

General Principles

28%–30%

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; developmental 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

3%–5%

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

11%–13%

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

2%–4%

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

5%–7%

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

8%–10%

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

11%–13%

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

7%–9%

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 (eg, surgical procedures, stents, feeding tubes)

Renal/urinary System

7%–9%

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 (eg, dialysis, renal transplantation)

Reproductive System

4%–6%

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

5%–7%

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)