General Principles

Biochemistry and molecular biology
- gene expression: DNA structure, replication, and exchange
- gene expression: transcription, including defects
- gene expression: translation, including defects
- structure and function of proteins
- energy metabolism, including metabolic sequences and regulation
- metabolic pathways of small molecules and associated diseases
- biosynthesis and degradation of other macromolecules and associated abnormalities, complex carbohydrates, glycoproteins, and proteoglycans

Biology of cells
- structure and function of cell components
- signal transduction
- cell-cell and cell-matrix adhesion
- cell motility
- intracellular sorting
- cellular homeostasis
- cell cycle
- structure and function of basic tissue components
- adaptive cell response to injury
- intracellular accumulations
- mechanisms of injury and necrosis
- apoptosis

Human development and genetics
- embryogenesis: programmed gene expression, tissue differentiation and morphogenesis, homeotic genes; development regulation of gene expression
- congenital abnormalities: principles, patterns of anomalies, dysmorphogenesis
- principles of pedigree analysis
- population genetics: Hardy-Weinberg law, founder effects, mutation-selection equilibrium
- genetic mechanisms
- clinical genetics

Biology of tissue response to disease
- inflammation, including cells and mediators
- reparative processes
- neoplasia

Gender, ethnic, and behavioral considerations affecting disease treatment and prevention
- progression through the life cycle, including birth through senescence
- psychologic and social factors influencing patient behavior
- patient interviewing, consultation, and interactions with the family
- medical ethics, jurisprudence, and professional behavior

Multisystem processes
- nutrition
- temperature regulation
- adaptation to environmental extremes
- fluid, electrolyte, and acid-base balance and disorders

Pharmacodynamic and pharmacokinetic processes
- general principles
- general properties of antimicrobials
- general properties of antineoplastic agents and immunosuppressants
Microbial biology and infection
- microbial classification and its basis
- bacteria and bacterial diseases
- viruses and viral diseases
- fungi and fungal infections
- parasites and parasitic diseases
- principles of sterilization and pure culture technique

Immune responses
- production and function of granulocytes, natural killer cells, and macrophages
- production and function of T lymphocytes, T-lymphocyte receptors
- production and function of B lymphocytes and plasma cells; immunoglobulin and antibodies: structure and biologic properties
- antigenicity and immunogenicity; antigen presentation; cell activation/regulation; tolerance/clonal deletion
- immunologic mediators: chemistry, function, molecular biology, classic and alternative complement pathways, cytokines, chemokines
- immunogenetics; MHC structure and function, class I, II molecules; erythrocyte antigens
- immunizations: vaccines, protective immunity
- alterations in immunologic function
- immunologically mediated disorders
- immunologic principles underlying diagnostic laboratory tests
- innate immunity

Quantitative methods
- fundamental concepts of measurement
- fundamental concepts of study design
- fundamental concepts of hypothesis testing and statistical inference
Hematopoietic and Lymphoreticular Systems

**Normal processes**
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life

**Abnormal processes**
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical injury
- neoplastic disorders
- metabolic and regulatory disorders
- vascular and endothelial disorders
- systemic disorders affecting the hematopoietic and lymphoreticular system
- idiopathic disorders

**Principles of therapeutics**
- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the hematopoietic system
- other therapeutic modalities (eg, splenectomy, chelating agents, radiation therapy for lymphomas, plasmapheresis)

Central and Peripheral Nervous Systems

**Normal processes**
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life

**Abnormal processes**
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- acquired metabolic and regulatory disorders
- vascular disorders
- systemic disorders affecting the nervous system
- idiopathic disorders affecting the nervous system
- congenital disorders, including metabolic
degenerative disorders
- paroxysmal disorders
- disorders of special senses
- psychopathologic disorders, processes and their evaluation

**Principles of therapeutics**
- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the nervous system
- other therapeutic modalities (eg, radiation, CFS shunting, surgery)
Skin and Related Connective Tissue  

**Normal processes**
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function, including barrier functions, thermal regulation, eccrine function
- repair, regeneration, and changes associated with stage of life or ethnicity
- skin defense mechanisms and normal flora

**Abnormal processes**
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic, regulatory, and structural disorders
- vascular disorders
- systemic disorders affecting the skin

**Principles of therapeutics**
- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the skin/connective tissue
- other therapeutic modalities (eg, laser, tattoo removal, cryotherapy)

Musculoskeletal System  

**Normal processes**
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life

**Abnormal processes**
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic, regulatory, and structural disorders
- vascular disorders
- systemic disorders affecting the musculoskeletal system
- idiopathic disorders
- degenerative disorders

**Principles of therapeutics**
- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the musculoskeletal system
- other therapeutic modalities (eg, radiation, surgery, casts, rehabilitation)
Respiratory System

Normal processes
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function, including surfactant formation, alveolar structure
- repair, regeneration, and changes associated with stage of life
- pulmonary defense mechanisms and normal flora

Abnormal processes
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic, regulatory, and structural disorders
- vascular and circulatory disorders
- systemic disorders affecting the respiratory system

Principles of therapeutics
- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the respiratory system
- other therapeutic modalities (eg, oxygen therapy, nasal CPAP, mechanical ventilation, physical therapy, surgical procedures, including transplantation)

Cardiovascular System

Normal processes
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life

Abnormal processes
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory disorders
- vascular disorders
- systemic diseases affecting the cardiovascular system
- congenital disorders of the heart and central vessels

Principles of therapeutics
- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the cardiovascular system
- other therapeutic modalities (eg, pacemakers, angioplasty, valves, grafts, other surgical procedures)
Gastrointestinal System

Normal processes
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life
- gastrointestinal defense mechanisms and normal flora

Abnormal processes
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory disorders
- vascular disorders
- systemic disorders affecting the gastrointestinal system

Principles of therapeutics
- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the gastrointestinal system
- other therapeutic modalities (e.g., surgical procedures, stents, feeding tubes)

Renal/urinary System

Normal processes
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- repair, regeneration, and changes associated with stage of life

Abnormal processes
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory disorders
- vascular disorders
- systemic diseases affecting the renal system

Principles of therapeutics
- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the renal and urinary system
- other therapeutic modalities (e.g., dialysis, renal transplantation)
Reproductive System

Normal processes
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
- reproductive system defense mechanisms and normal flora

Abnormal processes
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory processes
- systemic disorders affecting reproductive function
- disorders relating to pregnancy, the puerperium, and the postpartum period

Principles of therapeutics
- mechanisms of action, use, adverse effects of drugs for treatment of disorders of the reproductive system and management of normal reproductive function
- other therapeutic modalities affecting the reproductive system (eg, tampons)

Endocrine System

Normal processes
- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function, including hormone synthesis, secretion, action, and metabolism
- repair, regeneration, and changes associated with stage of life

Abnormal processes
- infectious, inflammatory, and immunologic disorders
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory processes
- vascular disorders
- systemic disorders affecting the endocrine system
- idiopathic disorders

Principles of therapeutics
- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the endocrine system
- other therapeutic modalities (eg, surgery, radiation)