

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

**2011**

**Step 1**

**Content Description and  
General Information**



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## 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 2011. *Eligibility periods* are explained in the *2011 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 Web site.

The information in this booklet, USMLE sample test materials and software tutorials, and other informational materials are available at the USMLE Web site (<http://www.usmle.org>). Information regarding any changes in the USMLE program will also be posted at the USMLE Web site. 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 Web site, you must run the tutorial and sample materials to become familiar with the test software prior to your test date. Please monitor the USMLE Web site (<http://www.usmle.org>) announcements section to access updated orientation and practice materials. The sample materials available at the USMLE Web site include an additional block of items with associated audio or video findings and a sequential item set. 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 21 and 22 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 19. 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 thirteen 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  $\mu\text{m}^3$ . 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)  $\beta$ -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

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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, exchange, and epigenetics
- gene expression: transcription
- gene expression: translation, post-translational processing, modifications, and disposition of proteins (degradation), including protein/glycoprotein synthesis, intra/extracellular sorting, and processes/functions related to Golgi complex and rough endoplasmic reticulum
- structure and function of proteins and enzymes
- energy metabolism

### **Biology of cells**

- adaptive cell responses and cellular homeostasis
- intracellular accumulations
- mechanisms of injury and necrosis
- apoptosis
- mechanisms of dysregulation
  - cell biology of cancer, including genetics of cancer
  - general principles of invasion and metastasis, including cancer staging
- cell/tissue structure, regulation, and function, including cytoskeleton, organelles, glycolipids, channels, gap junctions, extracellular matrix, and receptors

### **Human development and genetics**

- principles of pedigree analysis
  - inheritance patterns
  - occurrence and recurrence risk determination
- population genetics: Hardy-Weinberg law, founder effects, mutation-selection equilibrium
- principles of gene therapy
- genetic testing and counseling
- genetic mechanisms

### **Biology of tissue response to disease**

- acute inflammatory responses (patterns of response)
  - acute inflammation and mediator systems
  - vascular response to injury, including mediators
  - principles of cell adherence and migration
  - microbicidal mechanisms and tissue injury
  - clinical manifestations
- chronic inflammatory responses
- reparative processes
  - wound healing, hemostasis, and repair; thrombosis, granulation tissue, angiogenesis, fibrosis, scar/keloid formation
  - regenerative processes

### **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
  - influence of developmental stage on physician-patient interview
- psychological 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 behavioral responses to stress and illness
  - maladaptive behavioral responses to stress and illness
  - interactions between the patient and the physician or the health care system
  - patient adherence (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
  - multicultural ethnic characteristics
- medical ethics, jurisprudence, and professional behavior
  - consent and informed consent to treatment
  - physician-patient relationships
  - death and dying
  - birth-related issues
  - issues related to patient participation in research
  - interactions with other health professionals, including impaired physician and patient safety
  - 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
  - protein-calorie malnutrition
  - vitamin deficiencies and/or toxicities (including megaloblastic anemia with other findings)
  - mineral deficiencies and toxicities
- temperature regulation
- adaptation to environmental extremes, including occupational exposures
  - physical and associated disorders (including temperature, radiation, burns, decreased atmospheric pressure, high-altitude sickness, increased water pressure)
  - chemical (including gases, vapors, smoke inhalation, agricultural hazards, organic solvents, heavy metals, principles of poisoning and therapy)
- fluid, electrolyte, and acid-base balance disorders
- inherited metabolic disorders, including disorders related to amino acids, purines, porphyrins, carnitine, fatty acids, and carbohydrates

### **Pharmacodynamic and pharmacokinetic processes**

- general principles
  - pharmacokinetics: absorption, distribution, metabolism, excretion, dosage intervals
  - mechanisms of drug action, structure-activity relationships (including anticancer drugs)
  - concentration- and dose-effect relationships, types of agonists and antagonists and their actions
  - individual factors altering pharmacokinetics and pharmacodynamics
  - mechanisms of drug adverse effects, overdosage, toxicology
  - mechanisms of drug interactions
  - regulatory issues
  - signal transduction, including structure/function of all components of signal transduction pathway such as receptors, ligands
  - cell cycle/cell cycle regulation

### **Microbial biology and infection**

- microbial identification and classification, including principles, microorganism identification, and non-immunologic lab diagnosis
- bacteria
  - structure
  - processes, replication, and genetics
  - oncogenesis
  - antibacterial agents
- viruses

- structure
- processes, replication, and genetics
- oncogenesis
- antiviral agents
- fungi
  - structure
  - processes, replication, and genetics
  - antifungal agents
- parasites
  - structure
  - processes, replication, and genetics
  - antiparasitic agents
- prions
- epidemiology, outbreaks, and infection control

### **Quantitative methods**

- fundamental concepts of measurement
  - scales of measurement
  - distribution, central tendency, variability, probability
  - disease prevalence and incidence
  - disease outcomes
  - associations
  - health impact
  - sensitivity, specificity, predictive values
- fundamental concepts of study design
  - types of experimental studies
  - types of observational studies
  - sampling and sample size
  - subject selection and exposure allocation
  - 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, O<sub>2</sub> and CO<sub>2</sub> transport, transport proteins
  - 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 endothelial cells
  - autoimmunity and autoimmune diseases
  - anemia of chronic disease
  - non-immunologically mediated transfusion complications, transplant rejection
- traumatic and mechanical injury
- neoplastic disorders (including lymphoma, leukemia, multiple myeloma, dysproteinemias, amyloidosis)
- metabolic and regulatory disorders, including acquired
  - nutritional anemias
  - cythemia
  - hemorrhagic and hemostatic disorders

- bleeding secondary to platelet disorders and disorders of primary hemostasis
- vascular and endothelial disorders
- systemic disorders affecting the hematopoietic and lymphoreticular system
- idiopathic disorders
- degenerative disorders
- drug-induced adverse effects of the hematopoietic and lymphoreticular systems
- congenital and genetic disorders affecting the hematopoietic and lymphoreticular systems

### **Principles of therapeutics**

- mechanisms of action and use of drugs for treatment of disorders of the hematopoietic system
  - blood and blood products
  - treatment of anemia, drugs stimulating erythrocyte production
  - drugs stimulating leukocyte production
  - anticoagulants, thrombolytic drugs
  - antiplatelet drugs
  - antimicrobials and antiparasitics
  - antineoplastic and immunosuppressive drugs in the clinical context of disease
- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- gender and ethnic factors

## **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
  - 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, including definition of brain death

### **Abnormal processes**

- infectious, inflammatory, and immunologic disorders (including demyelinating disorders, myasthenia gravis and muscle channelopathies, and disorders of the eye and ear)
- traumatic and mechanical disorders
- neoplastic disorders, including primary and metastatic
- metabolic and regulatory disorders
- vascular disorders
- systemic disorders affecting the nervous system
- idiopathic disorders affecting the nervous system
- congenital and genetic disorders, including metabolic

- degenerative disorders
- paroxysmal disorders
- disorders of special senses
- psychopathologic disorders, processes, and their evaluation
  - early-onset 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
- drug-induced adverse effects on the central and peripheral nervous system
- neurologic pain syndromes

### **Principles of therapeutics**

- mechanisms of action and use of drugs for treatment of disorders of the nervous system
  - anesthetics
  - hypnotic sedatives
  - psychopharmacologic agents
  - anticonvulsants
  - analgesics
  - stimulants, amphetamines
  - antiparkinsonian drugs and drugs for dementia, Alzheimer type; multiple sclerosis; and restless legs syndrome
  - skeletal muscle relaxants, botulinum toxin
  - neuromuscular junction agonists and antagonists
  - antiglaucoma drugs
  - drugs used to decrease intracranial pressure
  - antimigraine agents
  - drugs affecting the autonomic nervous system, including all general autonomic pharmacology
  - antimicrobials, antineoplastic drugs, and antiparasitics
  - drugs used to treat cerebrovascular disorders
  - treatment for substance abuse disorders
- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- 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
- skin defense mechanisms and normal flora

#### **Abnormal processes**

- infectious, inflammatory, and immunologic disorders
  - bacterial infections
  - viral infections
  - fungal infections, including mycoses, dermatophytosis

- parasitic infections, ectoparasitic infestations, and mycobacterial infections
- immune and autoimmune disorders
- traumatic and mechanical disorders
  - thermal injury
  - decubitus ulcers
  - effects of ultraviolet light and radiation
- neoplastic disorders
  - keratinocytes
  - melanocytes
  - vascular neoplasms
  - other
- metabolic, regulatory, and structural disorders
- vascular disorders
- systemic disorders affecting the skin
- idiopathic disorders
- degenerative disorders
- drug-induced adverse effects on the skin and related connective tissue
- congenital and genetic disorders affecting the skin and related connective tissue

### **Principles of therapeutics**

- mechanisms of action and use of drugs for treatment of disorders of the skin and connective tissue
  - anti-inflammatory agents
  - emollients
  - sunscreen
  - retinoids
  - antimicrobial and antiparasitic agents
  - cytotoxic and immunologic therapy and antineoplastic drugs
- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- gender and ethnic factors

## **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
- traumatic and mechanical disorders (including fractures, sprains, strains, dislocations, joint injuries, repetitive motion injuries, and impingement syndromes)
- neoplastic disorders
- metabolic, regulatory, and structural disorders (including osteomalacia, osteoporosis, osteodystrophy, gout, and pseudogout)
- vascular disorders
- systemic disorders affecting the musculoskeletal system
- idiopathic disorders
- degenerative disorders
- drug-induced adverse effects on the musculoskeletal system
- congenital and genetic disorders affecting the musculoskeletal system

### **Principles of therapeutics**

- mechanisms of action and use of drugs for treatment of disorders of the musculoskeletal system
  - nonsteroidal anti-inflammatory drugs and analgesics
  - muscle relaxants
  - antigout therapy
  - immunosuppressive and antineoplastic drugs
  - drugs affecting bone mineralization
  - antimicrobial and antiparasitic agents
- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- gender and ethnic factors

### **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
    - pyogenic infectious diseases of the lower respiratory tract and pleura, viral infections, and associated complications
    - other infectious diseases of the lower respiratory tract
  - immunologic disorders
    - allergic and hypersensitivity disorders
    - autoimmune disorders
  - inflammatory disorders
    - pneumoconioses
    - acute and chronic alveolar injury
    - chronic obstructive pulmonary disease
    - restrictive pulmonary disease
- traumatic and mechanical disorders
- neoplastic disorders (including upper airway, lower airway and lung parenchyma, pleura, and metastatic tumors)
- metabolic, regulatory, and structural disorders
- vascular and circulatory disorders (including thromboembolic disease, pulmonary hypertension, pulmonary edema, and pleural effusion)
- systemic disorders affecting the respiratory system
- idiopathic disorders
- degenerative disorders
- drug-induced adverse effects on the respiratory system
- congenital and genetic disorders affecting the respiratory system

### **Principles of therapeutics**

- mechanisms of action and use of drugs for treatment of disorders of the respiratory system
  - decongestants, cough suppressants, expectorants, mucolytics
  - bronchodilator drugs
  - anti-inflammatory and cytotoxic drugs
  - antimicrobial agents and antiparasitic agents
  - antineoplastic agents
  - pulmonary vasodilators
- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- gender and ethnic factors

### **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
  - endothelium and secretory function, vascular smooth muscle, microcirculation, and lymph flow (including 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
- traumatic and mechanical disorders
- neoplastic disorders
- metabolic and regulatory disorders (including dysrhythmias, systolic and diastolic dysfunction, low- and high-output heart failure, cor pulmonale, systemic hypertension, ischemic heart disease, myocardial infarction, systemic hypotension and shock, and dyslipidemias)
- vascular disorders
- systemic diseases affecting the cardiovascular system
- congenital and genetic disorders of the heart and central vessels
- idiopathic disorders
- drug-induced adverse effects on the cardiovascular system
- degenerative disorders

### **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, and antiplatelet agents
  - inotropic agents and treatment of heart failure
  - immunosuppressive, antimicrobial, antineoplastic, and antiparasitic drugs
  - drugs to treat peripheral arterial disease
  - other pharmacotherapy

- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- gender and ethnic factors

**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
- traumatic and mechanical disorders
  - malocclusion
  - hiatal hernia
  - obstruction
  - perforation of hollow viscus and blunt trauma
  - inguinal, femoral, and abdominal wall hernias
  - esophageal, intestinal, and colonic diverticula
- neoplastic disorders, including benign and malignant
- metabolic and regulatory disorders (including motility disorders, malabsorption, hepatic failure, cholelithiasis, nutritional disorders)
- vascular disorders (including portal hypertension, esophageal varices, hemorrhoids, anal fissure, ischemia, angiodysplasia, thromboses, vasculitis)
- systemic disorders affecting the gastrointestinal system
- idiopathic disorders
- degenerative disorders
- drug-induced adverse effects on the gastrointestinal system
- congenital and genetic disorders affecting the gastrointestinal system

**Principles of therapeutics**

- mechanisms of action and use of drugs for treatment of disorders of the gastrointestinal system
  - treatment and prophylaxis of peptic ulcer disease and gastroesophageal reflux
  - drugs to alter gastrointestinal motility
  - fluid replacement
  - pancreatic replacement therapy and treatment of pancreatitis
  - drugs for treatment of hepatic failure and biliary disease
  - anti-inflammatory, immunosuppressive, antineoplastic, antimicrobial, and antiparasitic drugs
- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- gender and ethnic factors

## **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
    - lower urinary tract
  - inflammatory and immunologic disorders
    - glomerular disorders
    - tubular interstitial disease
- traumatic and mechanical disorders
- neoplastic disorders, including primary and metastases
- metabolic and regulatory disorders
  - renal failure, acute and chronic
  - tubular and collecting duct disorders
  - renal calculi
- vascular disorders
- systemic diseases affecting the renal system
- idiopathic disorders
- degenerative disorders
- drug-induced adverse effects on the renal/urinary system
- congenital and genetic disorders affecting the renal/urinary system

### **Principles of therapeutics**

- mechanisms of action and use 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
  - anti-inflammatory, antimicrobial, immunosuppressive, antineoplastic, and antiparasitic drugs
  - drugs used to treat lower urinary tract system
- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- gender and ethnic factors

## **Reproductive System**

### **Normal processes**

- embryonic development, fetal maturation, and perinatal changes, including gametogenesis
- organ structure and function
  - female structure, including breast
  - female function
  - male structure

- male function
- 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 (female and male)
- traumatic and mechanical disorders (female and male)
- neoplastic disorders (including female reproductive, male reproductive, breast [including fibrocystic changes], trophoblastic disease)
- metabolic and regulatory processes (female and male)
- prenatal and perinatal counseling and screening
- systemic disorders affecting reproductive function
- disorders relating to pregnancy, the puerperium, and the postpartum period
  - obstetric problems
  - complications affecting other organ systems
  - disorders associated with the puerperium
  - antepartum, intrapartum, postpartum disorders of the fetus
- idiopathic disorders
- drug-induced adverse effects on the reproductive system
- degenerative disorders
- congenital and genetic disorders affecting the reproductive system

### **Principles of therapeutics**

- mechanisms of action and use 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
    - estrogen, progesterone 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, including all gonadotropin-releasing hormone antagonists
  - abortifacients
  - antimicrobial and antiparasitic agents
  - antineoplastics
  - restoration of potency
- other therapeutic modalities affecting the reproductive system

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- family planning and pregnancy
- 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
- traumatic and mechanical disorders
- neoplastic disorders (including pituitary, thyroid, parathyroid, adrenal cortex, pancreatic islets, neural crest, pheochromocytoma)
- metabolic and regulatory processes (including diabetes mellitus, pituitary, hypothalamus, thyroid, parathyroid, pancreatic islet disorders, adrenal disorders)
- vascular disorders
- systemic disorders affecting the endocrine system
- idiopathic disorders
- degenerative disorders
- drug-induced adverse effects on the endocrine system
- congenital and genetic disorders affecting the endocrine system

### **Principles of therapeutics**

- mechanisms of action and use of drugs for treatment of disorders of the endocrine system
  - hormones and hormone analogs
  - stimulators of hormone production
  - inhibitors of hormone production
  - hormone antagonists
  - potentiators of hormone action
  - antiobesity agents
  - nonhormonal therapy for endocrine disorders
  - other treatment for diabetes
- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- gender and ethnic factors

## **Immune System**

### **Normal processes**

- development of cells of the adaptive immune response, including positive and negative selection during immune development
- structure, production, and function
  - granulocytes, natural killer cells, macrophages, mast cells, dendritic cells, cell receptors
  - T lymphocytes, including T-lymphocyte receptors, accessory molecules, cell activation and proliferation, cytotoxic T lymphocytes, and memory T lymphocytes

- B lymphocytes and plasma cells, including B-lymphocyte receptors, immunoglobulins, cell activation and proliferation, including development of antibodies and memory B lymphocytes
- structure and function of lymph nodes, host defense mechanisms, host barriers to infection, mucosal immunity
- immunogenetics
- Rh and ABO antigens, including genetics
- cellular basis of the immune response and immunologic mediators
  - antigen processing and presentation in the context of MHC I and MHC II molecules, including distribution of MHC I and MHC II on different cells, mechanism of MHC I and MHC II deficiencies, and the genetics of MHC
  - regulation of the adaptive immune response
  - activation, function, and molecular biology of complement
  - function and molecular biology of cytokines
- basis of immunologic diagnosis

### **Abnormal processes**

- disorders with alterations in immunologic function
  - abnormalities in adaptive immune responses
  - deficiencies of phagocytic cells and natural killer cells
  - complement deficiency
  - HIV infection/AIDS
  - Non-HIV infections of lymphocytes
  - systemic diseases of immunologic function
  - systemic disorders affecting the immune system and the effect of age on the function of components of the immune system
- immunologically mediated disorders
  - type I, type II, type III hypersensitivity
  - type IV hypersensitivity
  - transplantation risks and rejection, including transfusion reactions
  - isoimmunization, hemolytic disease of the newborn
- drug-induced adverse effects on the immune system, including Jarisch-Herxheimer

### **Principles of therapeutics**

- mechanisms of action and use of drugs that specifically affect immune function
  - vaccines (active and passive)
  - antiretrovirals
  - immunomodulating and antineoplastic drugs
  - biologics, including monoclonal and polyclonal antibodies
- other therapeutic modalities

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

- emotional and behavioral factors
- influence on person, family, and society
- occupational and other environmental risk factors
- gender and ethnic factors

# Sample Step 1

## Sample Questions

The following pages include 138 sample test questions. These questions are the same as those you install on your computer from the USMLE Web site. For information on obtaining the test software and additional information on preparing to take the test and testing, you must review the *2011 USMLE Bulletin of Information*: see [Preparing for the Test](#) and [Testing](#). Please note that reviewing the sample questions as they appear on pages 23-54 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 Web site well before your test date. The sample materials available at the USMLE Web site include an additional block of items with associated audio or video findings and a sequential item set. 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 21-22) 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 55. In the actual examination, answers will be selected on the screen; **no answer form will be provided**. An answer key is provided on page 56.

### USMLE Step 1 Laboratory Values

\* Included in the Biochemical Profile (SMA-12)

	<u>REFERENCE RANGE</u>	<u>SI REFERENCE INTERVALS</u>
<b>BLOOD, PLASMA, SERUM</b>		
* 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 <sup>2+</sup> ) .....	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 <sup>+</sup> ) .....	136-145 mEq/L .....	136-145 mmol/L
* Potassium (K <sup>+</sup> ) .....	3.5-5.0 mEq/L .....	3.5-5.0 mmol/L
Chloride (Cl <sup>-</sup> ).....	95-105 mEq/L .....	95-105 mmol/L
Bicarbonate (HCO <sub>3</sub> <sup>-</sup> ).....	22-28 mEq/L .....	22-28 mmol/L
Magnesium (Mg <sup>2+</sup> ).....	1.5-2.0 mEq/L .....	0.75-1.0 mmol/L
Estradiol, 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 <sup>+</sup> ] 36-44 nmol/L
PCO <sub>2</sub> .....	33-45 mm Hg .....	4.4-5.9 kPa
PO <sub>2</sub> .....	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 <sub>2</sub> O .....	275-295 mOsmol/kg H <sub>2</sub> O
Parathyroid hormone, serum, N-terminal .....	230-630 pg/mL .....	230-630 ng/L
* Phosphatase (alkaline), serum (p-NPP at 30°C) .....	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 ( <sup>123</sup> I) uptake.....	8%-30% of administered dose/24 h .....	0.08-0.30/24 h
Thyroxine (T <sub>4</sub> ), serum.....	5-12 μg/dL .....	64-155 nmol/L
Triglycerides, serum.....	35-160 mg/dL.....	0.4-1.81 mmol/L
Triiodothyronine (T <sub>3</sub> ), serum (RIA) .....	115-190 ng/dL .....	1.8-2.9 nmol/L
Triiodothyronine (T <sub>3</sub> ) 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>
<b>BODY MASS INDEX (BMI)</b>		
Body mass index .....	Adult: 19-25 kg/m <sup>2</sup>	
<b>CEREBROSPINAL FLUID</b>		
Cell count .....	0-5/mm <sup>3</sup>	0-5 x 10 <sup>6</sup> /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 <sub>2</sub> O	70-180 mm H <sub>2</sub> O
Proteins, total .....	<40 mg/dL	<0.40 g/L
<b>HEMATOLOGIC</b>		
Bleeding time (template) .....	2-7 minutes	2-7 minutes
Erythrocyte count .....	Male: 4.3-5.9 million/mm <sup>3</sup> Female: 3.5-5.5 million/mm <sup>3</sup>	4.3-5.9 x 10 <sup>12</sup> /L 3.5-5.5 x 10 <sup>12</sup> /L
Erythrocyte sedimentation rate (Westergren).....	Male: 0-15 mm/h Female: 0-20 mm/h	0-15 mm/h 0-20 mm/h
Hematocrit .....	Male: 41%-53% Female: 36%-46%	0.41-0.53 0.36-0.46
Hemoglobin A <sub>1c</sub> .....	≤ 6%	≤ 0.06
Hemoglobin, blood.....	Male: 13.5-17.5 g/dL Female: 12.0-16.0 g/dL	2.09-2.71 mmol/L 1.86-2.48 mmol/L
Hemoglobin, plasma .....	1-4 mg/dL	0.16-0.62 mmol/L
<b>Leukocyte count and differential</b>		
Leukocyte count .....	4500-11,000/mm <sup>3</sup>	4.5-11.0 x 10 <sup>9</sup> /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 <sup>3</sup>	80-100 fL
Partial thromboplastin time (activated) .....	25-40 seconds	25-40 seconds
Platelet count.....	150,000-400,000/mm <sup>3</sup>	150-400 x 10 <sup>9</sup> /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
<b>Volume</b>		
Plasma .....	Male: 25-43 mL/kg Female: 28-45 mL/kg	0.025-0.043 L/kg 0.028-0.045 L/kg
Red cell .....	Male: 20-36 mL/kg Female: 19-31 mL/kg	0.020-0.036 L/kg 0.019-0.031 L/kg
<b>SWEAT</b>		
Chloride.....	0-35 mmol/L	0-35 mmol/L
<b>URINE</b>		
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	
<b>Estriol, total (in pregnancy)</b>		
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
<b>17-Hydroxycorticosteroids</b>		
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
<b>17-Ketosteroids, total</b>		
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 <sub>2</sub> 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 1-46

1. 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
2. A 52-year-old woman comes to the physician because of a 2-day history of fever and left flank pain. She has been treated for multiple episodes of pyelonephritis during the past 3 years. Her temperature is 37.8°C (100.1°F). Physical examination shows left flank tenderness. Urinalysis shows 12–18 WBC/hpf with occasional lymphocytes and mononuclear cells with features of macrophages. Cultures of urine grow 80,000 colonies/mL of *Proteus mirabilis*. An x-ray of the abdomen shows a 3-cm mass in the lower pole of the left kidney. Gross examination of the mass after it has been resected shows that it is yellow, 3.2-cm in diameter, and centrally but not marginally necrotic. Histologic examination of the mass shows a predominance of epithelioid cells with partially clear and granular-to-foamy cytoplasm. Nuclei are eccentric, normochromic, symmetric, and without significant pleomorphism. Scattered lymphocytes and plasma cells are intermixed. Which of the following is the most likely diagnosis?
  - (A) Acute pyelonephritis
  - (B) Malacoplakia
  - (C) Renal cell carcinoma, clear cell type, intermediate grade
  - (D) Renal cell carcinoma, granular cell type
  - (E) Xanthogranulomatous pyelonephritis
3. 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
4. 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 keratosis
  - (B) Discoid lupus erythematosus
  - (C) Melanoma
  - (D) Mycosis fungoides
  - (E) Squamous cell carcinoma
5. 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

6. A 21-year-old man is brought to the emergency department by friends because of blurred vision, headache, abdominal pain, nausea, and vomiting for 30 minutes. His friends say that he drank 60 mL of wood alcohol 1 hour ago after a bet at a fraternity house party. His pulse is 58/min and regular, respirations are 28/min and shallow, and blood pressure is 130/72 mm Hg. Physical examination shows no other abnormalities. Laboratory studies show:

Serum	
Na <sup>+</sup>	139 mEq/L
Cl <sup>-</sup>	85 mEq/L
K <sup>+</sup>	4.5 mEq/L
HCO <sub>3</sub> <sup>-</sup>	13 mEq/L
Urine	
pH	5
Crystals	none
Arterial blood gas analysis on room air:	
pH	7.28
PO <sub>2</sub>	108 mm Hg
PCO <sub>2</sub>	22 mm Hg

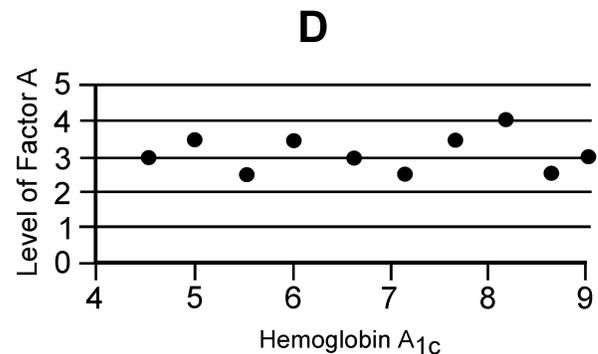
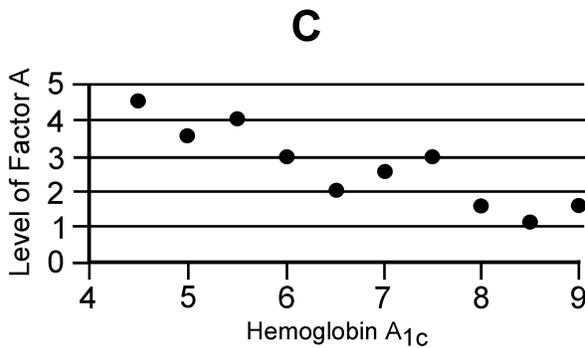
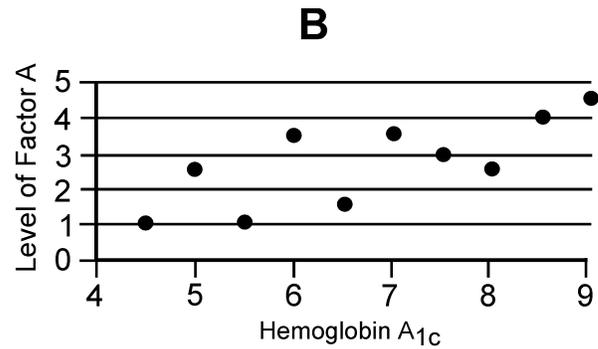
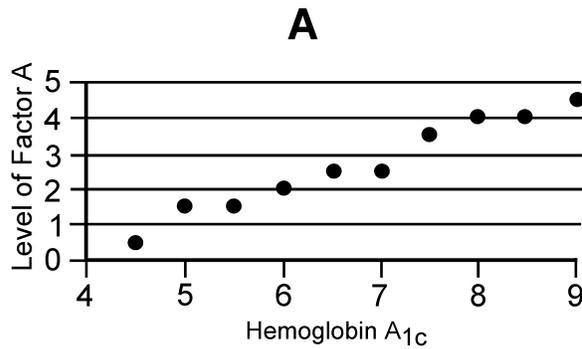
Which of the following is the most appropriate initial treatment for this patient?

- (A) Intravenous ethanol therapy
- (B) Intravenous sodium bicarbonate therapy
- (C) Oral acetylcysteine therapy
- (D) Oral activated charcoal therapy
- (E) Hemodialysis

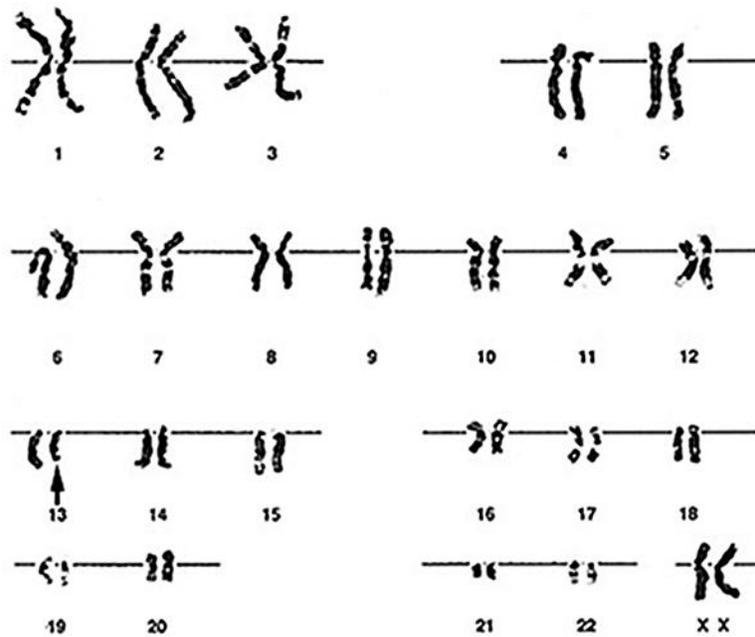
7. A 42-year-old woman, gravida 2, para 2, comes for a routine examination. She has type 2 diabetes mellitus well controlled with glyburide. She has a history of vulvar condylomata acuminata successfully treated with laser ablation 12 years ago. She does not smoke. She drinks a six-pack of beer nightly. She is sexually active and uses a diaphragm with spermicide for contraception. Her mother had breast cancer at the age of 65 years. The patient is 157 cm (5 ft 2 in) tall and weighs 100 kg (220 lb); BMI is 40 kg/m<sup>2</sup>. Physical examination shows no other abnormalities. Pelvic examination shows a 2-cm ulcer on the cervix. A biopsy specimen of the cervical lesion shows invasive squamous cell carcinoma. Which of the following is the most significant predisposing factor for this patient's cervical cancer?
- (A) Alcohol use
  - (B) Diaphragm and spermicide use
  - (C) Heredity
  - (D) Human papillomavirus infection
  - (E) Obesity
  - (F) Parity
  - (G) Type 2 diabetes mellitus
8. 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
9. A 55-year-old man who has alcoholic cirrhosis is brought to the emergency department because he has been vomiting blood for 2 hours. He has a 2-month history of abdominal distention, dilated veins over the anterior abdominal wall, and internal hemorrhoids. Which of the following veins is the most likely origin of the hematemesis?
- (A) Inferior mesenteric veins
  - (B) Left gastric vein
  - (C) Periumbilical veins
  - (D) Superior rectal vein
  - (E) Superior vena cava

10. 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
11. 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
12. A 4-month-old boy is brought to the emergency department 30 minutes after becoming unresponsive. He has a 1-day history of poor breast-feeding and vomiting. He is unresponsive to stimuli. Physical examination shows mild hepatomegaly. Serum studies show hypoglycemia and absence of ketones. The patient becomes responsive following an intravenous bolus of glucose. Urine studies show no ketones and increased concentrations of C6 and C8 carbon chain dicarboxylic acids. A deficiency of which of the following enzyme activities is the most likely cause of the findings in this patient?
- (A) Fructose-1,6-bisphosphatase
  - (B) Glucose-6-phosphatase
  - (C) Medium-chain acyl-CoA dehydrogenase
  - (D) Methylmalonyl-CoA mutase
  - (E) Ornithine carbamoyltransferase
13. A 72-year-old man comes to the physician because of sharp pain of his right thorax for 3 days and a rash in a band-like distribution over his right chest for 1 day. He babysits his 4-year-old grandson who recently developed chickenpox. Physical examination shows a vesicular rash in a T8 dermatomal distribution. Which of the following is the most likely source of virus in this patient's infection?
- (A) Hematogenous dissemination from the respiratory tract
  - (B) New infection from the grandson by the respiratory route
  - (C) New infection from the skin of the grandson
  - (D) Reactivation of a latent infection from the patient's dermal dendritic cells
  - (E) Reactivation of a latent infection from the patient's dorsal root ganglion
14. Vascular control is studied in an intact hind extremity of an anesthetized experimental animal. After a normal control period, the blood flow to the extremity is completely occluded for 1 minute. When the occlusion is released, blood flow increases abruptly and exceeds the control value for several minutes (reactive hyperemia). After an appropriate recovery period, the procedure is repeated and the extremity is actively exercised during the occlusion period. Which of the following best describes the reactive hyperemia after the second occlusion compared with that after the first occlusion?
- (A) Abolished
  - (B) Decreased but not abolished
  - (C) Increased
  - (D) Unchanged
15. 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

16. An investigator is studying the effect of the number of hours watching television (Factor A) on the percent of hemoglobin A<sub>1c</sub> in people with type 2 diabetes mellitus. Two different variables, Factor A and hemoglobin A<sub>1c</sub>, are compared. The results of the study indicate a correlation coefficient of +0.9. Which of the following graphs shown best corresponds to these results?



17. A 25-year-old woman is brought to the emergency department 1 hour after she fainted. She has had mild intermittent vaginal bleeding, sometimes associated with lower abdominal pain, during the past 3 days. She has had severe cramping pain in the right lower abdomen for 12 hours. She has not had a menstrual period for 3 months; previously, menses occurred at regular 28-day intervals. Abdominal examination shows mild tenderness to palpation in the right lower quadrant. Bimanual pelvic examination shows a tender walnut-sized mass in the right parametrium. Which of the following is the most likely diagnosis?
- (A) Appendicitis  
 (B) Cancer of the ovary  
 (C) Ectopic pregnancy  
 (D) Endometriosis  
 (E) Ovarian cyst  
 (F) Placenta previa
18. A 32-year-old woman with schizophrenia is brought to the physician because of rapid heartbeats, sweating, muscle rigidity, and confusion for 1 day. Medications include acetaminophen for dysmenorrhea, haloperidol, and multivitamins. Her temperature is 40.2°C (104.4°F), pulse is 100/min, respirations are 26/min, and blood pressure is 160/80 mm Hg. The skin is warm and moist, and the neck is supple. Funduscopic examination is normal. Deep tendon reflexes are 2+ without clonus, and plantar reflexes are normal; there is generalized muscle rigidity. Her thyroid-stimulating hormone concentration is 2.8 μU/mL. Which of the following is the most likely cause of this patient's condition?
- (A) Cerebral infarction  
 (B) Neuroleptic malignant syndrome  
 (C) Sepsis  
 (D) Serum triiodothyronine (T<sub>3</sub>) toxicosis  
 (E) Substernal toxic multinodular goiter



19. A 5-month-old girl has bilateral retinoblastoma. Neither parent has a history of having had retinoblastoma. Chromosomal analysis of the patient's stimulated peripheral blood lymphocytes is done; the photograph is of a representative karyotype. Which of the following critical events has most likely resulted from an aberration involving chromosome 13?

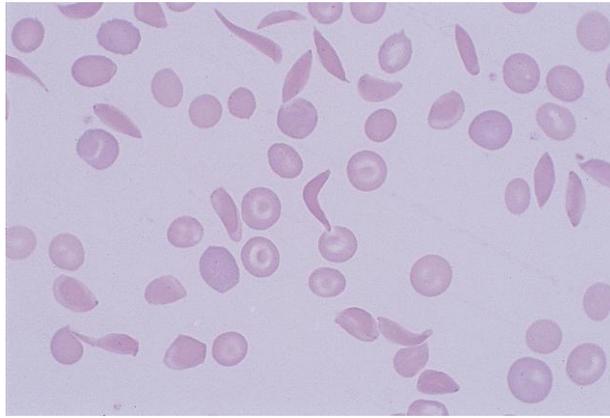
- (A) Proto-oncogene activation
- (B) Proto-oncogene amplification
- (C) Proto-oncogene loss
- (D) Tumor-suppressor gene activation
- (E) Tumor-suppressor gene loss

20. A 37-year-old man comes to the physician because of a 6-month history of chest pain that occurs when he swallows food; he has had a 9-kg (20-lb) weight loss during this period. He has not had heartburn or increased sensitivity in his hands to cold temperatures. He is 178 cm (5 ft 10 in) tall and now weighs 59 kg (130 lb); BMI is 19 kg/m<sup>2</sup>. Physical examination shows no abnormalities. A barium swallow shows esophageal dilation. Manometry shows a high resting pressure at the lower esophageal sphincter; there is little or no decrease in pressure associated with swallowing. Which of the following is the most likely diagnosis?

- (A) Achalasia
- (B) Esophagitis
- (C) Gastric ulcer
- (D) Gastroesophageal reflux disease
- (E) Hiatal hernia
- (F) Systemic sclerosis (scleroderma)

21. 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



22. A 2-year-old boy is brought to the emergency department because of shortness of breath and left-sided abdominal pain for 3 hours. He appears pale. Physical examination shows hypotension and tachycardia. There is splenomegaly with the spleen tip palpated 8 cm below the left costal margin. Laboratory studies show:

Hemoglobin	5.1 g/dL (N=12.1–14.9)
Hematocrit	16% (N=37%–44.4%)
Leukocyte count	4500/mm <sup>3</sup> (N=4000–11,500)
Platelet count	87,000/mm <sup>3</sup> (N=150,000–400,000)

A photomicrograph of a Wright-stained peripheral blood smear is shown. Which of the following is the most likely cause of this patient's current condition?

- (A) Aplastic crisis  
 (B) Autoimmune hemolysis  
 (C) Congestive heart failure  
 (D) Salmonella sepsis  
 (E) Splenic sequestration
- 
23. A 17-year-old boy comes to the emergency department because of severe thirst and weakness and a 4-kg (1.8-lb) weight loss over the past 36 hours. He began having voluminous painless watery diarrhea on the airplane while returning from a trip to Thailand 36 hours ago. He has not vomited. While supine, pulse is 110/min and blood pressure is 110/60 mm Hg. While standing, pulse is 170/min and blood pressure is 70/40 mm Hg. His abdomen is nontender and bowel sounds are increased. Which of the following treatments is most appropriate at this time?
- (A) Ciprofloxacin  
 (B) Doxycycline  
 (C) Exploratory laparotomy  
 (D) Potassium chloride  
 (E) Rehydration  
 (F) Trimethoprim-sulfamethoxazole
24. A 58-year-old woman comes to the physician because of intermittent vaginal bleeding during the past 3 months. She has been treated with tamoxifen since having a partial mastectomy and radiation therapy for a stage II carcinoma of the left breast 4 years ago. Her last menstrual period was at the age of 48 years. She has never had an abnormal Pap smear. Speculum examination shows no abnormalities. Bimanual examination shows no abnormal masses. Which of the following structures is the most likely source of the bleeding?
- (A) Cervical canal  
 (B) Fallopian tube  
 (C) Ovary  
 (D) Uterine endometrium  
 (E) Vagina

25. A 26-year-old man with HIV infection comes to the physician for a follow-up examination. Six months ago, he had an acute infection characterized by jaundice. Current medications include zidovudine (AZT), delavirdine, and ritonavir. Laboratory studies 6 months ago and today show:

Serum	6 Months Ago	Today
Total bilirubin	2.5 mg/dL	3.5 mg/dL
ALT	68 U/L	45 U/L
Hepatitis B surface antigen (HBsAg)	positive	positive
Hepatitis B e antigen (HBeAg)	positive	negative
IgM anti-hepatitis B core antigen (anti-HBcAg)	positive	negative
Anti-HBsAg	negative	negative
Anti-HBeAg	negative	positive
Anti-HBcAg	positive	positive

This patient's infection is most likely to resolve when he develops antibodies to which of the following?

- (A) Cytotoxic T lymphocytes
- (B) HBcAg
- (C) HBeAg
- (D) HBsAg
- (E) Natural killer cells

26. 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 B<sub>1</sub> (thiamine)
- (D) Vitamin B<sub>6</sub> (pyridoxine)
- (E) Vitamin B<sub>12</sub> (cobalamin)

27. A 20-year-old woman comes to the physician because of a 5-year history of increasingly severe, unilateral, throbbing headaches. The headaches, which are associated with nausea and occasional vomiting, are exacerbated by loud noises and last approximately 4 hours. Physical and neurologic examinations show no abnormalities. Treatment with which of the following at the onset of a headache is most likely to provide pain relief in this patient?

- (A) Amitriptyline
- (B) Divalproex
- (C) Oxygen
- (D) Phenytoin
- (E) Sumatriptan

28. A 32-year-old man with non-Hodgkin lymphoma comes to the physician 6 days after finishing the initial chemotherapy regimen. His leukocyte count is 1600/mm<sup>3</sup>, indicating greater bone marrow suppression than expected. When questioned, the patient says that he has been taking Madagascar periwinkle as an herbal remedy for his condition. He obtains this substance from an herbalist. Which of the following is the most appropriate response by the physician?

- (A) Ask the patient to stop using the herbal supplement because supplements are generally ineffective
- (B) Continue the patient's chemotherapy
- (C) Explain the adverse effects this herbal supplement has on the patient's treatment
- (D) Report the herbalist to the Food and Drug Administration
- (E) Suggest that the patient take daily multivitamin and protein supplements in addition to the herbal supplement

29. 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?

	<b>Cognitive</b>	<b>Social</b>	<b>Motor</b>
(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

30. 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

31. 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

32. 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 <sup>3</sup>
Neutrophils	65%
Lymphocytes	30%
Monocytes	5%
Mean corpuscular volume	82.2 μm <sup>3</sup>
Platelet count	20,000/mm <sup>3</sup>

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?

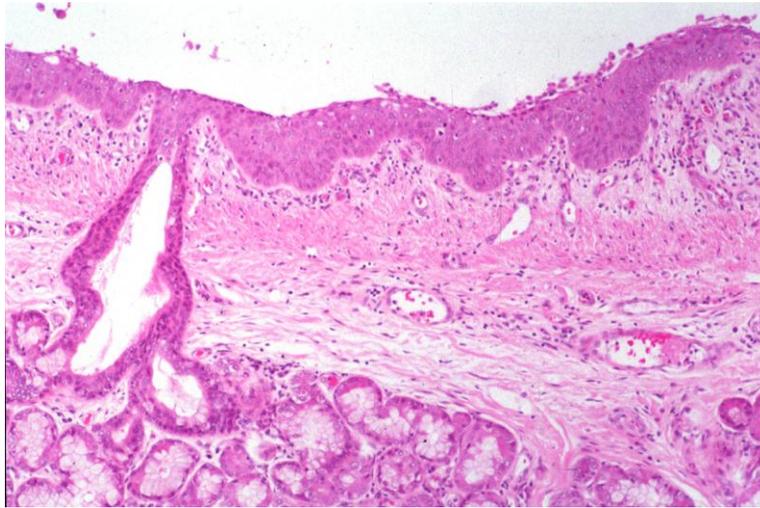
- (A) Acute megakaryocytic leukemia
- (B) Acute myelogenous leukemia
- (C) Aplastic anemia
- (D) Immune thrombocytopenic purpura
- (E) Epstein-Barr viral infection
- (F) Papovavirus infection
- (G) Thrombotic thrombocytopenic purpura

33. A 45-year-old woman has a 6-month history of progressive shortness of breath on exertion. She does not smoke. Pulmonary function findings are shown (values are given as % of predicted normal):

Vital capacity	60
Forced expiratory volume in 1 second (FEV <sub>1</sub> )	70
Diffusing capacity for carbon monoxide	50
Maximum voluntary ventilation	60

Which of the following most likely explains her limited ability to increase ventilation?

- (A) Airway obstruction  
(B) Decreased activation of pulmonary juxtacapillary (J) receptors  
(C) Decreased lung compliance  
(D) Depression of central chemoreceptors  
(E) Depression of peripheral chemoreceptors
- 
34. 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
35. 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
36. A 35-year-old man who works at a facility processing highly radioactive substances accidentally receives a high, whole-body dose of ionizing radiation estimated to be 1500 rads (15 gray). He dies 1 week later. At autopsy, histologic examination of the skin shows scattered, individual epidermal cells with shrunken, markedly eosinophilic cytoplasm and pyknotic, fragmented nuclei. These morphologic changes most likely indicate which of the following processes?
- (A) Apoptosis  
(B) Coagulation necrosis  
(C) Liquefaction necrosis  
(D) Mutagenesis  
(E) Tumor initiation
37. A 73-year-old woman comes to the physician because of a 2-month history of diffuse weakness and tingling of her arms and legs. Neurologic examination shows weakness of the extensor and flexor muscles of the lower extremities. Knee and ankle deep tendon reflexes are exaggerated. Sensation to vibration and position is decreased in all extremities, but the decrease is more prominent in the lower extremities than in the upper extremities. This patient most likely has a deficiency of which of the following vitamins?
- (A) Niacin  
(B) Vitamin B<sub>1</sub> (thiamine)  
(C) Vitamin B<sub>2</sub> (riboflavin)  
(D) Vitamin B<sub>6</sub> (pyridoxine)  
(E) Vitamin B<sub>12</sub> (cyanocobalamin)



38. A comatose 35-year-old man is admitted to the hospital after being involved in a motorcycle collision. He is intubated and mechanically ventilated. He dies 8 weeks later. A photomicrograph of tracheal tissue obtained at autopsy is shown. Which of the following processes best describes these findings?
- (A) Atrophy
  - (B) Dysplasia
  - (C) Hyperplasia
  - (D) Hypertrophy
  - (E) Metaplasia
  - (F) Neoplasia

39. 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)  $\alpha_1$ -Adrenergic
- (B)  $\beta_2$ -Adrenergic
- (C) Ganglionic nicotinic
- (D) Nicotinic receptor at the neuromuscular junction
- (E) Serotonergic

40. A 26-year-old woman is brought to the emergency department 3 hours after ingesting approximately 50 tablets of aspirin in a suicide attempt. She is nauseated, confused, and sleepy. Her pulse is 130/min, respirations are 30/min, and blood pressure is 100/60 mm Hg. Which of the following sets of laboratory values is most likely on evaluation of blood obtained before treatment?

	Serum $\text{HCO}_3^-$	Arterial Blood pH	Arterial Blood $\text{PCO}_2$
(A)	↑	↓	↑
(B)	↓	↓	↓
(C)	↑	↑	↓
(D)	↓	↓	↑
(E)	↑	↑	↑

41. A 43-year-old woman comes to the physician because she has not had a menstrual period for 3 months. Vital signs are normal. Examination of the breasts shows expressible galactorrhea bilaterally; there is no tenderness. Examination of external genitalia shows no abnormalities. The vaginal mucosa is pink and moist. There is a small cervical os with no lesions, drainage, or tenderness; cervical mucus is consistent with the proliferative phase. The uterus is small, nontender, and slightly posterior. Examination of the adnexa shows no masses or tenderness. Serum studies show:

Thyroid-stimulating hormone	2.1 $\mu\text{U}/\text{mL}$
Thyroxine ( $\text{T}_4$ )	1.1 $\mu\text{g}/\text{dL}$
Estradiol	20 $\text{pg}/\text{mL}$ (N=30–400)
Follicle-stimulating hormone	1 $\text{mIU}/\text{mL}$
Luteinizing hormone	1 $\text{mIU}/\text{mL}$
Prolactin	60 $\text{ng}/\text{mL}$

Which of the following is the most likely cause of the amenorrhea in this patient?

- (A) Adrenal 17 $\alpha$ -hydroxylase deficiency
- (B) Decreased prolactin release from the pituitary gland
- (C) Lesion of the infundibular stalk
- (D) Menopause
- (E) Pregnancy

42. A full-term female newborn is examined shortly after birth. She appears to be small for gestational age, and she has excess skin on the nape of the neck and lymphedema of the hands and feet. Chromosomal analysis shows some cells with a normal 46,XY karyotype and some cells with a 45,X karyotype. Which of the following mechanisms best explains this cytogenetic abnormality?
- (A) Nondisjunction in mitosis
  - (B) Reciprocal translocation
  - (C) Robertsonian translocation
  - (D) Skewed X-inactivation
  - (E) Uniparental disomy
43. A 46-year-old woman receives a non-T-lymphocyte-depleted, allogeneic bone marrow transplant from a matched, unrelated donor. Immunosuppressive therapy with cyclosporine is started. One month later, she has fever. Cytolytic destruction of the skin, gastrointestinal tract, and liver is seen, with associated dermatitis, enteritis, and hepatitis. Which of the following best explains these findings?
- (A) C3b deposition
  - (B) Cytomegalovirus infection
  - (C) Graft-versus-host disease
  - (D) Tolerance induction
  - (E) Type I (immediate) hypersensitivity
44. A 5-year-old girl is brought to the emergency department because of fever and severe abdominal pain. Acute appendicitis is diagnosed. In the examination room, she keeps her right hip flexed and resists active extension of the hip. The inflamed structure associated with these symptoms is most likely in contact with which of the following structures?
- (A) Abdominal wall and the external oblique muscle
  - (B) Obturator internus muscle
  - (C) Psoas major muscle
  - (D) Quadratus lumborum muscle
  - (E) Transversus abdominis muscle
45. 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

46. 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:

	<b>Day 1</b>	<b>Day 3</b>
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 <sup>+</sup>	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)

## SAMPLE ITEMS

### BLOCK 2, ITEMS 47-92

47. A 74-year-old man comes to the physician for a follow-up examination. He has a 3-month history of severe pain and swelling of the metacarpophalangeal joints, wrists, elbows, and knees. Previous treatment with aspirin, methotrexate, and naproxen has not relieved his symptoms. He has one kidney. Physical examination shows no other abnormalities. His serum rheumatoid factor is increased, and serum creatinine concentration is 3.8 mg/dL. Which of the following is the most appropriate pharmacotherapy?

- (A) Acetaminophen
- (B) Colchicine
- (C) Etanercept
- (D) Gold salts
- (E) Indomethacin

48. A previously healthy 32-year-old woman who works as a nurse comes to the emergency department because of a 3-week history of episodes of dizziness, nausea, and profuse sweating that resolve with eating. She does not smoke. She drinks four glasses of wine weekly. Vital signs are within normal limits. Physical examination shows no abnormalities. While in the emergency department, she becomes dizzy and diaphoretic; and her serum glucose concentration is 45 mg/dL. Laboratory studies obtained during the episode show:

Serum	
Glucose	35 mg/dL
C peptide	0.5 ng/mL (N=0.5–2.5)
Insulin	20 $\mu$ U/mL (N=5–20)
Cortisol	10 $\mu$ g/dL
Urine sulfonylurea	negative

Which of the following is the most likely site of a tumor in this patient?

- (A) Adrenal cortex
- (B) Adrenal medulla
- (C) Pancreas
- (D) Parathyroid gland
- (E) Pituitary gland
- (F) Thyroid gland

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

Serum	
Na <sup>+</sup>	141 mEq/L
Cl <sup>-</sup>	85 mEq/L
K <sup>+</sup>	2.1 mEq/L
HCO <sub>3</sub> <sup>-</sup>	35 mEq/L
Urine	
Na <sup>+</sup>	80 mEq/24 h
K <sup>+</sup>	170 mEq/24 h

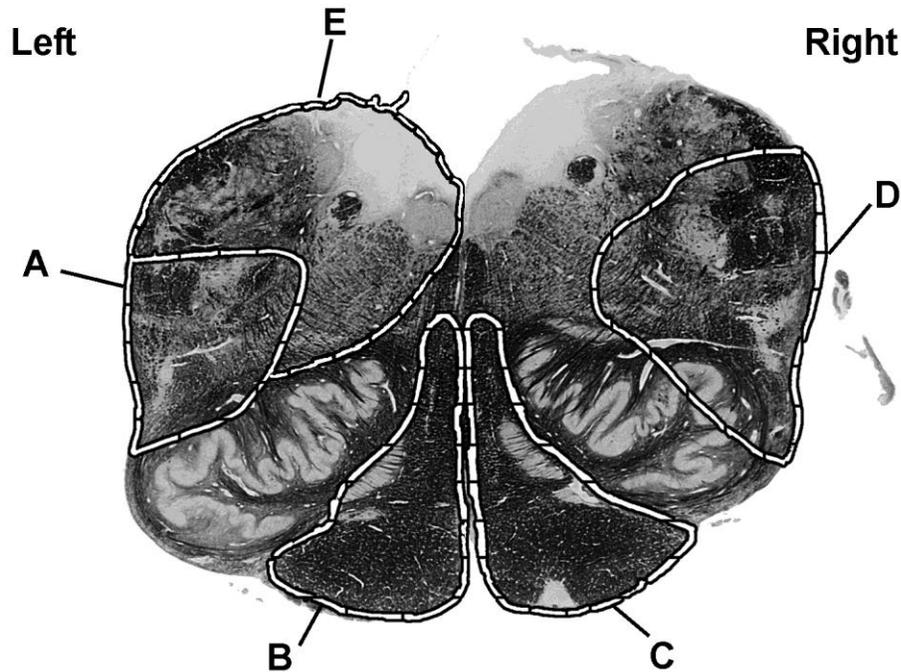
Which of the following is the most likely diagnosis?

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

50. A 15-year-old girl is brought to the physician by her mother because of an 8-month history of fatigue; she has had a 6.8-kg (15-lb) weight gain during this period. The mother states that her daughter has been depressed for the past 2 months and recently failed a subject in school because she did not have the energy to complete a book report. The patient's dog died 3 months ago. Her mother has major depressive disorder treated with paroxetine. The patient is 152 cm (5 ft) tall and weighs 68 kg (150 lb); BMI is 29 kg/m<sup>2</sup>. Her pulse is 50/min, and blood pressure is 100/50 mm Hg. Physical examination shows thinning hair and dry skin. Mental status examination shows a goal-oriented thought process and a depressed mood. Which of the following is the most likely cause of these findings?

- (A) Adjustment disorder
- (B) Bulimia nervosa
- (C) Chronic fatigue syndrome
- (D) Hypothyroidism
- (E) Major depressive disorder

51. A 68-year-old woman has the sudden onset of weakness in her right arm and leg. She can speak, but her words are not enunciated clearly. Neurologic examination 6 weeks later shows an extensor plantar reflex on the right. When she is asked to protrude her tongue, it deviates to the left, and the muscle in the left side of the tongue shows considerable atrophy. Which of the following labeled areas in the transverse sections of the brain stem is most likely damaged?



52. A 6-year-old boy is brought to the physician by his parents because of a 3-day history of fever, headache, and cough productive of a green, foul-smelling discharge that also exits from his nose. He has had repeated episodes of similar symptoms during the past 4 years. He appears pale and lethargic. His height and weight are both below the 10th percentile. Coarse rhonchi are heard bilaterally. An x-ray of the chest shows scattered peripheral opacities, dilated and thickened airways consistent with bronchiectasis, and a cardiac apex that is directed toward the right. The most likely cause of his recurrent infections is a dysfunction of which of the following cell types?
- (A) Alveolar capillary endothelial cell
  - (B) Alveolar macrophage
  - (C) Chondrocyte
  - (D) Ciliated columnar epithelial cell
  - (E) Clara cell
  - (F) Goblet cell
  - (G) Kulchitsky cell
  - (H) Squamous epithelial cell
  - (I) Type I pneumocyte
  - (J) Type II pneumocyte
53. A 76-year-old man comes to the emergency department because of a 12-hour history of fever and left lower quadrant abdominal pain. He has not passed a stool for the past 36 hours. His temperature is 38.3°C (100.9°F). A tender mass is palpable in the left lower quadrant of the abdomen. Stool is negative for occult blood. Laboratory studies show:
- |                 |   |
|-----------------|---|
| Hemoglobin      | 13 g/dL                                     |
| Leukocyte count | 17,000/mm <sup>3</sup><br>(84% neutrophils) |
| Platelet count  | 200,000/mm <sup>3</sup>                     |
| Serum amylase   | 115 U/L                                     |
| Urinalysis      | 0 to 1 WBC/hpf                              |
- An x-ray of the abdomen shows no abnormalities. The most likely diagnosis is an acute episode of which of the following disorders?
- (A) Cystitis
  - (B) Diverticulitis
  - (C) Infectious colitis
  - (D) Ischemic colitis
  - (E) Pyelonephritis

54. A 2-week-old female newborn delivered at term is brought to the physician by her mother because of an increasingly severe diaper rash since birth. No congenital anomalies were noted after delivery. Physical examination shows a red and swollen umbilical remnant that has not separated. There are ulcerations of the skin but no purulent exudate in the area of the diaper. A culture of one of the ulcers grows *Staphylococcus aureus*. Despite antibiotic therapy, 1 month later she develops a perirectal fissure, culture of which grows *Escherichia coli* but a smear of which shows scarce segmented neutrophils. Laboratory studies now show:

Hemoglobin	12.7 g/dL
Hematocrit	38%
Mean corpuscular volume	98 $\mu\text{m}^3$
Leukocyte count	89,790/mm <sup>3</sup>
Segmented neutrophils	89%
Bands	6%
Lymphocytes	3%
Monocytes	2%
Platelet count	249,000/mm <sup>3</sup>
Serum	
IgA	92 mg/dL
IgG	766 mg/dL
IgM	101 mg/dL

A peripheral blood smear shows normochromic, normocytic erythrocytes and leukocytes with normal morphology. This patient most likely has which of the following conditions?

- (A) Acute myelogenous leukemia
- (B) AIDS
- (C) Chédiak-Higashi syndrome
- (D) Common variable immunodeficiency
- (E) Leukocyte adhesion deficiency

55. A 70-year-old man is brought to the emergency department by his wife because of fever and shortness of breath for 2 days. He underwent an oral surgical procedure 6 weeks ago. His respirations are 22/min, and blood pressure is 140/60 mm Hg. A soft diastolic murmur is heard. The diagnosis of bacterial endocarditis is made. Gentamicin therapy is initiated. This patient is at increased risk for developing which of the following as a result of this therapy?

- (A) Cardiac ischemia
- (B) Hearing loss
- (C) Hyperglycemia
- (D) Lung infection
- (E) Torsades de pointes

56. 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	P <sub>CO<sub>2</sub></sub> (mm Hg)	HCO <sub>3</sub> <sup>-</sup> (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

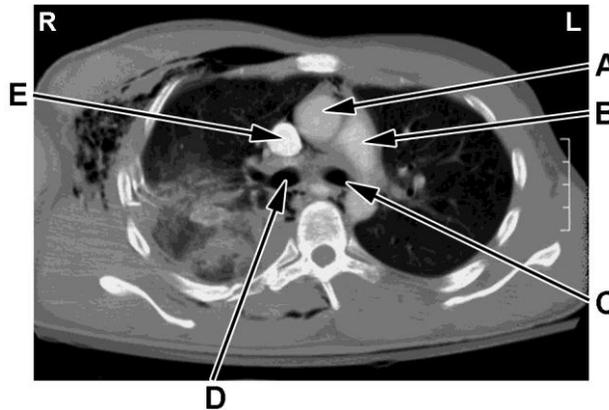
57. A 37-year-old man with pancreatic cancer is brought to the emergency department because of fever and muscle aches for 4 days. His temperature is 39.7°C (103.5°F), and blood pressure is 70/40 mm Hg. Physical examination shows no other abnormalities. Blood cultures grow lactose-positive, motile, gram-negative rods. Which of the following is the most likely cause of this patient's hypotension?

- (A) Endothelial cell cytotoxin
- (B) Endotoxin
- (C) Hemolysin
- (D) Protease
- (E) Superantigen

58. A 23-year-old man who is a graduate student comes to the physician because of a 3-month history of anxiety. He says that he has difficulty completing experiments in the laboratory and that he often worries about germs. He spends more than 2 hours daily cleaning his workbench with 50% hypochlorite solution to reduce his anxiety. He has persistent intrusive concerns that he will become infected while working with *Serratia marcescens* isolates. He becomes angry when others use his equipment or workbench. Physical examination shows no abnormalities. Which of the following is the most appropriate pharmacotherapy for this patient?

- (A) Amoxapine
- (B) Amoxicillin
- (C) Amphetamine
- (D) Carbamazepine
- (E) Chlorpromazine
- (F) Desipramine
- (G) Fluoxetine

59. A 26-year-old man is brought to the emergency department 45 minutes after sustaining multiple injuries in a motor vehicle collision. His respirations are 16/min. Examination of the right side of the chest shows crepitations, tenderness to palpation of the ribs, and decreased breath sounds. Chest x-rays confirm several rib fractures, a pulmonary contusion, and a right pneumothorax. A chest tube is inserted to reinflate the right lung. A contrast-enhanced CT scan of the chest is shown. Which of the following labeled structures best identifies the superior vena cava?



60. 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
61. 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
62. A 45-year-old man has a left ventricular ejection fraction of 25% ( $N > 55\%$ ) with diffuse hypokinesia. He has a sedentary lifestyle. 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  $\text{kg}/\text{m}^2$ . 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
63. 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

The genetic code

First position (5' end)	Second position				Third position (3' end)
	U	C	A	G	
U	Phe	Ser	Tyr	Cys	U C A G
	Phe	Ser	Tyr	Cys	
	Leu	Ser	Stop	Stop	
	Leu	Ser	Stop	Trp	
C	Leu	Pro	His	Arg	U C A G
	Leu	Pro	His	Arg	
	Leu	Pro	Gln	Arg	
	Leu	Pro	Gln	Arg	
A	Ile	Thr	Asn	Ser	U C A G
	Ile	Thr	Asn	Ser	
	Ile	Thr	Lys	Arg	
	Met	Thr	Lys	Arg	
G	Val	Ala	Asp	Gly	U C A G
	Val	Ala	Asp	Gly	
	Val	Ala	Glu	Gly	
	Val	Ala	Glu	Gly	

64. During an experiment, an investigator finds a point mutation (CGG→TGG) in the gene encoding the protein kinase regulatory subunit. The genetic code is shown in the figure. This mutation is most likely to alter the amino acid sequence with which of the following changes?

- (A) Arg→Trp
- (B) Gly→Arg
- (C) Gly→Trp
- (D) Thr→Gly
- (E) Trp→Arg

65. A 30-year-old man is brought to the emergency department 30 minutes after being stung by several wasps. He is confused and has difficulty breathing. His temperature is 38°C (100.4°F), pulse is 122/min, respirations are 34/min, and blood pressure is 80/40 mm Hg. Physical examination shows dry skin and decreased capillary refill. There are multiple erythematous, inflamed marks on the back and 1+ pitting edema of the ankles. In addition to the administration of 0.9% saline, the most appropriate next step in management is administration of which of the following?

- (A) Atropine
- (B) Captopril
- (C) Epinephrine
- (D) Losartan
- (E) Methacholine
- (F) Whole blood

66. 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

67. A 25-year-old man is brought to the emergency department because of a 1-week history of fever and cough productive of purulent sputum. His temperature is 38.9°C (102°F), pulse is 110/min, respirations are 24/min, and blood pressure is 110/70 mm Hg. Crackles, decreased breath sounds, and decreased fremitus are present in the right lower lobe. A chest x-ray shows a pleural effusion over the lower third of the thorax on the right in the midscapular line. A thoracentesis is scheduled. Which of the following locations in the midscapular line in this patient would be most appropriate for insertion of the needle during this procedure?

- (A) Above the 2nd rib
- (B) Below the 2nd rib
- (C) Above the 5th rib
- (D) Below the 5th rib
- (E) Above the 9th rib
- (F) Below the 9th rib

68. 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



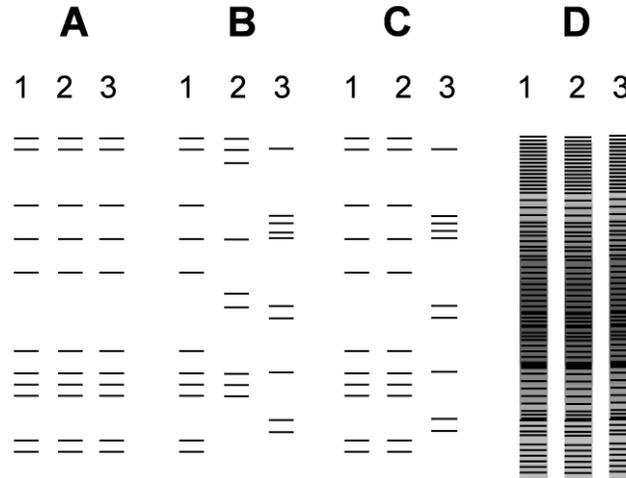
69. A 47-year-old man comes to the physician because of a 4-day history of pain in his left foot that began when he tripped over a curb. He has a 25-year history of type 2 diabetes mellitus. Examination of the left foot shows tenderness to palpation of the medial aspect of the left great toe and a decreased dorsal pedal pulse. The x-ray shown was taken to detect any fractures. No fracture is seen, but the arrow indicates calcification of which of the following structures?
- Extensor digitorum longus tendon
  - First dorsal metatarsal artery
  - Long plantar ligament
  - Skin
  - Sural nerve
- 
70. 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?
- Breast abscess with scarring
  - Fibroadenoma
  - Fibrocystic change
  - Infiltrating mammary carcinoma
  - Traumatic fat necrosis
71. A previously healthy 36-year-old man comes to the emergency department 12 hours after the sudden onset of increasingly severe abdominal pain. He recently returned from a 3-week sailing trip around Central America and several Caribbean islands. His temperature is 38.3°C (100.9°F), pulse is 96/min, respirations are 18/min, and blood pressure is 130/72 mm Hg. Abdominal examination shows right lower quadrant tenderness. His leukocyte count is 12,200/mm<sup>3</sup> (70% segmented neutrophils, 6% bands, 1% eosinophils, 20% lymphocytes, and 3% monocytes). Exploratory laparotomy and an appendectomy are done. Examination of the appendix shows multiple mucosal ulcers. Unicellular microorganisms are seen within the exudates at the base of the ulcers. Some of the microorganisms contain erythrocytes. Which of the following is the most likely source of this patient's infection?
- Being bitten by a sand fly
  - Infection from a sexual partner
  - Mosquito bite
  - Undercooked freshwater fish
  - Undercooked saltwater fish
  - Water contaminated by human feces
  - Water contaminated by infected snails
72. 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?
- Asthmatic bronchitis
  - Bullous emphysema
  - Chronic bronchitis
  - Congestive heart failure
  - Lobar pneumonia
  - Pleural effusion
  - Pleuritis
  - Pneumothorax
  - Pulmonary embolism

73. A 10-year-old boy is brought to the emergency department because of vomiting for 6 hours. He has had excessive thirst and excretion of large amounts of urine for 3 weeks. His pulse is 120/min, and respirations are 32/min. Physical examination shows sunken eyes and diminished skin turgor. Serum studies show hyperglycemia, ketosis, and metabolic acidosis. Urine studies show glucose and ketones. Which of the following sets of hepatic findings is most likely in this patient?

	<b>Protein Kinase A</b>	<b>Phosphoprotein Phosphatase</b>	<b>cAMP</b>
(A)	↑	↑	↓
(B)	↑	↓	↑
(C)	↑	↓	↓
(D)	↓	↑	↑
(E)	↓	↓	↑
(F)	↓	↓	↓

74. 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
75. A 15-year-old girl is brought to the physician because of a 3-week history of excessive thirst and voiding excessive amounts of urine. She shows no signs of kidney damage, and she is not taking any medications. Physical examination shows no abnormalities. She undergoes an 8-hour water deprivation test. She is also given 5 units of ADH (vasopressin), subcutaneously. Under both conditions, she continues to produce large volumes of dilute urine. Her symptoms are most likely due to a relative lack of which of the following proteins from the apical membranes of collecting duct epithelial cells?
- (A) Aquaporin  
 (B) Epithelial  $\text{Na}^+$  channel  
 (C)  $\text{Na}^+-\text{K}^+$ -ATPase  
 (D)  $\text{Na}^+-\text{K}^+-2\text{Cl}^-$  cotransporter  
 (E) Urea transporter
76. A 37-year-old woman comes to the physician because of a 2-month history of pain with movement of her hands and feet. Physical examination shows warmth and swelling of the metacarpophalangeal and metatarsophalangeal joints. Laboratory studies show increased titers of antibodies to Fc component of IgG and a negative antinuclear antibody test result. A drug is prescribed that binds to tumor necrosis factor- $\alpha$  (TNF- $\alpha$ ) and blocks its interaction with cell-surface TNF receptors. Her symptoms improve within 1 month. She is most likely receiving treatment with which of the following drugs?
- (A) Adalimumab  
 (B) Anakinra  
 (C) Gold  
 (D) Methotrexate  
 (E) Prednisone
77. A 6-year-old boy with glioblastoma has a recurrence of the tumor despite aggressive treatment. The physician discusses the patient's prognosis with his parents and recommends palliative care. The parents ask how they should talk with their son about his prognosis and possible death. The physician advises that the parents should be honest and follow the patient's lead during the conversation. This patient most likely has which of the following concepts of death?
- (A) Being asleep  
 (B) Being final  
 (C) Being a long journey  
 (D) Being a temporary separation from his parents  
 (E) No understanding of death

78. A 25-year-old woman comes to the physician because of a 10-year history of frequent occurrences of fever blisters. Physical examination shows perioral vesicles. Microscopic examination of culture of scrapings from three vesicles shows herpes simplex virus 1. Which of the following patterns in the figure shown was most likely observed when the viral DNA from the cultures was examined by restriction enzyme analysis on polyacrylamide gels?



79. A 26-year-old man who is HIV positive has a CD4+ T-lymphocyte count of 250/mm<sup>3</sup> (N<sub>500</sub>). 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
80. 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
81. An 84-year-old woman who resides in an assisted living facility is brought to the emergency department because of fever and cough for 1 week. The cough has been productive of foul-smelling, yellow-green sputum for 24 hours. She has a 2-year history of dementia, Alzheimer type. Her temperature is 38.5°C (101.3°F), pulse is 80/min, respirations are 20/min, and blood pressure is 116/66 mm Hg. Coarse inspiratory crackles are heard over the right lung field. Laboratory studies show a leukocyte count of 13,500/mm<sup>3</sup> (72% segmented neutrophils, 8% bands, 1% eosinophils, 16% lymphocytes, and 3% monocytes). A CT scan shows a cavitory lesion in the superior segment of the right lower lobe. The lesion has a thick wall and an irregular peripheral margin; there is no displacement of the adjacent bronchovascular bundle. Which of the following is the most likely cause of the lung lesion in this patient?
- (A) Antecedent viral pneumonia
  - (B) Aspiration of gastric contents
  - (C) Bronchial obstruction by metastatic carcinoma
  - (D) Lung infarction secondary to arterial thrombosis
  - (E) Primary carcinoma of the lung
  - (F) Secondary infection of a congenital lung cyst
  - (G) Septic embolism from an extrapulmonary site

82. 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

83. 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

84. 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

85. 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 S<sub>3</sub> gallop, and no murmur. There is 3+ pitting edema of the lower extremities. Serum studies show:

Na <sup>+</sup>	126 mEq/L
K <sup>+</sup>	5.4 mEq/L
Cl <sup>-</sup>	108 mEq/L
HCO <sub>3</sub> <sup>-</sup>	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

86. A 12-year-old girl is brought to the emergency department by her parents because of a 3-day history of fever and a 12-hour history of lethargy. Her parents say that she has been sleeping most of the day and has been unresponsive when awake. Her temperature is 39.2°C (102.6°F). Physical examination shows numerous petechial hemorrhages and nuchal rigidity. A lumbar puncture yields cloudy cerebrospinal fluid (CSF) that clots in the collection tube. Microscopic examination of the CSF shows numerous segmented neutrophils, and a Gram stain shows gram-negative diplococci. Which of the following is the most likely causal organism?

- (A) *Haemophilus influenzae*
- (B) *Mycoplasma pneumoniae*
- (C) *Neisseria meningitidis*
- (D) *Salmonella typhi*
- (E) *Streptococcus pneumoniae*

87. 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)	↑	↑	↓

88. 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

89. 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

90. 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

91. A healthy 28-year-old woman comes to the physician for advice on losing weight. She is 150 cm (4 ft 11 in) tall and weighs 56 kg (124 lb); BMI is 25 kg/m<sup>2</sup>. Physical examination shows no other abnormalities. The physician recommends a diet that will restrict her daily intake by 500 kilocalories. Which of the following processes is most likely to increase in this patient as a result of following this diet?

- (A) Adipocyte glucose uptake
- (B) Cerebral ketone utilization
- (C) Hepatic lipid oxidation
- (D) Muscle glucose uptake
- (E) Resting energy expenditure

92. An 18-year-old woman comes to the physician for a health maintenance examination. She has not had major medical illnesses. She takes no medications. She does not smoke cigarettes, drink alcohol, or use illicit drugs. Physical examination shows diffuse brownish yellow discoloration of all teeth. Which of the following most likely occurred during childhood to cause this finding?

- (A) Amelogenesis imperfecta
- (B) Dentinogenesis imperfecta
- (C) Rh incompatibility
- (D) Syphilis
- (E) Tetracycline use
- (F) Vitamin D deficiency

## SAMPLE ITEMS

### BLOCK 3, ITEMS 93-138

93. A 29-year-old man is brought to the physician for removal of a cast from his left leg. He sustained a fracture of the left lower extremity 6 weeks ago and was immobilized in a cast that extended from just below the knee to the foot. At the time of injury, there was severe pain but normal strength in the extremity. When the cast is removed today, physical examination shows a pronounced left footdrop with paresthesia and sensory loss over the dorsum of the left foot and lateral leg. Injury to which of the following nerves is the most likely cause of this patient's condition?
- (A) Common fibular (peroneal)
  - (B) Femoral
  - (C) Obturator
  - (D) Sciatic
  - (E) Tibial
94. A 15-year-old girl who is a ballet dancer has not had a menstrual period for the past 3 months. Menses were previously regular at 29-day intervals. She has lost weight over the past year; her weight is 70% of that expected for her height. She is afebrile and has purpuric lesions on her extremities and trunk. Platelet, absolute neutrophil, and lymphocyte counts are below the reference range. She has macrocytic anemia. The most likely cause of these symptoms is a deficiency of which of the following nutrients?
- (A) Folic acid
  - (B) Iron
  - (C) Linoleic acid
  - (D) Magnesium
  - (E) Niacin
  - (F) Protein
  - (G) Vitamin A
  - (H) Vitamin B<sub>6</sub> (pyridoxine)
  - (I) Vitamin C
  - (J) Vitamin D
  - (K) Vitamin E
  - (L) Vitamin K
  - (M) Zinc
95. 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
96. 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
97. A 33-year-old woman contracts malaria while on a 3-month business trip to a Central American country. She is treated with a full course of chloroquine and recovers uneventfully. Four months after returning to the USA, she has another febrile illness that resembles malaria. A peripheral blood smear shows ring forms in her erythrocytes. Which of the following species of *Plasmodium* is most likely to have caused the second febrile illness?
- (A) *P. falciparum*
  - (B) *P. knowlesii*
  - (C) *P. malariae*
  - (D) *P. vivax*



98. 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

99. 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

100. 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 $\mu\text{m}^3$

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)  $\beta$ -Thalassemia minor
- (E) Pernicious anemia

101. 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

102. 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) apoE- $\epsilon$ 4
- (D) LDL receptor
- (E) VLDL receptor



103. A 64-year-old man comes to the physician because of swelling in his feet for the past 2 years. He says that his skin is dry and itchy and his feet "feel heavy." One of his legs is shown. Which of the following is the most likely cause of his condition?

- (A) Arteriolar constriction and arteriolar hypertension
- (B) Arteriolar dilation and venous hypertension
- (C) Venous constriction and arteriolar constriction
- (D) Venous hypertension and incompetent valves
- (E) Venous hypertension and venous constriction

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104. 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

105. 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

106. 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<sub>1c</sub> 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

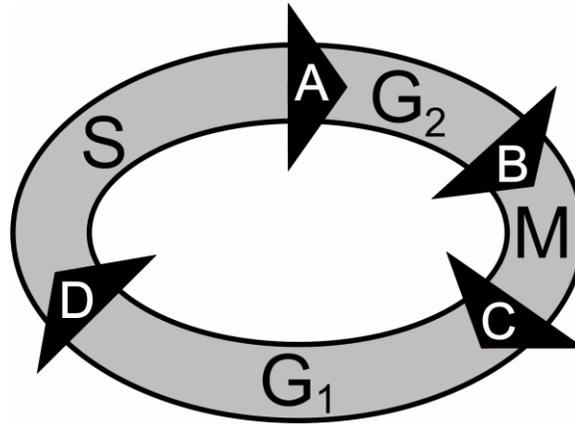
107. Investigators are studying the use of a new laboratory test to identify patients with a particular disease. The table below summarizes the results of initial research involving 200 subjects.

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

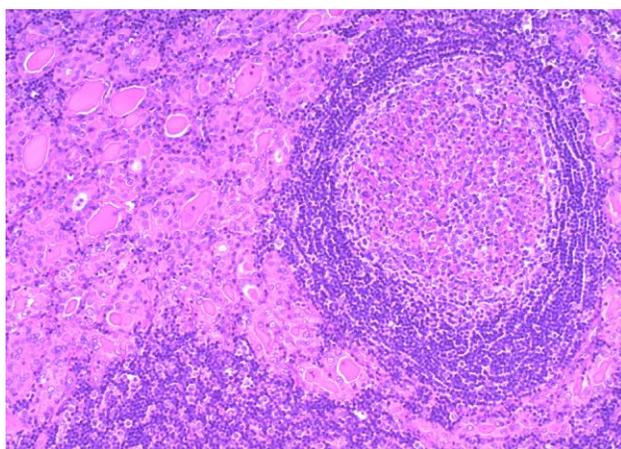
Which of the following is the approximate sensitivity of a positive test result?

- (A) 0.30  
 (B) 0.33  
 (C) 0.60  
 (D) 0.67  
 (E) 0.75
- 
108. A 48-year-old man has hepatic cancer that is unresponsive to standard therapy. He enrolls in a clinical study of a novel chemotherapeutic agent that, as a side effect, blocks kinesin, a component of the cellular microtubular transport system. One week later, he develops skeletal muscle weakness. An alteration in which of the following components of the neuromuscular junction is the most likely cause of the muscle weakness?
- (A) A decrease in the number of postsynaptic neurotransmitter receptors  
 (B) A decrease in the number of presynaptic neurotransmitter vesicles  
 (C) A decrease in the presynaptic neuron calcium permeability  
 (D) Impaired  $\alpha$ -motoneuron action potential conduction  
 (E) Impaired skeletal muscle action potential conduction
109. 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
110. 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
111. 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

112. A previously healthy 8-month-old boy is brought to the physician because his eyes have been crossed for 6 days. His mother recalls that her maternal grandfather wore an eye patch. Ophthalmologic examination under general anesthesia shows a solitary retinal tumor of the right eye approximately 2 optic disc diameters with calcifications and vitreous seedings. Physical examination shows strabismus and white pupillary reflex in the right eye. Molecular analysis of the tumor shows two faulty copies of a gene for a protein that serves as an important inhibitor of cell-cycle progression. This regulatory protein normally exerts its effect in preventing this uncontrolled growth at which of the following labeled points in the diagram shown?



113. A 16-year-old boy is brought to the physician for a routine examination. He has a lifelong history of developmental delays and unusual movements such as hand flapping. He has a meager vocabulary. Two maternal uncles have mental retardation. Physical examination shows coarse facial features and macro-orchidism. DNA testing shows an expansion of a trinucleotide repeat. The patient comes from a family of four daughters. If the parents appear healthy, on average how many of their daughters are most likely carriers of this gene mutation?
- (A) 0  
(B) 1  
(C) 2  
(D) 3  
(E) 4
114. A 23-year-old woman has a progressive increase in her serum  $\beta$ -human chorionic gonadotropin ( $\beta$ -hCG) concentrations during an 8-week period. A hydatidiform mole is removed, but the  $\beta$ -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
115. 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
116. 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



117. A 40-year-old woman comes to the physician because of sluggishness and cold intolerance for 3 months. Five years ago, she had diffuse thyroid gland enlargement with histology as shown in the photomicrograph. One year later, the size of the gland had decreased. She has gained 10 kg (22 lb) during the past 5 years. Physical examination now shows no palpable thyroid gland. Serum studies show:

	<b>On Initial Visit</b>	<b>5 Years Later</b>
Thyroid-stimulating hormone	1 $\mu\text{U}/\text{mL}$	10 $\mu\text{U}/\text{mL}$
Thyroxine ( $\text{T}_4$ )	5.5 $\mu\text{g}/\text{dL}$	3.2 $\mu\text{g}/\text{dL}$
Thyroid-peroxidase antibody	8 IU/mL (N=0–2)	9 IU/mL

Which of the following is the most likely diagnosis?

- (A) Chronic autoimmune (Hashimoto) thyroiditis
- (B) Diffuse nontoxic goiter
- (C) Diffuse toxic goiter (Graves disease)
- (D) Follicular carcinoma
- (E) Papillary carcinoma
- (F) Riedel thyroiditis
- (G) Subacute granulomatous thyroiditis

118. A 55-year-old man is brought to the emergency department because of a 4-hour history of temperatures to  $39.4^\circ\text{C}$  ( $103^\circ\text{F}$ ). He has completed four courses of chemotherapy for lung cancer. Physical examination shows no other abnormalities. Combination intravenous antibiotic therapy is started, but the patient does not significantly improve. A chest x-ray shows a new pulmonary infiltrate. Bronchoalveolar lavage and a lung biopsy specimen confirm a diagnosis of aspergillosis. A regimen of amphotericin B is started. This patient is most likely to develop which of the following adverse effects?

- (A) Dermal necrosis
- (B) Liver toxicity
- (C) Renal impairment
- (D) Retinal damage
- (E) Vestibular toxicity

119. A 63-year-old woman is brought to the physician because of blurred vision in the right eye for 1 day. She also has had a right-sided headache for the past week and fever with fatigue for the past 2 weeks. Physical examination shows a vessel along the right temple that is nodular and tender. Histologic examination of the vessel shows multinucleated histiocytes infiltrating the wall of a medium-sized artery. Which of the following is the most appropriate next step in management?

- (A) Administration of a  $\beta$ -adrenergic blocking agent
- (B) Administration of a corticosteroid
- (C) Administration of sulfone
- (D) Cranial angiography
- (E) Surgical removal of the involved vessel

120. 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?

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

121. A previously healthy 3-month-old boy is brought to the physician because of a runny nose and a dry cough for 2 days. Physical examination shows tachypnea, a nasal discharge, and wheezing. An x-ray of the chest shows hyperexpansion but no infiltrates. The causal virus was most likely transmitted by which of the following routes?

- (A) Blood transfusion
- (B) Ingestion of contaminated formula
- (C) Inoculation onto mucous membranes
- (D) Insect bite
- (E) Transplacental transfer

123. 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

122. A 40-year-old woman comes to the physician because of pain in the region of her left jaw, left-sided earache, and headache for 3 days. The patient has not had any trauma to her face or jaw but says she often grinds her teeth. She is concerned because she is a singer, and it is painful when she opens her mouth wide to sing. There is also a clicking sound when she opens her mouth. Physical examination shows the left side of the jaw deviating slightly to the left on elevation. The area around the left mandibular condyle is painful on palpation. Mandibular depression is difficult to perform because of pain. This movement also elicits an audible clicking sound. There is tightness indicative of a muscle spasm along the left mandibular ramus. Palpation shows no other area of tightness. Spasms of which of the following muscles are most likely associated with this condition?

- (A) Buccinator
- (B) Masseter
- (C) Mylohyoid
- (D) Posterior belly of the digastric
- (E) Superior pharyngeal constrictor

124. 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*

125. 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

126. 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 <sup>+</sup>	110 mEq/L
Cl <sup>-</sup>	72 mEq/L
K <sup>+</sup>	4.5 mEq/L
HCO <sub>3</sub> <sup>-</sup>	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

127. A 6-week-old male infant is brought to the emergency department because of a swollen abdomen. He is refusing to eat and has not had a bowel movement for 3 days. His mother says that he had constipation since birth and was kept in the hospital an extra day after birth because of delayed passage of stool. Physical examination shows abdominal distention. An x-ray of the abdomen shows distended loops of proximal bowel with an abrupt narrowing to a small caliber of the distal 15-cm segment of colon. Which of the following pathologic findings is most likely in a biopsy specimen of the distal rectum in this patient?

- (A) Absent myenteric ganglion cells
- (B) Abundant inspissated mucus
- (C) Hypertrophy of the muscle wall
- (D) Nodular lymphoid hyperplasia
- (E) Transmural coagulative necrosis

128. 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

129. A 52-year-old man comes to the emergency department because he has had vomiting, nausea, and abdominal pain for the past 12 hours. He says he attempted suicide 3 days ago by "taking everything in the medicine cabinet." He was stuporous for approximately 12 hours after the overdose but felt better the following day. At this time, he has jaundice and pain in the right upper quadrant. Which of the following drugs is most likely to have caused the pain, vomiting, and jaundice?

- (A) Acetaminophen
- (B) Aspirin
- (C) Cimetidine
- (D) Diphenhydramine
- (E) Triazolam

130. A previously healthy 48-year-old man comes to the physician because of fever and cough for 2 days. He attended a convention 10 days ago, and two of his friends who stayed in the same hotel have similar symptoms. His temperature is 38.3°C (101°F), pulse is 76/min, respirations are 20/min, and blood pressure is 130/70 mm Hg. Crackles are heard over the right lung base. A chest x-ray shows a patchy infiltrate in the right lower lobe. A Gram stain of sputum shows segmented neutrophils and small gram-negative rods that stain poorly. A sputum culture grows opal-like colonies on yeast extract. Which of the following is the most likely causal organism?

- (A) *Campylobacter jejuni*
- (B) *Eikenella corrodens*
- (C) *Legionella pneumophila*
- (D) *Proteus mirabilis*
- (E) *Pseudomonas aeruginosa*

131. 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
132. 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
133. 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
134. A 2-year-old girl is brought to the emergency department because of pain in her right forearm after a fall 1 hour ago. She has a history of fractures of the left femur and right tibia. Physical examination shows blue sclerae. There is tenderness to palpation over the distal right radius. A mutation in which of the following genes is the most likely cause of the recurrent fractures in this patient?
- (A) Calcitonin
  - (B) Collagen, type I
  - (C)  $1\alpha$ -Hydroxylase
  - (D) Parathyroid hormone
  - (E) Vitamin D receptor
135. A 25-year-old man comes to the physician because of progressive weakness and an increasingly protuberant abdomen during the past 3 years. Physical examination shows splenomegaly. His hematocrit is 28%, and platelet count is  $20,000/\text{mm}^3$ . A biopsy specimen of bone marrow shows accumulation of lipid-laden macrophages. Glucocerebroside has accumulated in the patient's reticuloendothelial cells (macrophage system). Inheritance of mutant alleles most likely caused impairment of which of the following enzyme activities in this patient?
- (A) Ceramidase
  - (B)  $\alpha$ -Galactosidase
  - (C)  $\beta$ -Glucosidase
  - (D) Hexosaminidase
  - (E)  $\alpha$ -L-Iduronidase
  - (F) Sphingomyelinase
136. 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

137. 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
138. 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*

## Answer Form for Step 1 Sample Questions

### Block 1 (Questions 1-46)

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.	___		
8.	___	18.	___	28.	___	38.	___		
9.	___	19.	___	29.	___	39.	___		
10.	___	20.	___	30.	___	40.	___		

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### Block 2 (Questions 47-92)

47.	___	57.	___	67.	___	77.	___	87.	___
48.	___	58.	___	68.	___	78.	___	88.	___
49.	___	59.	___	69.	___	79.	___	89.	___
50.	___	60.	___	70.	___	80.	___	90.	___
51.	___	61.	___	71.	___	81.	___	91.	___
52.	___	62.	___	72.	___	82.	___	92.	___
53.	___	63.	___	73.	___	83.	___		
54.	___	64.	___	74.	___	84.	___		
55.	___	65.	___	75.	___	85.	___		
56.	___	66.	___	76.	___	86.	___		

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### Block 3 (Questions 93-138)

93.	___	103.	___	113.	___	123.	___	133.	___
94.	___	104.	___	114.	___	124.	___	134.	___
95.	___	105.	___	115.	___	125.	___	135.	___
96.	___	106.	___	116.	___	126.	___	136.	___
97.	___	107.	___	117.	___	127.	___	137.	___
98.	___	108.	___	118.	___	128.	___	138.	___
99.	___	109.	___	119.	___	129.	___		
100.	___	110.	___	120.	___	130.	___		
101.	___	111.	___	121.	___	131.	___		
102.	___	112.	___	122.	___	132.	___		

## Answer Key for Step 1 Sample Questions

### Block 1 (Questions 1-46)

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

### Block 2 (Questions 47-92)

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

### Block 3 (Questions 93-138)

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