

2009

Step 1

**Content Description and
General Information**

US·MLE

United States

Medical

Licensing

Examination

™

A Joint Program of the Federation of State
Medical Boards of the United States, Inc.,
and the National Board of Medical Examiners®

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CONTENTS

Introduction	3
Preparing for the Test, Applying for the Test, Scheduling Test Dates, and Testing	3
Examination Content	3
Step 1 Test Question Formats	4
Content Outline	6
Sample Step 1	22
Normal Laboratory Values	23
Test Questions for Sample Step 1	25
Answer Form for Sample Step 1	51
Answer Key for Sample Step 1	52

Introduction

This booklet is intended to help you prepare for Step 1 of the United States Medical Licensing Examination™ (USMLE™) if you are an applicant with an eligibility period that has an ending date in 2009. *Eligibility periods* are explained in the *2009 USMLE Bulletin of Information*, with which you must become familiar to apply for the examination. In addition to reading the *Bulletin*, you should run the sample Step 1 test materials and tutorials provided at the USMLE website.

The information in this booklet, USMLE sample test materials and software tutorials, and other informational materials are available at the USMLE website (<http://www.usmle.org>). Information regarding any changes in the USMLE program will also be posted at the USMLE website. You must obtain the most recent information to ensure an accurate understanding of current USMLE rules.

Preparing for the Test, Applying for the Test, Scheduling Test Dates, and Testing

In addition to the information in this booklet, you should review the sections that appear in the *Bulletin*: Preparing for the Test, Applying for the Test and Scheduling Your Test Date, and Testing.

Although the sample test materials in this booklet are provided in computer format at the USMLE website, you must run the tutorial and sample materials to become familiar with the test software prior to your test date. Migration of Step 1 to new test delivery software will occur in 2009. Please monitor the USMLE website (<http://www.usmle.org>) announcements section to check for changes in test delivery software, and to access updated orientation and practice materials. The sample materials available at the USMLE website include an additional block of items with associated audio or video findings and a sequential item set in the FRED V2 interface. You should become familiar with test items that have audio or video components and sequential item sets as these formats may be used in the actual examination. The block of items with

associated audio or video and sequential item sets does not appear in this booklet.

The Step 1 examination consists of questions ("test items") presented in standard multiple-choice formats, as described on pages 4 and 5 of this booklet. The test items are divided into "blocks" (see the Test Lengths and Formats in the *Bulletin*). You may want to study the descriptions of test item formats that follow before you run the sample test items. A Normal Laboratory Values Table, including Standard International conversions, is reproduced on pages 23 and 24 of this booklet. This table will be available as an on-line reference when you take the examination. Please note that values shown in the actual examination may differ slightly from those printed in this booklet.

Examination Content

Step 1 consists of multiple-choice questions prepared by examination committees composed of faculty members, teachers, investigators, and clinicians with recognized prominence in their respective fields. Committee members are selected to provide broad representation from the academic, practice, and licensing communities across the United States and Canada. The test is designed to measure basic science knowledge. Some questions test the examinee's fund of information per se, but the majority of questions require the examinee to interpret graphic and tabular material, to identify gross and microscopic pathologic and normal specimens, and to solve problems through application of basic science principles.

Step 1 is constructed from an integrated content outline that organizes basic science content according to general principles and individual organ systems. Test questions are classified in one of these major areas depending on whether they focus on concepts and principles that are important across organ systems or within individual organ systems.

Sections focusing on individual organ systems are subdivided according to normal and abnormal processes, principles of therapy, and

psychosocial, cultural, and environmental considerations. Each examination covers content related to the traditionally defined disciplines of anatomy, behavioral sciences, biochemistry, microbiology, pathology, pharmacology, and physiology, as well as to interdisciplinary areas including genetics, aging, immunology, nutrition, and molecular and cell biology.

While not all topics listed in the content outline are included in every examination, overall content coverage is comparable in the various examination forms that will be taken by different examinees.

A full content outline for the USMLE Step 1 examination is provided on pages 6 to 21. It describes the scope of the examination in detail. To facilitate review, the major categories are indicated in bold type, with the subcategories in regular type.

The content outline is not intended as a curriculum development or study guide. It provides a flexible structure for test construction that can readily accommodate new topics, emerging content domains, and shifts in emphasis. The categorizations and content coverage are subject to change. Broadly based learning that establishes a strong general understanding of concepts and principles in the basic sciences is the best preparation for the examination.

Step 1 Test Question Formats

Single One Best Answer Questions

This is the traditional, most frequently used multiple-choice format. These items consist of a statement or question followed by three to eleven response options arranged in alphabetical or logical order. A portion of the questions involves interpretation of graphic or pictorial materials. The response options for all questions are lettered (eg, A, B, C, D, E). Examinees are required to select the best answer to the question. Other options may be partially correct, but there is only ONE BEST answer.

Strategies for Answering Single One Best Answer Test Questions

- Read each question carefully. It is important to understand what is being asked.
- Try to generate an answer and then look for it in the option list.
- Alternatively, read each option carefully, eliminating those that are clearly incorrect.
- Of the remaining options, select the one that is most correct.
- If unsure about an answer, it is better to guess since unanswered questions are automatically counted as wrong answers.

Example Item

A 32-year-old woman with type 1 diabetes mellitus has had progressive renal failure over the past 2 years. She has not yet started dialysis. Examination shows no abnormalities. Her hemoglobin concentration is 9 g/dL, hematocrit is 28%, and mean corpuscular volume is 94 μm^3 . A blood smear shows normochromic, normocytic cells. Which of the following is the most likely cause?

- (A) Acute blood loss
- (B) Chronic lymphocytic leukemia
- (C) Erythrocyte enzyme deficiency
- (D) Erythropoietin deficiency
- (E) Immuno-hemolysis
- (F) Microangiopathic hemolysis
- (G) Polycythemia vera
- (H) Sickle cell disease
- (I) Sideroblastic anemia
- (J) β -Thalassemia trait

(Answer: D)

Sequential Item Sets

A single patient-centered vignette may be associated with two or three consecutive questions about the information presented. Each question is linked to the initial patient vignette but is testing a different point. Questions are designed to be answered in sequential order. You are required to select the one best answer to each question. Other options may be partially correct, but there is only ONE BEST answer. You must click “Proceed to Next Item” to view the next item in the set; once you click on this button, you will not be able to add or change an answer to the displayed (previous) item.

Step 1 Content Outline

Table of Contents

General Principles	7
Biochemistry and Molecular Biology	
Biology of Cells	
Human Development and Genetics	
Biology of Tissue Response to Disease	
Gender, Ethnic, and Behavioral Considerations Affecting Disease Treatment and Prevention	
Multisystem Processes	
Pharmacodynamic and Pharmacokinetic Processes	
Microbial Biology and Infection	
Immune Responses	
Quantitative Methods	
Hematopoietic and Lymphoreticular Systems	11
Central and Peripheral Nervous Systems	12
Skin and Related Connective Tissue	13
Musculoskeletal System	14
Respiratory System	15
Cardiovascular System	16
Gastrointestinal System	17
Renal/Urinary System	18
Reproductive System	19
Endocrine System	20

Examples of diseases and normal processes are listed within this content outline. The purpose of these examples is only to clarify and illustrate the particular categories they are appended to; they are **not** intended to direct the examinee toward preparing for questions on them. Examinees should not focus their studies on the examples only. The examination encompasses the categories in the content outline, but the examination will not be limited to or emphasize the examples or the categories for which examples are given.

General Principles

Biochemistry and molecular biology

- gene expression: DNA structure, replication, and exchange
 - DNA structure: single- and double-stranded DNA, stabilizing forces, supercoiling
 - analysis of DNA: sequencing, restriction analysis, PCR amplification, hybridization
 - DNA replication, mutation, repair, degradation, and inactivation
 - gene structure and organization; chromosomes; centromere, telomere
 - recombination, insertion sequences, transposons
 - mechanisms of genetic exchange, including transformation, transduction, conjugation, crossover, recombination, linkage
 - plasmids and bacteriophages
- gene expression: transcription, including defects
 - transcription of DNA into RNA, enzymatic reactions, RNA, RNA degradation
 - regulation: cis-regulatory elements, transcription factors, enhancers, promoters, silencers, repressants, splicing
- gene expression: translation, including defects
 - the genetic code
 - structure and function of tRNA
 - structure and function of ribosomes
 - protein synthesis
 - regulation of translation
 - post-translational modifications, including phosphorylation, addition of CHO units
 - protein degradation
- structure and function of proteins
 - principles of protein structure and folding
 - enzymes: kinetics, reaction mechanisms
 - structural and regulatory proteins: ligand binding, self-assembly
 - regulatory properties
- energy metabolism, including metabolic sequences and regulation
 - generation of energy from carbohydrates, fatty acids, and essential amino acids; glycolysis, pentose phosphate pathway, tricarboxylic acid cycle, ketogenesis, electron transport and oxidative phosphorylation, glycogenolysis
 - storage of energy: gluconeogenesis, glycogenesis, fatty acid and triglyceride synthesis
 - thermodynamics: free energy, chemical equilibria and group transfer potential, energetics of ATP and other high-energy compounds
- metabolic pathways of small molecules and associated diseases
 - biosynthesis and degradation of amino acids (eg, homocystinuria, maple syrup urine disease)
 - biosynthesis and degradation of purine and pyrimidine nucleotides
 - biosynthesis and degradation of lipids (eg, dyslipidemias, carnitine deficiency)
 - biosynthesis and degradation of porphyrins
 - galactosemia and other small sugar disorders
 - biosynthesis and degradation of alcohols and other small molecules
- biosynthesis and degradation of other macromolecules and associated abnormalities, complex carbohydrates (eg, lysosomal storage disease), glycoproteins, and proteoglycans (eg, type II glycogen storage disease)

Biology of cells

- structure and function of cell components (eg, endoplasmic reticulum, Golgi complex, mitochondria, lysosome, peroxidase, endosome, centriole, microtubule, ribosome, polysome, plasma membrane, cytosol, cilia, nucleus, cytoskeleton)
- signal transduction (including basic principles, receptors and channels, second messengers, signal transduction pathways)
- cell-cell and cell-matrix adhesion
- cell motility

- intracellular sorting (eg, trafficking, endocytosis)
- cellular homeostasis (eg, turnover, pH maintenance, proteasome, ions, soluble proteins)
- cell cycle (eg, mitosis, meiosis, structure of spindle apparatus, cell cycle regulation)
- structure and function of basic tissue components (including epithelial cells, connective tissue cells, muscle cells, nerve cells, and extracellular matrix)
- adaptive cell response to injury
- intracellular accumulations (eg, pigments, fats, proteins, carbohydrates, minerals, inclusions, vacuoles)
- mechanisms of injury and necrosis
- apoptosis

Human development and genetics

- embryogenesis: programmed gene expression, tissue differentiation and morphogenesis, homeotic genes, and developmental regulation of gene expression
- congenital abnormalities: principles, patterns of anomalies, dysmorphogenesis
- principles of pedigree analysis, including inheritance patterns, occurrence and recurrence risk determination
- population genetics: Hardy-Weinberg law, founder effects, mutation-selection equilibrium
- genetic mechanisms: chromosomal abnormalities, mendelian inheritance, multifactorial diseases
- clinical genetics, including genetic testing, prenatal diagnosis, newborn screening, genetic counseling/ethics, gene therapy

Biology of tissue response to disease

- inflammation, including cells and mediators
 - acute inflammation and mediator systems
 - vascular response to injury, including mediators
 - inflammatory cell recruitment, including adherence and cell migration, and phagocytosis
 - bactericidal mechanisms and tissue injury
 - clinical manifestations (eg, pain, fever, leukocytosis, leukemoid reaction, and chills)
 - chronic inflammation
- reparative processes
 - wound healing, hemostasis, and repair: thrombosis, granulation tissue, angiogenesis, fibrosis, scar/keloid formation
 - regenerative processes
- neoplasia
 - classification, histologic diagnosis
 - grading and staging of neoplasms
 - cell biology, biochemistry, and molecular biology of neoplastic cells: transformation, oncogenes, altered cell differentiation, and proliferation
 - hereditary neoplastic disorders
 - invasion and metastasis
 - tumor immunology
 - paraneoplastic manifestations of cancer
 - cancer epidemiology and prevention

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

- progression through the life cycle, including birth through senescence
 - cognitive, language, motor skills, and social and interpersonal development
 - sexual development (eg, puberty, menopause)
 - influence of developmental stage on physician-patient interview
- psychologic and social factors influencing patient behavior
 - personality traits or coping style, including coping mechanisms
 - psychodynamic and behavioral factors, related past experience
 - family and cultural factors, including socioeconomic status, ethnicity, and gender
 - adaptive and maladaptive behavioral responses to stress and illness (eg, drug-seeking behavior, sleep deprivation)
 - interactions between the patient and the physician or the health care system (eg, transference)

- patient adherence, including general and adolescent
- patient interviewing, consultation, and interactions with the family
 - establishing and maintaining rapport
 - data gathering
 - approaches to patient education
 - enticing patients to make lifestyle changes
 - communicating bad news
 - “difficult” interviews (eg, anxious or angry patients)
 - multicultural ethnic characteristics
- medical ethics, jurisprudence, and professional behavior
 - consent and informed consent to treatment
 - physician-patient relationships (eg, ethical conduct, confidentiality)
 - death and dying
 - birth-related issues
 - issues related to patient participation in research
 - interactions with other health professionals (eg, referral)
 - sexuality and the profession; other “boundary” issues
 - ethics of managed care
 - organization and cost of health care delivery

Multisystem processes

- nutrition
 - generation, expenditure, and storage of energy at the whole-body level
 - assessment of nutritional status across the life span, including calories, protein, essential nutrients, hypoalimentation
 - functions of nutrients, including essential, trans-fatty acids, cholesterol
 - protein-calorie malnutrition
 - vitamin deficiencies and/or toxicities
 - mineral deficiencies and toxicities
 - eating disorders (eg, obesity, anorexia, bulimia, alternative diets and nutritional supplements)
- temperature regulation
- adaptation to environmental extremes, including occupational exposures
 - physical and associated disorders (eg, temperature, radiation, burns, decreased atmospheric pressure, high-altitude sickness, increased water pressure)
 - chemical (eg, gases, vapors, smoke inhalation, agricultural hazards, volatile organic solvents, heavy metals, principles of poisoning and therapy)
- fluid, electrolyte, and acid-base balance and disorders (eg, dehydration, acidosis, alkalosis)

Pharmacodynamic and pharmacokinetic processes

- general principles
 - pharmacokinetics: absorption, distribution, metabolism, excretion, dosage intervals
 - mechanisms of drug action, structure-activity relationships
 - concentration- and dose-effect relationships (eg, efficacy, potency), types of agonists and antagonists and their actions
 - individual factors altering pharmacokinetics and pharmacodynamics (eg, age, gender, disease, tolerance, compliance, body weight, metabolic proficiency, pharmacogenetics)
 - drug side effects, overdosage, toxicology
 - drug interactions
 - regulatory issues (eg, drug development, approval, scheduling)
- general properties of autacoids, including peptides and analogs, biogenic amines, prostanoids and their inhibitors, and smooth muscle/endothelial autacoids
- general principles of autonomic pharmacology
- general properties of antimicrobials, including mechanisms of action and resistance
- general properties of antineoplastic agents and immunosuppressants, including drug effects on rapidly dividing mammalian cells

Microbial biology and infection

- microbial classification and its basis

- bacteria and bacterial diseases
 - structure and composition
 - metabolism, physiology, and regulation
 - genetics
 - nature and mechanisms of action of virulence factors
 - pathophysiology of infection
 - epidemiology and ecology
 - principles of cultivation, assay, and laboratory diagnosis
- viruses and viral diseases
 - physical and chemical properties
 - replication
 - genetics
 - principles of cultivation, assay, and laboratory diagnosis
 - molecular basis of pathogenesis
 - pathophysiology of infection
 - latent and persistent infections
 - epidemiology
 - oncogenic viruses
- fungi and fungal infections
 - structure, physiology, cultivation, and laboratory diagnosis
 - pathogenesis and epidemiology
- parasites and parasitic diseases
 - structure, physiology, and laboratory diagnosis
 - pathogenesis and epidemiology
- 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 and regulation; tolerance and 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
 - T- or B-lymphocyte deficiencies (eg, DiGeorge syndrome)
 - deficiencies of phagocytic cells
 - combined immunodeficiency disease
 - HIV infection/AIDS and other acquired disorders of immune responsiveness
 - drug-induced alterations in immune responses, immunopharmacology
- immunologically mediated disorders
 - hypersensitivity (types I–IV)
 - transplant and transplant rejection
 - autoimmune disorders
 - risks of transplantation, transfusion (eg, graft-versus-host disease)
 - isoimmunization, hemolytic disease of the newborn
 - immunopathogenesis
- immunologic principles underlying diagnostic laboratory tests (eg, ELISA, complement fixation, RIA, agglutination)
- innate immunity

Quantitative methods

- fundamental concepts of measurement
 - scales of measurement
 - distribution, central tendency, variability, probability

- disease prevalence and incidence
- disease outcomes (eg, fatality rates)
- associations (eg, correlation and covariance)
- health impact (eg, risk differences and ratios)
- sensitivity, specificity, predictive values
- fundamental concepts of study design
 - types of experimental studies (eg, clinical trials, community intervention trials)
 - types of observational studies (eg, cohort, case-control, cross-sectional, case series, community surveys)
 - sampling and sample size
 - subject selection and exposure allocation (eg, randomization, stratification, self-selection, systematic assignment)
 - outcome assessment
 - internal and external validity
- fundamental concepts of hypothesis testing and statistical inference
 - confidence intervals
 - statistical significance and Type I error
 - statistical power and Type II error

Hematopoietic and Lymphoreticular Systems

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
 - production and function of erythrocytes, hemoglobin, O₂ and CO₂ transport, transport proteins
 - production and function of leukocytes and the lymphoreticular system
 - production and function of platelets
 - production and function of coagulation and fibrinolytic factors
- repair, regeneration, and changes associated with stage of life

Abnormal processes

- infectious, inflammatory, and immunologic disorders
 - infections of the blood, reticuloendothelial system, and lymphatics
 - allergic and anaphylactic reactions and other immunopathologic mechanisms
 - acquired disorders of immune deficiency
 - autoimmunity and autoimmune diseases (eg, Coombs positive hemolytic anemia, cryoglobulinemias, ITP)
 - anemia of chronic disease
 - transfusion complications, transplant rejection
- traumatic and mechanical injury (eg, mechanical injury to erythrocytes, splenic rupture)
- neoplastic disorders (eg, lymphoma, leukemia, multiple myeloma)
- metabolic and regulatory disorders, including acquired and congenital
 - anemias and cytopenias (eg, iron deficiency anemia, hemoglobinopathies, hereditary spherocytosis)
 - cythemia
 - hemorrhagic and hemostatic disorders (eg, coagulopathies, DIC)
 - bleeding secondary to platelet disorders (eg, von Willebrand)
- vascular and endothelial disorders (eg, effects and complications of splenectomy, hypersplenism, TTP, hemolytic uremic syndrome)
- systemic disorders affecting the hematopoietic and lymphoreticular system (eg, nutritional deficiencies, systemic lupus erythematosus)
- idiopathic disorders

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the hematopoietic system
 - blood and blood products

- treatment of anemia, drugs stimulating erythrocyte production (eg, erythropoietin)
- drugs stimulating leukocyte production (eg, G-CSF, GM-CSF)
- anticoagulants, thrombolytic drugs
- antiplatelet drugs
- antimicrobials (eg, antimalarials, anti-HIV)
- antineoplastic and immunosuppressive drugs
- drugs used to treat acquired disorders of immune responsiveness
- other therapeutic modalities (eg, splenectomy, chelating agents, radiation therapy for lymphomas, plasmapheresis)

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

- emotional and behavioral factors (eg, diet, depression and immune responses, “blood doping” among athletes)
- influence on person, family, and society (eg, childhood leukemia)
- occupational and other environmental risk factors (eg, heavy metals, hydrocarbons, lead)
- gender and ethnic factors (eg, herbal treatments with bone marrow depression)

Central and Peripheral Nervous Systems

Normal processes

- embryonic development, fetal maturation, and perinatal changes, including neural tube derivatives, cerebral ventricles, neural crest derivatives
- organ structure and function
 - spinal cord, including gross anatomy, blood supply, and spinal reflexes
 - brain stem, including cranial nerves and nuclei, reticular formation, anatomy, and blood supply
 - brain, including gross anatomy and blood supply; cognition, language, memory; hypothalamic function; limbic system and emotional behavior; circadian rhythms and sleep; control of eye movement
 - sensory systems, including proprioception, pain, vision, hearing, balance, taste, and olfaction
 - motor systems, including brain and spinal cord, basal ganglia and cerebellum
 - autonomic nervous system
 - peripheral nerve
- cell/tissue structure and function
 - axonal transport
 - excitable properties of neurons, axons and dendrites, including channels
 - synthesis, storage, release, reuptake, and degradation of neurotransmitters and neuromodulators
 - pre- and postsynaptic receptor interactions, trophic and growth factors
 - brain metabolism
 - glia, myelin
 - brain homeostasis: blood-brain barrier; cerebrospinal fluid formation and flow; choroid plexus
- repair, regeneration, and changes associated with stage of life

Abnormal processes

- infectious, inflammatory, and immunologic disorders (eg, meningitis, multiple sclerosis, myasthenia gravis, and disorders of the eye and ear)
- traumatic and mechanical disorders (eg, subdural and epidural hematomas, cord compression, peripheral nerve injury)
- neoplastic disorders, including primary and metastatic
- acquired metabolic and regulatory disorders (eg, delirium)
- vascular disorders (eg, cerebrovascular occlusion, venous sinus thrombosis, arterial aneurysms, hemorrhage)
- systemic disorders affecting the nervous system (eg, lupus, diabetic neuropathy)
- idiopathic disorders affecting the nervous system
- congenital disorders, including metabolic (eg, neural tube defects, cerebral palsy, mental retardation, Down syndrome)
- degenerative disorders (eg, peripheral neuropathy, Alzheimer dementia, Parkinson disease,

- Huntington disease, amyotrophic lateral sclerosis)
- paroxysmal disorders (eg, epilepsy, headache, pain syndromes, and sleep disorders including narcolepsy, restless legs syndrome/periodic limb movement, circadian rhythm disorders, parasomnias)
- disorders of special senses (eg, blindness, deafness)
- psychopathologic disorders, processes and their evaluation
 - early-onset disorders (eg, learning disorders)
 - disorders related to substance use
 - schizophrenia and other psychotic disorders
 - mood disorders
 - anxiety disorders
 - somatoform disorders
 - personality disorders
 - physical and sexual abuse of children, adults, and elders
 - other disorders (eg, dissociative, impulse control)

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the nervous system
 - anesthetics
 - hypnotics
 - psychopharmacologic agents (eg, anxiolytics, antidepressants, antipsychotic agents, mood stabilizing agents)
 - anticonvulsants
 - analgesics
 - stimulants, amphetamines
 - antiparkinsonian drugs
 - skeletal muscle relaxants, botulinum toxin
 - neuromuscular junction blocking agents (including postsynaptic)
 - antiglaucoma drugs
 - drugs used to decrease intracranial pressure (eg, mannitol, high-dose glucocorticoids)
 - antimigraine agents
 - drugs affecting autonomic nervous system (eg, anticholinesterases)
- other therapeutic modalities (eg, radiation, CSF shunting, surgery)

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

- emotional and behavioral factors (eg, drug abuse, dementia, sleep deprivation, accident prevention, pets)
- influence on person, family, and society (eg, developmental disabilities, dementia, generation reversal, nutrition, seizures, sleep disorders)
- occupational and other environmental risk factors (eg, boxing, carbon monoxide exposure)
- gender and ethnic factors

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 (eg, senile purpura, male pattern baldness, postmenopausal hair changes)
- skin defense mechanisms and normal flora

Abnormal processes

- infectious, inflammatory, and immunologic disorders
 - bacterial infections (eg, acne, cellulitis, carbuncle, abscess, necrotizing fasciitis, gangrene)

- viral infections (eg, herpes infections, chickenpox, rubella, measles, roseola, verrucae)
- fungal infections, including mycoses, dermatophytosis (eg, tinea)
- parasitic infections (eg, scabies, lice)
- immune and autoimmune disorders (eg, discoid lupus erythematosus, scleroderma, dermatomyositis, alopecia, psoriasis, urticaria, allergic dermatosis)
- traumatic and mechanical disorders (eg, thermal injury, decubitus ulcers, effects of ultraviolet light and radiation)
- neoplastic disorders
 - keratinocytes (eg, seborrheic keratosis, actinic keratosis, basal cell carcinoma, squamous cell carcinoma, and ichthyosis)
 - melanocytes (eg, nevi, melanoma)
 - vascular neoplasms (eg, hemangiomas, Kaposi sarcoma)
 - other (eg, T-cell lymphoma, skin appendage tumors)
- metabolic, regulatory, and structural disorders (eg, vitamin deficiencies, hypervitaminosis, hyperhidrosis)
- vascular disorders (eg, vasculitis, Raynaud disease)
- systemic disorders affecting the skin (eg, Ehlers-Danlos syndrome, Marfan syndrome)

Principles of therapeutics

- mechanisms of action, 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, keratinolytics)
- other therapeutic modalities (eg, laser, tattoo removal, cryotherapy)

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

- emotional and behavioral factors (eg, sun exposure, acne)
- influence on person, family, and society (eg, psoriasis)
- occupational and other environmental risk factors
- gender and ethnic factors (eg, keloid)

Musculoskeletal System

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function
 - biology of bones, joints, tendons, skeletal muscle
 - exercise and physical conditioning
- repair, regeneration, and changes associated with stage of life

Abnormal processes

- infectious, inflammatory, and immunologic disorders
 - infectious disorders (eg, septic arthritis, Lyme disease, osteomyelitis)
 - inflammatory disorders (eg, fibrositis, synovitis, tenosynovitis)
 - immunologic disorders (eg, rheumatoid arthritis, ankylosing spondylitis, polymyositis, systemic lupus erythematosus, dermatomyositis, polymyalgia rheumatica)
- traumatic and mechanical disorders (eg, fractures, sprains, strains, dislocations, repetitive motion injuries)
- neoplastic disorders (eg, osteosarcoma, metastatic disease)
- metabolic, regulatory, and structural disorders (eg, dwarfism, osteogenesis imperfecta, osteomalacia, osteoporosis, osteodystrophy, gout, muscular dystrophy)
- vascular disorders (eg, polyarteritis nodosa, bone infarcts)
- systemic disorders affecting the musculoskeletal system (eg, diabetes mellitus)
- idiopathic disorders (eg, Dupuytren contracture, scoliosis, Paget disease)
- degenerative disorders (eg, disc disease, osteoarthritis)

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the musculoskeletal system
 - nonsteroidal anti-inflammatory drugs and analgesics
 - muscle relaxants
 - antigout therapy (eg, allopurinol, colchicine, uricosuric drugs)
 - immunosuppressive drugs (eg, glucocorticoids, gold, cytotoxic agents)
 - drugs affecting bone mineralization (eg, bisphosphonates, calcitonin, estrogen analogs)
- other therapeutic modalities (eg, radiation, surgery, casts, rehabilitation)

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

- emotional and behavioral factors (eg, diet, exercise, seat belts, bicycle helmets)
- influence on person, family, and society (eg, osteoporosis, fractures in elderly, alcohol abuse, and fractures)
- occupational and other environmental risk factors (eg, athletes, musicians)
- gender and ethnic factors (eg, bone mass)

Respiratory System

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
 - airways, including mechanics and regulation of breathing
 - lung parenchyma, including ventilation, perfusion, gas exchange
 - pleura
 - nasopharynx and sinuses
- 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
 - infectious diseases
 - infectious diseases of the upper respiratory tract (eg, sinusitis, pharyngitis)
 - acute infectious diseases of the lower respiratory tract and pleura and their complications (eg, pneumonia, bronchiectasis, abscess, empyema)
 - chronic infectious diseases of the lower respiratory tract (eg, Mycobacterium, endemic fungal infections, Nocardia/Actinomyces)
 - immunologic disorders
 - allergic and hypersensitivity disorders (eg, asthma)
 - autoimmune disorders (eg, Wegener granulomatosis, Goodpasture syndrome)
 - inflammatory disorders
 - pneumoconioses
 - acute and chronic alveolar injury (eg, acute respiratory distress syndrome, chlorine gas/smoke inhalation)
 - obstructive pulmonary disease
 - restrictive pulmonary disease (eg, sarcoidosis, idiopathic fibrosis)
- traumatic and mechanical disorders (eg, foreign body aspiration, pneumothorax, atelectasis, sleep apnea)
- neoplastic disorders (eg, polyps, bronchogenic carcinoma, carcinoid tumors, bronchial adenoma, mesothelioma, metastatic tumors)
- metabolic, regulatory, and structural disorders (eg, hypoventilation, disorders of gas exchange, ventilation-perfusion imbalance, neonatal respiratory distress syndrome)
- vascular and circulatory disorders (eg, thromboembolic disease, pulmonary hypertension, pulmonary

- edema, pleural effusion)
- 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 (eg, decongestants, cough suppressants, expectorants, mucolytics; bronchodilator drugs; anti-inflammatory and cytotoxic drugs; antimicrobial agents; antineoplastic agents)
- other therapeutic modalities (eg, oxygen therapy, nasal CPAP, mechanical ventilation, physical therapy, surgical procedures, including transplantation)

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

- emotional and behavioral factors (eg, smoking, substance abuse, pets, and allergies)
- influence on person, family, and society (eg, tuberculosis, asthma, chronic obstructive pulmonary disease, school issues, protective parents, family smoking)
- occupational and other environmental risk factors
- gender and ethnic factors (eg, sarcoidosis, lung cancer)

Cardiovascular System

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
 - chambers, valves
 - cardiac cycle, mechanics, heart sounds, cardiac conduction
 - hemodynamics, including systemic, pulmonary, coronary, and blood volume
 - circulation in specific vascular beds
- cell/tissue structure and function
 - heart muscle, metabolism, oxygen consumption, biochemistry, and secretory function (eg, atrial natriuretic peptide)
 - endothelium and secretory function, vascular smooth muscle, microcirculation, and lymph flow
 - mechanisms of atherosclerosis
 - neural and hormonal regulation of the heart, blood vessels, and blood volume, including responses to change in posture, exercise, and tissue metabolism
- repair, regeneration, and changes associated with stage of life

Abnormal processes

- infectious, inflammatory, and immunologic disorders
 - infectious disorders (eg, endocarditis, myocarditis, pericarditis)
 - inflammatory and immunologic disorders (eg, acute rheumatic fever, systemic lupus erythematosus, vasculitis, temporal arteritis)
- traumatic and mechanical disorders (eg, tamponade, valvular disease, obstructive cardiomyopathy)
- neoplastic disorders
- metabolic and regulatory disorders (eg, dysrhythmias, systolic and diastolic dysfunction, low- and high-output heart failure, cor pulmonale, systemic hypertension, ischemic heart disease, myocardial infarction, systemic hypotension, and shock)
- vascular disorders (eg, aneurysms, occlusions, varicosities, atherosclerosis)
- systemic diseases affecting the cardiovascular system (eg, amyloidosis, aortic dissection with Marfan syndrome, scleroderma)
- congenital disorders of the heart and central vessels

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the cardiovascular system
 - coronary and peripheral vasodilators
 - antiarrhythmic drugs
 - antihypertensive drugs
 - measures used to combat hypotension and shock

- drugs affecting cholesterol and lipid metabolism
- drugs affecting blood coagulation, thrombolytic agents
- inotropic agents and treatment of heart failure
- immunosuppressive and antimicrobial drugs
- drugs to treat peripheral arterial disease
- other therapeutic modalities (eg, pacemakers, angioplasty, valves, grafts, other surgical procedures)

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

- emotional and behavioral factors (eg, smoking, alcohol, ischemic heart disease, obesity, exercise, diet)
- influence on person, family, and society (eg, altered lifestyle)
- occupational and other environmental risk factors (eg, stress)
- gender and ethnic factors (eg, hypertension)

Gastrointestinal System

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function, including alimentary canal, liver and biliary system, salivary glands and exocrine pancreas, motility, and digestion and absorption
- cell/tissue structure and function
 - endocrine and neural regulatory functions, including GI hormones
 - salivary, gastrointestinal, pancreatic, hepatic secretory products, including enzymes, proteins, bile salts, and processes
 - synthetic and metabolic functions of hepatocytes
- repair, regeneration, and changes associated with stage of life
- gastrointestinal defense mechanisms and normal flora

Abnormal processes

- infectious, inflammatory, and immunologic disorders
 - infectious disorders (eg, peritonitis, hepatitis, gingivostomatitis, peptic ulcer, gastritis, esophagitis, traveler's diarrhea, food poisoning)
 - inflammatory disorders (eg, cholecystitis, pancreatitis)
 - immunologic disorders (eg, Crohn disease, ulcerative colitis)
- traumatic and mechanical disorders
 - malocclusion
 - hiatus hernia
 - obstruction (eg, volvulus, intussusception, esophageal atresia, annular pancreas, postsurgical obstruction)
 - perforation of hollow viscus and blunt trauma
 - inguinal, femoral, and abdominal wall hernias
 - esophageal and intestinal diverticula (eg, Meckel diverticulum)
- neoplastic disorders, including benign and malignant
- metabolic and regulatory disorders (eg, motility disorders, malabsorption, hepatic failure, cholelithiasis)
- vascular disorders (eg, portal hypertension, esophageal varices, hemorrhoids, anal fissure, ischemia, angiodysplasia, thromboses, vasculitis)
- systemic disorders affecting the gastrointestinal system

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the gastrointestinal system
 - treatment and prophylaxis of peptic ulcer disease and gastroesophageal reflux (eg, antacids, antisecretory drugs, mucosal protective agents, antibiotics)
 - drugs to alter gastrointestinal motility (eg, cathartics, antidiarrheal drugs, antiemetic drugs, prokinetic drugs)
 - fluid replacement (eg, oral rehydration)

- pancreatic replacement therapy and treatment of pancreatitis
- drugs for treatment of hepatic failure (eg, lactulose) and biliary disease (eg, drugs to dissolve gallstones)
- anti-inflammatory, immunosuppressive, antineoplastic, and antimicrobial drugs
- other therapeutic modalities (eg, surgical procedures, stents, feeding tubes)

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

- emotional and behavioral factors (eg, peptic ulcer, encopresis, Monday morning stomach)
- influence on person, family, and society (eg, inflammatory bowel disease, irritable bowel disease, pancreatitis and alcohol, chronic laxative abuse)
- occupational and other environmental risk factors
- gender and ethnic factors (eg, diets)

Renal/urinary System

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
 - kidneys, ureters, bladder, urethra
 - glomerular filtration and hemodynamics
 - tubular reabsorption and secretion, including transport processes and proteins
 - urinary concentration and dilution
 - renal mechanisms in acid-base balance
 - renal mechanisms in body fluid homeostasis
 - micturition
- cell/tissue structure and function, including renal metabolism and oxygen consumption, hormones produced by or acting on the kidney
- repair, regeneration, and changes associated with stage of life

Abnormal processes

- infectious, inflammatory, and immunologic disorders
 - infectious disorders
 - upper urinary tract (eg, pyelonephritis, papillary necrosis)
 - lower urinary tract (eg, cystitis, urethritis)
 - inflammatory and immunologic disorders
 - glomerular disorders (eg, glomerulonephritis, nephrotic syndrome, and IgA nephropathy)
 - tubular interstitial disease (eg, interstitial nephritis)
- traumatic and mechanical disorders (eg, obstructive uropathy)
- neoplastic disorders, including primary (eg, renal, urinary bladder and collecting system) and metastases
- metabolic and regulatory disorders
 - renal failure, acute and chronic (eg, acute tubular necrosis)
 - tubular and collecting duct disorders (eg, Fanconi syndrome, renal tubular acidosis, nephrogenic diabetes insipidus, polycystic kidney disease)
 - renal calculi
- vascular disorders (eg, renal artery stenosis)
- systemic diseases affecting the renal system (eg, diabetes mellitus, hepatitis, amyloidosis, systemic lupus erythematosus, Wegener granulomatosis)

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the renal and urinary system
 - diuretics, antidiuretic drugs
 - drugs and fluids used to treat volume, electrolyte, and acid-base disorders
 - drugs used to enhance renal perfusion (eg, dopamine)
 - anti-inflammatory, antimicrobial, immunosuppressive, and antineoplastic drugs
 - drugs used to treat lower urinary tract system (eg, incontinence, bladder function, benign

- prostatic hyperplasia)
- other therapeutic modalities (eg, dialysis, renal transplantation)

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

- emotional and behavioral factors (eg, drug-induced interstitial nephritis, diet)
- influence on person, family, and society (eg, hemodialysis, living related kidney donation, transplants)
- occupational and other environmental risk factors (eg, heavy metals)
- gender and ethnic factors (eg, disease progression, urinary tract infections)

Reproductive System

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
 - female structure, including breast
 - female function (eg, menstrual cycle, puberty, menopause)
 - male structure
 - male function (eg, spermatogenesis, puberty)
 - intercourse, orgasm
 - pregnancy, including ovulation, fertilization, implantation, labor and delivery, the puerperium, lactation, gestational uterus, placenta
- cell/tissue structure and function, including hypothalamic-pituitary-gonadal axis, sex steroids, and gestational hormones
- reproductive system defense mechanisms and normal flora

Abnormal processes

- infectious, inflammatory, and immunologic disorders (eg, toxic shock syndrome, breast abscess, orchitis, sexually transmitted diseases, autoimmune hypogonadism, cystic mastitis)
- traumatic and mechanical disorders (eg, female incontinence, prolapse, cystocele, torsion of testis, varicocele, circumcision, phimosis)
- neoplastic disorders (eg, female reproductive, male reproductive, breast [including fibrocystic changes], trophoblastic disease)
- metabolic and regulatory processes
 - female (eg, anovulation, infertility, polycystic ovaries, endometriosis, orgasmic dysfunction, delayed and premature puberty, menopausal syndrome)
 - male (eg, infertility, impotence, gynecomastia, delayed and premature puberty, benign prostatic hyperplasia)
- systemic disorders affecting reproductive function (eg, obesity, myotonic dystrophy, cirrhosis, renal failure)
- disorders relating to pregnancy, the puerperium, and the postpartum period
 - obstetric problems (eg, ectopic pregnancy, third-trimester bleeding)
 - complications affecting other organ systems (eg, eclampsia, gestational diabetes, thyroid disorders)
 - disorders associated with the puerperium (eg, postpartum hemorrhage, sepsis, depression)
 - antepartum, intrapartum, postpartum disorders of the fetus (eg, prematurity, postmaturity, cord compression, macrosomia)

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the reproductive system and management of normal reproductive function
 - female reproductive tract
 - fertility drugs
 - oral contraception, other methods of contraception (eg, condoms)
 - estrogen, progestogen replacement, treatment of menopause
 - stimulants and inhibitors of labor
 - estrogen and progesterone antagonists

- stimulators and inhibitors of lactation
- male reproductive tract
 - fertility drugs
 - androgen replacement and antagonists
- gonadotropin-releasing hormone and gonadotropin replacement
- abortifacients
- antimicrobials
- antineoplastics
- restoration of potency
- other therapeutic modalities affecting the reproductive system (eg, tampons)

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

- emotional and behavioral factors (eg, sexually transmitted diseases)
- influence on person, family, and society (eg, infertility)
- occupational and other environmental risk factors (eg, radiation)
- family planning and pregnancy (eg, unwanted)
- gender identity, sexual orientation, sexuality, libido
- effects of traumatic stress syndrome, violence, rape, child abuse

Endocrine System

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
 - hypothalamus, posterior and anterior pituitary gland
 - thyroid gland
 - parathyroid glands
 - adrenal cortex, adrenal medulla
 - pancreatic islets
 - ovary and testis
 - adipose tissue
- cell/tissue structure and function, including hormone synthesis, secretion, action, and metabolism
 - peptide hormones
 - steroid hormones, including vitamin D
 - thyroid hormones
 - catecholamine hormones
 - renin-angiotensin system
- repair, regeneration, and changes associated with stage of life

Abnormal processes

- infectious, inflammatory, and immunologic disorders (eg, subacute thyroiditis, Graves disease, sarcoidosis)
- traumatic and mechanical disorders
- neoplastic disorders (eg, pituitary, thyroid, parathyroid, adrenal cortex, pancreatic islets, neural crest, pheochromocytoma)
- metabolic and regulatory processes (eg, diabetes mellitus, pituitary, hypothalamus, thyroid, parathyroid, pancreatic islet disorders, adrenal disorders)
- vascular disorders (eg, pituitary apoplexy)
- systemic disorders affecting the endocrine system
- idiopathic disorders (eg, hirsutism)

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the endocrine system
 - hormones and hormone analogs
 - stimulators of hormone production (eg, sulfonylureas)
 - inhibitors of hormone production (eg, thiouracils)

- hormone antagonists
- potentiators of hormone action (eg, thiazolidinediones)
- antiobesity agents
- other therapeutic modalities (eg, surgery, radiation)

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

- emotional and behavioral factors (eg, compliance in diabetes mellitus, factitious use of insulin, psychogenic polydipsia)
- influence on person, family, and society
- occupational and other environmental risk factors (eg, radiation exposure, iodine deficiency)
- gender and ethnic factors

Sample Step 1

Sample Questions

The following pages include 144 sample test questions. These questions are the same as those you install on your computer from the USMLE website. For information on obtaining the test software and additional information on preparing to take the test and testing, you must review the *2009 USMLE Bulletin of Information*: see [Preparing for the Test](#) and [Testing](#). Please note that reviewing the sample questions as they appear on pages 25-50 is not a substitute for acquainting yourself with the test software. You should run the Step 1 tutorial and sample test questions that are provided on the USMLE website well before your test date. The sample materials available at the USMLE website include an additional block of items with associated audio or video findings and a sequential item set in the FRED V2 interface. You should become familiar with test items that have audio or video components and sequential item sets as these formats may be used in the actual examination. The block of items with associated audio or video and sequential item sets does not appear in this booklet.

These sample questions are illustrative of the types of questions used in the Step 1 examination. Although the questions exemplify content on the examination, they may not reflect the content coverage on individual examinations. In the actual examination, questions may appear randomly; they will not be grouped according to specific content. The questions will be presented one at a time in a format designed for easy on-screen reading, including use of exhibit buttons (separate windows) for the Normal Laboratory Values Table (included here on pages 23-24) and some pictorials. Photographs, charts, and x-ray films referred to in this booklet are not of the same quality as the pictorials used in the actual examination. In addition, you will have the capability to adjust the brightness and contrast of pictorials on the computer screen.

To take the following sample test questions as they would be timed in the actual examination, you should allow a maximum of one hour for each block, for a total of three hours. Please be aware that most examinees perceive the time pressure to be greater during an actual examination. An answer form for recording answers is provided on page 51. In the actual examination, answers will be selected on the screen; **no answer form will be provided**. An answer key is provided on page 52.

USMLE Step 1 Laboratory Values

* Included in the Biochemical Profile (SMA-12)

	<u>REFERENCE RANGE</u>	<u>SI REFERENCE INTERVALS</u>
BLOOD, PLASMA, SERUM		
* Alanine aminotransferase (ALT), serum.....	8-20 U/L	8-20 U/L
Amylase, serum.....	25-125 U/L.....	25-125 U/L
* Aspartate aminotransferase (AST), serum.....	8-20 U/L	8-20 U/L
Bilirubin, serum (adult) Total // Direct	0.1-1.0 mg/dL // 0.0-0.3 mg/dL	2-17 μmol/L // 0-5 μmol/L
* Calcium, serum (Ca ²⁺).....	8.4-10.2 mg/dL.....	2.1-2.8 mmol/L
* Cholesterol, serum.....	Rec:<200 mg/dL	<5.2 mmol/L
Cortisol, serum	0800 h: 5-23 μg/dL // 1600 h: 3-15 μg/dL	138-635 nmol/L // 82-413 nmol/L
	2000 h: ≤ 50% of 0800 h	Fraction of 0800 h: ≤ 0.50
Creatine kinase, serum.....	Male: 25-90 U/L	25-90 U/L
	Female: 10-70 U/L	10-70 U/L
* Creatinine, serum.....	0.6-1.2 mg/dL	53-106 μmol/L
Electrolytes, serum		
Sodium (Na ⁺).....	136-145 mEq/L.....	136-145 mmol/L
* Potassium (K ⁺).....	3.5-5.0 mEq/L.....	3.5-5.0 mmol/L
Chloride (Cl ⁻).....	95-105 mEq/L	95-105 mmol/L
Bicarbonate (HCO ₃ ⁻).....	22-28 mEq/L.....	22-28 mmol/L
Magnesium (Mg ²⁺)	1.5-2.0 mEq/L.....	0.75-1.0 mmol/L
Estriol, total, serum (in pregnancy)		
24-28 wks // 32-36 wks.....	30-170 ng/mL // 60-280 ng/mL	104-590 nmol/L // 208-970 nmol/L
28-32 wks // 36-40 wks.....	40-220 ng/mL // 80-350 ng/mL	140-760 nmol/L // 280-1210 nmol/L
Ferritin, serum	Male: 15-200 ng/mL	15-200 μg/L
	Female: 12-150 ng/mL	12-150 μg/L
Follicle-stimulating hormone, serum/plasma	Male: 4-25 mIU/mL	4-25 U/L
	Female: premenopause 4-30 mIU/mL	4-30 U/L
	midcycle peak 10-90 mIU/mL	10-90 U/L
	postmenopause 40-250 mIU/mL	40-250 U/L
Gases, arterial blood (room air)		
pH	7.35-7.45	[H ⁺] 36-44 nmol/L
PCO ₂	33-45 mm Hg	4.4-5.9 kPa
PO ₂	75-105 mm Hg	10.0-14.0 kPa
* Glucose, serum.....	Fasting: 70-110 mg/dL	3.8-6.1 mmol/L
	2-h postprandial: < 120 mg/dL	< 6.6 mmol/L
Growth hormone - arginine stimulation	Fasting: < 5 ng/mL	< 5 μg/L
	provocative stimuli: > 7 ng/mL	> 7 μg/L
Immunoglobulins, serum		
IgA	76-390 mg/dL.....	0.76-3.90 g/L
IgE	0-380 IU/mL	0-380 kIU/L
IgG	650-1500 mg/dL	6.5-15 g/L
IgM	40-345 mg/dL	0.4-3.45 g/L
Iron	50-170 μg/dL	9-30 μmol/L
Lactate dehydrogenase, serum.....	45-90 U/L	45-90 U/L
Luteinizing hormone, serum/plasma	Male: 6-23 mIU/mL	6-23 U/L
	Female: follicular phase 5-30 mIU/mL	5-30 U/L
	midcycle 75-150 mIU/mL.....	75-150 U/L
	postmenopause 30-200 mIU/mL	30-200 U/L
Osmolality, serum.....	275-295 mOsmol/kg H ₂ O	275-295 mOsmol/kg H ₂ O
Parathyroid hormone, serum, N-terminal	230-630 pg/mL	230-630 ng/L
* Phosphatase (alkaline), serum (p-NPP at 30EC) ...	20-70 U/L	20-70 U/L
* Phosphorus (inorganic), serum.....	3.0-4.5 mg/dL	1.0-1.5 mmol/L
Prolactin, serum (hPRL)	< 20 ng/mL	< 20 μg/L
* Proteins, serum		
Total (recumbent)	6.0-7.8 g/dL	60-78 g/L
Albumin	3.5-5.5 g/dL.....	35-55 g/L
Globulin	2.3-3.5 g/dL.....	23-35 g/L
Thyroid-stimulating hormone, serum or plasma.....	0.5-5.0 μU/mL	0.5-5.0 mU/L
Thyroidal iodine (¹²³ I) uptake.....	8%-30% of administered dose/24 h	0.08-0.30/24 h
Thyroxine (T ₄), serum.....	5-12 μg/dL	64-155 nmol/L
Triglycerides, serum	35-160 mg/dL.....	0.4-1.81 mmol/L
Triiodothyronine (T ₃), serum (RIA)	115-190 ng/dL	1.8-2.9 nmol/L
Triiodothyronine (T ₃) resin uptake	25%-35%	0.25-0.35
* Urea nitrogen, serum	7-18 mg/dL	1.2-3.0 mmol/L
* Uric acid, serum	3.0-8.2 mg/dL	0.18-0.48 mmol/L

USMLE Step 1 Laboratory Values (continued)

	<u>REFERENCE RANGE</u>	<u>SI REFERENCE INTERVALS</u>
BODY MASS INDEX (BMI)		
Body mass index.....	Adult: 19-25 kg/m ²	
CEREBROSPINAL FLUID		
Cell count.....	0-5/mm ³	0-5 x 10 ⁶ /L
Chloride	118-132 mEq/L.....	118-132 mmol/L
Gamma globulin.....	3%-12% total proteins.....	0.03-0.12
Glucose	40-70 mg/dL	2.2-3.9 mmol/L
Pressure	70-180 mm H ₂ O	70-180 mm H ₂ O
Proteins, total	<40 mg/dL	<0.40 g/L
HEMATOLOGIC		
Bleeding time (template)	2-7 minutes.....	2-7 minutes
Erythrocyte count	Male: 4.3-5.9 million/mm ³ Female: 3.5-5.5 million/mm ³	4.3-5.9 x 10 ¹² /L 3.5-5.5 x 10 ¹² /L
Erythrocyte sedimentation rate (Westergren).....	Male: 0-15 mm/h	0-15 mm/h
	Female: 0-20 mm/h.....	0-20 mm/h
Hematocrit	Male: 41%-53%	0.41-0.53
	Female: 36%-46%	0.36-0.46
Hemoglobin A _{1c}	≤ 6%.....	≤ 0.06
Hemoglobin, blood	Male: 13.5-17.5 g/dL	2.09-2.71 mmol/L
	Female: 12.0-16.0 g/dL.....	1.86-2.48 mmol/L
Hemoglobin, plasma.....	1-4 mg/dL.....	0.16-0.62 mmol/L
Leukocyte count and differential		
Leukocyte count	4500-11,000/mm ³	4.5-11.0 x 10 ⁹ /L
Segmented neutrophils.....	54%-62%	0.54-0.62
Bands	3%-5%	0.03-0.05
Eosinophils	1%-3%	0.01-0.03
Basophils.....	0%-0.75%.....	0-0.0075
Lymphocytes	25%-33%	0.25-0.33
Monocytes	3%-7%	0.03-0.07
Mean corpuscular hemoglobin	25.4-34.6 pg/cell	0.39-0.54 fmol/cell
Mean corpuscular hemoglobin concentration	31%-36% Hb/cell	4.81-5.58 mmol Hb/L
Mean corpuscular volume	80-100 μm ³	80-100 fL
Partial thromboplastin time (activated)	25-40 seconds.....	25-40 seconds
Platelet count.....	150,000-400,000/mm ³	150-400 x 10 ⁹ /L
Prothrombin time.....	11-15 seconds.....	11-15 seconds
Reticulocyte count.....	0.5%-1.5%.....	0.005-0.015
Thrombin time.....	<2 seconds deviation from control	<2 seconds deviation from control
Volume		
Plasma	Male: 25-43 mL/kg.....	0.025-0.043 L/kg
	Female: 28-45 mL/kg.....	0.028-0.045 L/kg
Red cell	Male: 20-36 mL/kg	0.020-0.036 L/kg
	Female: 19-31 mL/kg	0.019-0.031 L/kg
SWEAT		
Chloride	0-35 mmol/L	0-35 mmol/L
URINE		
Calcium	100-300 mg/24 h.....	2.5-7.5 mmol/24 h
Chloride	Varies with intake.....	Varies with intake
Creatinine clearance.....	Male: 97-137 mL/min Female: 88-128 mL/min	
Estriol, total (in pregnancy)		
30 wks.....	6-18 mg/24 h	21-62 μmol/24 h
35 wks.....	9-28 mg/24 h	31-97 μmol/24 h
40 wks.....	13-42 mg/24 h	45-146 μmol/24 h
17-Hydroxycorticosteroids	Male: 3.0-10.0 mg/24 h.....	8.2-27.6 μmol/24 h
	Female: 2.0-8.0 mg/24 h	5.5-22.0 μmol/24 h
17-Ketosteroids, total.....	Male: 8-20 mg/24 h	28-70 μmol/24 h
	Female: 6-15 mg/24 h	21-52 μmol/24 h
Osmolality	50-1400 mOsmol/kg H ₂ O	
Oxalate.....	8-40 μg/mL	90-445 μmol/L
Potassium	Varies with diet	Varies with diet
Proteins, total	<150 mg/24 h	<0.15 g/24 h
Sodium	Varies with diet	Varies with diet
Uric acid.....	Varies with diet	Varies with diet

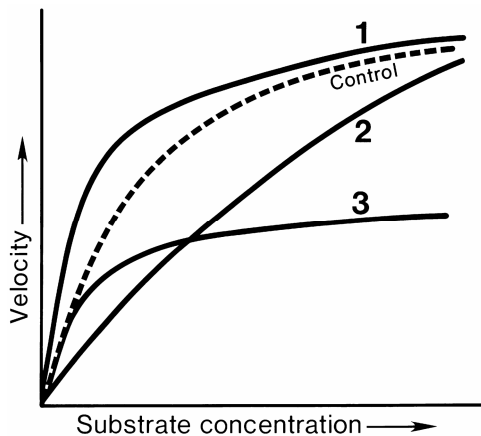
SAMPLE ITEMS
BLOCK 1, ITEMS 1-48

1. A healthy 25-year-old man is undergoing an exercise stress test. Which of the following is most likely to occur in this man's skeletal muscle during exercise?

- (A) Decreased capillary hydrostatic pressure
- (B) Decreased metabolite concentration
- (C) Increased arteriolar diameter
- (D) Increased oxygen concentration
- (E) Increased vascular resistance

2. A 16-year-old boy has a 1-day history of pain in the right ear. He swims every morning. The right ear canal is red and swollen. He has pain when the auricle is pulled or the tragus is pushed. Which of the following is the most likely diagnosis?

- (A) Acute otitis media
- (B) Bullous myringitis
- (C) Chronic otitis media
- (D) External otitis
- (E) Mastoiditis



3. The control curve shown in the graph illustrates the relationship between the initial velocity of a reaction and the substrate concentration for any enzyme obeying Michaelis-Menten kinetics. Which of the following curves best represents the result that would be obtained by halving the amount of enzyme?

- (A) Curve 1
- (B) Curve 2
- (C) Curve 3
- (D) Control curve

4. An otherwise healthy 3-week-old boy is brought to the physician's office because of jaundice and dark urine for the past 2 weeks. He has hepatomegaly, and his stools are loose, clay-colored, and acholic. Serum conjugated bilirubin concentration is increased. Which of the following is the most likely cause of the hyperbilirubinemia?

- (A) Defect in cholesterol synthesis
- (B) Deficiency of glucuronosyltransferase
- (C) Hemolysis
- (D) Inflammation of the terminal ileum
- (E) Obstruction of the biliary system

5. A man pushes a piano across the floor. At the wrist, the force is transmitted from the carpal bones to the radius. At the elbow, the force is transmitted from the ulna to the humerus. Which of the following structures transmits the force from the radius to the ulna?

- (A) Annular ligament
- (B) Bicipital aponeurosis
- (C) Flexor retinaculum
- (D) Intermuscular septum
- (E) Interosseous membrane

6. A normal peptide has 100 amino acids. Following mutation, it has only 20; 1–10 are the same as the normal peptide; 11–20 differ from the normal peptide. Which of the following mutations occurred?

- (A) Nucleotide deletion in the codon for amino acid 11 (codon 11)
- (B) Nucleotide deletion in codon 20
- (C) Nucleotide deletion in the intervening sequence
- (D) Nucleotide substitution in codon 11
- (E) Nucleotide substitution in codon 20

7. Which of the following is used as a metabolic energy source by erythrocytes after an overnight fast?

- (A) Free fatty acids
- (B) Glucose
- (C) β -Hydroxybutyrate
- (D) Pyruvate
- (E) Triglycerides

8. A 60-year-old man develops a tremor in his fingers. The tremor is most pronounced when he reaches for his coffee cup or points to an object. Which of the following components of the motor system is most likely to be involved?

- (A) Basal ganglia
- (B) Cerebellar hemisphere
- (C) Cerebellar vermis
- (D) Frontal eye field
- (E) Motor nucleus of the thalamus

9. A patient being treated with clindamycin for aspiration pneumonia develops diarrhea. The stool contains a toxin that kills cultured epithelial cells. Stool culture grows an anaerobic gram-positive rod. The same organism is cultured from his bedpan. Which of the following is most likely to sterilize the bedpan?

- (A) Boiling for 45 minutes
- (B) Exposure to benzalkonium chloride for 1 hour
- (C) Exposure to ethyl alcohol for 1 hour
- (D) Exposure to saturated steam (121°C) for 15 minutes
- (E) Heating in an oven at 150°C for 30 minutes

10. An 18-year-old woman has gastroenteritis with nausea and vomiting and is able to ingest only small amounts of water. After 3 days, she develops light-headedness, especially when sitting or standing. Arterial blood gas analysis is most likely to show which of the following sets of values?

	pH	PCO ₂ (mm Hg)	HCO ₃ ⁻ (mEq/L)
(A)	7.30	28	15
(B)	7.30	55	27
(C)	7.40	40	24
(D)	7.50	30	22
(E)	7.50	47	35

11. A 10-year-old boy is severely burned. Nitrogen loss occurs during the first few days after the burn. During this acute period, which of the following substances plays a major role in nitrogen loss?

- (A) Cortisol
- (B) Erythropoietin
- (C) Insulin
- (D) Parathyroid hormone
- (E) Thyroxine (T₄)

12. An 8-year-old boy needs to be coaxed to go to school and, while there, often complains of severe headaches or stomach pain. His mother frequently has to take him home because of his symptoms. At night, he tries to sleep with his parents. When they insist that he sleep in his own room, he says that there are monsters in his closet. Which of the following best explains this behavior?

- (A) Childhood schizophrenia
- (B) Normal concerns of latency-age children
- (C) Separation anxiety disorder
- (D) Socialized conduct disorder
- (E) Symbiotic psychosis

13. An 18-year-old female athlete reports easy fatigability and weakness. Physical examination shows no abnormalities. Laboratory studies show:

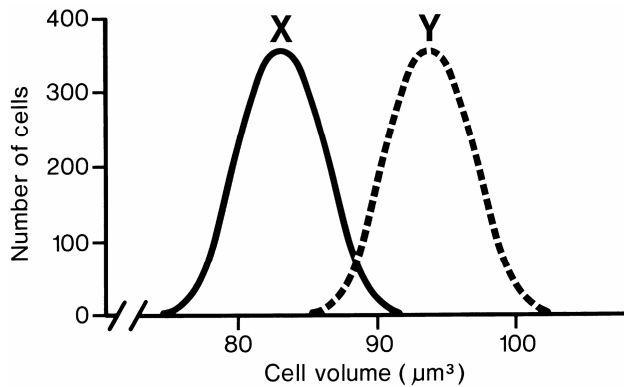
Serum	
Na ⁺	141 mEq/L
Cl ⁻	85 mEq/L
K ⁺	2.1 mEq/L
HCO ₃ ⁻	35 mEq/L
Urine	
Na ⁺	80 mEq/24 h
K ⁺	170 mEq/24 h

Which of the following is the most likely diagnosis?

- (A) Aldosterone deficiency
- (B) Anxiety reaction with hyperventilation
- (C) Diabetic ketoacidosis
- (D) Ingestion of anabolic steroids
- (E) Surreptitious use of diuretics

14. A 45-year-old man has abnormal circadian variation in body temperature, disruption of the sleep-wake cycle, and an impaired nocturnal surge of secretion of melatonin. An MRI of the brain is most likely to show a lesion involving which of the following nuclei?

- (A) Accessory optic
- (B) Lateral preoptic
- (C) Pretectal
- (D) Suprachiasmatic
- (E) Supraoptic



15. Cells from a single population are suspended in solutions X and Y, and cell volume measurements are made. The graph shows the volume of cells in solution X (solid curve) and solution Y (dashed curve). The results indicate that solution Y, with respect to X, is which of the following?

(A) Hypertonic
 (B) Hypotonic
 (C) Isosmotic
 (D) Isotonic

16. The nervous system increases the force of muscle contraction in a graded fashion primarily by recruitment of active motor units and by increasing which of the following?

(A) Amplitude of action potentials of single motoneurons
 (B) Duration of action potentials in single motor nerve fibers
 (C) Frequency of firing of individual motoneurons
 (D) Number of active end-plates on the muscle fiber
 (E) Rate of synthesis of acetylcholine at the motor nerve terminal

17. A 60-year-old woman who has had four children and completed menopause 6 years ago develops urinary incontinence whenever she coughs, sneezes, or laughs. The physician should suggest exercises to strengthen which of the following muscles?

(A) Detrusor
 (B) Obturator internus
 (C) Piriformis
 (D) Rectus abdominis
 (E) Urogenital diaphragm

18. In patients with AIDS, the failure to form granulomas in tissues infected by *Mycobacterium tuberculosis* is most likely due to which of the following?

(A) Clonal deletion of T lymphocytes reactive to mycobacterial antigens
 (B) Decreased production of tumor necrosis factor- α by macrophages
 (C) Inability of T lymphocytes to provide helper functions for B lymphocytes
 (D) Inability of T lymphocytes to recruit and immobilize monocytes
 (E) Poor phagocytic activity of macrophages

19. Hospital discharge of a 75-year-old man is delayed due to unavailability of a bed in a nursing home. He is bedridden and unable to attend to his personal needs. During a 3-day period, his pulse increases from 82/min to 125/min, and blood pressure decreases from 124/72 mm Hg to 100/55 mm Hg. Laboratory values include:

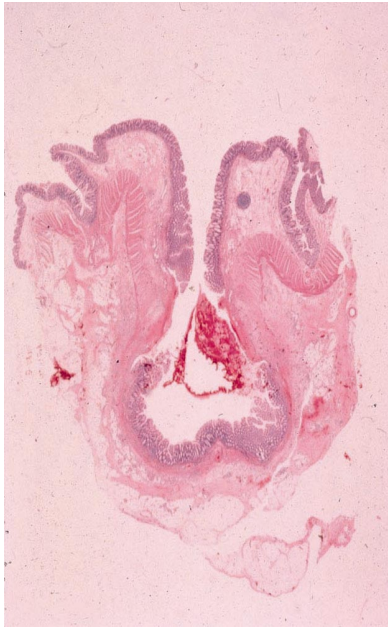
	Day 1	Day 3
Hemoglobin	16.4 g/dL	18.4 g/dL
Serum		
Urea nitrogen	18 mg/dL	56 mg/dL
Glucose	100 mg/dL	89 mg/dL
Na ⁺	135 mEq/L	151 mEq/L
Creatinine	1.1 mg/dL	1.2 mg/dL

Which of the following is the most likely diagnosis?

(A) Acute renal failure
 (B) Dehydration
 (C) Diabetic ketoacidosis
 (D) Gastrointestinal hemorrhage
 (E) Syndrome of inappropriate ADH (vasopressin)

20. Gram-positive cocci in clusters are seen in purulent fluid drained from a skin abscess. Rapid identification of these organisms will be facilitated by evaluation of the clumping of latex beads coated with which of the following?

(A) IgG and fibrinogen
 (B) Interleukin-1 (IL-1) and factor VIII (antihemophilic factor)
 (C) Properdin and platelet factor 3
 (D) Prothrombin and C3b
 (E) Transferrin and plasminogen



21. A 73-year-old woman has episodes of abdominal pain and increasingly severe constipation. Test of the stool for occult blood is positive. The photomicrograph shows features of the resected colon. Which of the following is the most likely diagnosis?
- (A) Adenocarcinoma
 (B) Diverticular disease
 (C) Polypoid adenoma
 (D) Villous adenoma
 (E) Volvulus
-
22. A 1-day-old newborn is evaluated for possible sepsis. Blood cultures grow gram-positive cocci in pairs and chains that agglutinate with group B antiserum. The most likely epidemiologic risk factor for this infection involves bacterial colonization of which of the following?
- (A) Mother's vagina
 (B) Newborn's gastrointestinal tract
 (C) Newborn's nasopharynx
 (D) Placenta
 (E) Umbilical cord remnant
23. A 3-year-old boy with mental retardation has hepatosplenomegaly. Analysis of tissue obtained on biopsy of the liver shows unusually large amounts of glucocerebroside. Which of the following enzymes is most likely to be deficient?
- (A) Hormone-sensitive lipase
 (B) Lipoprotein lipase
 (C) Lysosomal hydrolase
 (D) Sphingolipid synthase
 (E) Tissue phospholipase
24. After infection with measles virus, a 6-year-old boy produces antibodies to all eight viral proteins. The next year he is again exposed to measles virus. Antibodies to which of the following viral proteins are most likely to be protective?
- (A) Hemagglutinin
 (B) Matrix
 (C) Nonstructural
 (D) Nucleocapsid
 (E) Polymerase
25. A 45-year-old man has a left ventricular ejection fraction of 25% (N>55%) with diffuse hypokinesis. He has a sedentary life-style. He eats red meat up to 6 times weekly and drinks 4 alcoholic beverages daily. He is 185 cm (6 ft 1 in) tall and weighs 86 kg (190 lb); BMI is 25 kg/m². His blood pressure is 90/60 mm Hg. Coronary arteriography shows no evidence of atherosclerosis. To prevent further heart damage, which of the following is the most appropriate recommendation?
- (A) Aerobic exercise program
 (B) Avoidance of alcohol
 (C) Ingestion of more vegetables and decrease in red meat intake
 (D) Isometric/weight-training exercise program
 (E) Weight loss
26. Oral administration of grapefruit juice increases the bioavailability of a variety of drugs, including felodipine, midazolam, saquinavir, and verapamil. After oral administration of any one of these drugs, which of the following is most likely to be increased in the presence of grapefruit juice?
- (A) Hepatic CYP3A4 activity
 (B) Intestinal drug metabolism
 (C) Peak serum concentration
 (D) Total body clearance
 (E) Volume of distribution
27. A 74-year-old man with urinary frequency and urgency has benign prostatic hyperplasia. He refuses operative intervention but agrees to a trial of finasteride therapy. During the trial, synthesis of which of the following substances is most likely to be inhibited?
- (A) Androstenedione
 (B) Dihydrotestosterone
 (C) Estradiol
 (D) Estrone
 (E) Testosterone

28. A 23-year-old woman has a progressive increase in her serum β -human chorionic gonadotropin (β -hCG) concentrations during an 8-week period. A hydatidiform mole is removed, but the β -hCG concentration continues to increase. Which of the following is the most likely diagnosis?
- (A) Adrenal adenoma
 - (B) Choriocarcinoma
 - (C) Ectopic pregnancy
 - (D) Pituitary insufficiency
 - (E) A second noninvasive mole
29. A 30-year-old woman with a 1-week history of severe diarrhea feels dizzy when she stands up. Blood pressure (while supine) is 112/76 mm Hg with a pulse of 88/min; blood pressure (while standing) is 80/60 mm Hg with a pulse of 120/min. In addition to controlling her diarrhea, the most appropriate initial therapy is intravenous administration of which of the following?
- (A) Desmopressin
 - (B) 5% Dextrose in water
 - (C) Fresh frozen plasma
 - (D) 0.9% Saline
 - (E) Methoxamine
 - (F) Verapamil
30. A 60-year-old man has a 5-day history of productive cough and shortness of breath with exertion. In addition to a normal left lung base, examination of the chest in the area of the right lung base shows:
- | | |
|---------------------|-----------|
| Breath sounds | bronchial |
| Percussion note | dull |
| Tactile fremitus | increased |
| Adventitious sounds | crackles |
- Which of the following is the most likely diagnosis?
- (A) Asthmatic bronchitis
 - (B) Bullous emphysema
 - (C) Chronic bronchitis
 - (D) Congestive heart failure
 - (E) Lobar pneumonia
 - (F) Pleural effusion
 - (G) Pleuritis
 - (H) Pneumothorax
 - (I) Pulmonary embolism
31. Warfarin is administered to a 56-year-old man following placement of a prosthetic cardiac valve. The warfarin dosage is adjusted to maintain an INR of 2.5. Subsequently, trimethoprim-sulfamethoxazole therapy is begun for a recurring urinary tract infection. In addition to monitoring prothrombin time, which of the following actions should the physician take to maintain adequate anticoagulation?
- (A) Begin therapy with vitamin K
 - (B) Increase the dosage of warfarin
 - (C) Make no alterations in the dosage of warfarin
 - (D) Decrease the dosage of warfarin
 - (E) Stop the warfarin and change to low-dose aspirin
32. An inherited metabolic disorder of carbohydrate metabolism is characterized by an abnormally increased concentration of hepatic glycogen with normal structure and no detectable increase in serum glucose concentration after oral administration of fructose. These two observations suggest that the disease is a result of the absence of which of the following enzymes?
- (A) Fructokinase
 - (B) Glucokinase
 - (C) Glucose-6-phosphatase
 - (D) Phosphoglucomutase
 - (E) UDPG-glycogen transglucosylase
33. A genetic male newborn has fully developed male sexual ducts and recognizable fallopian tubes. Which of the following processes was most likely disturbed during the embryonic period?
- (A) Production of estrogen by the embryonic testes
 - (B) Production of müllerian-inhibitory substance by the embryonic testes
 - (C) Production of testosterone by the embryonic testes
 - (D) Response of the paramesonephric (müllerian) ducts to estrogen
 - (E) Response of the paramesonephric (müllerian) ducts to testosterone

34. A 30-year-old woman whose mother and grandmother have died of carcinoma of the breast refuses to have mammography. She says that she knows she is at risk but states, "I hate having my breasts squashed—it's uncomfortable." Her physician would like her to have annual mammograms. Which of the following is most likely to influence her to agree to mammography?

- (A) Exaggerate her risk for breast cancer
- (B) Insist that she obtain counseling regarding unresolved grief
- (C) Offer analgesia prior to mammography
- (D) Show her photographs of the results of untreated cancer
- (E) Tell her that the therapeutic relationship will be terminated unless she has annual mammograms

35. A 50-year-old man with a history of alcoholism has difficulty with short-term memory. He is unable to recall the date and cannot remember what he ate for breakfast this morning. He thinks the examiner is a long-lost friend and carries on a conversation with the examiner as if they have known each other for years. His long-term memory appears intact. The patient dies shortly thereafter of a myocardial infarct. Pathologic examination of his brain is most likely to disclose an abnormality involving which of the following?

- (A) Amygdala
- (B) Caudate nucleus
- (C) Hippocampus
- (D) Locus caeruleus
- (E) Mammillary bodies

36. Two chemicals are isolated from the body. When administered at the same time, these chemicals induce gastric acid secretion that is four times as great as that induced by either one alone. The two chemicals are most likely to be which of the following?

- (A) Acetylcholine and secretin
- (B) Gastrin and cholecystokinin
- (C) Gastrin and histamine
- (D) Histamine and vasoactive intestinal polypeptide
- (E) Secretin and cholecystokinin

37. Investigators are studying the use of a new laboratory test to identify patients with a particular disease. The table below summarizes the results of initial research involving 200 subjects.

		Disease		
		Present	Absent	
Test Result	Positive	60	40	100
	Negative	20	80	100
		80	120	200

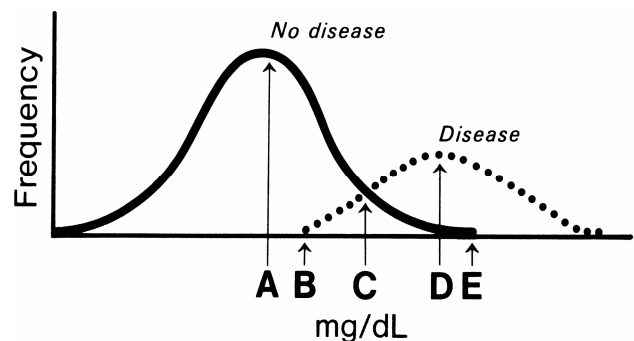
Which of the following is the approximate sensitivity of a positive test result?

- (A) 0.30
- (B) 0.33
- (C) 0.60
- (D) 0.67
- (E) 0.75

38. A cardiac catheterization is done in a healthy person. The blood sample withdrawn from the catheter shows 60% oxygen saturation, and the pressure recording shows oscillations from a maximum of 26 mm Hg to a minimum of 14 mm Hg. The catheter tip was located in which of the following areas?

- (A) Ductus arteriosus
- (B) Foramen ovale
- (C) Left atrium
- (D) Pulmonary artery
- (E) Right atrium

39. An inexpensive screening test for a disease is available through analysis of venous blood. The distributions of blood concentrations for persons with and without the disease are depicted in the graph. The disease is irreversible and fatal if not discovered and treated early. Which of the following letters represents the most appropriate cutoff point between normal and abnormal?



40. A 7-month-old infant is brought to the physician's office because of poor weight gain despite large food intake. He has had two episodes of pneumonia and has frequent bulky stools. He coughs frequently. X-rays of the lungs show increased markings and hyperinflation. Trypsin is absent in a fresh stool sample, and the fat content is increased. Which of the following is the most likely cause of this infant's disorder?
- (A) Autoimmune disorder
 - (B) Defective ion transport at epithelial surfaces
 - (C) Disaccharidase deficiency
 - (D) Inability to synthesize apolipoprotein B
 - (E) Villous atrophy of the jejunum
41. Genes of laterality, such as *iv* or *inv*, determine the right-left axis ("sidedness"). A mutation in a laterality gene is the most logical explanation for a child who was born with which of the following abnormalities?
- (A) Bifid heart
 - (B) Dextrocardia
 - (C) Double-outlet right ventricle
 - (D) Persistent truncus arteriosus
 - (E) Transposition of the great vessels
42. Hepatitis A virus (HAV) is resistant to solvents such as chloroform and 20% diethyl ether, while HIV-1 is sensitive to such solvents. This resistance is best explained by absence of which of the following in HAV?
- (A) Icosahedral symmetry
 - (B) Reverse transcriptase
 - (C) Single-stranded RNA
 - (D) Spherical structure
 - (E) Viral envelope
43. A 66-year-old man has become increasingly short-tempered with his wife. He has diarrhea, weight loss, and weakness in the proximal muscles. He has atrial fibrillation and tachycardia. Which of the following is the most likely diagnosis?
- (A) Congestive heart failure
 - (B) Cushing syndrome
 - (C) Hyperthyroidism
 - (D) Mitral valve prolapse
 - (E) Pheochromocytoma
44. Several contiguous cells are labeled with a fluorescent dye that cannot cross cell membranes. One cell is experimentally bleached with light that destroys the dye, but the cell soon recovers dye fluorescence. This recovery is best explained by the presence of which of the following structures between the bleached cell and its fluorescent neighbors?
- (A) A basal lamina
 - (B) Desmosomes (maculae adherentes)
 - (C) Gap junctions
 - (D) Glycosaminoglycans
 - (E) Tight junctions (zonulae occludentes)
45. A 75-year-old man has had increasing shortness of breath with exertion during the past 2 weeks. He has a 25-year history of hypertension well controlled with diuretics. Two months ago, serum urea nitrogen and creatinine concentrations were within the reference ranges. His pulse is 98/min, respirations are 19/min, and blood pressure is 180/100 mm Hg. The lungs are dull to percussion at the bases, and crackles are heard one-third of the way up bilaterally. Cardiac examination shows increased jugular venous pressure, an S3 gallop, and no murmur. There is 3+ pitting edema of the lower extremities. Serum studies show:
- | | |
|-------------------------------|-----------|
| Na ⁺ | 126 mEq/L |
| K ⁺ | 5.4 mEq/L |
| Cl ⁻ | 108 mEq/L |
| HCO ₃ ⁻ | 16 mEq/L |
| Urea nitrogen | 75 mg/dL |
| Creatinine | 3 mg/dL |
- This patient most likely has which of the following types of acid-base disturbance?
- (A) Metabolic acidosis
 - (B) Metabolic alkalosis
 - (C) Respiratory acidosis
 - (D) Respiratory alkalosis

46. A 6-year-old boy has a large intra-abdominal mass in the midline just above the symphysis pubis. During an operation, a cystic mass is found attached to the umbilicus and to the apex of the bladder. Which of the following is the most likely diagnosis?
- (A) Hydrocele
 - (B) Meckel cyst
 - (C) Meckel diverticulum
 - (D) Omphalocele
 - (E) Urachal cyst
47. A 25-year-old man is started on clozapine for schizophrenia, paranoid type. He had been unsuccessfully treated for the past 2 months with haloperidol. The patient should be monitored for which of the following adverse effects?
- (A) Decreased erythrocyte count
 - (B) Decreased leukocyte count
 - (C) Decreased platelet count
 - (D) Increased eosinophil count
 - (E) Increased hemolysis
48. A 76-year-old man with a history of prostatic hypertrophy has the recent onset of increased difficulty urinating. Symptoms began shortly after he started taking a nasal decongestant orally for cold symptoms. Which of the following types of receptors is most likely to be involved in these adverse effects?
- (A) α 1-Adrenergic
 - (B) β 2-Adrenergic
 - (C) Ganglionic nicotinic
 - (D) Nicotinic receptor at the neuromuscular junction
 - (E) Serotonergic

SAMPLE ITEMS
BLOCK 2, ITEMS 49-96

49. Four drugs produce the same therapeutic effect by the same mechanism, but each has a unique toxicity. When used at a maximally effective therapeutic dose, the drug with which of the following sets of characteristics is most likely to have the highest incidence of toxicity?

	Median Effective Dose	Toxic Dose₁ / Effective Dose₉₉
(A)	0.5x	2.8
(B)	1x	2.1
(C)	5x	4.0
(D)	33x	3.0

50. A 24-year-old woman has a marked increase in the size of her uterus between 26 and 30 weeks' gestation. Ultrasonography shows a marked increase in the amount of amniotic fluid; the fetus is normal in size for gestational age. Which of the following is the most likely diagnosis?

- (A) Congenital heart disease
- (B) Duodenal atresia
- (C) Erythroblastosis fetalis
- (D) Horseshoe kidney
- (E) Neural tube defect

51. A 28-year-old man who had rheumatic fever as a child comes to the physician's office because of fatigue and dyspnea for the past 4 months. An early diastolic sound followed by a low-pitched rumbling decrescendo diastolic murmur is present 4 cm left of the sternal border in the fourth intercostal space and is heard best with the patient in the left lateral decubitus position. Which of the following valve defects is most likely in this patient?

- (A) Aortic regurgitation
- (B) Aortic stenosis
- (C) Mitral regurgitation
- (D) Mitral stenosis
- (E) Pulmonic regurgitation
- (F) Pulmonic stenosis
- (G) Tricuspid regurgitation
- (H) Tricuspid stenosis

52. A 4-year-old boy has delayed motor development and choreoathetosis. He had normal development at birth. He chews his fingers and lips, which has resulted in tissue loss. He has arthritis. Serum and urine uric acid concentrations are increased. Which of the following abnormalities is the most likely cause of these findings?







- (A) Adenine phosphoribosyltransferase deficiency
- (B) Hypoxanthine-guanine phosphoribosyltransferase deficiency
- (C) Increased cellular turnover of nucleic acids
- (D) Increased conversion of hypoxanthine to inosine monophosphate
- (E) Phosphoribosylpyrophosphate synthetase deficiency

53. A healthy 35-year-old woman has a cast removed from her leg after 6 weeks of immobilization. Which of the following best characterizes her gastrocnemius muscle at this time?

- (A) Conversion to fast fibers
- (B) Decrease in number of fibers
- (C) Decrease in number of myofibrils
- (D) Increase in mitochondrial content
- (E) Increase in number of satellite cells

54. A 68-year-old man has had low back pain over the past 2 months. Laboratory studies show a normochromic, normocytic anemia and azotemia. Serum and urine calcium concentrations are abnormally increased, and urinalysis shows excessive protein (4+) and proteinaceous casts. Bone marrow examination is most likely to show uncontrolled proliferation of which of the following cells?

- (A) Basophils
- (B) Lymphocytes
- (C) Macrophages
- (D) Plasma cells
- (E) Reticulocytes

	RIGHT EYE	LEFT EYE
Without treatment		
Treatment with tyramine		
Treatment with epinephrine		

55. The circles represent the size of a patient's pupils without treatment and following treatment with tyramine and with epinephrine. Which of the following is compatible with the findings shown for the left eye?

- (A) Blockade of α -adrenergic receptors
- (B) Blockade of β -adrenergic receptors
- (C) Blockade of muscarinic receptors
- (D) Inhibition of cholinesterase
- (E) Sympathetic denervation

56. A 50-year-old man being treated for increased serum LDL concentration has muscle pain that has recently become more severe, especially with exercise. He is most likely to be taking a drug with which of the following mechanisms of action?

- (A) Binding bile acids
- (B) Decreasing binding of bile acids
- (C) Decreasing production of LDL
- (D) Decreasing the activity of lipoprotein lipase
- (E) Inhibiting the activity of 3-hydroxy-3-methylglutaryl (HMG) CoA reductase

57. A 20-year-old man comes to the physician's office for a scheduled health maintenance examination. His father died of a myocardial infarction at age 55 years. Physical examination shows a tendon xanthoma on the elbow. His serum total cholesterol concentration is 360 mg/dL. A mutation is most likely to be found in which of the following genes?

- (A) apoA2
- (B) apoC2
- (C) apoE4
- (D) LDL receptor
- (E) VLDL receptor

58. A 74-year-old man has had confusion for 2 weeks. He has smoked two packs of cigarettes daily for 50 years. An x-ray of the chest shows a 5-cm mass in the lung. Laboratory studies of serum show:

Na ⁺	110 mEq/L
Cl ⁻	72 mEq/L
K ⁺	4.5 mEq/L
HCO ₃ ⁻	30 mEq/L
Glucose	200 mg/dL
Creatinine	1.4 mg/dL

Which of the following is the most likely cause of these findings?

- (A) Adenocarcinoma of the lung
- (B) Craniopharyngioma
- (C) Medullary carcinoma of the thyroid gland
- (D) Renal cell carcinoma
- (E) Small cell carcinoma of the lung

59. The following numbered codons relate to the partial sequence of an mRNA for a protein. Termination codons are UAG, UGA, and UAA; the initiation codon is AUG. The triplets are numbered as shown:

132	133	134	135	136	137	138	139
UUG	CUG	CCA	UAU	UUA	UGU	GUU	AAU

Insertion of uridine between the end of codon 135 and the beginning of 136 will result in a protein containing how many amino acids?

- (A) 134
- (B) 135
- (C) 136
- (D) 137
- (E) 138

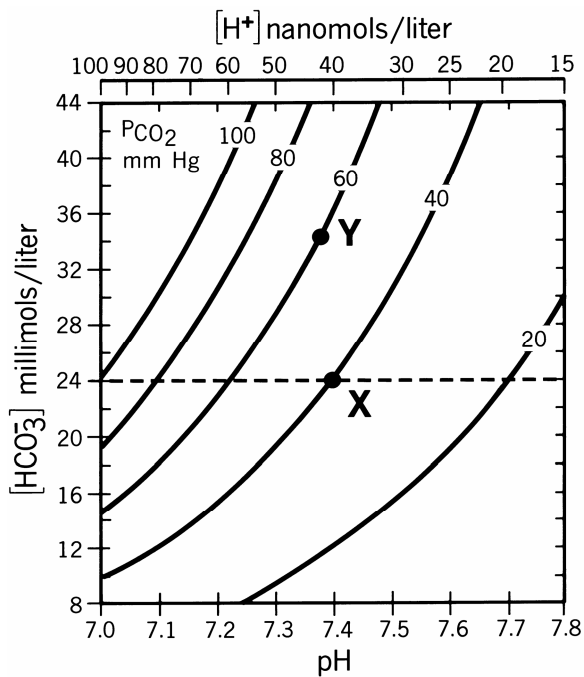
-
60. A previously healthy, tall, and slender 19-year-old woman has the sudden onset of right-sided chest pain followed by progressive dyspnea. Ten hours later, an x-ray of the chest shows a collapsed right lung and air in the right pleural space. Which of the following is the most likely underlying condition?
- (A) Bronchiectasis
 - (B) Lung abscess
 - (C) Panacinar emphysema
 - (D) Pulmonary sequestration
 - (E) Subpleural blebs
61. A newborn develops meningitis. *Streptococcus* is isolated from the mother's vagina. The organism agglutinates with antiserum directed against type B surface carbohydrate. The virulence of this organism is related to a bacterial constituent that interferes with which of the following host phagocyte functions?
- (A) Aggregation
 - (B) Chemotaxis
 - (C) Ingestion
 - (D) Intracellular killing
 - (E) Pseudopod formation
62. A 46-year-old man has a 4-week history of epigastric pain; test of stool is positive for occult blood. Examination of tissue obtained on biopsy of the gastric antrum shows curved bacterial rods. Which of the following additional findings is most likely?
- (A) Achlorhydria
 - (B) Antiparietal cell antibodies
 - (C) Cholecystitis with antral seeding
 - (D) Immunodeficiency state
 - (E) Increased urease activity in the antrum
63. A 52-year-old man with recently diagnosed type 2 diabetes mellitus comes to the physician for a follow-up examination. Physical examination shows no abnormalities. Laboratory studies show an increased hemoglobin A_{1c} despite patient compliance with diet and exercise recommendations. Treatment with a sulfonylurea is started. Which of the following is most likely to occur in this patient?
- (A) Decreased entry of glucose into the muscle cells
 - (B) Decreased production of glucose from the liver
 - (C) Decreased secretion of insulin from the pancreas
 - (D) Decreased speed of carbohydrate absorption from the intestines
 - (E) Increased entry of glucose into the muscle cells
 - (F) Increased production of glucose from the liver
 - (G) Increased secretion of insulin from the pancreas
 - (H) Increased speed of carbohydrate absorption from the intestines
64. A 52-year-old woman is admitted to the hospital because of breast cancer metastatic to the liver. Her prognosis is poor. She begs her husband to stay with her at the hospital because she is afraid to be left alone. Which of the following defense mechanisms best explains her behavior?
- (A) Denial
 - (B) Displacement
 - (C) Regression
 - (D) Repression
 - (E) Sublimation

65. A 51-year-old woman with cancer is being treated with a hematopoietic growth factor. Leukocyte differentials before and after treatment are shown:

	Before Treatment	After Treatment
Leukocyte count	1000/mm ³	10,000/mm ³
Eosinophils	1%	1%
Lymphocytes	90%	9%
Neutrophils	9%	90%

The growth factor is most likely to be which of the following?

- (A) Granulocyte colony-stimulating factor
- (B) Transforming growth factor- β
- (C) Interleukin-6 (IL-6)
- (D) IL-8
- (E) Macrophage colony-stimulating factor



66. In the diagram shown, point X indicates the acid-base status of a healthy person. Which of the following is the most likely cause of the condition indicated by point Y?

- (A) Adaptation to high altitude
- (B) Chronic obstructive pulmonary disease
- (C) Diarrhea
- (D) Ingestion of a strong acid
- (E) Severe prolonged vomiting

67. *Escherichia coli* strains X and Y are both resistant to ampicillin. Ampicillin resistance is stable in strain X when it is grown for multiple generations in the absence of the antibiotic. However, strain Y loses ampicillin resistance when it is grown in media without the antibiotic. Which of the following best explains the acquisition of ampicillin susceptibility in strain Y?

- (A) Downregulation of the resistance gene
- (B) Insertion of a transposon into the resistance gene
- (C) Loss of a plasmid carrying the resistance gene
- (D) Point mutations in the resistance gene
- (E) Recombination with a defective copy of the resistance gene

68. A 30-year-old man comes to the clinic because of a painful ulcer on his penis for the past week. He has had multiple sexual partners, including commercial sex workers. Physical examination shows lymphadenopathy in the inguinal region and a 1-cm tender ulcer with no induration located on the frenulum. A culture of the ulcer grows colonies on supplemented chocolate agar. A Gram stain of the colonies shows gram-negative coccobacilli. Which of the following is the most likely causal organism?

- (A) *Haemophilus ducreyi*
- (B) Herpes simplex virus
- (C) *Neisseria gonorrhoeae*
- (D) *Treponema pallidum*
- (E) *Trichomonas vaginalis*

69. A 40-year-old woman receives an intravenous infusion of drug X that selectively constricts the efferent arterioles in her kidneys. Following the infusion, total cardiac output and renal afferent arteriolar tone are unchanged, but renal efferent arteriolar tone and total renal vascular resistance have both increased. Which of the following sets of changes most likely occurred following the infusion of drug X?

	Glomerular Filtration Rate	Filtration Fraction	Renal Blood Flow
(A)	↓	↓	↑
(B)	↓	↑	↓
(C)	↓	↑	↔
(D)	↑	↓	↔
(E)	↑	↑	↓

70. A 25-year-old woman has a 3-day history of vomiting and diarrhea. She has postural hypotension and poor tissue turgor. Her serum sodium concentration is 130 mEq/L. Which of the following findings is most likely?
- (A) Decreased serum aldosterone concentration
 (B) Increased serum atrial natriuretic peptide concentration
 (C) Increased effective circulating volume
 (D) Increased serum ADH (vasopressin) concentration
 (E) Urine osmolality less than serum osmolality
71. A 40-year-old man with a 20-year history of alcohol abuse is brought to the hospital by his friends because he was difficult to rouse. He ate a large meal several hours ago. He is emaciated and lethargic. Examination shows severely restricted horizontal eye movements and ataxia of both upper extremities. The most likely cause of these findings is a deficiency of which of the following nutrients?
- (A) Folic acid
 (B) Vitamin A
 (C) Vitamin B₁ (thiamine)
 (D) Vitamin B₆ (pyridoxine)
 (E) Vitamin B₁₂ (cobalamin)
72. Three weeks after a renal transplant, a patient develops fever and leukopenia, followed by prostration and severe pulmonary and hepatic dysfunction. Which of the following is the most likely viral cause?
- (A) Adenovirus type 12
 (B) Coxsackievirus
 (C) Cytomegalovirus
 (D) Influenza virus
 (E) Parvovirus B19
73. A 10-month-old girl cries when her mother tries to put her in her grandmother's arms. She happily allowed herself to be held when her grandmother visited 2 months ago. Which of the following best explains this behavior?
- (A) Development of problems with socialization
 (B) Maltreatment by the grandmother
 (C) Sensation of a poor relationship between the mother and the grandmother
 (D) Separation anxiety disorder
 (E) Stranger anxiety
74. Three weeks after traveling to California to study desert flowers, a 32-year-old man develops a fever, chest pain, and sore muscles. Two days later, red tender nodules appear on the shins, and the right ankle is painful and tender. An x-ray of the chest shows a left pleural effusion. Which of the following is the most likely diagnosis?
- (A) Blastomycosis
 (B) Coccidioidomycosis
 (C) Histoplasmosis
 (D) Mycobacterium marinum infection
 (E) Mycoplasma pneumoniae infection
75. Serum samples from a healthy woman with a history of regular 28-day menstrual cycles show a peak in the serum concentration of 17β-estradiol over the past 12 hours. No progesterone is detectable. Within 3 days, which of the following is expected to occur?
- (A) Cessation of menstruation
 (B) Decreased basal body temperature
 (C) Onset of menstruation
 (D) Ovulation
 (E) Regression of the corpus luteum

76. A 50-year-old man has had gradually progressive weakness of the hands during the past year. Physical examination shows atrophy of the forearm muscles, fasciculations of the muscles of the chest and upper extremities, and hyperreflexia of the lower extremities. A Babinski sign is present bilaterally. Sensation is intact. Which of the following is the most likely diagnosis?
- (A) Amyotrophic lateral sclerosis
 - (B) Dementia, Alzheimer type
 - (C) Guillain-Barré syndrome
 - (D) Multiple cerebral infarcts
 - (E) Multiple sclerosis
77. A healthy 19-year-old man receives a tetanus immunization booster prior to induction into the US Marines. Six hours later, he has pain and massive swelling at the site of injection. The following day, the skin breaks down, forming an ulcer at the site. Which of the following events plays a critical role in this reaction?
- (A) Accumulation of mononuclear cells at the site of antigen injection
 - (B) Antigen capture by Langerhans cells in the epidermis
 - (C) Local fixation of complement by preformed circulating antibodies
 - (D) Local release of histamine
 - (E) Predominant synthesis of IgM antibodies
78. A 32-year-old man is brought to the emergency department because of multiple nonlethal stab wounds. He is incarcerated and serving a life sentence for murder and armed robbery. After his condition is stabilized, he insists that it is his "right" to remain in the hospital until he is fully "cured." He threatens to harm the attending physician if she endorses his return to prison. Which of the following is the most likely diagnosis?
- (A) Adjustment disorder with mixed features
 - (B) Antisocial personality disorder
 - (C) Bipolar disorder, manic
 - (D) Borderline personality disorder
 - (E) Narcissistic personality disorder
 - (F) Paranoid personality disorder
 - (G) Post-traumatic stress disorder
 - (H) Schizophrenia, paranoid type
79. Breast carcinomas often cause the skin of the breast to become puffy and pitted, resembling orange peel. The pits most likely correspond with which of the following?
- (A) Attachments of suspensory ligaments (retinacula cutis) to the dermis
 - (B) Diffuse scarring in subcutaneous fibrous tissue
 - (C) Focal invasion of the dermis by neoplastic cells
 - (D) Openings of sebaceous glands
 - (E) Openings of sweat glands
80. A 12-year-old girl with sickle cell disease has pain in her right arm. An x-ray of the right upper extremity shows bony lesions consistent with osteomyelitis. Which of the following is the most likely causal organism?
- (A) *Clostridium septicum*
 - (B) *Enterococcus faecalis*
 - (C) *Listeria monocytogenes*
 - (D) *Proteus mirabilis*
 - (E) *Pseudomonas aeruginosa*
 - (F) *Salmonella enteritidis*
 - (G) *Serratia marcescens*
81. A 16-year-old girl is brought to the emergency department after attempting suicide by cutting her wrist. The deepest part of the wound is between the tendons of the flexor carpi radialis and the flexor digitorum superficialis. This patient is most likely to have a deficit of which of the following?
- (A) Adduction and abduction of the fingers
 - (B) Extension of the index finger
 - (C) Flexion of the ring and small fingers
 - (D) Sensation over the base of the small finger
 - (E) Opposition of the thumb and other fingers
82. A 4-year-old girl has been unable to eat for 2 days because of a gastrointestinal tract disorder. Which of the following is the major source of fuel being oxidized by her skeletal muscles?
- (A) Muscle creatine phosphate
 - (B) Muscle glycogen
 - (C) Muscle triglycerides
 - (D) Serum fatty acids
 - (E) Serum glucose

83. An asymptomatic 50-year-old woman has hypertension. Her urinary excretion of catecholamines is increased. A CT scan shows a suprarenal mass. Which of the following is the most likely cause?
- (A) Benign neoplasm of the adrenal cortex
 - (B) Benign neoplasm of the adrenal medulla
 - (C) Malignant neoplasm of the adrenal cortex
 - (D) Malignant neoplasm of the adrenal medulla
 - (E) Diffuse hyperplasia of the adrenal cortex
 - (F) Diffuse hypoplasia of the adrenal medulla
84. A 21-year-old man has weight loss and severe intermittent bloody diarrhea. A barium enema and colonoscopy show multiple ulcers and inflammatory changes extending from the rectum to the mid-transverse colon. Biopsy specimens taken from multiple sites show acute and chronic inflammation restricted to the mucosa. Which of the following is the most likely diagnosis?
- (A) AIDS-associated gastroenteritis
 - (B) Amebiasis
 - (C) Crohn disease
 - (D) *Clostridium difficile*-associated colitis
 - (E) *Escherichia coli*-associated colitis
 - (F) Ischemic colitis
 - (G) *Salmonella* gastroenteritis
 - (H) Ulcerative colitis
85. A 12-year-old girl is admitted to the hospital because of marked shortness of breath, an erythematous rash, and painful, swollen hip and knee joints. She is agitated. A chest x-ray shows an enlarged heart and changes consistent with pulmonary edema. Intractable congestive heart failure develops, and she dies on the second hospital day. This child most likely had a recent history of which of the following?
- (A) Cyanosis with chest pain
 - (B) Jaundice
 - (C) Meningitis
 - (D) Pharyngitis
 - (E) Skin infection
86. A 1-week-old newborn has microcephaly, intrauterine growth retardation, widely spaced eyes, and a cat-like cry. Which of the following karyotypes is most likely?
- (A) 45,X
 - (B) 46,XX
 - (C) 46,XX,del(5)(p12)
 - (D) 46,XX,t(14;21)
 - (E) 46,XY
 - (F) 47,XX,+13
 - (G) 47,XX,+21
 - (H) 69,XXY
87. A 6-year-old girl has the sudden onset of swelling of her face, hands, legs, and feet 1 week after a viral upper respiratory tract infection. She is afebrile and normotensive. Laboratory studies show:
- | | |
|---------------|----------------|
| Serum | |
| Albumin | 2.0 g/dL |
| Urea nitrogen | 6.0 mg/dL |
| Creatinine | 0.6 mg/dL |
| Cholesterol | 280 mg/dL |
| Urine protein | 4+; 6.0 g/24 h |
- Which of the following is the most likely diagnosis?
- (A) Focal glomerulosclerosis
 - (B) Membranous glomerulonephritis
 - (C) Membranoproliferative glomerulonephritis
 - (D) Minimal change disease
 - (E) Rapidly progressive glomerulonephritis
88. Norepinephrine stimulation of G proteins results in an increased intracellular concentration of calcium. This increase is not reversed by the extracellular calcium chelator EGTA. Which of the following is the most likely source of the increased intracellular calcium concentration?
- (A) Endoplasmic reticulum
 - (B) Golgi complex
 - (C) Mitochondria
 - (D) Nucleus
 - (E) Plasma membrane



89. A 4-year-old girl has the sudden onset of abdominal pain and vomiting. She has a mass in the right lower quadrant and hyperactive bowel sounds. A segment of resected bowel is shown in the photograph. Which of the following is the most likely diagnosis?

- (A) Appendicitis
- (B) Intussusception
- (C) Meckel diverticulum
- (D) Necrotizing enterocolitis
- (E) Strangulated hernia

90. A 3-year-old boy has a history of repeated pyogenic infections. He had normal antibody responses following childhood immunizations and normal recovery from chickenpox and measles. Decreased numbers or functional defects in which of the following cells best explains the cause of his infections?

- (A) B lymphocytes
- (B) Eosinophils
- (C) Macrophages
- (D) Neutrophils
- (E) T lymphocytes

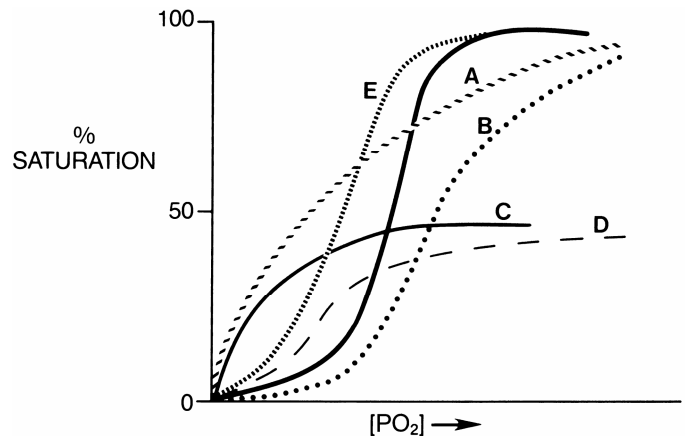
91. A 29-year-old woman comes to the physician for a consultation 1 month after her 7-year-old daughter was killed in a motor vehicle collision. The patient is upset and restless and wrings her hands frequently. She cannot sleep at night, has lost her appetite, and cries easily and frequently. She is preoccupied with thoughts of her daughter and sometimes thinks she momentarily sees her daughter sitting in the living room. She says she wishes that she had been hit by the car, too. She denies any thoughts of killing herself. Which of the following is the best explanation for these findings?

- (A) Dysthymic disorder
- (B) Major depressive disorder
- (C) Normal grief reaction
- (D) Obsessive-compulsive disorder
- (E) Schizoaffective disorder

92. A healthy elderly person is most likely to show decreased auditory acuity for which of the following tones?

- (A) High-frequency tones only
- (B) Low-frequency tones only
- (C) Tones of all frequencies
- (D) Tones presented by air but not by bone conduction
- (E) Tones presented by bone but not by air conduction

93. The unlabeled solid curve in the graph shown represents the loading behavior of normal human hemoglobin at a pH of 7.35 as a function of oxygen concentration. Which of the following labeled curves best represents the most likely change after addition of carbon dioxide?



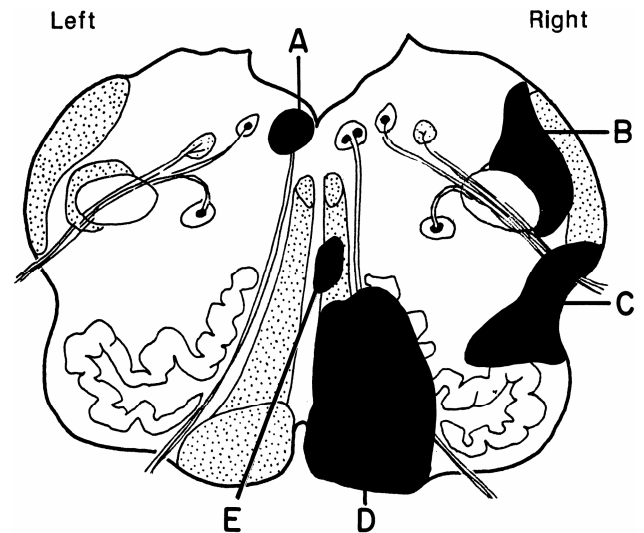
94. A 45-year-old woman who is being treated for hypertension and hypercholesterolemia develops diffuse muscle pain and weakness. Her serum creatine kinase activity is increased. Which of the following drugs is most likely to have caused this clinical picture?

- (A) Captopril
- (B) Hydrochlorothiazide
- (C) Lovastatin
- (D) Nicotinic acid
- (E) Propranolol

95. A 32-year-old man is brought to the emergency department because of confusion, wheezing, vomiting, and diarrhea for the past 6 hours. He is sweating and salivating profusely. There is generalized muscle weakness. Which of the following substances is the most likely cause of these findings?

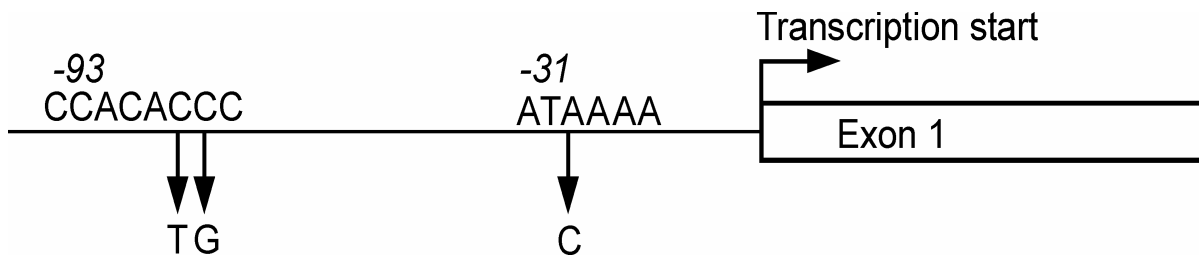
- (A) Glutethimide
- (B) Heroin
- (C) Jimson weed (belladonna alkaloids)
- (D) Parathion
- (E) Phencyclidine (PCP)

96. A 48-year-old woman has loss of pain and temperature sensation in the left upper and lower extremities. Which of the following labeled areas in the drawing of the medulla shown is the most likely site of the causal lesion?



SAMPLE ITEMS
BLOCK 3, ITEMS 97-144

97. A 55-year-old woman has a hysterectomy and bilateral salpingo-oophorectomy for abnormal uterine bleeding. Histologic examination of the ovaries shows small atretic follicles. Which of the following processes is the most likely cause of these histologic findings?
- (A) Apoptosis
 - (B) Metamorphosis
 - (C) Metaplasia
 - (D) Necrosis
 - (E) Transformation
98. A 50-year-old woman has had a painless mass in the parotid gland for the past 8 months. A 2-cm, discrete, solid mass is found in the parotid gland on parotidectomy. Histologic examination shows a neoplastic lesion with uniform epithelial and myoepithelial cells; these cells form acini, tubules, and ducts supported by myxoid and chondroid stroma. Which of the following is the most likely complication of this type of parotid lesion?
- (A) Contralateral immune-mediated parotitis
 - (B) Hematogenous metastases to lungs and bone
 - (C) Ipsilateral submaxillary salivary gland neoplasm
 - (D) Local recurrence
 - (E) Regional lymph node metastases
99. A 24-year-old woman who breast-feeds her infant develops a warm, painful mass and erythema of the overlying skin in the upper outer quadrant of the right breast. The pain and redness resolve with antibiotic therapy. Several months later, the same area is firm and the overlying skin is dimpled. Which of the following is the most likely cause of these findings?
- (A) Breast abscess with scarring
 - (B) Fibroadenoma
 - (C) Fibrocystic change
 - (D) Infiltrating mammary carcinoma
 - (E) Traumatic fat necrosis
100. An 80-year-old man is admitted to the hospital for treatment of a burn that covers 20% of his total body surface area. Two days after admission, his behavior has changed. He accuses the staff of torturing him. He cannot recall why he was admitted to the hospital and is not oriented to date and place. His wife says he was "fine" before the burn. Which of the following is the most likely diagnosis?
- (A) Adjustment disorder
 - (B) Delirium
 - (C) Paranoid personality disorder
 - (D) Schizophrenia, paranoid type
 - (E) Senile onset of dementia, Alzheimer type
101. A 45-year-old woman develops a high spiking fever and shaking chills 2 weeks after returning from central Africa. Which of the following tests on the patient's blood will establish the most likely diagnosis?
- (A) Acid-fast stain
 - (B) Giemsa stain
 - (C) Gram stain
 - (D) India ink wet mount
 - (E) KOH stain
 - (F) Methylene blue stain
102. A 26-year-old man who is HIV positive has a CD4+ T-lymphocyte count of $250/\text{mm}^3$ ($N \geq 500$). After 5 weeks of therapy with two nucleoside reverse transcriptase inhibitors and a protease inhibitor, he feels weak and is easily fatigued. His hemoglobin concentration has decreased from 12.8 g/dL to 8.2 g/dL. Which of the following is the most likely cause of the anemia in this patient?
- (A) Decreased formation of erythrocytes
 - (B) Folic acid deficiency
 - (C) Increased formation of erythrocyte antibodies
 - (D) Increased fragility of erythrocytes
 - (E) Iron deficiency



103. The locations of three different nucleotide substitution mutations near the human β -globin gene are shown by the vertical arrows. Each of these mutations can lead to β^+ -thalassemia major. These three nucleotides of the wild-type sequence are most likely to be required for which of the following?
- (A) Binding eIF4F
 (B) Binding eIF4G
 (C) Binding histone acetylase
 (D) Binding histone deacetylase
 (E) Binding negative-acting transcription factors
 (F) Binding positive-acting transcription factors
-
104. A 3-month-old male infant is brought to the physician because of recurrent viral infections and rashes over his trunk. Lymph nodes are difficult to detect on physical examination; imaging studies indicate the lack of a thymus. Urine deoxyadenosine concentration is 100 times greater than normal. A peripheral blood smear shows a marked decrease in both mature B and T lymphocytes. A deficiency of which of the following enzymes is most likely in this patient?
- (A) Adenine phosphoribosyltransferase
 (B) Adenosine deaminase
 (C) Adenosine kinase
 (D) Adenylosuccinate synthetase
 (E) Hypoxanthine-guanine phosphoribosyltransferase
 (F) Ribonucleotide reductase
105. A 50-year-old woman with a history of ovarian cancer comes to the physician's office because of swelling in her right leg for the past month. Examination shows edema in the right lower extremity. Which of the following is the most likely cause of the edema?
- (A) Decreased capillary hydrostatic pressure
 (B) Decreased interstitial hydrostatic pressure
 (C) Increased capillary oncotic pressure
 (D) Increased capillary permeability
 (E) Obstruction of lymph vessels
106. One day after a 10-km race, a previously healthy 42-year-old man has dark urine. Urinalysis shows:
- | | |
|-------------------------|----------|
| Specific gravity | 1.010 |
| Dipstick | |
| Glucose | negative |
| Blood | positive |
| Nitrates | negative |
| Microscopic examination | |
| WBC | negative |
| RBC | negative |
- Which of the following is the most likely cause of these findings?
- (A) Acute glomerulonephritis
 (B) Hypovolemia
 (C) Renal infarct
 (D) Renal vein thrombosis
 (E) Rhabdomyolysis
107. A 55-year-old woman with breast cancer develops shortness of breath and poor exercise tolerance while being treated with doxorubicin. Which of the following is the most likely cause of these symptoms?
- (A) Dilated cardiomyopathy
 (B) Obstructive pulmonary disease
 (C) Pulmonary hypertension
 (D) Restrictive cardiomyopathy
 (E) Restrictive pulmonary disease

108. During an experiment, a 25-year-old man receives an intravenous infusion of angiotensin II at a rate that increases plasma concentrations approximately threefold. Which of the following sets of physiologic changes is most likely in this man?

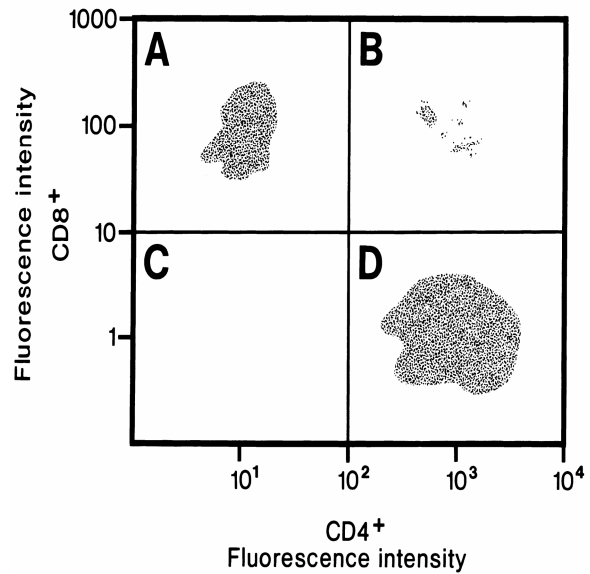
	Plasma Renin Activity	Filtration Fraction	Efferent Arteriole Resistance
(A)	↑	↑	↑
(B)	↑	↑	↓
(C)	↑	↓	↑
(D)	↑	↓	↓
(E)	↓	↑	↑
(F)	↓	↑	↓
(G)	↓	↓	↑
(H)	↓	↓	↓

109. An otherwise healthy 26-year-old woman has had petechiae on her legs during the last 24 hours. Laboratory studies show:

Hemoglobin	13.1 g/dL
Hematocrit	39.7%
Leukocyte count	8500/mm ³
Neutrophils	65%
Lymphocytes	30%
Monocytes	5%
Mean corpuscular volume	82.2 μm ³
Platelet count	20,000/mm ³

A peripheral blood smear shows normal red cell morphology; a bone marrow smear shows mature megakaryocytic hyperplasia. Which of the following is the most likely diagnosis?

- (A) Acute megakaryocytic leukemia
 (B) Acute myelogenous leukemia
 (C) Aplastic anemia
 (D) Immune thrombocytopenic purpura
 (E) Epstein-Barr viral infection
 (F) Papovavirus infection
 (G) Thrombotic thrombocytopenic purpura
110. A 25-year-old woman with previously well controlled type 1 diabetes mellitus develops ketoacidosis 2 days after onset of a urinary tract infection. The most likely cause of the ketoacidosis is decreased efficacy of insulin on muscle, adipose tissue, and liver resulting from antagonism by which of the following hormones?
- (A) Androstenedione
 (B) Cortisol
 (C) Glucagon
 (D) Leptin
 (E) Thyroxine (T₄)
111. Flow cytometric data of T lymphocytes stained with fluorescent antibody to CD4⁺ and CD8⁺ antigens from a healthy person are shown in the figure. The lymphocytes from which of the following quadrants will respond most vigorously to immunization with hepatitis A virus vaccine?



112. A specific congenital form of deafness results from mutation of a sequence of connexin 26 that encodes the channel within the connexon of the gap junction. This mutation is most likely to affect which of the following domains of the protein?

- (A) Amino terminus
 (B) Carboxyl terminus
 (C) Cytoplasmic loop
 (D) Extracellular loop
 (E) Transmembrane region

113. A 63-year-old man with a 5-year history of congestive heart failure comes to the emergency department because of a 1-month history of fatigue and labored breathing. Evaluation shows pulmonary edema. Furosemide is administered. Which of the following sets of physiologic changes is most likely following administration of the drug?

	Na⁺-K⁺-Cl⁻ Transport in the Thick Ascending Loop of Henle	Osmolarity of the Medullary Interstitium	Water Absorption in the Descending Loop of Henle
(A)	↑	↑	↑
(B)	↑	↓	↓
(C)	↑	↓	↑
(D)	↑	↓	↓
(E)	↓	↑	↑
(F)	↓	↑	↓
(G)	↓	↓	↑
(H)	↓	↓	↓

114. A 3-month-old female infant from South America is adopted. She has been exclusively breast-fed. The only known medical history is treatment with an antibiotic for a gastrointestinal infection prior to arrival in the USA; the specific antibiotic is not known. Three days after receiving the infant, the adoptive parents note that she no longer moves her left upper and lower extremities. Radiologic examination shows an intracranial hemorrhage without signs of head trauma. Laboratory studies show anemia and prolonged partial thromboplastin and prothrombin times. Her condition is most likely associated with a deficiency in which of the following?

- (A) γ -Aminobutyric acid (GABA) decarboxylation
- (B) Glutamic acid γ (gamma) carboxylation
- (C) Heme synthesis
- (D) Thymidine synthesis
- (E) Xanthine oxidation

115. A 24-year-old primigravid woman at 28 weeks' gestation has had nagging headaches, a puffy-looking face, and swollen legs for the past week. Her blood pressure is 180/95 mm Hg; it was within normal limits earlier in the pregnancy. Urinalysis shows a protein concentration of 0.6 g/dL. Which of the following is the most likely diagnosis?

- (A) Acute glomerulonephritis
- (B) Congestive heart failure
- (C) Eclampsia
- (D) Nephrotic syndrome
- (E) Preeclampsia

116. A 75-year-old woman has increasing shortness of breath on exertion. Findings on physical examination are unremarkable. X-rays of the chest show no abnormalities of the heart or lungs. Pertinent laboratory findings include:

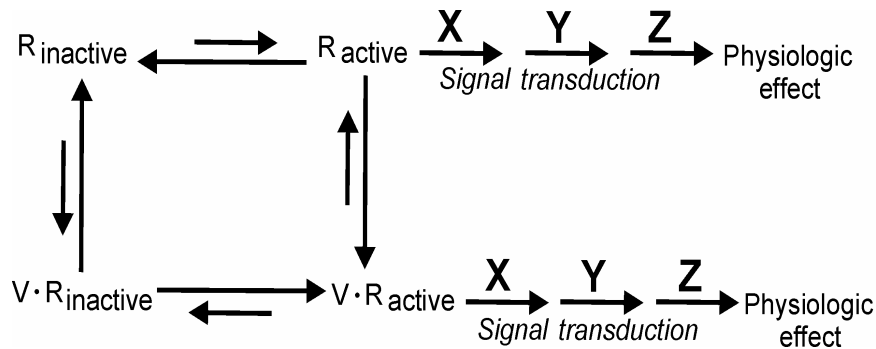
Hematocrit	28%
Hemoglobin	9 g/dL
Mean corpuscular volume	70 μm^3

Which of the following is the most likely basis for these findings?

- (A) Acquired hemolytic anemia
- (B) Chronic blood loss
- (C) Folic acid deficiency
- (D) β -Thalassemia minor
- (E) Pernicious anemia

117. The incidence of chronic pulmonary disease in a community is 1.5 times greater than the national rate. If successful, which of the following interventions would provide the greatest decrease in chronic pulmonary disease in this community?

- (A) Decrease the prevalence of cigarette smoking
- (B) Decrease radon levels in homes
- (C) Increase the number of people performing aerobic exercise
- (D) Increase the rate of flu immunization
- (E) Increase the rate of pneumococcal immunization
- (F) Remove asbestos from all buildings
- (G) Remove lead from all gasoline and other fuels



118. The diagram shows the equilibrium between active and inactive forms of a receptor (R), its interaction with a drug (V), and the coupling of the active form of the receptor to a signal transduction pathway. Drug W acts at site Y of the signal transduction pathway to diminish the physiologic effect of drug V. Which of the following terms accurately describes the effect of drug W on the dose-response curve for drug V?

- (A) Competitive antagonism
- (B) Full agonism
- (C) Noncompetitive antagonism
- (D) Partial agonism
- (E) Reverse agonism

119. After an overnight fast, a child eats a breakfast of cornflakes and milk. The amount of trypsinogen in his duodenum increases because the vagus nerve signals the pancreas to increase which of the following?

- (A) Degradation of trypsin
- (B) Exocytosis of preexisting trypsinogen
- (C) The rate of trypsinogen activation
- (D) Transcription of the trypsinogen gene
- (E) Translation of trypsinogen mRNA

120. An investigator studying the synthesis of thyroid hormones has developed a transgenic animal deficient in thyroid peroxidase. Within the thyroid gland of this animal, which of the following is most likely to be inhibited?

- (A) Cleavage of iodine from iodinated tyrosines in the thyroid cell cytoplasm
- (B) Endocytosis of colloid from the follicle lumen into the thyroid cell
- (C) Iodide oxidation and binding to tyrosine in the follicle lumen
- (D) Movement of iodide from plasma into thyroid cells
- (E) Separation of thyroxine (T₄) from thyroglobulin in lysosomes

121. A 30-year-old woman comes to the emergency department because she thinks she has had a heart attack. One hour ago, she had the sudden onset of chest pain, faintness, pounding heart, flushed skin, and nausea that lasted 20 minutes. She now feels better. She has limited her activity because she has had two similar episodes over the past 2 weeks. Medical evaluation is normal. Which of the following is the most appropriate nonpharmacologic therapy?

- (A) Assertiveness training
- (B) Cognitive behavioral therapy
- (C) Dynamic psychotherapy
- (D) Psychoanalysis
- (E) Psychodrama

122. A 9-month-old girl has had two seizures in the past month. She was born at home and received no state-mandated newborn screening. She has developmental delays. Her skin is fair and her hair is a lighter color than that of other family members. Her diapers have a musty odor. Which of the following is most likely to have an increased concentration in this infant's urine?

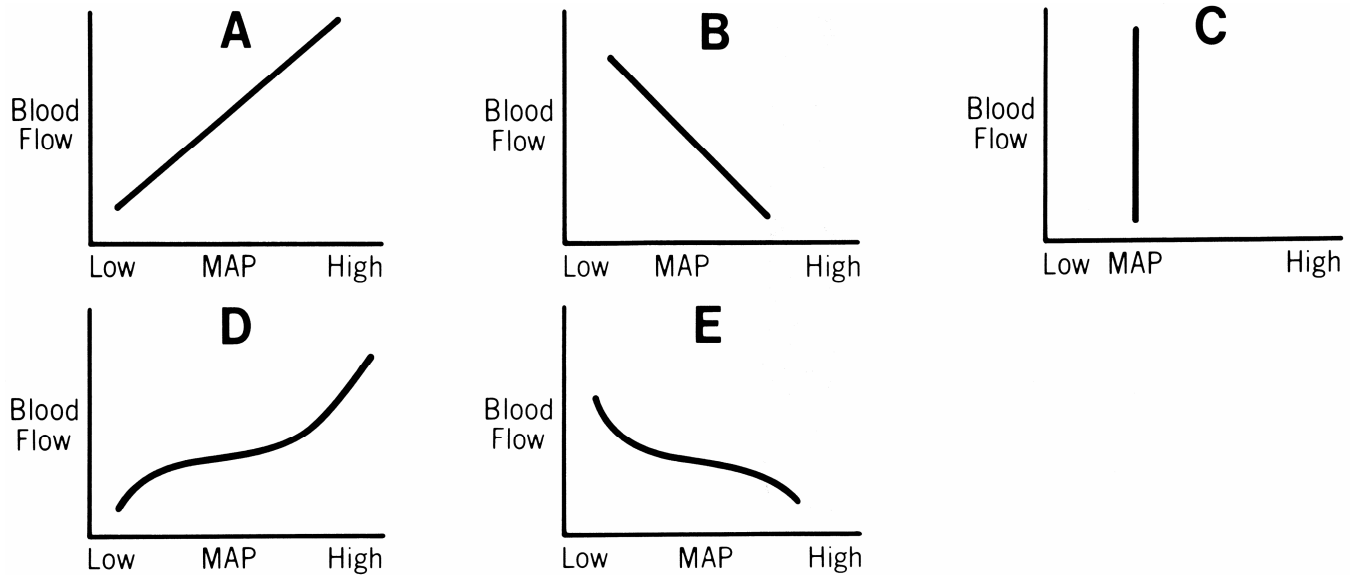
- (A) Homocysteine
- (B) Homogentisic acid
- (C) Isoleucine
- (D) Isovaleric acid
- (E) Phenylacetic acid

123. A 10-month-old girl is brought to the physician because of a 2-day history of diarrhea. She can sit unassisted and has started to crawl. Her mother is concerned because she babbles most of the time she is awake, and she becomes very upset if her mother leaves the room, "even for just a second." Which of the following best describes the girl's development?

	Cognitive	Social	Motor
(A)	Delayed	delayed	delayed
(B)	Delayed	delayed	normal
(C)	Delayed	normal	delayed
(D)	Delayed	normal	normal
(E)	Normal	delayed	delayed
(F)	Normal	delayed	normal
(G)	Normal	normal	delayed
(H)	Normal	normal	normal

124. A 12-year-old boy has a pruritic, coin-shaped, scaly erythematous lesion with a raised border and central clearing on his right arm. Potassium hydroxide preparation results are consistent with tinea corporis. A drug with which of the following mechanisms of action is most likely to be effective?
- (A) Blockade of ergosterol synthesis
 (B) Inhibition of DNA synthesis
 (C) Inhibition of ribosomal protein synthesis
 (D) Interference with mycolic acid synthesis
 (E) Irreversible binding to DNA-dependent RNA polymerase
125. A full-term 2-week-old male newborn has cyanosis. Pregnancy and delivery were uncomplicated. His lungs are clear, and a midsystolic murmur is heard that is loudest in the left third intercostal space and associated with a thrill. Which of the following is the most likely diagnosis?
- (A) Atrial septal defect
 (B) Bicuspid aortic valve
 (C) Coarctation of the aorta
 (D) Patent ductus arteriosus
 (E) Tetralogy of Fallot
126. A 55-year-old man develops loss of visual accommodation while taking an antidepressant drug. The most likely cause is blockade of which of the following receptors?
- (A) α -Adrenergic
 (B) β -Adrenergic
 (C) Histaminergic
 (D) Muscarinic
 (E) Serotonergic
127. An otherwise healthy 55-year-old Asian American man is given isoniazid and vitamin B₆ (pyridoxine) after conversion of his PPD skin test. An x-ray of the chest shows no abnormalities. Four weeks later, he develops abdominal pain and jaundice. Which of the following is the most likely explanation?
- (A) Hepatic tuberculosis
 (B) Hepatitis B
 (C) Isoniazid-induced hepatitis
 (D) Pyridoxine-induced cholecystitis
 (E) Tuberculous pancreatitis
128. A 30-year-old man with peptic ulcer disease suddenly develops pain, redness, and swelling of his right first metatarsophalangeal joint. There is no history of injury. Serum uric acid concentration is 8 mg/dL. Examination of joint aspirate shows birefringent crystals. Which of the following drugs is most appropriate to treat the acute symptoms in this patient?
- (A) Allopurinol
 (B) Colchicine
 (C) Morphine
 (D) Probenecid
 (E) Sulfinpyrazone
129. The thrombolytic effect of tissue plasminogen activator depends on which of the following?
- (A) Circulating heparin
 (B) Concomitant therapy with high doses of aspirin
 (C) Factor II (prothrombin) concentration
 (D) Fibrinogen concentration
 (E) Presence of fibrin at the site of the thrombus

130. Which of the following figures (A–E) best illustrates the relationship between blood flow and mean arterial pressure (MAP) in a vascular bed that demonstrates autoregulation of blood flow?



131. A new opportunistic pathogen has been isolated from the stool of HIV-infected patients with persistent diarrhea. Microscopic examination indicates that this microorganism is spherical with a diameter of 3 to 5 μ . The presence of which of the following suggests that this is a eukaryotic microorganism?
- (A) Cell membrane
(B) DNA
(C) Introns in genes
(D) Messenger RNA
(E) Ribosomes
132. A 72-year-old man collapses while playing golf. He has a 5-year history of angina and type 2 diabetes mellitus. Paramedics arrive in 10 minutes. Examination shows no respirations or blood pressure; an ECG shows asystole. Cardiopulmonary resuscitation is attempted for 10 minutes without success. Which of the following is the most likely cause of death in this patient?
- (A) Cardiac tamponade
(B) Embolus to the right middle cerebral artery
(C) Necrosis of the myocardium
(D) Rupture of the papillary muscle
(E) Ventricular fibrillation
133. A 34-year-old woman has had a nonproductive cough for 2 months. She has never smoked. An x-ray of the chest shows bilateral interstitial markings and hilar adenopathy. Which of the following findings is most likely on transbronchial biopsy?
- (A) Areas of hemorrhagic infiltrate
(B) Areas of liquefaction necrosis
(C) Dilatation of respiratory bronchioles
(D) Microabscesses
(E) Noncaseating granulomas
134. A 43-year-old man has a 1-day history of fever and increasing headache, irritability, photophobia, and lethargy. Physical examination shows neck stiffness. Cerebrospinal fluid (CSF) shows 76,000 neutrophils/mm³, occasionally with intracytoplasmic gram-positive cocci. Which of the following substances is most responsible for the CSF neutrophil count?
- (A) Bradykinin
(B) C5a
(C) Factor XII (Hageman factor)
(D) Histamine
(E) Leukotriene E₄

135. A 36-year-old woman dies from an acute adrenal crisis following a surgical procedure. A pituitary tumor was diagnosed 3 weeks ago. At autopsy, the adrenal glands are small, and the cortex is composed primarily of cells from the zona glomerulosa. Which of the following best explains the decreased size of the cortex?

- (A) Autoimmune destruction
- (B) Decreased ACTH concentration
- (C) Decreased cortisol concentration
- (D) Denervation
- (E) Granulomatous disease

136. A 30-year-old woman has anxiety about episodes of abdominal pain that have alternated with diarrhea and constipation over the past year. She often has these episodes when she is stressed or tired. Physical examination and laboratory studies are within normal limits during these episodes. Which of the following is the most likely diagnosis?

- (A) Gastroenteritis
- (B) Generalized anxiety disorder
- (C) Hypochondriasis
- (D) Irritable bowel syndrome
- (E) Major depressive disorder
- (F) Somatization disorder

137. A 70-kg (154-lb) man on a fixed NaCl intake (200 mmol/day) is given daily injections of a potent mineralocorticoid hormone for 4 days. He has free access to water and consumes his usual caloric intake. Excretion of NaCl is as follows:

Day	NaCl (mmol)
1	30
2	90
3	180
4	200

Assuming that 1 L of 0.9% saline contains 150 mmol of NaCl and weighs 1 kg, how much will this patient weigh (in kg) at the end of day 4?

- (A) 66
- (B) 68
- (C) 70
- (D) 72
- (E) 74

138. A 46-year-old man comes to the physician because of a 2-week history of intermittent dizziness and difficulty standing up. His symptoms began after he started treatment with sildenafil for erectile dysfunction. Physical examination shows no abnormalities. Which of the following is the most likely mechanism of action of sildenafil causing these adverse effects?

- (A) Decreased basal vascular smooth muscle tone
- (B) Decreased parasympathetic nerve activity
- (C) Decreased sympathetic nerve activity
- (D) Increased basal vascular smooth muscle tone
- (E) Increased parasympathetic nerve activity
- (F) Increased sympathetic nerve activity

139. A 72-year-old man who is a retired construction worker comes to the physician because he has had a lesion on his face for 3 months. Physical examination shows a 6-mm, red, ulcerated lesion with heaped borders. A biopsy specimen of the lesion shows atypical, dysplastic keratinocytes within the epidermis and dermis. Which of the following is the most likely diagnosis?

- (A) Actinic keratoses
- (B) Discoid lupus erythematosus
- (C) Melanoma
- (D) Mycosis fungoides
- (E) Squamous cell carcinoma

140. A 95-year-old woman in a nursing home has had advanced vascular dementia, severe dysphagia, and a 9-kg (20-lb) weight loss over the past 2 months. Her four children are divided regarding the decision to provide artificial feeding through a gastrostomy tube. There is no living will. The oldest son approaches the physician after a family meeting and says, "You should simply decide what is best for her and tell the others that's what we should do." Assuming the physician proceeds in this manner, which of the following best describes the physician's action?

- (A) Paternalism
- (B) Preserving fairness in use of resources
- (C) Protecting patient autonomy
- (D) Rationing care
- (E) Truth-telling

141. Scanning of inhaled, radioactively labeled aerosols has been used to study the distribution of pulmonary ventilation. However, data obtained using aerosols with a particle diameter of $20\ \mu$ do not accurately reflect the distribution of alveolar ventilation in the lungs. Which of the following is the best explanation for this finding?
- (A) Ingestion of these particles by alveolar macrophages occurs nonuniformly
 - (B) The majority of particles this size do not adhere to airway or alveolar walls
 - (C) Many particles are rapidly absorbed into the pulmonary capillary blood
 - (D) Most particles this size are deposited in the conducting airways
 - (E) Removal of particles by the mucociliary system is too fast to allow scanning
142. A 12-year-old boy is brought to the physician by his father because of redness and swelling of his left foot for 24 hours. Three days ago, the boy scraped his foot while wading in a drainage ditch. Examination of the left foot shows a purulent abrasion with edema, erythema, and tenderness on the lateral side. Infection is most likely to next spread from the lateral side of the foot to the regional lymph nodes in which of the following areas?
- (A) Lateral surface of the thigh
 - (B) Medial malleolus, posteriorly
 - (C) Popliteal fossa
 - (D) Sole of the foot
 - (E) Superficial inguinal area
143. A 70-year-old man has ecchymoses, perifollicular petechiae, and swelling of the gingiva. He has lived alone since the death of his wife 2 years ago. His diet consists primarily of cola and hot dogs. Which of the following is the most likely diagnosis?
- (A) Beriberi
 - (B) Kwashiorkor
 - (C) Pellagra
 - (D) Rickets
 - (E) Scurvy
144. In the *Haemophilus influenzae* type b vaccine, the bacterial capsular polysaccharide is conjugated to a carrier protein to improve immunogenicity in children. Which of the following cells become activated following contact with peptides processed from this vaccine in the context of MHC type II proteins?
- (A) B lymphocytes
 - (B) Macrophages
 - (C) Natural killer cells
 - (D) Plasma cells
 - (E) T lymphocytes

Answer Form for Step 1 Sample Questions

Block 1 (Questions 1-48)

- | | | | | |
|---------|---------|---------|---------|---------|
| 1. ___ | 11. ___ | 21. ___ | 31. ___ | 41. ___ |
| 2. ___ | 12. ___ | 22. ___ | 32. ___ | 42. ___ |
| 3. ___ | 13. ___ | 23. ___ | 33. ___ | 43. ___ |
| 4. ___ | 14. ___ | 24. ___ | 34. ___ | 44. ___ |
| 5. ___ | 15. ___ | 25. ___ | 35. ___ | 45. ___ |
| 6. ___ | 16. ___ | 26. ___ | 36. ___ | 46. ___ |
| 7. ___ | 17. ___ | 27. ___ | 37. ___ | 47. ___ |
| 8. ___ | 18. ___ | 28. ___ | 38. ___ | 48. ___ |
| 9. ___ | 19. ___ | 29. ___ | 39. ___ | |
| 10. ___ | 20. ___ | 30. ___ | 40. ___ | |
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Block 2 (Questions 49-96)

- | | | | | |
|---------|---------|---------|---------|---------|
| 49. ___ | 59. ___ | 69. ___ | 79. ___ | 89. ___ |
| 50. ___ | 60. ___ | 70. ___ | 80. ___ | 90. ___ |
| 51. ___ | 61. ___ | 71. ___ | 81. ___ | 91. ___ |
| 52. ___ | 62. ___ | 72. ___ | 82. ___ | 92. ___ |
| 53. ___ | 63. ___ | 73. ___ | 83. ___ | 93. ___ |
| 54. ___ | 64. ___ | 74. ___ | 84. ___ | 94. ___ |
| 55. ___ | 65. ___ | 75. ___ | 85. ___ | 95. ___ |
| 56. ___ | 66. ___ | 76. ___ | 86. ___ | 96. ___ |
| 57. ___ | 67. ___ | 77. ___ | 87. ___ | |
| 58. ___ | 68. ___ | 78. ___ | 88. ___ | |
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Block 3 (Questions 97-144)

- | | | | | |
|----------|----------|----------|----------|----------|
| 97. ___ | 107. ___ | 117. ___ | 127. ___ | 137. ___ |
| 98. ___ | 108. ___ | 118. ___ | 128. ___ | 138. ___ |
| 99. ___ | 109. ___ | 119. ___ | 129. ___ | 139. ___ |
| 100. ___ | 110. ___ | 120. ___ | 130. ___ | 140. ___ |
| 101. ___ | 111. ___ | 121. ___ | 131. ___ | 141. ___ |
| 102. ___ | 112. ___ | 122. ___ | 132. ___ | 142. ___ |
| 103. ___ | 113. ___ | 123. ___ | 133. ___ | 143. ___ |
| 104. ___ | 114. ___ | 124. ___ | 134. ___ | 144. ___ |
| 105. ___ | 115. ___ | 125. ___ | 135. ___ | |
| 106. ___ | 116. ___ | 126. ___ | 136. ___ | |

Answer Key for Step 1 Sample Questions

Block 1 (Questions 1-48)

1. C	11. A	21. B	31. D	41. B
2. D	12. C	22. A	32. C	42. E
3. C	13. E	23. C	33. B	43. C
4. E	14. D	24. A	34. C	44. C
5. E	15. B	25. B	35. E	45. A
6. A	16. C	26. C	36. C	46. E
7. B	17. E	27. B	37. E	47. B
8. B	18. D	28. B	38. D	48. A
9. D	19. B	29. D	39. B	
10. E	20. A	30. E	40. B	

Block 2 (Questions 49-96)

49. B	59. E	69. E	79. A	89. B
50. B	60. E	70. D	80. F	90. D
51. D	61. C	71. C	81. E	91. C
52. B	62. E	72. C	82. D	92. A
53. C	63. G	73. E	83. B	93. B
54. D	64. C	74. B	84. H	94. C
55. E	65. A	75. D	85. D	95. D
56. E	66. B	76. A	86. C	96. C
57. D	67. C	77. C	87. D	
58. E	68. A	78. B	88. A	

Block 3 (Questions 97-144)

97. A	107. A	117. A	127. C	137. D
98. D	108. E	118. C	128. B	138. A
99. A	109. D	119. B	129. E	139. E
100. B	110. B	120. C	130. D	140. A
101. B	111. D	121. B	131. C	141. D
102. A	112. E	122. E	132. E	142. C
103. F	113. H	123. H	133. E	143. E
104. B	114. B	124. A	134. B	144. E
105. E	115. E	125. E	135. B	
106. E	116. B	126. D	136. D	