampling for organism isolation

2. Bacteriology:

General characteristics, pathogenesis and medical importance of bacteria:

- 2.1 Aerobic/microaerophilic gram negative rods and cocci: Campylobacter, Helicobacter, Acetobacter, Brucella, Legionella, Neisseria, Branhamella, Kingella, Moraxella, Acinetobacter, Comomonas, Alcaligenes, Bordetella, Pseudomonas, Francisella
- 2.2 Facultative anaerobic gram negative rods: Providencia, Salmonella, Shigella, Yersinia, Gardenella, Vibrio, Pleisomonas, Aeromonas, Escherichia coli, Citrobacter, Hafnia, Morganella, Enterobacter, Klebsiella, Proteus, Serratia, Pasteurella, Hemophilus
- 2.3 Gram negative anaerobic rods and cocci: Bacteroides, Veillonella
- 2.4 Gram positive cocci: Micrococcus, Staphylococcus, Streptococcus, Peptococcus, Peptostreptococcus
- 2.5 Gram positive endospore forming rods and cocci: Bacillus, Clostridium
- 2.6 Gram positive non sporing rods: Lactobacillus, Listeria

- 2.7 Actinomycetes and related bacteria: Actinomyces, Nocardia Mycobacterium, Corynebacterium, Mycoplasma
- 2.8 Spirochetes: Leptospira, Treponema, Borrelia
- 2.9 Rickettsias: Coxiella, Rickettsia, Chlamydia
- 2.10 Isolation and Enumeration techniques
- 2.11 Identification based on morphological, cultural and biochemical properties
- 2.12 Bacteria, isolation, detection and identification using rapid and automated methods
- 2.13 Principle, procedure and applications of Serological and immunological Methods: Agglutination and Precipitation tests, Immuno staining and Immunofluorescence test, ELISA, Radioimmunoassay (RIA) and Immunoelectrophoresis
- 2.14 Principle, Procedure and application of Bio typing, Sero typing, Phage typing
- 2.15 Principle, Procedure and application of Molecular typing methods :DNA extraction & agar gel electrophoresis, PCR, Gene Sequencing techniques, Ribotyping, pulse field gel electrophoresis
- 2.16 Antimicrobial Susceptibility Testing: Kirby Bauer disc diffusion method, MIC determination, ESBL testing
- 2.17 Diagnostic bacteriology experiments:
 - 2.17.1 Methods of collection, processing and culture of Stool, Sputum, Blood, Urine, Throat /Nasal swab, Vaginal swabs, Pus, body fluids and diagnosis of bacterial infections, automation in bacteriology, recent advances in microbiology
 - 2.17.2 Processing of clinical samples and diagnosis of: Respiratory Tract Infection; Urinary Tract Infection; Gastrointestinal Tract Infection- Cholera and other diarrheal diseases, food poisoning; Genital Tract Infections-Bacterial Vaginosis, Pelvic Inflammatory Disease (PID); Sexually Transmitted Infections- Gonorrhoea, Syphilis, Chlamydial Infection; Eye infection; Ear infections; Oral infections-Mandibular abscess, Gingivitis and Anaerobic Infections of Oral Cavity; Gas Gangrene; Peptic Ulcer; Tuberculosis; Leprosy; Enteric fever; Bacteremia; Septicemia, Bacterial Endocarditis; Meningitis

3. Virology :

- 3.1 General structure, properties and classification schemes of virus, virus cell interactions and viral replication
- 3.2 Classification, structure, medical importance, pathogenesis and laboratory diagnosis, prevention and control of: Poxviruses, Herpes viruses, Adenoviruses, Picorna virus, Orthomyxovirus, Paramyxovirus, Arbovirus, Rhabdo viruses, Hepatitis virus, Retroviruses (HIV, HTLV), New emerging viruses, Vaccines, Antiviral drugs
- 3.3 Principles of bio-safety and requirements of virology laboratory
- 3.4 Methods of cultivation and purification of viruses

- 3.5 Principle, procedure and applications of serodiagnostic methods in virology- haemagglutination and haemagglutination-inhibition tests, Complement fixation, neutralization, Western blot, flowcytometry and immunohistochemistry
- 3.6 Principle, procedure and application of Nucleic acid based diagnostic methods in virology: Nucleic acid hybridization, polymerase chain reaction, microarray and nucleotide, sequencing. Microscopic techniques- Fluorescence, confocal and electron microscopic techniques
- 3.7 Diagnostic Virology Experiments :
 - 3.7.1 Preparation of media and reagents sterility checking, Glassware decontamination, washing, sterilization
 - 3.7.2 Propagation of viruses; Tissue culture and egg inoculation technique for the isolation of common medically important viruses; Routes of inoculations in embryonated eggs
 - 3.7.3 Preparation of virus stocks; plaque assay and determination of TCID₅₀
 - 3.7.4 Detection of Virus Antigen by ELISA; Immunofluorescence assay; Hemagglutination; Agar gel diffusion; Polymerase chain reaction
 - 3.7.5 Electron microscopy
- 4. Mycology**
 - 4.1 General properties and classification of fungi
 - 4.2 Classification of medically important fungi and general characteristics of Aspergillus, Candida, Fusarium, Cryptococcus, Histoplasma, Trichophyton, Epidermophyton, Blastomyces Cryptococcus, Tinea, Microsporum, Coccidioidomyces, Paracoccidioidomyces; Fungal toxins and Allergies,
 - 4.3 Antifungal drugs
 - 4.4 Diagnostic Mycology Experiments :
 - 4.4.1 Laboratory Diagnosis of Fungal diseases: Sample collection and processing for diagnosis of Subcutaneous mycosis, Systemic Mycoses, Opportunistic Mycoses
 - 4.4.2 Preparation of fungal stains and staining techniques
 - 4.4.3 Fungal culture techniques
 - 4.4.4 Isolation and characterization of medically important fungi from clinical specimens and report writing
 - 4.4.5 Isolation and characterization of dimorphic fungi
- 5. Parasitology**
 - 5.1 Study of morphology, important developmental stages, symptoms, pathogenesis, epidemiology, diagnosis, treatment, prevention of following parasites: Entamoeba histolytica, Giardia lamblia, Trichomonas, Ascaris lumbricoides, Ancylostoma duodenale and Necator amecarinus, Enterobius vermicularis, Trichuris trichiura, Strongyloides stercoralis, Taenia, Echinococcus, Hymenolepis nana, Brugia, Loa loa, Onchocerca, Dracunculosis., Plasmodium, Leishmania, Toxoplasma, Wucheria

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- 5.2 Diagnostic Parasitology Experiments :
- 5.2.1 Stool sample collection and processing for observation of parasites by microscopy
 - 5.2.2 Occult blot test in the stool sample
 - 5.2.3 Stool culture
 - 5.2.4 Microscopic observation of Entamoeba, Giardia, Plasmodium, Leishmania, Taenia, Ascaris and othermedically important protozoans and helminthic parasites, ova count and report writing
 - 5.2.5 Laboratory diagnosis of blood and tissue parasites - preparation of thick and thin smear of blood sample, staining, identification and report writing
 - 5.2.6 Routine and special tests done on stool
 - 5.2.7 Laboratory diagnosis of blood and tissue parasites

Section (D) - 25 Marks

6. Immunology

- 6.1 History of immunology, innate and aquired immunity, mechanisms of innate immunity inflammation-inflammatory cells, mediators, inflammatory response types, antigens, cells and organs of immune system, evolution of immunity
- 6.2 Immunoglobulin: Structure and function; regulation of immune response
- 6.3 Advances in the development of vaccines
- 6.4 Theory of Hypersensitivity reactions, their types, mechanism, examples
- 6.5 Complement system and its roles in disease.
- 6.6 Autoimmune diseases: mechanism of common diseases, principle and procedure for test for autoimmune diseases
- 6.7 Transplantation Immunology: Major histocompatibility complex, their types, genetics, Role of MHC in organ transplant, MHC association with diseases, Principle of transplantation, Graft rejection
- 6.8 Preparation, preservation and titration of complement
- 6.9 Monoclonal and polyclonal antibodies preparation, application in biomedical research, clinical diagnosis and treatment.
- 6.10 Vaccines, their preparation, uses
- 6.11 Diagnostic procedure of common immunological/serological tests
- 6.12 Immunological reaction and their various types. Details about agglutination, precipitation, flocculation, complement fixation ,ELISA
- 6.13 Quality control and evaluation of kits used in laboratory
- 6.14 Rapid methods used in immulogy
- 6.15 Serodiagnostic methods in clinical microbiology
- 6.16 Immunological methods in clinical laboratories
- 6.17 Immunological methods for disease diagnosis

7. Antimicrobials

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आन्तरिक प्रतियोगितात्मक परीक्षाको पाठ्यक्रम

- 7.1 Types of antibiotics, Mechanism of action of various antibiotics, spectrum, antibiotic resistance
- 7.2 Antibiotic susceptibility testing by various methods

8. Molecular Biology

- 8.1 Chromosomes structure, chromosomal abnormalities, mutations and important genetic diseases
- 8.2 Molecular methods used in clinical microbiology for disease diagnosis
- 8.3 Collection , preservation and transport of specimen for molecular testing
- 8.4 Recombinant DNA technology: necessary elements.
- 8.5 Separation of DNA and RNA
- 8.6 Application of genetics in medicine
- 8.7 Polymerase chain reaction: principle, types, procedure, uses in medicine
- 8.8 Insitu hybridization: principle, types, procedure, uses in medicine, Chromogenic insitu hybridization, silver enhanced insitu hybridization, genomic insitu hybridization
- 8.9 Gel electrophoresis: principle, procedure, uses

9. Systemic Microbiology:

- 9.1 **Blood stream infections:** Bacteremia, Septicemia, Types of Bacteremia, Infective endocarditis, etiology, transmission, pathogenesis, epidemiology and clinical features and laboratory diagnosis of blood/tissue parasites, Leptospirosis, Brucellosis, Typhus fever, Viral hemorrhagic fever, Systemic fungal infections
- 9.2 **Respiratory tract infections:** Various Bacterial, viral and fungal infections of respiratory tract. Etiology, transmission, pathogenesis, epidemiology and clinical features and diagnosis of Common cold, Pharyngitis and Tonsillitis, otitis and sinusitis, acute epiglottitis, oral cavity infections, laryngitis, and tracheitis, diphtheria, whooping cough, bronchitis, pneumonia, tuberculosis, opportunistic infections, Viral respiratory infections
- 9.3 **Urinary tract infections and sexually transmitted diseases :** Various Bacterial, viral and fungal infections of the urinary tract, TORCH, etiology, pathogenesis, transmission, clinical features and diagnosis of syphilis, gonorrhoea, Chlamydial infections, HIV, bacterial, Vaginosis, genital herpes, papiloma virus infections, opportunistic STDs,
- 9.4 **Gastrointestinal tract infections:** Etiology, pathogenesis, clinical features, and laboratory diagnosis of diarrhoea and dysentery, Helicobacter pylori infection, food poisoning, parasites in the GI tract
- 9.5 **Hepatobiliary infections:** Etiology, pathogenesis, clinical features, and laboratory diagnosis of Viral hepatitis, Hepatobiliary parasites

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- 9.6 **Musculoskeletal infections:** Etiology, clinical features and laboratory diagnosis of pyogenic skin infections, viral skin infections, Polio, superficial and subcutaneous mycosis, leprosy and parasitic skin infections, Gas gangrene
- 9.7 **Central nervous system infections:** meningitis caused by bacteria, viruses, fungi and protozoa; viral encephalitis, rabies, brain abscesses, tetanus, botulism.
- 9.8 **Infections of the skin, ear and eye:** Etiology, transmission, diagnosis and prevention

10. Recent advances in clinical microbiology

11. Emerging and re-emerging pathogens