



**ศูนย์ประเมินและรับรองความรู้ความสามารถในการประกอบวิชาชีพเวชกรรม
แพทยสภา**

**เกณฑ์ ตารางข้อสอบ และตัวอย่างข้อสอบ
เพื่อประเมินและรับรองความรู้ความสามารถในการประกอบวิชาชีพเวชกรรม**

ขั้นตอนที่ 1 : วิทยาศาสตร์การแพทย์พื้นฐาน (Basic Medical Sciences)

คำนำ

ตามที่แพทยสภาได้กำหนดให้แพทย์ที่สำเร็จการศึกษาจากสถาบันที่แพทยสภารับรองในต่างประเทศที่ประสงค์จะประกอบวิชาชีพเวชกรรมในประเทศไทยและนักศึกษาที่เข้าศึกษาวิชาแพทยศาสตร์ตั้งแต่ปีการศึกษา.ศ.2546 จะต้องสอบเพื่อรับใบอนุญาตประกอบวิชาชีพเวชกรรมของแพทยสภานั้น

ในการนี้แพทยสภา ร่วมกับกลุ่มสถาบันแพทยศาสตร์แห่งประเทศไทยได้จัดตั้งศูนย์ประเมินและรับรองความรู้ความสามารถในการประกอบวิชาชีพเวชกรรมเพื่อทำหน้าที่ควบคุมคุณภาพของการประเมินความรู้ความสามารถของนักศึกษาระหว่างการฝึกอบรมในหลักสูตรแพทยศาสตรบัณฑิต และรับรองความรู้ความสามารถของบัณฑิตแพทย์ในการประกอบวิชาชีพเวชกรรมโดยบริหารจัดการสอบเพื่อรับใบอนุญาตประกอบวิชาชีพเวชกรรมของแพทยสภา และได้ออกข้อบังคับแพทยสภาว่าด้วยการจัดตั้งศูนย์ประเมินและรับรองความรู้ความสามารถในการประกอบวิชาชีพเวชกรรม พ.ศ.2547 เมื่อวันที่ 24 มีนาคม 2547

คณะกรรมการบริหารศูนย์ประเมินและรับรองความรู้ความสามารถในการประกอบวิชาชีพเวชกรรมจึงกำหนด ให้มีการประเมินและรับรองความรู้ความสามารถ 2 ขั้นตอน คือ ขั้นตอนที่ 1 การประเมินความรู้ด้านวิทยาศาสตร์การแพทย์พื้นฐาน (Basic Medical Sciences) และขั้นตอนที่ 2 การประเมินความรู้ความสามารถด้านวิทยาศาสตร์การแพทย์คลินิก (Clinical Sciences) โดยสาระของการสอบจะอิงตามเกณฑ์มาตรฐานผู้ประกอบวิชาชีพเวชกรรมแพทยสภาฉบับ พ.ศ. 2545

ในการนี้คณะกรรมการบริหารศูนย์ประเมินและรับรองความรู้ความสามารถในการประกอบวิชาชีพเวชกรรมจึงกำหนดตารางข้อสอบวิทยาศาสตร์การแพทย์พื้นฐานสำหรับการสอบเพื่อรับใบอนุญาตประกอบวิชาชีพเวชกรรมของแพทยสภานั้น 1 สำหรับผู้ออกข้อสอบ ผู้สอบ และหน่วยงานที่เกี่ยวข้องใช้เป็นแนวทางในการเตรียมสอบและจัดหาข้อสอบ ส่วนตารางข้อสอบวิทยาศาสตร์การแพทย์คลินิกนั้น คณะกรรมการบริหารศูนย์ประเมินและรับรองความรู้ความสามารถในการประกอบวิชาชีพเวชกรรมจะได้ออกและแจ้งให้ทราบต่อไป

ตารางข้อสอบวิทยาศาสตร์การแพทย์พื้นฐานสำหรับการสอบเพื่อรับใบอนุญาตประกอบวิชาชีพเวชกรรมของแพทยสภานั้น ขั้นตอนที่ 1 นี้ได้จัดทำขึ้นโดยอาศัยเกณฑ์มาตรฐานผู้ประกอบวิชาชีพเวชกรรมของแพทยสภาฉบับ พ.ศ.2545 เป็นฐานโดยกำหนดรหัสของหมวดหมู่ต่าง ๆ ตามเอกสารหมายเลข 1 และกำหนดน้ำหนักของหมวดหมู่ต่าง ๆ รวมทั้งจำนวนข้อสอบของแต่ละหมวดหมู่จากจำนวนข้อสอบ 300 ข้อตามเอกสารหมายเลข 2

อนึ่ง คณะกรรมการบริหารศูนย์ประเมินและรับรองความรู้ความสามารถในการประกอบวิชาชีพเวชกรรมได้เล็ง เห็นความสำคัญของการนำความรู้ด้านวิทยาศาสตร์การแพทย์พื้นฐานไปประยุกต์ใช้ในการประกอบวิชาชีพเวชกรรม จึงกำหนดแนวคิดของข้อสอบเพื่อประเมินความรู้ด้านวิทยาศาสตร์การแพทย์พื้นฐานนี้ว่าข้อสอบที่จะนำมาใช้ประเมินความรู้ดังกล่าวควรเป็นความรู้ที่สามารถนำไปประยุกต์ใช้ได้โดยปฏิบัติดังตัวอย่างที่อยู่ส่วนท้ายของตารางข้อสอบวิทยาศาสตร์การแพทย์พื้นฐานในเอกสารหมายเลข 1 หากสถาบันผลิตบัณฑิตแพทย์ใดประสงค์ที่จะประเมินความรู้ด้านวิทยาศาสตร์การแพทย์พื้นฐานนอกเหนือจากแนวคิดดังกล่าวย่อมสามารถดำเนินการในการประเมินความรู้ความสามารถเพื่อปริญญาแพทยศาสตรบัณฑิตของสถาบันนั้น ๆ

เอกสารหมายเลข 1
ตารางข้อสอบวิทยาศาสตร์การแพทย์พื้นฐาน
(Table of Specification of Basic Medical Sciences)

B1 General Principles

B1.1 Biochemistry and molecular biology

- B1.1.1 Biochemistry and function of macromolecules and their derivatives
 - B1.1.1.1 *carbohydrate*
 - B1.1.1.2 *lipid*
 - B1.1.1.3 *nucleic acid*
- B1.1.2 Structure, properties and function of amino acids and proteins
 - B1.1.2.1 *amino acid structures and properties*
 - B1.1.2.2 *principles of protein structure and folding*
 - B1.1.2.3 *enzymes: kinetics, reaction mechanisms and regulation*
 - B1.1.2.4 *structural and regulatory proteins: ligand binding, self-assembly*
 - B1.1.2.5 *regulatory properties*
- B1.1.3 Gene expression: DNA structure, replication, and exchange
 - B1.1.3.1 *DNA structure: single- and double-stranded DNA, stabilizing forces, supercoiling*
 - B1.1.3.2 *gene structure and organization: chromosomes, centromere, telomere*
 - B1.1.3.3 *DNA replication, mutation, repair, degradation, and inactivation*
 - B1.1.3.4 *recombination, insertion sequences, transposon*
 - B1.1.3.5 *mechanisms of genetic exchange, including transformation, transduction, conjugation, crossover, recombination, linkage*
- B1.1.4 Gene expression: transcription, including defects
 - B1.1.4.1 *transcription of DNA into RNA, enzymatic reactions, RNA, RNA degradation*
 - B1.1.4.2 *regulation: cis-regulatory elements, transcription factors, enhancers, promoters, silencers, repressants, splicing*
- B1.1.5 Gene expression: translation, including defects
 - B1.1.5.1 *the genetic code*
 - B1.1.5.2 *structure and function of tRNA*
 - B1.1.5.3 *structure and function of ribosomes*
 - B1.1.5.4 *protein synthesis*
 - B1.1.5.5 *regulation of translation*
 - B1.1.5.6 *post-translational modifications, including phosphorylation, addition of carbohydrate units*
 - B1.1.5.7 *protein degradation*
- B1.1.6 Genetic engineering technology
 - B1.1.6.1 *analysis of DNA: sequencing, restriction analysis, PCR amplification hybridization*
 - B1.1.6.2 *plasmids and bacteriophages*
 - B1.1.6.3 *gene cloning*
 - B1.1.6.4 *recombinant DNA technology and application*
- B1.1.7 Energy metabolism, including metabolic sequences, regulation, and disorders
 - B1.1.7.1 *generation of energy from carbohydrates, fatty acids, and amino acids; glycolysis, pentose phosphate pathway, tricarboxylic acid cycle, β oxidation, ketogenesis and ketone bodies oxidation, electron transport and oxidative phosphorylation, glycogenolysis*
 - B1.1.7.2 *storage of energy: gluconeogenesis, glycogenesis, fatty acid and triglyceride synthesis*

- B1.4.2.1 *wound healing, hemostasis, and repair: thrombosis, granulation tissue, angiogenesis, fibrosis, scar/keloid formation*
- B1.4.2.2 *regenerative processes*
- B1.4.3 Neoplasia
 - B1.4.3.1 *classification, histologic diagnosis*
 - B1.4.3.2 *grading and staging of neoplasms*
 - B1.4.3.3 *cell biology, biochemistry, and molecular biology of neoplastic cells: transformation, oncogenes, oncogenesis, altered cell differentiation, and proliferation*
 - B1.4.3.4 *hereditary neoplastic disorders*
 - B1.4.3.5 *invasion and metastasis*
 - B1.4.3.6 *tumor immunology*
 - B1.4.3.7 *paraneoplastic manifestations of cancer*
 - B1.4.3.8 *cancer epidemiology and prevention*
- B1.5 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental**
 - B1.5.1 Progression through the life cycle, including birth through senescence
 - B1.5.1.1 *cognitive, language, motor skills, social and interpersonal development*
 - B1.5.1.2 *sexual development (eg, puberty, menopause)*
 - B1.5.1.3 *influence of developmental stage on physician/patient interview*
 - B1.5.2 Psychologic and social factors influencing patient behavior
 - B1.5.2.1 *personality traits or coping style, including coping mechanisms*
 - B1.5.2.2 *psychodynamic and behavioral factors, related past experience*
 - B1.5.2.3 *family and cultural factors, including socioeconomic status, ethnicity, and gender*
 - B1.5.2.4 *adaptive and maladaptive behavioral responses to stress and illness (eg, drug-seeking behavior, sleep deprivation)*
 - B1.5.2.5 *interactions between the patient and the physician or the health care system (eg, patient transfer)*
 - B1.5.2.6 *patient adherence, including general and adolescent*
 - B1.5.3 Patient interviewing, consultation, and interactions with the family
 - B1.5.3.1 *establishing and maintaining rapport*
 - B1.5.3.2 *data gathering*
 - B1.5.3.3 *approaches to patient education including patient's understanding about the health problems, purpose of therapy, proper use of drugs, adherence to therapy and signs of major adverse drug effects*
 - B1.5.3.4 *enticing patients to make lifestyle changes*
 - B1.5.3.5 *communicating bad news*
 - B1.5.3.6 *"difficult" interviews (eg, anxious or angry patients)*
 - B1.5.3.7 *multicultural ethnic characteristics*
 - B1.5.4 Medical ethics, jurisprudence, and professional behavior
 - B1.5.4.1 *consent and informed consent to treatment*
 - B1.5.4.2 *physician-patient relationships (eg, ethical conduct, confidentiality)*
 - B1.5.4.3 *death and dying*
 - B1.5.4.4 *birth-related issues*
 - B1.5.4.5 *issues related to patient participation in research*
 - B1.5.4.6 *communications with other health professionals (eg, case refer)*
 - B1.5.4.7 *sexuality and the profession: other "boundary" issues*
 - B1.5.4.8 *health schemes, national drug policies*

- B1.5.4.9 ethics and standards of care among various health schemes*
- B1.5.4.10 organization and cost of health care delivery*
- B1.5.4.11 concept and utilization of national essential drug list (NEDL)*
- B1.5.4.12 ethics, equity and budget constraints in prescribing high cost drugs (eg, erythropoietin, anti-HIV)*

B1.6 Multisystem processes

- B1.6.1 Nutrition
 - B1.6.1.1 generation, expenditure, and storage of energy at the whole-body level*
 - B1.6.1.2 assessment of nutritional status across the life span, including calories, protein, essential nutrients, hypoalimentation,*
 - B1.6.1.3 functions of nutrients*
 - B1.6.1.4 protein-calorie balance and malnutrition*
 - B1.6.1.5 vitamins: structures of vitamins and derivatives of medical important, absorption storage and excretion, functions, food sources and requirements, deficiencies and/or toxicities*
 - B1.6.1.6 mineral requirements, deficiencies and toxicities*
 - B1.6.1.7 eating disorders (eg, obesity, bulimia)*
 - B1.6.1.8 biotransformation*
 - B1.6.1.9 food toxicology*
- B1.6.2 Temperature regulation
- B1.6.3 Adaptation to environmental extremes, including occupational exposures
 - B1.6.3.1 physical and associated disorders (eg, radiation, decreased atmospheric pressure)*
 - B1.6.3.2 chemical poisoning and therapy (eg, agricultural hazards, biological venom and toxins, heavy metal)*
- B1.6.4 Fluid, electrolyte, and acid-base balance and disorders (eg, dehydration, acidosis, alkalosis)
- B1.6.5 Exercise physiology

B1.7 Principles of specimen collections and laboratory interpretations

B1.8 Pharmacodynamic and pharmacokinetic processes

- B1.8.1 General principles
 - B1.8.1.1 pharmacokinetics: absorption and bioavailability, distribution, metabolism, excretion, dose, method of administration and dosage intervals*
 - B1.8.1.2 pharmacodynamics, mechanisms of drug action, structure-activity relationships, receptors, signal transduction*
 - B1.8.1.3 concentration- and dose-effect relationships (eg, efficacy, potency), types and actions of agonists and antagonists*
 - B1.8.1.4 individual factors or special populations altering pharmacokinetics and pharmacodynamics (eg, age, pregnancy, pharmacogenetics)*
 - B1.8.1.5 adverse drug effects including contraindication, warning, precautions, side effects, drug interactions, overdose and toxicity*
 - B1.8.1.6 regulatory issues (eg, drug development, approval)*
 - B1.8.1.7 pharmacoconomics*
 - B1.8.1.8 pharmacovigilance (eg, ADR reporting system)*
 - B1.8.1.9 concept of rational drug prescription*
- B1.8.2 General properties of autacoids, including peptides and analogs, biogenic amines, prostanoids and their inhibitors, and smooth muscle/endothelial autacoids
- B1.8.3 General principles of autonomic pharmacology
- B1.8.4 General properties of antimicrobials, including mechanisms of action and resistance

B1.8.5 General properties of antineoplastic agents and immunosuppressants, including drug effects on rapidly dividing mammalian cells

B1.9 Microbial biology and infection

B1.9.1 Microbial classification

B1.9.2 Bacteria and bacterial diseases

B1.9.2.1 structure and composition

B1.9.2.2 metabolism, physiology, and regulation

B1.9.2.3 genetics

B1.9.2.4 nature and mechanisms of action of virulence factors

B1.9.2.5 pathophysiology of infection

B1.9.2.6 epidemiology and ecology

B1.9.2.7 principles of cultivation, assay, and laboratory diagnosis

B1.9.3 Viruses and viral diseases

B1.9.3.1 physical and chemical properties

B1.9.3.2 replication

B1.9.3.3 genetics

B1.9.3.4 principles of cultivation, assay, and laboratory diagnosis

B1.9.3.5 molecular basis of pathogenesis

B1.9.3.6 pathophysiology of infection

B1.9.3.7 latent and persistent infections

B1.9.3.8 epidemiology

B1.9.3.9 oncogenic viruses

B1.9.4 Fungi and fungal infections

B1.9.4.1 structure, physiology, cultivation, and laboratory diagnosis

B1.9.4.2 pathogenesis and epidemiology

B1.9.5 Parasites and parasitic diseases

B1.9.5.1 structure, physiology, life cycles, and laboratory diagnosis

B1.9.5.2 pathogenesis and epidemiology prevention and control

B1.9.6 Principles of sterilization and pure culture technique

B1.10 Immune responses

B1.10.1 Production and function of granulocytes, natural killer cells, macrophages

B1.10.2 Production and function of T lymphocytes, T-lymphocyte receptors

B1.10.3 Production and function of B lymphocytes and plasma cells, immunoglobulin and antibodies, structure and biologic properties

B1.10.4 Antigenicity and immunogenicity, antigen presentation, cell activation and regulation, tolerance and clonal deletion

B1.10.5 Immunologic mediators: chemistry, function, molecular biology, classic and alternative complement pathways, cytokines, chemokines

B1.10.6 Immunogenetics: MHC structure and function, class I, II molecules; erythrocyte antigens; transplantation

B1.10.7 Immunizations, vaccines, protective immunity

B1.10.8 Alterations in immunologic function

B1.10.8.1 T- or B-lymphocyte deficiencies

B1.10.8.2 deficiencies of phagocytic cells

B1.10.8.3 combined immunodeficiency disease

B1.10.8.4 HIV infection/AIDS and other acquired disorders of immune responsiveness

B1.10.8.5 drug-induced alterations in immune responses, immunopharmacology

- B1.10.9 Immunologically mediated disorders
 - B1.10.9.1 hypersensitivity (types I–IV)*
 - B1.10.9.2 transplant rejection*
 - B1.10.9.3 autoimmune disorders*
 - B1.10.9.4 risks of transplantation, transfusion (eg, graft-versus-host disease)*
 - B1.10.9.5 isoimmunization, hemolytic disease of the newborn*
 - B1.10.9.6 immunopathogenesis*
- B1.10.10 immunologic principles underlying diagnostic laboratory tests (eg, ELISA, complement fixation)
- B1.10.11 innate immunity

B1.11 Quantitative methods

- B1.11.1 Fundamental concepts of measurement
 - B1.11.1.1 scales of measurement*
 - B1.11.1.2 distribution, central tendency, variability, probability*
 - B1.11.1.3 disease prevalence and incidence*
 - B1.11.1.4 disease outcomes (eg, fatality rates)*
 - B1.11.1.5 associations (eg, correlation and covariance)*
 - B1.11.1.6 health impact (eg, risk differences and ratios)*
 - B1.11.1.7 efficacy of drug therapy (eg, odd ratio, number needed to treat, risk reduction)*
 - B1.11.1.8 risk of drug therapy (eg, number needed to harm)*
 - B1.11.1.9 sensitivity, specificity, predictive values*
- B1.11.2 Fundamental concepts of study design
 - B1.11.2.1 types of experimental studies (eg, clinical trials, field trials, community intervention trials)*
 - B1.11.2.2 types of observational studies (eg, cohort, case-control)*
 - B1.11.2.3 sampling and sample size*
 - B1.11.2.4 subject selection and exposure allocation (eg, randomization, systematic assignment)*
 - B1.11.2.5 outcome assessment*
 - B1.11.2.6 internal and external validity*
 - B1.11.2.7 level of evidence*
- B1.11.3 Fundamental concepts of hypothesis testing and statistical inference
 - B1.11.3.1 confidence intervals*
 - B1.11.3.2 statistical significance and Type I error*
 - B1.11.3.3 statistical power and Type II error*

B2 Hematopoietic and Lymphoreticular Systems

B2.1 Normal processes

- B2.1.1 Embryonic development, fetal maturation, and perinatal changes
- B2.1.2 Organ structure and function
- B2.1.3 Cell/tissue structure and function
 - B2.1.3.1 production and function of erythrocytes, hemoglobin, O₂ and CO₂ transport, transport proteins*
 - B2.1.3.2 production and function of leukocytes and the lymphoreticular system*
 - B2.1.3.3 production and function of platelets*
 - B2.1.3.4 production and function of coagulation and fibrinolytic factors*
- B2.1.4 Repair, regeneration, and changes associated with stage of life

B2.2 Abnormal processes

- B2.2.1 Infectious, inflammatory, and immunologic disorders

- B2.2.1.1 *infections of the blood, reticuloendothelial system, and lymphatics (eg. AHF, infectious mononucleosis, malaria, filariasis)*
- B2.2.1.2 *allergic and anaphylactic reactions and other immunopathologic mechanisms*
- B2.2.1.3 *acquired disorders of immune deficiency*
- B2.2.1.4 *autoimmunity and autoimmune diseases (eg, Coombs' positive hemolytic anemia, cryoglobulinemias, ITP)*
- B2.2.1.5 *transfusion complications*
- B2.2.2 Neoplastic disorders (eg, leukemia, lymphoma, myeloproliferative disorders, multiple myeloma)
- B2.2.3 Metabolic and regulatory disorders, including acquired and congenital
 - B2.2.3.1 *anemias and cytopenias*
 - *nutritional anemia (eg, iron deficiency anemia, megaloblastic anemia)*
 - *hereditary hemolytic anemia (eg, thalassemia, hemoglobinopathies, hereditary spherocytosis, G6PD deficiency)*
 - *acquired hemolytic anemia (eg, PNH)*
 - *cytopenia (eg, aplastic anemia, agranulocytosis)*
 - B2.2.3.2 *hemorrhagic and hemostatic disorders (eg, acquired coagulopathies, DIC), hereditary (eg, hemophilia)*
 - B2.2.3.3 *bleeding secondary to platelet disorders (eg, von Willebrand's, APDE)*
- B2.2.4 Vascular and endothelial disorders (eg, hypersplenism, TTP, hemolytic-uremic syndrome)
- B2.2.5 Systemic disorders affecting the hematopoietic and lymphoreticular system (eg, nutritional deficiencies, systemic lupus erythematosus), hematologic manifestations of systemic disorders, hematologic disorders present as systemic diseases
- B2.2.6 Idiopathic disorders

B2.3 Principles of therapeutics

- B2.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the hematopoietic system
 - B2.3.1.1 *blood and blood products*
 - B2.3.1.2 *treatment of anemia, drugs stimulating erythrocyte production (eg,erythropoietin, androgen)*
 - B2.3.1.3 *drugs stimulating leukocyte production (eg, G-CSF, GM-CSF)*
 - B2.3.1.4 *anticoagulants, thrombolytic drugs*
 - B2.3.1.5 *antiplatelet drugs*
 - B2.3.1.6 *antimicrobials (eg, antimalarials, anti-retroviral)*
 - B2.3.1.7 *antineoplastic and immunosuppressive drugs*
 - B2.3.1.8 *drugs used to treat acquired disorders of immune responsiveness (eg. IVIG)*
 - B2.3.1.9 *therapeutic antibodies*
- B2.3.2 Other therapeutic modalities (eg, splenectomy, chelating agents, radiation therapy for lymphomas, plasmapheresis, principles of stem cell transplantation)

B2.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

- B2.4.1 Emotional and behavioral factors (eg, diet, depression and immune responses, "blood doping" among athletes)
- B2.4.2 Influence on person, family, and society (eg, childhood leukemia)
- B2.4.3 Occupational and other environmental risk factors (eg, heavy metals, hydrocarbons, lead)
- B2.4.4 Gender and ethnic factors (eg, herbal treatments with bone marrow depression)

B3 Central and Peripheral Nervous Systems

B3.1 Normal processes

- B3.1.1 Embryonic development, fetal maturation, and perinatal changes, including neural tube derivatives, cerebral ventricles, neural crest derivatives
- B3.1.2 Organ structure and function
 - B3.1.2.1 *spinal cord, including gross anatomy, blood supply, and spinal reflexes*
 - B3.1.2.2 *brain stem, including cranial nerves and nuclei, reticular formation, gross anatomy, and blood supply*
 - B3.1.2.3 *brain, including gross anatomy and blood supply; cognition, language, memory; hypothalamic function; limbic system and emotional behavior; circadian rhythms and sleep; and control of eye movement*
 - B3.1.2.4 *sensory systems, including proprioception, pain, vision, hearing, balance, taste, and olfaction*
 - B3.1.2.5 *motor systems, including brain and spinal cord, basal ganglia and cerebellum*
 - B3.1.2.6 *autonomic nervous system*
 - B3.1.2.7 *peripheral nerves and synapse*
- B3.1.3 Cell/tissue structure and function
 - B3.1.3.1 *axonal transport*
 - B3.1.3.2 *excitable properties of neurons, axons and dendrites, including channels*
 - B3.1.3.3 *synthesis, storage, release, reuptake, and degradation of neurotransmitters and neuromodulators*
 - B3.1.3.4 *pre- and postsynaptic receptor interactions, trophic and growth factors*
 - B3.1.3.5 *brain metabolism*
 - B3.1.3.6 *glia, myelin*
 - B3.1.3.7 *brain homeostasis: blood-brain barrier; cerebrospinal fluid formation and flow; choroid plexus*
 - B3.1.3.8 *repair, regeneration, and changes associated with stage of life*

B3.2 Abnormal processes

- B3.2.1 Infectious, inflammatory, and immunologic disorders (eg, multiple sclerosis, myasthenia gravis)
- B3.2.2 Traumatic and mechanical disorders (eg, subdural and epidural hematomas, cord compression, peripheral nerve injury)
- B3.2.3 Neoplastic disorders, including primary and metastatic
- B3.2.4 Acquired metabolic and regulatory disorders (eg, delirium, Reye's syndrome)
- B3.2.5 Vascular disorders (eg, cerebrovascular disease)
- B3.2.6 Systemic disorders affecting the nervous system (eg, lupus, diabetic neuropathy)
- B3.2.7 Congenital disorders, including metabolic (eg, neural tube defects, cerebral palsy, mental retardation, Down syndrome)
- B3.2.8 Degenerative disorders (eg, Alzheimer's disease, Parkinson's disease, amyotrophic lateral sclerosis)
- B3.2.9 Paroxysmal disorders (eg, epilepsy, headache, pain syndromes, and sleep disorders including narcolepsy, periodic paralysis)
- B3.2.10 Disorders of special senses (eg, blindness, deafness)
- B3.2.11 Movement disorders (eg, chorea, tremor, dystonia, rigidity, hypokinnesia)
- B3.2.12 Psychopathologic disorders, processes and their evaluation
 - B3.2.12.1 *early-onset disorders (eg, learning disorders)*
 - B3.2.12.2 *disorders related to substance use*
 - B3.2.12.3 *schizophrenia and other psychotic disorders*

- B3.2.12.4 *mood disorders*
- B3.2.12.5 *anxiety disorders*
- B3.2.12.6 *somatiform disorders*
- B3.2.12.7 *personality disorders*
- B3.2.12.8 *physical and sexual abuse of children, adults, and elders*
- B3.2.12.9 *other disorders (eg, dissociative, impulse control, post-traumatic stress disorder)*

B3.3 Principles of therapeutics

B3.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the nervous system

- B3.3.1.1 *anesthetics*
- B3.3.1.2 *hypnotics*
- B3.3.1.3 *psychopharmacologic agents (eg, anxiolytics, antidepressants, antipsychotic agents, mood-stabilizing agents)*
- B3.3.1.4 *anticonvulsants*
- B3.3.1.5 *analgesics*
- B3.3.1.6 *stimulants, amphetamines*
- B3.3.1.7 *antiparkinsonian drugs*
- B3.3.1.8 *skeletal muscle relaxants, botulinum toxin*
- B3.3.1.9 *neuromuscular junction blocking agents*
- B3.3.1.10 *antiglaucoma drugs*
- B3.3.1.11 *drugs used to decrease intracranial pressure (eg, mannitol, high-dose glucocorticoids)*
- B3.3.1.12 *antimigraine agents*
- B3.3.1.13 *drugs affecting autonomic nervous system (eg, anticholinesterases)*

B3.3.2 Other therapeutic modalities (eg, radiation, CFS shunting, surgery)

B3.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

- B3.4.1 Emotional and behavioral factors (eg, drug abuse, sleep deprivation, accident prevention, pets)
- B3.4.2 Influence on person, family, and society (eg, developmental disabilities, dementia, generational reversal, nutrition, seizures, sleep disorders)
- B3.4.3 Occupational and other environmental risk factors (eg, boxing, carbon monoxide exposure)
- B3.4.4 Gender and ethnic factors (eg, dementia)

B4 Skin and Related Connective Tissue

B4.1 Normal processes

- B4.1.1 Embryonic development, fetal maturation, and perinatal changes
- B4.1.2 Organ structure and function
- B4.1.3 Cell/tissue structure and function, including barrier functions, thermal regulation, eccrine function
- B4.1.4 Repair, regeneration, and changes associated with stage of life or ethnicity (eg, senile purpura, male pattern baldness, postmenopausal hair changes) skin defense mechanisms and normal flora

B4.2 Abnormal processes

- B4.2.1 Infectious, inflammatory, and immunologic disorders
 - B4.2.1.1 *bacterial infections, (eg, acne, cellulitis, carbuncle, abscess, necrotizing fasciitis, gangrene)*
 - B4.2.1.2 *viral infections (eg, herpes infections, chickenpox, rubella, measles, roseola, verrucae)*
 - B4.2.1.3 *fungal infections, including mycoses, dermatophytosis (eg, tinea)*

- B4.2.1.4 *parasitic infections (eg, scabies, lice, creeping eruptions)*
- B4.2.1.5 *dermal inflammation, eczema, vesiculobullous disease:pemphigus), insect bites and stings*
- B4.2.1.6 *immune and autoimmune disorders (eg, lupus erythematosus, scleroderma, dermatomyositis, alopecia, psoriasis, urticaria, allergic dermatosis)*
- B4.2.2 Traumatic and mechanical disorders (eg, thermal injury, decubitus ulcers, effects of ultraviolet light and radiation)
- B4.2.3 Neoplastic disorders
 - B4.2.3.1 *keratinocytes (eg, seborrheic keratosis, actinic keratosis, basal cell carcinoma, squamous cell carcinoma)*
 - B4.2.3.2 *melanocytes (eg, nevi, melanoma)*
 - B4.2.3.3 *vascular neoplasms (eg, hemangiomas, Kaposi's sarcoma)*
 - B4.2.3.4 *other (eg, leukemia- lymphoma, skin appendage tumors)*
- B4.2.4 Metabolic, regulatory, and structural disorders (eg, vitamin deficiencies, hypervitaminosis, hyperhidrosis)
- B4.2.5 Vascular disorders (eg, vasculitis, Raynaud's disease)
- B4.2.6 Systemic disorders affecting the skin

B4.3 Principles of therapeutics

- B4.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the skin and connective tissue, including anti-inflammatory agents (eg, corticosteroids, antihistamines), emollients, sunscreen, retinoids, antimicrobial agents, cytotoxic and immunologic therapy (eg, methotrexate, PUVA, keratolytics)
- B4.3.2 Other therapeutic modalities (eg, laser, tattoo removal, cryotherapy)

B4.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

- B4.4.1 Emotional and behavioral factors (eg, sun exposure, acne)
- B4.4.2 Influence on person, family, and society (eg, psoriasis)
- B4.4.3 Occupational and other environmental risk factors
- B4.4.4 Gender and ethnic factors (eg, keloid)

B5 Musculoskeletal System

B5.1 Normal processes

- B5.1.1 Embryonic development, fetal maturation, and perinatal changes
- B5.1.2 Organ structure and function
- B5.1.3 Cell/tissue structure and function
 - B5.1.3.1 *biology of bones, joints, tendons, skeletal muscle*
 - B5.1.3.2 *energy metabolism in muscle*
 - B5.1.3.3 *exercise and physical conditioning*
- B5.1.4 Repair, regeneration, and changes associated with stage of life

B5.2 Abnormal processes

- B5.2.1 Infectious, inflammatory, and immunologic disorders
 - B5.2.1.1 *infectious disorders*
 - B5.2.1.2 *inflammatory disorders (eg, fibrositis, synovitis, tenosynovitis)*
 - B5.2.1.3 *immunologic disorders (eg, rheumatoid arthritis, ankylosing spondylitis, polymyositis, connective tissue diseases)*
- B5.2.2 Traumatic and mechanical disorders (eg, repetitive motion injuries)
- B5.2.3 Neoplastic disorders (eg, osteosarcoma, metastatic disease)

- B5.2.4 Metabolic, regulatory, and structural disorders (eg, dwarfism, osteogenesis imperfecta, osteomalacia, osteoporosis, gout)
- B5.2.5 Vascular disorders (eg, bone infarcts)
- B5.2.6 Systemic disorders affecting the musculoskeletal system (eg, diabetes mellitus),
- B5.2.7 Idiopathic disorders (eg, Dupuytren's contracture)
- B5.2.8 Degenerative disorders (eg, disc disease, osteoarthritis)

B5.3 Principles of therapeutics

- B5.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the musculoskeletal system
 - B5.3.1.1 *nonsteroidal anti-inflammatory drugs*
 - B5.3.1.2 *muscle relaxants*
 - B5.3.1.3 *antigout therapy*
 - B5.3.1.4 *immunosuppressive drugs (eg, glucocorticoids, gold salt, cytotoxic agents)*
 - B5.3.1.5 *drugs affecting bone mineralization (eg, diphosphonates, calcitonin, estrogen analogs)*
- B5.3.2 Other therapeutic modalities (eg, radiation, surgery, casts, rehabilitation)

B5.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

- B5.4.1 Emotional and behavioral factors (eg, diet, exercise, seat belts, bicycle helmets)
- B5.4.2 Influence on person, family, and society (eg, osteoporosis, fractures in elderly, alcohol abuse/fractures)
- B5.4.3 Occupational and other environmental risk factors (eg, athletes, musicians)
- B5.4.4 Gender and ethnic factors (eg, bone mass)

B6 Respiratory System

B6.1 Normal processes

- B6.1.1 Embryonic development, fetal maturation, and perinatal changes
- B6.1.2 Organ structure and function
 - B6.1.2.1 *airways, including mechanics and regulation of breathing*
 - B6.1.2.2 *lung parenchyma, including ventilation, perfusion, gas exchange*
 - B6.1.2.3 *pleura*
- B6.1.3 Cell/tissue structure and function, including surfactant formation, alveolar structure
- B6.1.4 Repair, regeneration, and changes associated with stage of life
- B6.1.5 Pulmonary defense mechanisms and normal flora

B6.2 Abnormal processes

- B6.2.1 Infectious, inflammatory, and immunologic disorders
 - B6.2.1.1 *infectious diseases*
 - *infectious diseases of the upper respiratory tract*
 - *acute infectious diseases of the lower respiratory tract, pleura and their complications*
 - *chronic infectious diseases of the lower respiratory tract*
 - B6.2.1.2 *immunologic disorders*
 - *allergic and hypersensitivity disorders*
 - *autoimmune disorders (eg, Wegener's granulomatosis)*
 - B6.2.1.3 *inflammatory disorders*
 - *pneumoconiosis*
 - *acute and chronic alveolar injury (eg, acute respiratory distress syndrome, chlorine gas/smoke inhalation)*

- *obstructive pulmonary disease*
 - *restrictive pulmonary disease (eg, sarcoidosis)*
- B6.2.2 Traumatic and mechanical disorders (eg, aspiration, pneumothorax, atelectasis, sleep apnea)
- B6.2.3 Neoplastic disorders (eg, polyps, bronchogenic carcinoma, mesothelioma)
- B6.2.4 Metabolic, regulatory, and structural disorders (eg, hypoventilation, ventilation-perfusion imbalance, neonatal respiratory distress syndrome)
- B6.2.5 Vascular and circulatory disorders (eg, pulmonary hypertension, pulmonary edema, pleural effusion)
- B6.2.6 Systemic disorders affecting the respiratory system

B6.3 Principles of therapeutics

- B6.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the respiratory system (eg, decongestants, cough suppressants, expectorants, mucolytics; bronchodilator drugs)
- B6.3.2 Other therapeutic modalities (eg, oxygen therapy, nasal CPAP, mechanical ventilation, physical therapy)

B6.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

- B6.4.1 Emotional and behavioral factors (eg, smoking)
- B6.4.2 Influence on person, family, and society (eg, family smoking)
- B6.4.3 Occupational and other environmental risk factors
- B6.4.4 Gender and ethnic factors (eg, lung cancer)

B7 Cardiovascular System

B7.1 Normal processes

- B7.1.1 Embryonic development, fetal maturation, and perinatal changes
- B7.1.2 Organ structure and function
- B7.1.2.1 chambers, valves*
 - B7.1.2.2 cardiac cycle, mechanics, heart sounds, cardiac output*
 - B7.1.2.3 hemodynamics, including systemic, pulmonary, coronary, and blood volume*
 - B7.1.2.4 circulation in specific vascular beds*
- B7.1.3 Cell/tissue structure and function
- B7.1.3.1 heart muscle, metabolism, oxygen consumption, biochemistry, and secretory function (eg, atrial natriuretic peptide)*
 - B7.1.3.2 endothelium and secretory function, vascular smooth muscle, microcirculation, and lymph flow*
 - B7.1.3.3 neural and hormonal regulation of the heart, blood vessels, and blood volume, including responses to change in posture, exercise, and tissue metabolism*
- B7.1.4 Repair, regeneration, and changes associated with stage of life

B7.2 Abnormal processes

- B7.2.1 Infectious, inflammatory, and immunologic disorders
- B7.2.1.1 infectious disorders (eg, endocarditis)*
 - B7.2.1.2 inflammatory and immunologic disorders (eg, acute rheumatic fever, vasculitis)*
- B7.2.2 Traumatic and mechanical disorders (eg, tamponade, valvular disease, obstructive cardiomyopathy)
- B7.2.3 Neoplastic disorders
- B7.2.4 Metabolic and regulatory disorders (eg, hypertension, dysrhythmias, systolic and diastolic dysfunction, cor pulmonale, ischemic heart disease)
- B7.2.5 Vascular disorders (eg, atherosclerosis) systemic diseases affecting the cardiovascular system

B7.2.6 Congenital disorders of the heart and central vessels

B7.3 Principles of therapeutics

B7.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the cardiovascular system

B7.3.1.1 coronary and peripheral vasodilators

B7.3.1.2 antiarrhythmic drugs

B7.3.1.3 antihypertensive drugs

B7.3.1.4 measures used to combat hypotension and shock

B7.3.1.5 drugs affecting cholesterol and lipid metabolism

B7.3.1.6 drugs affecting blood coagulation, thrombolytic agents

B7.3.1.7 inotropic agents and treatment of heart failure

B7.3.1.8 immunosuppressive and antimicrobial drugs

B7.3.1.9 drugs to treat peripheral arterial disease

B7.3.1.10 drugs to treat nicotine dependence (smoking cessation therapy)

B7.3.2 Other therapeutic modalities (eg, pacemakers, angioplasty, valve replacement)

B7.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

B7.4.1 Emotional and behavioral factors (eg, smoking, alcohol, ischemic heart disease, obesity, exercise, diet)

B7.4.2 Influence on person, family, and society (eg, altered lifestyle)

B7.4.3 Occupational and other environmental risk factors (eg, stress)

B7.4.4 Gender and ethnic factors (eg, hypertension)

B8 Gastrointestinal System

B8.1 Normal processes

B8.1.1 Embryonic development, fetal maturation, and perinatal changes

B8.1.2 Organ structure and function, including alimentary canal, liver and biliary system, salivary glands and exocrine pancreas, motility, digestion and absorption

B8.1.3 Cell/tissue structure and function

B8.1.3.1 endocrine and neural regulatory functions, including GI hormones

B8.1.3.2 salivary, gastrointestinal, pancreatic, hepatic secretory products, including enzymes, proteins, bile salts, and processes

B8.1.3.3 synthetic and metabolic functions of hepatocytes

B8.1.4 Repair, regeneration, and changes associated with stage of life

B8.1.5 Gastrointestinal defense mechanisms and normal flora

B8.2 Abnormal processes

B8.2.1 Infectious, inflammatory, and immunologic disorders

B8.2.1.1 infectious disorders (eg, peritonitis, hepatitis, intestinal parasitic infection)

B8.2.1.2 diarrhea and food poisoning

B8.2.1.3 inflammatory disorders (eg, cholecystitis, pancreatitis)

B8.2.1.4 immunologic disorders (eg, inflammatory bowel diseases)

B8.2.2 Traumatic and mechanical disorders

B8.2.2.1 hiatus hernia

B8.2.2.2 obstruction (eg, volvulus, postsurgical obstruction)

B8.2.2.3 perforation of hollow viscus and blunt trauma

B8.2.2.4 inguinal, femoral, and abdominal wall hernias

B8.2.2.5 esophageal and colonic diverticula, Meckel's diverticulum

B8.2.3 Neoplastic disorders, including benign and malignant

- B8.2.4 Metabolic and regulatory disorders (eg, hepatic failure, motility disorders)
- B8.2.5 Vascular disorders (eg, portal hypertension, hemorrhoids)
- B8.2.6 Systemic disorders affecting the gastrointestinal system
- B8.2.7 Congenital anomalies (eg, omphalocele, hirschsprung's disease)

B8.3 Principles of therapeutics

- B8.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the gastrointestinal system
 - B8.3.1.1 Treatment and prophylaxis of peptic ulcer disease and gastroesophageal reflux*
 - B8.3.1.2 Drugs to alter gastrointestinal motility (eg, antiemetic drugs, prokinetic drugs)*
 - B8.3.1.3 Fluid replacement (eg, oral rehydration)*
 - B8.3.1.4 Pancreatic replacement therapy and treatment of pancreatitis drugs for treatment of hepatic failure (eg, lactulose) and biliary disease (eg, drugs to dissolve gallstones)*
 - B8.3.1.5 Anti-inflammatory, immunosuppressive, antineoplastic, antimicrobial drugs and anti-parasitic drugs*
- B8.3.2 Other therapeutic modalities (eg, surgical procedures, stents, feeding tubes)

B8.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

- B8.4.1 Emotional and behavioral factors (eg, peptic ulcer, encopresis)
- B8.4.2 Influence on person, family, and society (eg, inflammatory bowel disease, irritable bowel disease, pancreatitis and alcohol, chronic laxative abuse)
- B8.4.3 Occupational and other environmental risk factors
- B8.4.4 Gender and ethnic factors (eg, diets)

B9 Renal/Urinary System

B9.1 Normal processes

- B9.1.1 Embryonic development, fetal maturation, and perinatal changes
- B9.1.2 Organ structure and function
 - B9.1.2.1 kidneys, ureters, bladder, urethra*
 - B9.1.2.2 glomerular filtration and hemodynamics*
 - B9.1.2.3 tubular reabsorption and secretion, including transport processes and proteins*
 - B9.1.2.4 urinary concentration and dilution*
 - B9.1.2.5 normal urinary compositions*
 - B9.1.2.6 renal mechanisms in acid-base balance*
 - B9.1.2.7 renal mechanisms in body fluid homeostasis*
 - B9.1.2.8 micturition*
- B9.1.3 Cell/tissue structure and function, including renal metabolism and oxygen consumption, hormones produced by or acting on the kidney
- B9.1.4 Repair, regeneration, and changes associated with stage of life

B9.2 Abnormal processes

- B9.2.1 Infectious, inflammatory, and immunologic disorders
 - B9.2.1.1 infectious disorders*
 - upper urinary tract (eg, pyelonephritis, papillary necrosis)
 - lower urinary tract (eg, cystitis, urethritis)
 - B9.2.1.2 inflammatory and immunologic disorders*
 - glomerular disorders (eg, glomerulonephritis, nephrotic syndrome)
 - tubular interstitial disease (eg, interstitial nephritis, transplant rejection)
- B9.2.2 Traumatic and mechanical disorders (eg, obstructive uropathy)

- B9.2.3. Neoplastic disorders (eg, renal, urinary bladder and collecting system, metastases)
- B9.2.4. Metabolic and regulatory disorders
 - B9.2.4.1 renal failure, acute and chronic (eg, acute tubular necrosis)*
 - B9.2.4.2 tubular and collecting duct disorders (eg, Fanconi's syndrome, renal tubular acidosis, nephrogenic diabetes insipidus, polycystic kidney disease)*
 - B9.2.4.3 urolithiasis*
- B9.2.5. Vascular disorders (eg, renal artery stenosis)
- B9.2.6. Systemic diseases affecting the renal system (eg, diabetes mellitus, amyloidosis, systemic lupus erythematosus)

B9.3 Principles of therapeutics

- B9.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the renal and urinary system
 - B9.3.1.1 diuretics, antidiuretic drugs*
 - B9.3.1.2 drugs and fluids used to treat volume, electrolyte, and acid-base disorders*
 - B9.3.1.3 drugs used to enhance renal perfusion (eg, dopamine)*
 - B9.3.1.4 anti-inflammatory, antimicrobial, immunosuppressive, and antineoplastic drugs*
 - B9.3.1.5 drugs used to treat lower urinary tract system (eg, incontinence, bladder function, benign prostatic hyperplasia)*
- B9.3.2 Other therapeutic modalities (eg, dialysis, renal transplantation)

B9.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

- B9.4.1 Emotional and behavioral factors (eg, drug-induced interstitial nephritis, diet)
- B9.4.2 Influence on person, family, and society (eg, hemodialysis, living related kidney donation, transplants)
- B9.4.3 Occupational and other environmental risk factors (eg, heavy metals)
- B9.4.4 Gender and ethnic factors (eg, disease progression, urinary tract infections)

B10 Reproductive System

B10.1 Normal processes

- B10.1.1 Embryonic development, fetal maturation, and perinatal changes
- B10.1.2 Organ structure and function
 - B10.1.2.1 female structure, including breast*
 - B10.1.2.2 female function (eg, menstrual cycle, puberty, menopause)*
 - B10.1.2.3 male structure*
 - B10.1.2.4 male function (eg, spermatogenesis, puberty)*
 - B10.1.2.5 intercourse, orgasm*
 - B10.1.2.6 pregnancy, including labor and delivery, the puerperium, lactation, gestational uterus, placenta*
- B10.1.3 Cell/tissue structure and function, including hypothalamic-pituitary-gonadal axis, sex steroids, and gestational hormones
- B10.1.4 Reproductive system defense mechanisms and normal flora

B10.2 Abnormal processes

- B10.2.1 Infectious, inflammatory, and immunologic disorders (eg, toxic shock syndrome, breast abscess, orchitis, sexually transmitted diseases, autoimmune hypogonadism, cystic mastitis)
- B10.2.2 Traumatic and mechanical disorders (eg, female incontinence, torsion of testis, varicocele)
- B10.2.3 Neoplastic disorders
- B10.2.4 Metabolic and regulatory processes

- B10.2.4.1 *female (eg, anovulation, infertility, polycystic ovaries, endometriosis, orgasmic dysfunction, delayed and premature puberty)*
 - *menopausal syndrome*
- B10.2.4.2 *male (eg, infertility, impotence, gynecomastia, delayed and premature puberty)*
 - *benign prostatic hyperplasia*
- B10.2.5 Systemic disorders affecting reproductive function (eg, obesity, myotonic dystrophy, cirrhosis, renal failure)
- B10.2.6 Disorders relating to pregnancy, the puerperium, and the postpartum period
 - B10.2.6.1 *obstetric problems (eg, ectopic pregnancy, third-trimester bleeding)*
 - B10.2.6.2 *complications affecting other organ systems (eg, eclampsia, gestational diabetes, thyroid disorders)*
 - B10.2.6.3 *disorders associated with the puerperium (eg, postpartum hemorrhage, sepsis, depression)*
 - B10.2.6.4 *antepartum, intrapartum, postpartum disorders of the fetus (eg, prematurity, postmaturity, cord compression, macrosomia)*

B10.3 Principles of therapeutics

- B10.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the reproductive system and management of normal reproductive function
 - B10.3.1.1 *Female reproductive tract*
 - *fertility drugs*
 - *oral contraception, other methods of contraception*
 - *estrogen, progestogen replacement*
 - *stimulants and inhibitors of labor*
 - *estrogen and progesterone antagonists, treatment of menopause*
 - *stimulators and inhibitors of lactation*
 - B10.3.1.2. *Male reproductive tract*
 - *androgen replacement and antagonists*
 - B10.3.1.3 *Gonadotropin-releasing hormone and gonadotropin replacement*
 - B10.3.1.4 *Abortifacients*
 - B10.3.1.5 *Antimicrobials*
 - B10.3.1.6 *Antineoplastics*
 - B10.3.1.7 *Restoration of potency including men's health (eg, drugs use in erectile dysfunction)*
- B10.3.2 Other therapeutic modalities affecting the reproductive system (eg, tampons, anabolic steroids)

B10.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

- B10.4.1 Emotional and behavioral factors (eg, sexually transmitted diseases)
- B10.4.2 Influence on person, family, and society (eg, infertility)
- B10.4.3 Occupational and other environmental risk factors (eg, radiation)
- B10.4.4 Family planning and pregnancy (eg, unwanted)
- B10.4.5 Gender identity, sexual orientation, sexuality, libido
- B10.4.6 Effects of traumatic stress syndrome, violence, rape, child abuse

B11 Endocrine System

B11.1 Normal processes

- B11.1.1. Embryonic development, fetal maturation, and perinatal changes
- B11.1.2. Organ structure and function
 - B11.1.2.1 *hypothalamus, posterior and anterior pituitary gland*

- B11.1.2.2 *thyroid gland*
- B11.1.2.3 *parathyroid glands*
- B11.1.2.4 *adrenal cortex, adrenal medulla*
- B11.1.2.5 *pancreatic islets*
- B11.1.2.6 *ovary and testis*
- B11.1.2.7 *adipose tissue*

B11.1.3 Cell/tissue structure and function, including hormone synthesis, secretion, action and metabolism

- B11.1.3.1 *peptide hormones*
- B11.1.3.2 *steroid hormones, including vitamin D*
- B11.1.3.3 *thyroid hormones*
- B11.1.3.4 *catecholamine hormones*
- B11.1.3.5 *renin-angiotensin system*

B11.1.4 Repair, regeneration, and changes associated with stage of life

B11.2 Abnormal processes

- B11.2.1 Infectious, inflammatory, and immunologic disorders (eg, Graves' disease, Hashimoto's thyroiditis)
- B11.2.2 Traumatic and mechanical disorders
- B11.2.3 Neoplastic disorders
- B11.2.4 Metabolic and regulatory processes (eg, diabetes mellitus)
- B11.2.5 Vascular disorders (eg, pituitary apoplexy)
- B11.2.6 Systemic disorders affecting the endocrine system (eg, hemochromatosis)
- B11.2.7 Idiopathic disorders (eg, hirsutism)

B11.3 Principles of therapeutics

B11.3.1 Mechanisms of action, indication and use, and adverse effects of drugs for treatment of disorders of the endocrine system

- B11.3.1.1 *hormones and hormone analogs*
- B11.3.1.2 *stimulators of hormone production (eg, sulfonylureas)*
- B11.3.1.3 *inhibitors of hormone production (eg, thiouracils)*
- B11.3.1.4 *hormone antagonists*
- B11.3.1.5 *potentiators of hormone action (eg, metformin)-antiobesity agents*

B11.3.2 Other therapeutic modalities (eg, surgery, radiation)

B11.4 Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environmental

- B11.4.1 Emotional and behavioral factors (eg, compliance in diabetes mellitus)
- B11.4.2 Influence on person, family, and society
- B11.4.3 Occupational and other environmental risk factors (eg, radiation exposure, iodine deficiency)
- B11.4.4 Gender and ethnic factors

เอกสารหมายเลข 2
น้ำหนักของหมวดหมู่ต่าง ๆ และจำนวนข้อสอบของแต่ละหมวดหมู่

สาระ		น้ำหนักโดยประมาณ#
B1 General Principles		33%
B1.1	Biochemistry and molecular biology	10%
B1.2	Biology of cells	10%
B1.3	Human development and genetics	10%
B1.4	Biology of tissue response to disease	10%
B1.5	Gender, ethnic, and behavioral considerations affecting disease treatment and prevention, including psychosocial, cultural, occupational, and environment	5%
B1.6	Multisystem processes	10%
B1.7	Principles of specimen collections and laboratory interpretations	5%
B1.8	Pharmacodynamic and pharmacokinetic processes	10%
B1.9	Microbial biology and infection	10%
B1.10	Immune responses	10%
B1.11	Quantitative methods	10%
B2 Hematopoietic and Lymphoreticular Systems		7.4%
B2.1	Normal processes	
B2.2	Abnormal processes	
B2.3	Principles of therapeutics	
B2.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	
B3 Central and Peripheral Nervous Systems		7.4%
B3.1	Normal processes	
B3.2	Abnormal processes	
B3.3	Principles of therapeutics	
B3.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	
B4 Skin and Related Connective Tissue		3.7%
B4.1	Normal processes	
B4.2	Abnormal processes	
B4.3	Principles of therapeutics	
B4.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	
B5 Musculoskeletal System		3.7%
B5.1	Normal processes	
B5.2	Abnormal processes	
B5.3	Principles of therapeutics	
B5.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	

น้ำหนักที่กำหนดในตารางข้างต้นเป็นตัวเลขโดยประมาณ ศูนย์ฯ ขอสงวนสิทธิ์ที่จะปรับเปลี่ยนได้ตามความเหมาะสม

สาระ		น้ำหนักโดยประมาณ
B6 Respiratory System		7.4%
B6.1	Normal processes	
B6.2	Abnormal processes	
B6.3	Principles of therapeutics	
B6.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	
B7 Cardiovascular System		7.4%
B7.1	Normal processes	
B7.2	Abnormal processes	
B7.3	Principles of therapeutics	
B7.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	
B8 Gastrointestinal System		7.4%
B8.1	Normal processes	
B8.2	Abnormal processes	
B8.3	Principles of therapeutics	
B8.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	
B9 Renal/Urinary System		7.4%
B9.1	Normal processes	
B9.2	Abnormal processes	
B9.3	Principles of therapeutics	
B9.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	
B10 Reproductive System		7.4%
B10.1	Normal processes	
B10.2	Abnormal processes	
B10.3	Principles of therapeutics	
B10.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	
B11 Endocrine System		7.4%
B11.1	Normal processes	
B11.2	Abnormal processes	
B11.3	Principles of therapeutics	
B11.4	Gender, ethnic, and behavioral considerations affecting disease, etc.	

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ตัวอย่างข้อสอบ

- หญิงอายุ 60 ปี มีบุตร 4 คน และหมดประจำเดือนมาแล้ว 6 ปี มีอาการกลั้นปัสสาวะไม่อยู่ทุกครั้งที่ไอ จามหรือหัวเราะ ควรแนะนำให้หญิงผู้นี้ออกกำลังกายกล้ามเนื้อใด
A. Detrusor
B. Obturator internus
C. Piriformis
D. Rectus abdominis
E. Pelvic diaphragm

ตอบ E

- ชายอายุ 60 ปี มีอาการนิ้วมือสั่น อาการสั่นจะเป็นมากเมื่อเย็นมือไปจับถ้วยกาแฟหรือซีไปที่จุดใดจุดหนึ่ง ชายผู้นี้มีความผิดปกติที่ระบบประสาทส่วนใด
A. Basal ganglia
B. Cerebellar hemisphere
C. Supplementary motor area
D. Frontal eye field
E. Motor nucleus of the thalamus

ตอบ B

- ชายอายุ 80 ปี มีแผลมะเร็งที่หนังหุ้มอวัยวะข้างขวา เซลล์มะเร็งจะแพร่กระจายไปที่ต่อมน้ำเหลืองกลุ่มใดเป็นกลุ่มแรก
A. External iliac
B. Internal iliac
C. Superficial inguinal
D. Deep inguinal
E. Lumbar (para-aortic)

ตอบ C

- ทารกชายอายุ 3 เดือน มีก้อนที่คอ ผลการตรวจเนื้อเยื่อของก้อนพบว่าเป็นไทมัส จากความรู้เกี่ยวกับ embryology นอกจากไทมัสแล้ว เนื้อเยื่อใดต่อไปนี้มีโอกาสอยู่ติดที่ได้มากที่สุด
A. Jugulodigastric lymph node
B. Lingual tonsil
C. Parathyroid gland
D. Submandibular gland
E. Thyroid gland

ตอบ C

- ชายอายุ 70 ปีอยู่คนเดียวมา 2 ปีตั้งแต่ภรรยาเสียชีวิต ชอบรับประทานข้าวเหนียวกับหมูขี้แห้งและน้ำอัดลมแทบทุกมื้อ มี ecchymosis, perifollicular petichiae, และเหงือกบวม ชายผู้นี้ น่าจะเป็นโรคอะไร
A. Beriberi
B. Kwashiorkor
C. Pellagra
D. Rickets
E. Scurvy

ตอบ E

- ชายผู้หนึ่งมี genotype เป็นชาย มี male sexual duct เจริญเต็มที่ แต่พบว่ามี uterine tubes ด้วย ชายผู้นี้ น่าจะเกิดความผิดปกติของกระบวนการใดในช่วงที่เป็น embryo
A. การสร้าง estrogen โดย embryonic testes
B. การสร้าง anti Mullerian hormone โดย embryonic testes
C. การสร้าง testosterone โดย embryonic testes
D. การตอบสนองต่อ estrogen ของ parameso-nephric (mullerian) ducts
E. การตอบสนองต่อ testosterone ต่อ parameso-nephric (mullerian) ducts

ตอบ B

- หญิงปกติมีประจำเดือนรอบละ 28 วัน พบว่าซีรั่ม 17β -estradiol ขึ้นสูงสุดเมื่อ 12 ชั่วโมงที่ผ่านมา และไม่พบ progesterone ท่านคิดว่า จะเกิดอะไรขึ้นภายใน 3 วัน
A. ประจำเดือนหยุด
B. Basal body temperature ลดลง
C. ประจำเดือนเริ่มมา
D. มี ovulation
E. Corpus luteum ฝ่อ

ตอบ D

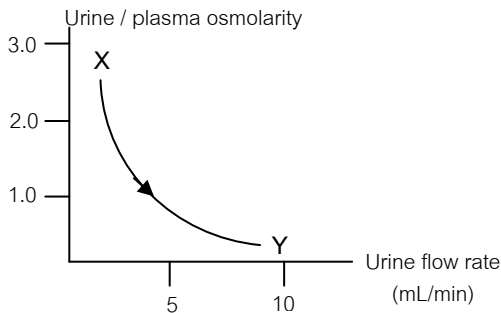
- ปัจจัยใดทำให้ enteric gram-negative bacteria มี resistance ต่อ penicillin G มากกว่า gram-positive bacteria
A. Cytoplasmic membrane
B. Lipoprotein
C. Outer membrane
D. Peptidoglycan
E. Teichoic acid

ตอบ C

- ชายอายุ 16 ปี มีดีซ่าน ผลการตรวจทางห้องปฏิบัติ การพบ mean corpuscular hemoglobin concentration (MCHC) และ osmotic fragility ของเม็ดเลือดแดงสูงกว่าปกติ ค่า enzyme ของตับอยู่ในเกณฑ์ปกติ และการทดสอบ direct antiglobulin ให้ผลลบ ในการตรวจ peripheral blood smear จะพบเม็ดเลือดแดงเป็นอย่างไร
A. Ovalocytes
B. Schistocytes
C. Spherocytes
D. Target cells
E. Tear drop cells

ตอบ C

10. กราฟแสดง urine/plasma osmolarity และ urinary flow rate ในคนปกติ การเปลี่ยนแปลงจากจุด X ไปสู่จุด Y เกิดจากเหตุในข้อใดมากที่สุด
- การดื่มน้ำ 1 ลิตร
 - การดื่มน้ำ isotonic glucose solution 200 มล.
 - การดื่มน้ำ hypertonic glucose solution 200 มล.
 - การดื่มน้ำ hypertonic sodium chloride solution 200 มล.
 - ได้รับการฉีด ADH (vasopressin)



ตอบ A

11. เด็กหญิงอายุ 6 ปี มีอาการบวมที่หน้า มือ ขาและเท้ามา 2 วัน ไม่พบว่ามีไข้ ความดันเลือดปกติ มีประวัติว่า 1 สัปดาห์ก่อนมีอาการติดเชื้อทางเดินหายใจส่วนบนจากไวรัส ตรวจเลือดพบ

Albumin	2.0 g/dL
Urea nitrogen (BUN)	6.0 mg/dL
Creatinine	0.6 mg/dL
Cholesterol	550 mg/dL

ตรวจปัสสาวะพบ

Urine protein	4+
24 hour urine protein	6.0 g
Urine sediment	: oval fat bodies, hyaline และ granular cast

เด็กหญิงรายนี้น่าจะป่วยเป็นโรคอะไรมากที่สุด

- Diffuse poststreptococcal glomerulonephritis
- Membranous nephropathy
- Membranoproliferative glomerulonephritis
- Minimal change disease
- Rapidly progressive glomerulonephritis

ตอบ D

12. ยาสี่ชนิดมีกลไกการออกฤทธิ์และ therapeutic effect เหมือนกัน แต่มี toxicity ต่างกัน หากใช้ยาในขนาดสูงสุดเป็น effective therapeutic dose ยาที่มีลักษณะเฉพาะตามข้อใด จะมีอุบัติการณ์ของการเกิดพิษมากที่สุด

	Median effective dose	Toxic dose ₁ / effective dose ₉₉
A.	0.5 x	2.8
B.	1 x	2.1
C.	5 x	4.0
D.	33 x	3.0

ตอบ B

13. คนสูงอายุที่มีสุขภาพดี จะมี auditory acuity ของ tone เสียงในข้อใดลดลง
- เฉพาะ high-frequency tones
 - เฉพาะ low-frequency tones
 - เสียงทุกความถี่
 - เสียงจาก air conduction ลดลง แต่จาก bone conduction ยังปกติ
 - เสียงจาก bone conduction ลดลง แต่จาก air conduction ยังปกติ

ตอบ A

14. ชายอายุ 20 ปี ถูกนำส่งแผนกฉุกเฉิน เพราะเห็นภาพหลอนที่น่าสะพรึงกลัว มีอาการสับสน บอกวันเวลาและสถานที่ไม่ถูก และมี slurred speech ชายผู้นี้น่าจะป่วยเป็นโรคอะไรมากที่สุด
- Brief reactive psychosis
 - Delirium
 - Mania
 - Psychotic depression
 - Schizophrenia

ตอบ B

15. ชายอายุ 74 ปี ถ่ายปัสสาวะบ่อยและกลั้นปัสสาวะไม่อยู่ ตรวจพบมี benign prostatic hypertrophy ปฏิเสธการผ่าตัด แต่ยอมที่จะลองรักษาด้วย finasteride ยานี้ยับยั้งการสังเคราะห์สารในข้อใด
- Androstenedione
 - Dihydrotestosterone
 - Estradiol
 - Estrone
 - Testosterone

ตอบ B

16. เด็กชายอายุ 8 ปี ถูกฝังต่อย ภายใน 5 นาที พบว่าบริเวณที่ถูกฝังต่อยมีลักษณะบวม แดง นูน ขนาดเส้นผ่าศูนย์กลาง 2 ซม. เนื้อเยื่อบริเวณดังกล่าวจะมีการเปลี่ยนแปลงอย่างไร
- Foreign body reaction
 - Hemorrhage
 - Lymphocytic infiltration
 - Neutrophilic migration
 - Vasodilation

ตอบ E

17. จากการตรวจศพชายอายุ 56 ปี พบว่าไตทั้งสองข้างมีลักษณะดังภาพ ความผิดปกติที่อาจพบร่วมกับพยาธิสภาพนี้คืออะไร
- Berry aneurysm
 - Corneal dystrophy
 - High-pitched deafness
 - Hydronephrosis
 - Ureteropelvic obstruction



ตอบ A