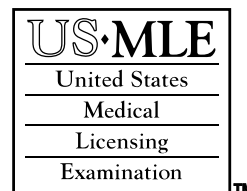


STEP 1

2004 USMLE™

content description and sample test materials

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



Copyright © 2003 by the Federation of State Medical Boards of the United States, Inc. and the National Board of Medical Examiners® (NBME®). All rights reserved. Printed in the United States of America. The USMLE™ is a joint program of the Federation of State Medical Boards of the United States, Inc. and the National Board of Medical Examiners.

CONTENTS

| | |
|--|----|
| Introduction | 3 |
| Preparing for the Test, Applying for the Test, Scheduling Test Dates, and Testing | 3 |
| Examination Content | 3 |
| Step 1 Test Question Format | 4 |
| Content Outline | 5 |
| Sample Step 1 | 20 |
| Normal Laboratory Values | 21 |
| Answer Form for Sample Step 1 | 23 |
| Test Questions for Sample Step 1 | 24 |
| Answer Key for Sample Step 1 | 49 |

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 2004. *Eligibility periods* are explained on page 12 of the *2004 USMLE Bulletin of Information*, with which you must become familiar to apply for the examination. In addition to reading the *Bulletin*, you should run the sample Step 1 test materials and tutorials provided at the USMLE website or by your registration entity on CD.

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

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

In addition to the information in this booklet, you should review the sections that appear on pages 9-19 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 the same as those provided in computer format at the USMLE website and on CD, you must run the tutorial and sample materials to become familiar with the test software prior to your test date.

The Step 1 examination consists of questions ("test items") presented in standard multiple-choice formats, as described on page 4 of this booklet. The test items are divided into "blocks" (see Test Lengths and Formats on page 9 of 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.

Other computer interface features include clickable icons for marking questions to be reviewed, automated review of marked and incomplete questions, a clock indicating the time remaining, and a help application. This will provide examinees with a realistic understanding of the computer interface and timing of the examination.

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 Format

Single One Best Answer Questions

Step 1 includes only single questions with one best answer. This is the traditional, most frequently used multiple-choice format. These items consist of a statement or question followed by three to eleven response options arranged in alphabetical or logical order. A portion of the questions involves interpretation of graphic or pictorial materials. The response options for all questions are lettered (eg, A, B, C, D, E). Examinees are required to select the best answer to the question. Other options may be partially correct, but there is only ONE BEST answer.

Strategies for Answering Single One Best Answer Test Questions

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

Example Item

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

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

(Answer: D)

Step 1 Content Outline

Table of Contents

| | |
|--|----|
| General Principles | 6 |
| Biochemistry and Molecular Biology | |
| Biology of Cells | |
| Human Development and Genetics | |
| Biology of Tissue Response to Disease | |
| Gender, Ethnic, and Behavioral Considerations Affecting Disease Treatment and Prevention | |
| Multisystem Processes | |
| Pharmacodynamic and Pharmacokinetic Processes | |
| Microbial Biology and Infection | |
| Immune Responses | |
| Quantitative Methods | |
| Hematopoietic and Lymphoreticular Systems | 10 |
| Central and Peripheral Nervous Systems | 11 |
| Skin and Related Connective Tissue | 12 |
| Musculoskeletal System | 13 |
| Respiratory System | 14 |
| Cardiovascular System | 15 |
| Gastrointestinal System | 15 |
| Renal/Urinary System | 16 |
| Reproductive System | 17 |
| Endocrine System | 18 |

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

General Principles

Biochemistry and molecular biology

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

Biology of cells

- signal transduction: second messenger systems – voltage- and ligand-gated channels and receptors
- cell components (eg, endoplasmic reticulum, plasma membrane, nucleus)
- cytoskeleton, including cell movement and intracellular transport
- secretion and exocytosis, endocytosis, transcytosis
- cell cycle, mitosis, meiosis, structure and regulation of spindle apparatus, control points
- epithelial cells, including surface specialization, intercellular junctions, gap junctions, and desmosomes
- fibroblasts, endothelial cells, and mesenchymal cells: basement membrane, extracellular matrix, proteoglycans, fibronectins, adhesion molecules, annexins
- muscle cells, including cardiac, smooth, skeletal: structure and regulation of contractile elements, excitation-contraction coupling
- adaptive cell response to injury (eg, hypertrophy and metaplasia)

- mechanisms of cell injury and necrosis, including free radical mediated cell injury
- apoptosis (ie, programmed cell death)

Human development and genetics

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

Biology of tissue response to disease

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

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

- progression through the life cycle, including birth through senescence
 - cognitive, language, motor skills, and social and interpersonal development
 - sexual development (eg, puberty, menopause)
 - influence of developmental stage on physician/patient interview
- psychologic and social factors influencing patient behavior
 - personality traits or coping style, including coping mechanisms
 - psychodynamic and behavioral factors, related past experience
 - family and cultural factors, including socioeconomic status, ethnicity, and gender
 - adaptive and maladaptive behavioral responses to stress and illness (eg, drug-seeking behavior, sleep deprivation)
 - interactions between the patient and the physician or the health care system (eg, transference)
 - patient adherence, including general and adolescent
- patient interviewing, consultation, and interactions with the family
 - establishing and maintaining rapport
 - data gathering
 - approaches to patient education
 - enticing patients to make lifestyle changes
 - communicating bad news
 - “difficult” interviews (eg, anxious or angry patients)
 - multicultural ethnic characteristics
- medical ethics, jurisprudence, and professional behavior
 - consent and informed consent to treatment
 - physician-patient relationships (eg, ethical conduct, confidentiality)

- death and dying
- birth-related issues
- issues related to patient participation in research
- interactions with other health professionals (eg, referral)
- sexuality and the profession; other “boundary” issues
- ethics of managed care
- organization and cost of health care delivery

Multisystem processes

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

Pharmacodynamic and pharmacokinetic processes

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

Microbial biology and infection

- microbial classification and its basis
- bacteria and bacterial diseases
 - structure and composition
 - metabolism, physiology, and regulation
 - genetics
 - nature and mechanisms of action of virulence factors
 - pathophysiology of infection
 - epidemiology and ecology
 - principles of cultivation, assay, and laboratory diagnosis
- viruses and viral diseases
 - physical and chemical properties
 - replication
 - genetics

- principles of cultivation, assay, and laboratory diagnosis
- molecular basis of pathogenesis
- pathophysiology of infection
- latent and persistent infections
- epidemiology
- oncogenic viruses
- fungi and fungal infections
 - structure, physiology, cultivation, and laboratory diagnosis
 - pathogenesis and epidemiology
- parasites and parasitic diseases
 - structure, physiology, and laboratory diagnosis
 - pathogenesis and epidemiology
- principles of sterilization and pure culture technique

Immune responses

- production and function of granulocytes, natural killer cells, macrophages
- production and function of T lymphocytes, T-lymphocyte receptors
- production and function of B lymphocytes and plasma cells; immunoglobulin and antibodies: structure and biologic properties
- antigenicity and immunogenicity; antigen presentation; cell activation and regulation; tolerance and clonal deletion
- immunologic mediators: chemistry, function, molecular biology, classic and alternative complement pathways, cytokines, chemokines
- immunogenetics; MHC structure and function, class I, II molecules; erythrocyte antigens; transplantation
- immunizations: vaccines, protective immunity
- alterations in immunologic function
 - T- or B-lymphocyte deficiencies
 - deficiencies of phagocytic cells
 - combined immunodeficiency disease
 - HIV infection/AIDS and other acquired disorders of immune responsiveness
 - drug-induced alterations in immune responses, immunopharmacology
- immunologically mediated disorders
 - hypersensitivity (types I–IV)
 - transplant rejection
 - autoimmune disorders
 - risks of transplantation, transfusion (eg, graft-versus-host disease)
 - isoimmunization, hemolytic disease of the newborn
 - immunopathogenesis
- immunologic principles underlying diagnostic laboratory tests (eg, ELISA, complement fixation, RIA, agglutination)
- innate immunity

Quantitative methods

- fundamental concepts of measurement
 - scales of measurement
 - distribution, central tendency, variability, probability
 - disease prevalence and incidence
 - disease outcomes (eg, fatality rates)
 - associations (eg, correlation and covariance)
 - health impact (eg, risk differences and ratios)
 - sensitivity, specificity, predictive values
- fundamental concepts of study design
 - types of experimental studies (eg, clinical trials, community intervention trials)
 - types of observational studies (eg, cohort, case-control, cross-sectional, case series, community surveys)
 - sampling and sample size

- subject selection and exposure allocation (eg, randomization, stratification, self-selection, systematic assignment)
- outcome assessment
- internal and external validity
- fundamental concepts of hypothesis testing and statistical inference
 - confidence intervals
 - statistical significance and Type I error
 - statistical power and Type II error

Hematopoietic and lymphoreticular systems

Normal processes

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

Abnormal processes

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

Principles of therapeutics

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

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

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

Central and peripheral nervous systems

Normal processes

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

Abnormal processes

- infectious, inflammatory, and immunologic disorders (eg, meningitis, multiple sclerosis, myasthenia gravis)
- traumatic and mechanical disorders (eg, subdural and epidural hematomas, cord compression, peripheral nerve injury)
- neoplastic disorders, including primary and metastatic
- acquired metabolic and regulatory disorders (eg, delirium, Reye’s syndrome)
- vascular disorders (eg, cerebrovascular occlusion, venous sinus thrombosis, arterial aneurysms, hemorrhage)
- systemic disorders affecting the nervous system (eg, lupus, diabetic neuropathy)
- idiopathic disorders affecting the nervous system
- congenital disorders, including metabolic (eg, neural tube defects, cerebral palsy, mental retardation, Down syndrome)
- degenerative disorders (eg, peripheral neuropathy, Alzheimer’s dementia, Parkinson’s disease, Huntington’s disease, amyotrophic lateral sclerosis)
- paroxysmal disorders (eg, epilepsy, headache, pain syndromes, and sleep disorders including narcolepsy, restless legs syndrome/periodic limb movement, circadian rhythm disorders, parasomnias)
- disorders of special senses (eg, blindness, deafness)
- psychopathologic disorders, processes and their evaluation
 - early-onset disorders (eg, learning disorders)
 - disorders related to substance use
 - schizophrenia and other psychotic disorders
 - mood disorders
 - anxiety disorders

- somatoform disorders
- personality disorders
- physical and sexual abuse of children, adults, and elders
- other disorders (eg, dissociative, impulse control, post-traumatic stress disorder)

Principles of therapeutics

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

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

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

Skin and related connective tissue

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
- cell/tissue structure and function, including barrier functions, thermal regulation, eccrine function
- repair, regeneration, and changes associated with stage of life or ethnicity (eg, senile purpura, male pattern baldness, postmenopausal hair changes)
- skin defense mechanisms and normal flora

Abnormal processes

- infectious, inflammatory, and immunologic disorders
 - bacterial infections (eg, acne, cellulitis, carbuncle, abscess, necrotizing fasciitis, gangrene)
 - viral infections (eg, herpes infections, chickenpox, rubella, measles, roseola, verrucae)
 - fungal infections, including mycoses, dermatophytosis (eg, tinea)
 - parasitic infections (eg, scabies, lice)
 - immune and autoimmune disorders (eg, discoid lupus erythematosus, scleroderma, dermatomyositis, alopecia, psoriasis, urticaria, allergic dermatosis)
- traumatic and mechanical disorders (eg, thermal injury, decubitus ulcers, effects of ultraviolet light and radiation)
- neoplastic disorders
 - keratinocytes (eg, seborrheic keratosis, actinic keratosis, basal cell carcinoma, squamous cell carcinoma)
 - melanocytes (eg, nevi, melanoma, ichthyosis)
 - vascular neoplasms (eg, hemangiomas, Kaposi's sarcoma)
 - other (eg, T-cell lymphoma, skin appendage tumors)

- metabolic, regulatory, and structural disorders (eg, vitamin deficiencies, hypervitaminosis, hyperhidrosis)
- vascular disorders (eg, vasculitis, Raynaud's disease)
- systemic disorders affecting the skin (eg, Ehlers-Danlos syndrome, Marfan's syndrome)

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the skin and connective tissue, including anti-inflammatory agents (eg, corticosteroids, antihistamines), emollients, sunscreen, retinoids, antimicrobial agents, cytotoxic and immunologic therapy (eg, methotrexate, PUVA, keratinolytics)
- other therapeutic modalities (eg, laser, tattoo removal, cryotherapy)

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

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

Musculoskeletal system

Normal processes

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

Abnormal processes

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

Principles of therapeutics

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

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

- emotional and behavioral factors (eg, diet, exercise, seat belts, bicycle helmets)

- influence on person, family, and society (eg, osteoporosis, fractures in elderly, alcohol abuse/fractures)
- occupational and other environmental risk factors (eg, athletes, musicians)
- gender and ethnic factors (eg, bone mass)

Respiratory system

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
 - airways, including mechanics and regulation of breathing
 - lung parenchyma, including ventilation, perfusion, gas exchange
 - pleura
- cell/tissue structure and function, including surfactant formation, alveolar structure
- repair, regeneration, and changes associated with stage of life
- pulmonary defense mechanisms and normal flora

Abnormal processes

- infectious, inflammatory, and immunologic disorders
 - infectious diseases
 - infectious diseases of the upper respiratory tract (eg, sinusitis, pharyngitis)
 - acute infectious diseases of the lower respiratory tract and pleura and their complications (eg, pneumonia, bronchiectasis, abscess, empyema)
 - chronic infectious diseases of the lower respiratory tract (eg, Mycobacterium, endemic fungal infections, Nocardia/Actinomyces)
 - immunologic disorders
 - allergic and hypersensitivity disorders (eg, asthma)
 - autoimmune disorders (eg, Wegener's granulomatosis, Goodpasture's syndrome)
 - inflammatory disorders
 - pneumoconioses
 - acute and chronic alveolar injury (eg, acute respiratory distress syndrome, chlorine gas/smoke inhalation)
 - obstructive pulmonary disease
 - restrictive pulmonary disease (eg, sarcoidosis, idiopathic fibrosis)
- traumatic and mechanical disorders (eg, aspiration, pneumothorax, atelectasis, sleep apnea)
- neoplastic disorders (eg, polyps, bronchogenic carcinoma, mesothelioma, metastatic tumors)
- metabolic, regulatory, and structural disorders (eg, hypoventilation, disorders of gas exchange, ventilation-perfusion imbalance, neonatal respiratory distress syndrome)
- vascular and circulatory disorders (eg, thromboembolic disease, pulmonary hypertension, pulmonary edema, pleural effusion)
- systemic disorders affecting the respiratory system

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the respiratory system (eg, decongestants, cough suppressants, expectorants, mucolytics; bronchodilator drugs; anti-inflammatory and cytotoxic drugs; antimicrobial agents; antineoplastic agents)
- other therapeutic modalities (eg, oxygen therapy, nasal CPAP, mechanical ventilation, physical therapy, surgical procedures, including transplantation)

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

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

Cardiovascular system

Normal processes

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

Abnormal processes

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

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the cardiovascular system
 - coronary and peripheral vasodilators
 - antiarrhythmic drugs
 - antihypertensive drugs
 - measures used to combat hypotension and shock
 - drugs affecting cholesterol and lipid metabolism
 - drugs affecting blood coagulation, thrombolytic agents
 - inotropic agents and treatment of heart failure
 - immunosuppressive and antimicrobial drugs
 - drugs to treat peripheral arterial disease
- other therapeutic modalities (eg, pacemakers, angioplasty, valves, grafts, other surgical procedures)

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

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

Gastrointestinal system

Normal processes

- embryonic development, fetal maturation, and perinatal changes

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

Abnormal processes

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

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the gastrointestinal system
 - treatment and prophylaxis of peptic ulcer disease and gastroesophageal reflux (eg, antacids, antisecretory drugs, motility drugs, mucosal protective agents, antibiotics)
 - drugs to alter gastrointestinal motility (eg, cathartics, antidiarrheal drugs, antiemetic drugs, prokinetic drugs)
 - fluid replacement (eg, oral rehydration)
 - pancreatic replacement therapy and treatment of pancreatitis
 - drugs for treatment of hepatic failure (eg, lactulose) and biliary disease (eg, drugs to dissolve gallstones)
 - anti-inflammatory, immunosuppressive, antineoplastic, and antimicrobial drugs
- other therapeutic modalities (eg, surgical procedures, stents, feeding tubes)

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

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

Renal/urinary system

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
 - kidneys, ureters, bladder, urethra

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

Abnormal processes

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

Principles of therapeutics

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

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

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

Reproductive system

Normal processes

- embryonic development, fetal maturation, and perinatal changes
- organ structure and function
 - female structure, including breast
 - female function (eg, menstrual cycle, puberty, menopause)
 - male structure
 - male function (eg, spermatogenesis, puberty)
 - intercourse, orgasm
 - pregnancy, including labor and delivery, the puerperium, lactation, gestational uterus, placenta

- cell/tissue structure and function, including hypothalamic-pituitary-gonadal axis, sex steroids, and gestational hormones
- reproductive system defense mechanisms and normal flora

Abnormal processes

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

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the reproductive system and management of normal reproductive function
 - female reproductive tract
 - fertility drugs
 - oral contraception, other methods of contraception (eg, condoms)
 - estrogen, progestogen replacement
 - stimulants and inhibitors of labor
 - estrogen and progesterone antagonists, treatment of menopause
 - stimulators and inhibitors of lactation
 - male reproductive tract
 - fertility drugs
 - androgen replacement and antagonists
 - gonadotropin-releasing hormone and gonadotropin replacement
 - abortifacients
 - antimicrobials
 - antineoplastics
 - restoration of potency
- other therapeutic modalities affecting the reproductive system (eg, tampons, anabolic steroids)

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

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

Endocrine system

Normal processes

- embryonic development, fetal maturation, and perinatal changes

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

Abnormal processes

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

Principles of therapeutics

- mechanisms of action, use, and adverse effects of drugs for treatment of disorders of the endocrine system
 - hormones and hormone analogs
 - stimulators of hormone production (eg, sulfonylureas)
 - inhibitors of hormone production (eg, thiouracils)
 - hormone antagonists
 - potentiators of hormone action (eg, thiazolidinediones, demeclocycline)
 - antiobesity agents (eg, dexfenfluramine)
- other therapeutic modalities (eg, surgery, radiation)

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

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

Sample Step 1

Sample Questions

The following pages include 150 sample test questions. These questions are the same as those you install on your computer from the USMLE website or CD. For information on obtaining the test software and additional information on preparing to take the test and testing, you must review the *2004 USMLE Bulletin of Information*: see Preparing for the Test (pages 9-10) and Testing (pages 16-19). Please note that reviewing the sample questions as they appear on pages 24-48 is not a substitute for acquainting yourself with the test software. You should run the Step 1 tutorial and sample test questions that are provided on the USMLE website or CD well before your test date.

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 23. In the actual examination, answers will be selected on the screen; **no answer form will be provided**. An answer key is provided on page 49.

USMLE Step 1 Laboratory Values

* Included in the Biochemical Profile (SMA-12)

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

USMLE Step 1 Laboratory Values (continued)

| | <u>REFERENCE RANGE</u> | <u>SI REFERENCE INTERVALS</u> |
|---|--|--|
| BODY MASS INDEX (BMI) | | |
| Body mass index | Adult: 19-25 kg/m ² | |
| CEREBROSPINAL FLUID | | |
| Cell count | 0-5 cells/mm ³ | 0-5 x 10 ⁶ /L |
| Chloride | 118-132 mEq/L | 118-132 mmol/L |
| Gamma globulin | 3%-12% total proteins | 0.03-0.12 |
| Glucose | 40-70 mg/dL | 2.2-3.9 mmol/L |
| Pressure | 70-180 mm H ₂ O | 70-180 mm H ₂ O |
| Proteins, total | <40 mg/dL | <0.40 g/L |
| HEMATOLOGIC | | |
| Bleeding time (template) | 2-7 minutes | 2-7 minutes |
| Erythrocyte count | Male: 4.3-5.9 million/mm ³ Female: 3.5-5.5 million/mm ³ | 4.3-5.9 x 10 ¹² /L 3.5-5.5 x 10 ¹² /L |
| Erythrocyte sedimentation rate (Westergren) | Male: 0-15 mm/h 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 _{1C} | ≤ 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 |
| Leukocyte count and differential | | |
| Leukocyte count | 4500-11,000/mm ³ | 4.5-11.0 x 10 ⁹ /L |
| Segmented neutrophils | 54%-62% | 0.54-0.62 |
| Bands | 3%-5% | 0.03-0.05 |
| Eosinophils | 1%-3% | 0.01-0.03 |
| Basophils | 0%-0.75% | 0-0.0075 |
| Lymphocytes | 25%-33% | 0.25-0.33 |
| Monocytes | 3%-7% | 0.03-0.07 |
| Mean corpuscular hemoglobin | 25.4-34.6 pg/cell | 0.39-0.54 fmol/cell |
| Mean corpuscular hemoglobin concentration | 31%-36% Hb/cell | 4.81-5.58 mmol Hb/L |
| Mean corpuscular volume | 80-100 μm ³ | 80-100 fl |
| Partial thromboplastin time (activated) | 25-40 seconds | 25-40 seconds |
| Platelet count | 150,000-400,000/mm ³ | 150-400 x 10 ⁹ /L |
| Prothrombin time | 11-15 seconds | 11-15 seconds |
| Reticulocyte count | 0.5%-1.5% of red cells | 0.005-0.015 |
| Thrombin time | < 2 seconds deviation from control | <2 seconds deviation from control |
| Volume | | |
| 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 |
| SWEAT | | |
| Chloride | 0-35 mmol/L | 0-35 mmol/L |
| URINE | | |
| Calcium | 100-300 mg/24 h | 2.5-7.5 mmol/24 h |
| Chloride | Varies with intake | Varies with intake |
| Creatinine clearance | Male: 97-137 mL/min Female: 88-128 mL/min | |
| Estriol, total (in pregnancy) | | |
| 30 wks | 6-18 mg/24 h | 21-62 μmol/24 h |
| 35 wks | 9-28 mg/24 h | 31-97 μmol/24 h |
| 40 wks | 13-42 mg/24 h | 45-146 μmol/24 h |
| 17-Hydroxycorticosteroids | | |
| Male | 3.0-10.0 mg/24 h | 8.2-27.6 μmol/24 h |
| Female | 2.0-8.0 mg/24 h | 5.5-22.0 μmol/24 h |
| 17-Ketosteroids, total | | |
| Male | 8-20 mg/24 h | 28-70 μmol/24 h |
| Female | 6-15 mg/24 h | 21-52 μmol/24 h |
| Osmolality | 50-1400 mOsm/kg | |
| 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 |

Answer Form for Step 1 Sample Questions

Block 1 (Questions 1-50)

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 1. | ___ | 11. | ___ | 21. | ___ | 31. | ___ | 41. | ___ |
| 2. | ___ | 12. | ___ | 22. | ___ | 32. | ___ | 42. | ___ |
| 3. | ___ | 13. | ___ | 23. | ___ | 33. | ___ | 43. | ___ |
| 4. | ___ | 14. | ___ | 24. | ___ | 34. | ___ | 44. | ___ |
| 5. | ___ | 15. | ___ | 25. | ___ | 35. | ___ | 45. | ___ |
| 6. | ___ | 16. | ___ | 26. | ___ | 36. | ___ | 46. | ___ |
| 7. | ___ | 17. | ___ | 27. | ___ | 37. | ___ | 47. | ___ |
| 8. | ___ | 18. | ___ | 28. | ___ | 38. | ___ | 48. | ___ |
| 9. | ___ | 19. | ___ | 29. | ___ | 39. | ___ | 49. | ___ |
| 10. | ___ | 20. | ___ | 30. | ___ | 40. | ___ | 50. | ___ |

Block 2 (Questions 51-100)

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|------|-----|
| 51. | ___ | 61. | ___ | 71. | ___ | 81. | ___ | 91. | ___ |
| 52. | ___ | 62. | ___ | 72. | ___ | 82. | ___ | 92. | ___ |
| 53. | ___ | 63. | ___ | 73. | ___ | 83. | ___ | 93. | ___ |
| 54. | ___ | 64. | ___ | 74. | ___ | 84. | ___ | 94. | ___ |
| 55. | ___ | 65. | ___ | 75. | ___ | 85. | ___ | 95. | ___ |
| 56. | ___ | 66. | ___ | 76. | ___ | 86. | ___ | 96. | ___ |
| 57. | ___ | 67. | ___ | 77. | ___ | 87. | ___ | 97. | ___ |
| 58. | ___ | 68. | ___ | 78. | ___ | 88. | ___ | 98. | ___ |
| 59. | ___ | 69. | ___ | 79. | ___ | 89. | ___ | 99. | ___ |
| 60. | ___ | 70. | ___ | 80. | ___ | 90. | ___ | 100. | ___ |

Block 3 (Questions 101-150)

| | | | | | | | | | |
|------|-----|------|-----|------|-----|------|-----|------|-----|
| 101. | ___ | 111. | ___ | 121. | ___ | 131. | ___ | 141. | ___ |
| 102. | ___ | 112. | ___ | 122. | ___ | 132. | ___ | 142. | ___ |
| 103. | ___ | 113. | ___ | 123. | ___ | 133. | ___ | 143. | ___ |
| 104. | ___ | 114. | ___ | 124. | ___ | 134. | ___ | 144. | ___ |
| 105. | ___ | 115. | ___ | 125. | ___ | 135. | ___ | 145. | ___ |
| 106. | ___ | 116. | ___ | 126. | ___ | 136. | ___ | 146. | ___ |
| 107. | ___ | 117. | ___ | 127. | ___ | 137. | ___ | 147. | ___ |
| 108. | ___ | 118. | ___ | 128. | ___ | 138. | ___ | 148. | ___ |
| 109. | ___ | 119. | ___ | 129. | ___ | 139. | ___ | 149. | ___ |
| 110. | ___ | 120. | ___ | 130. | ___ | 140. | ___ | 150. | ___ |

Sample Questions

Block 1 (Questions 1-50)

1. A 74-year-old man with urinary frequency and urgency has benign prostatic hypertrophy. 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
2. A 10-month-old girl cries when her mother tries to put her in her grandmother's arms. She happily allowed herself to be held when her grandmother visited 2 months ago. Which of the following best explains this behavior?

 - (A) Development of problems with socialization
 - (B) Maltreatment by the grandmother
 - (C) Sensation of a poor relationship between the mother and the grandmother
 - (D) Separation anxiety disorder
 - (E) Stranger anxiety
3. A 30-year-old woman being treated for hypertension has the sudden onset of fever and malaise. Temperature is 38.3 C (101 F) orally and blood pressure is normal. She has a malar rash, swelling and tenderness of the wrists and knees, and a friction rub at the left lower sternal border. Which of the following drugs is the most likely cause of these findings?

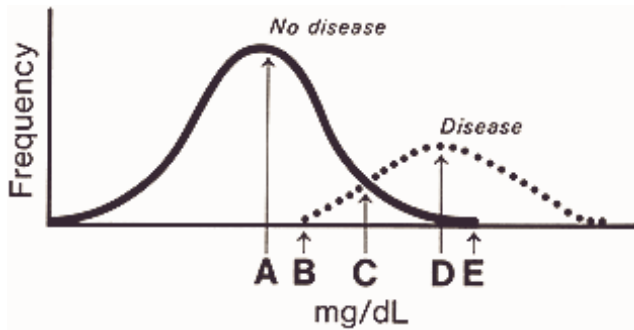
 - (A) Captopril
 - (B) Hydralazine
 - (C) Minoxidil
 - (D) Nitroprusside
 - (E) Propranolol
4. A man pushes a piano across the floor. At the wrist, the force is transmitted from the carpal bones to the radius. At the elbow, the force is transmitted from the ulna to the humerus. Which of the following structures transmits the force from the radius to the ulna?

 - (A) Annular ligament
 - (B) Bicipital aponeurosis
 - (C) Flexor retinaculum
 - (D) Intermuscular septum
 - (E) Interosseous membrane
5. 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?

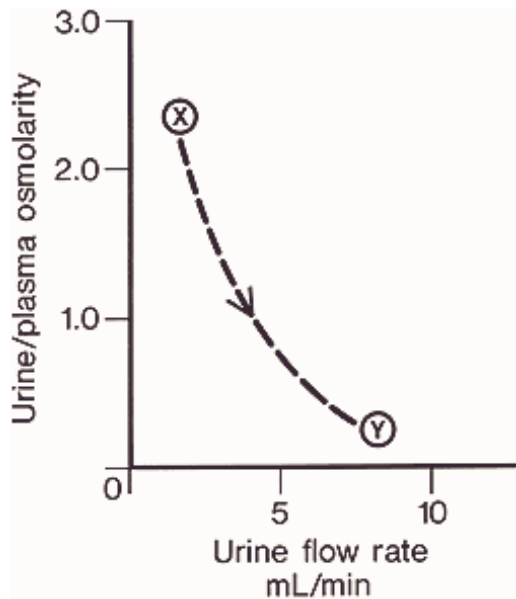
 - (A) Contralateral immune-mediated parotitis
 - (B) Hematogenous metastases to lungs and bone
 - (C) Ipsilateral submaxillary salivary gland neoplasm
 - (D) Local recurrence
 - (E) Regional lymph node metastases
6. Enteric gram-negative bacteria are more resistant to penicillin G than gram-positive bacteria. Which of the following is most closely associated with this difference?

 - (A) Cytoplasmic membrane
 - (B) Lipoprotein
 - (C) Outer membrane
 - (D) Peptidoglycan
 - (E) Teichoic acid

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

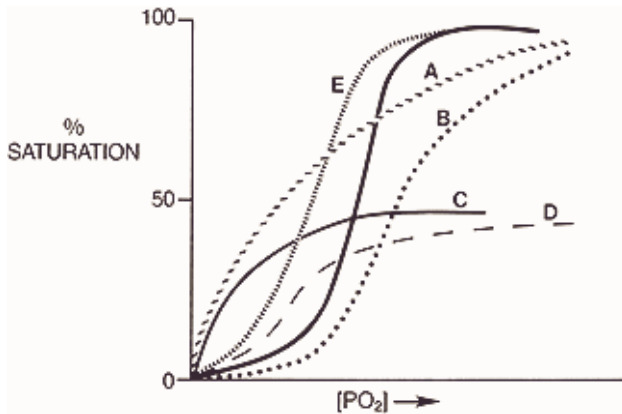


8. Serum samples from a normal woman with a history of regular 28-day menstrual cycles show a peak in the serum concentration of 17β -estradiol over the past 12 hours. No progesterone is detectable. Within 3 days, which of the following is expected to occur?
- Cessation of menstruation
 - Decreased basal body temperature
 - Onset of menstruation
 - Ovulation
 - Regression of the corpus luteum
9. *Escherichia coli* strains X and Y are both resistant to ampicillin. Ampicillin resistance is stable in strain X when it is grown for multiple generations in the absence of the antibiotic. However, strain Y loses ampicillin resistance when it is grown in media without the antibiotic. Which of the following best explains the acquisition of ampicillin susceptibility in strain Y?
- Downregulation of the resistance gene
 - Insertion of a transposon into the resistance gene
 - Loss of a plasmid carrying the resistance gene
 - Point mutations in the resistance gene
 - Recombination with a defective copy of the resistance gene
10. Platelet-derived growth factor binds to its receptor, activating cell growth. The receptor-growth factor complex uses which of the following mechanisms to signal the cell to divide?
- Activation of tyrosine kinase
 - Binding of GTP to a G protein
 - Binding to DNA
 - Increase in intracellular calcium concentration
 - Opening of an ion channel
11. An 8-year-old boy is stung by a bee. Within 5 minutes, he develops a 2-cm, raised, red, swollen lesion at the site of injury. Which of the following findings will be predominant in tissue from the lesion?
- Foreign body reaction
 - Hemorrhage
 - Lymphocytic infiltration
 - Neutrophilic migration
 - Vasodilation
12. A healthy elderly person is most likely to show decreased auditory acuity for which of the following tones?
- High-frequency tones only
 - Low-frequency tones only
 - Tones of all frequencies
 - Tones presented by air but not by bone conduction
 - Tones presented by bone but not by air conduction
13. A 50-year-old man has had gradually progressive weakness of the hands over the past year. Examination shows atrophy of the forearm muscles, fasciculations of the muscles of the chest and upper limbs, hyperreflexia of the lower limbs, and extensor plantar reflexes. Sensation is intact. Which of the following is the most likely diagnosis?
- Amyotrophic lateral sclerosis
 - Dementia, Alzheimer's type
 - Guillain-Barré syndrome
 - Multiple cerebral infarcts
 - Multiple sclerosis



14. The graph shows urine/plasma osmolarity versus urinary flow rate in a healthy human subject. Which of the following most likely produced the change from X to Y?
- Oral ingestion of 1 L of water
 - Oral ingestion of 200 mL of an isotonic sodium chloride solution
 - Oral ingestion of 200 mL of a hypertonic glucose solution
 - Oral ingestion of 200 mL of a hypertonic sodium chloride solution
 - Injection of ADH (vasopressin)
-
15. A 16-year-old boy has jaundice. Laboratory studies show an increase in both mean corpuscular hemoglobin concentration and osmotic fragility of erythrocytes. Liver enzyme activities are within the reference range, and a direct antiglobulin test is negative. Which of the following types of erythrocyte is most likely to be found on a peripheral blood smear from this patient?
- Ovalocytes
 - Schistocytes
 - Spherocytes
 - Target cells
 - Tear drop cells
16. A 60-year-old man develops a tremor in his fingers. The tremor is most pronounced when he reaches for his coffee cup or points to an object. Which component of the motor system is most likely to be involved?
- Basal ganglia
 - Cerebellar hemisphere
 - Cerebellar vermis
 - Frontal eye field
 - Motor nucleus of the thalamus
17. A 60-year-old woman who has had four children and completed menopause 6 years ago develops urinary incontinence whenever she coughs, sneezes, or laughs. The physician should suggest exercises to strengthen which of the following muscles?
- Detrusor
 - Obturator internus
 - Piriformis
 - Rectus abdominis
 - Urogenital diaphragm
18. A 6-year-old boy with short stature and delayed bone age is started on recombinant growth hormone therapy. Which of the following laboratory findings in serum is most likely after 3 months of therapy?
- Decreased insulin-like growth factor 1 concentration
 - Increased alkaline phosphatase activity
 - Increased calcium concentration
 - Increased phosphorus concentration
 - Increased urea nitrogen (BUN) concentration
19. Which of the following is lower in umbilical arterial blood of a normal fetus than in maternal arterial blood?
- Hematocrit
 - O₂ affinity
 - O₂ capacity
 - PO₂
 - Viscosity

20. The unlabeled solid curve represents the loading behavior of normal human hemoglobin at pH 7.35 as a function of oxygen concentration. Which curve best represents the most likely change following addition of carbon dioxide?



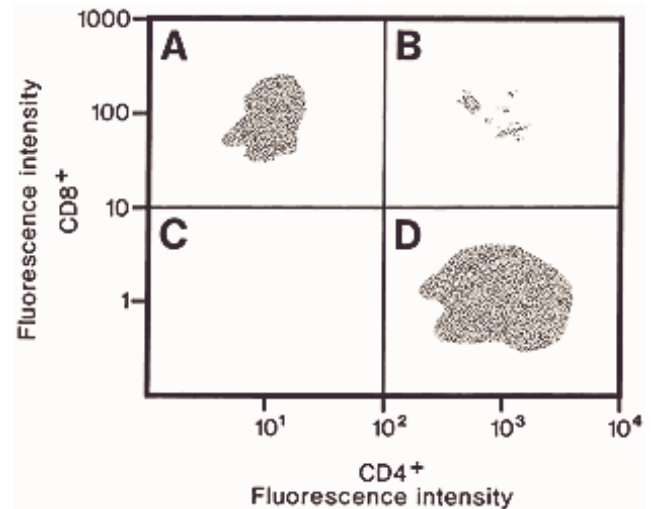
21. A 21-year-old man has weight loss and severe intermittent bloody diarrhea. A barium enema and colonoscopy show multiple ulcers and inflammatory changes extending from the rectum to the mid-transverse colon. Biopsy specimens taken from multiple sites show acute and chronic inflammation restricted to the mucosa. The most likely diagnosis is

- (A) AIDS-associated gastroenteritis
- (B) amebiasis
- (C) Crohn's disease
- (D) *Clostridium difficile*-associated colitis
- (E) *Escherichia coli*-associated colitis
- (F) ischemic colitis
- (G) *Salmonella* gastroenteritis
- (H) ulcerative colitis

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

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

23. Flow cytometric data of T lymphocytes stained with fluorescent antibody to CD4⁺ and CD8⁺ antigens from a healthy person are shown. The lymphocytes from which quadrant will respond most vigorously to immunization with hepatitis A virus vaccine?



24. A 64-year-old man is in the hospital because of the terminal stages of emphysema. His relatives note that, although he seems alert and oriented and recognizes them, he has become less interested and engaged with them when they visit. Which of the following is the most likely explanation for this behavior?

- (A) Development of delirium
- (B) Development of a psychotic disorder
- (C) Exacerbation of a personality disorder
- (D) Oversedation
- (E) Withdrawal

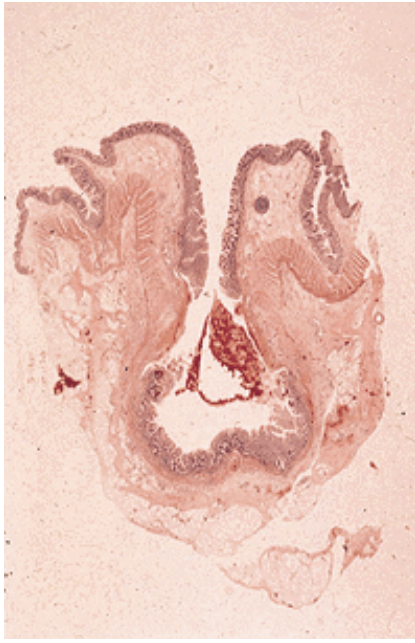
25. A 6-year-old boy has a large intra-abdominal mass in the midline just above the symphysis pubis. During an operation, a cystic mass is found attached to the umbilicus and to the apex of the bladder. The most likely diagnosis is

- (A) hydrocele
- (B) Meckel's cyst
- (C) Meckel's diverticulum
- (D) omphalocele
- (E) urachal cyst

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

| | Median effective dose | Toxic dose ₁ /effective dose ₉₉ |
|-----|-----------------------|---|
| (A) | 0.5x | 2.8 |
| (B) | 1x | 2.1 |
| (C) | 5x | 4.0 |
| (D) | 33x | 3.0 |

27. A cardiac catheterization is done in a healthy person. The blood sample withdrawn from the catheter shows 60% oxygen saturation, and the pressure recording shows oscillations from a maximum of 26 mm Hg to a minimum of 14 mm Hg. Where was the catheter tip located?
- (A) Ductus arteriosus
 (B) Foramen ovale
 (C) Left atrium
 (D) Pulmonary artery
 (E) Right atrium
28. 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. X-ray film of the chest shows an enlarged heart and changes consistent with pulmonary edema. Intractable congestive heart failure develops, and she dies on the second hospital day. The 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
29. Which of the following drugs applied topically produces mydriasis without producing cycloplegia?
- (A) Atropine
 (B) Neostigmine
 (C) Phentolamine
 (D) Phenylephrine
 (E) Pilocarpine
30. A 56-year-old man has progressive shortness of breath, a cough, and a low-grade fever. He began taking a drug for recurrent ventricular arrhythmias 5 months ago. Erythrocyte sedimentation rate is increased. Pulmonary function tests show decreased diffusing capacity. X-ray film of the chest shows diffuse interstitial pneumonia. Which of the following drugs is the most likely cause of these findings?
- (A) Amiodarone
 (B) Angiotensin-converting enzyme (ACE) inhibitor
 (C) Atenolol
 (D) Furosemide
 (E) Metronidazole
 (F) Penicillin
 (G) Procainamide
 (H) Propranolol
 (I) Tetracycline
 (J) Verapamil
31. A 38-year-old woman has had the gradual development of a goiter. Serum thyroxine (T₄) and triiodothyronine (T₃) concentrations are in the reference range. Serum concentration of thyroid-stimulating hormone is slightly increased. Serum contains antimicrosomal antibodies, but no thyroid-stimulating hormone antibodies are detected. Which of the following is the most likely diagnosis?
- (A) Chronic autoimmune (Hashimoto's) thyroiditis
 (B) Graves' disease
 (C) Primary atrophy of the thyroid gland
 (D) Riedel's struma
 (E) Subacute thyroiditis

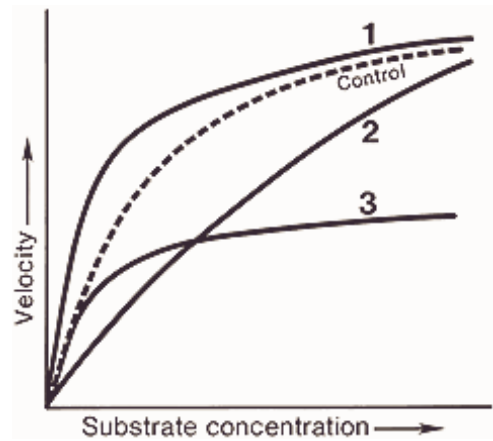


32. A 73-year-old woman has episodes of abdominal pain and increasingly severe constipation. Test for occult blood in stools is positive. The photo-micrograph shows features of the resected colon. The most likely diagnosis is

- (A) adenocarcinoma
- (B) diverticular disease
- (C) polypoid adenoma
- (D) villous adenoma
- (E) volvulus

33. A 7-year-old child has had a high fever and a sore throat for 2 days. Examination shows pharyngeal erythema, a swollen right tonsil with a creamy exudate, and painful right submandibular lymphadenopathy. Throat culture on blood agar yields numerous small β -hemolytic colonies that are inhibited by bacitracin. Which of the following is the most likely causal organism?

- (A) Adenovirus
- (B) *Candida albicans*
- (C) *Corynebacterium diphtheriae*
- (D) Coxsackievirus
- (E) Epstein-Barr virus
- (F) *Haemophilus influenzae*
- (G) *Mycobacterium tuberculosis*
- (H) *Mycoplasma pneumoniae*
- (I) Rhinovirus
- (J) *Streptococcus pyogenes* (group A)



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

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

35. A malnourished 50-year-old man with alcoholism and severe dental caries has a 2-week history of malaise and right-sided chest pain. He is febrile and has a cough productive of foul-smelling, purulent sputum. X-ray film of the chest shows a fluid-filled cavity, 2 cm in diameter, in the upper lobe of the right lung. The most likely diagnosis is

- (A) abscess
- (B) bronchiectasis
- (C) pulmonary infarct
- (D) squamous cell carcinoma
- (E) tuberculosis

36. Three weeks after a renal transplant, a patient develops fever and leukopenia, followed by prostration and severe pulmonary and hepatic dysfunction. Which of the following is the most likely viral cause?

- (A) Adenovirus type 12
- (B) Coxsackievirus
- (C) Cytomegalovirus
- (D) Influenza virus
- (E) Parvovirus B19

37. A couple requests blood typing of their 2-year-old child (father AB, Rh-negative; mother B, Rh-negative). Results of hemagglutination assays of the child's blood are as follows: (+ = hemagglutination; - = no hemagglutination)

| | |
|-------------------------------|---|
| Saline plus child's RBC | - |
| Anti A plus child's RBC | - |
| Anti B plus child's RBC | + |
| Anti D plus child's RBC | - |
| Child's serum plus type A RBC | + |
| Child's serum plus type B RBC | - |
| Child's serum plus type D RBC | - |

Which of the following conclusions concerning the child's parentage is valid?

- (A) The child could be the natural offspring of this couple
- (B) The mother could be the natural mother, but the father could not be the natural father
- (C) The father could be the natural father, but the mother could not be the natural mother
- (D) Neither the father nor the mother could be the natural parents

38. A 29-year-old woman comes to the physician for a consultation 1 month after her 7-year-old daughter was killed in an automobile accident. 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 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

39. A 59-year-old man develops excessive sweating and salivation, diarrhea, and bradycardia while being treated with neostigmine for myasthenia gravis. Which of the following is the most appropriate therapy for these symptoms and signs?

- (A) Atropine
- (B) Carbachol
- (C) Edrophonium
- (D) Epinephrine
- (E) Pralidoxime

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

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

41. A 50-year-old man with a history of alcohol dependence has difficulty with primary (immediate) 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. Tertiary (remote) memory appears intact. The patient dies shortly thereafter from a myocardial infarct. Pathologic examination of his brain is most likely to disclose an abnormality involving the

- (A) amygdala
- (B) caudate nucleus
- (C) hippocampus
- (D) locus ceruleus
- (E) mamillary bodies

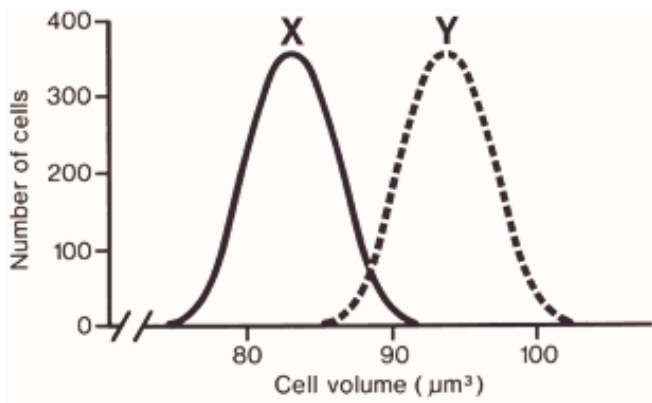
42. A 12-year-old girl with sickle cell disease has pain in her right arm. An x-ray film of her arm shows bony lesions consistent with osteomyelitis. Which of the following is the most likely causal organism?
- (A) *Clostridium septicum*
 (B) *Enterococcus faecalis*
 (C) *Listeria monocytogenes*
 (D) *Proteus mirabilis*
 (E) *Pseudomonas aeruginosa*
 (F) *Salmonella enteritidis*
 (G) *Serratia marcescens*
43. 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 (BUN) | 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
44. A 3-month-old male infant has a lump in his neck. Examination of tissue from the mass shows it to be the thymus. Based on embryonic origin, which of the following additional structures is most likely to have an ectopic location?
- (A) Jugulodigastric lymph node
 (B) Lingual tonsil
 (C) Parathyroid gland
 (D) Submandibular gland
 (E) Thyroid gland
45. Metabolism of 100 g of carbohydrate, 25 g of fat, and 20 g of protein yields approximately how many kilocalories?
- (A) 300
 (B) 500
 (C) 700
 (D) 900
 (E) 1100
46. A male neonate has syndactyly of the index, middle, and third fingers of his left hand. Which of the following cellular processes is most likely to have failed during development?
- (A) Apoptosis
 (B) Differentiation
 (C) Fusion
 (D) Migration
 (E) Proliferation
47. The intravenous administration of a substance results in a decrease in mean arterial blood pressure. Laboratory studies show that the substance is inactivated by peptidase. The substance is most likely to be
- (A) angiotensin II
 (B) bradykinin
 (C) histamine
 (D) neuropeptide Y
 (E) serotonin
48. A patient has a hereditary disorder characterized by a grossly abnormal EEG and an increased blood ammonium concentration. The most likely cause is a deficiency of which of the following enzymes?
- (A) Asparagine synthetase
 (B) Carbamoyl phosphate synthetase I
 (C) Fumarase
 (D) Glutamate-oxaloacetate aminotransferase
 (E) Glutaminase

49. Poisoning the $\text{Na}^+\text{-K}^+$ pump with digitalis causes which of the following changes in large axons?
- (A) Decreased intracellular Cl^- concentration
 - (B) Decreased intracellular K^+ concentration
 - (C) Decreased intracellular Na^+ concentration
 - (D) Immediate block in propagation of action potentials
 - (E) Slow hyperpolarization of membrane potentials
50. If the axillary artery is ligated proximally as it passes over the first rib, blood will be supplied to the distal axillary artery through which of the following arteries?
- (A) Brachial
 - (B) Internal thoracic
 - (C) Subclavian
 - (D) Subscapular
 - (E) Vertebral

Sample Questions

Block 2 (Questions 51-100)

51. A neonate develops meningitis. Streptococcus is isolated from the mother's vagina. The organism agglutinates with antiserum directed against type B surface carbohydrate. The virulence of this organism is related to a bacterial constituent that interferes with which of the following host phagocyte functions?
- (A) Aggregation
 - (B) Chemotaxis
 - (C) Ingestion
 - (D) Intracellular killing
 - (E) Pseudopod formation
52. Which of the following pulmonary variables is most likely to be lower than normal in a patient with adult respiratory distress syndrome?
- (A) Alveolar-arterial PO₂ difference
 - (B) Compliance of the lung
 - (C) Oncotic pressure of alveolar fluid
 - (D) Surface tension of alveolar fluid
 - (E) Work of breathing
53. 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
54. A healthy 19-year-old man receives a tetanus immunization booster prior to induction in the 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
55. 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 head 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
56. An 80-year-old man has an ulcerating carcinoma of his scrotal skin on the right. Which group of lymph nodes is most likely to receive metastatic cells first?
- (A) External iliac
 - (B) Internal iliac
 - (C) Superficial inguinal
 - (D) Deep inguinal
 - (E) Lumbar (para-aortic)



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

- (A) hypertonic
- (B) hypotonic
- (C) isosmotic
- (D) isotonic

58. A 70-year-old man has ecchymosis, perifollicular petechiae, and swelling of the gingiva. He has lived alone since the death of his wife 2 years ago. His diet consists primarily of cola and hot dogs. The most likely diagnosis is

- (A) beriberi
- (B) kwashiorkor
- (C) pellagra
- (D) rickets
- (E) scurvy

59. 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 upright. Tests of arterial blood are most likely to show which of the following sets of values?

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

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

- (A) IgG and fibrinogen
- (B) interleukin-1 (IL-1) and factor VIII (antihemophilic factor)
- (C) properdin and platelet factor 3
- (D) prothrombin and C3b
- (E) transferrin and plasminogen

61. A 55-year-old man dies of respiratory failure after a 10-year illness that began with weakness in the muscles of the hand. The disease progressed to involve all four limbs, the tongue, and respiratory muscles. Intellectual capacity was preserved. At autopsy, which of the following central nervous system abnormalities is most likely to be seen?

- (A) Decreased pigmentation in the substantia nigra and locus ceruleus
- (B) Demyelination of the posterior columns, corticospinal tracts, and spinocerebellar tracts
- (C) Granulovacuolar degeneration with neuritic plaques and neurofibrillary tangles
- (D) Loss of motoneurons in the anterior horns, hypoglossal nuclei, and cerebral motor cortex
- (E) Symmetric atrophy of the caudate nuclei and frontal cortex

62. A small, nonenveloped virus has no virion-associated enzyme activity; the replication cycle takes place exclusively in the cytoplasm of infected cells. Purified genomic nucleic acid added to cells results in the production of low levels of infectious virus. The genome of the virus is most likely to be which of the following?

- (A) Double-stranded DNA
- (B) Single-stranded, nonsegmented, negative-sense RNA
- (C) Single-stranded, nonsegmented, positive-sense DNA
- (D) Single-stranded, nonsegmented, positive-sense RNA
- (E) Single-stranded, segmented, negative-sense RNA

63. The following data are obtained during evaluation of an 18-year-old woman:

| | Blood pressure (mm Hg) | O ₂ saturation (%) |
|------------------|------------------------|-------------------------------|
| Right atrium | 7 (N=5) | 90 (N=75) |
| Right ventricle | 35/7 (N=25/5) | 90 (N=75) |
| Pulmonary artery | 35/8 (N=25/15) | 90 (N=75) |
| Left atrium | 7 (N=9) | 95 (N=95) |
| Left ventricle | 110/7 (N=110/9) | 95 (N=95) |
| Aorta | 110/75 (N=110/75) | 95 (N=95) |

Which of the following is the most likely diagnosis?

- (A) Atrial septal defect
- (B) Mitral stenosis
- (C) Patent ductus arteriosus
- (D) Pulmonic stenosis
- (E) Tricuspid insufficiency

64. Warfarin is administered to a 56-year-old man following placement of a prosthetic cardiac valve. The warfarin dosage is adjusted to maintain a prothrombin time of 18 sec. Subsequently, trimethoprim- sulfamethoxazole therapy is begun for recurring urinary tract infections. In addition to monitoring prothrombin time, what action 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) Reduce the dosage of warfarin
- (E) Stop the warfarin and change to low-dose aspirin

65. A genetic male has fully developed male sexual ducts and recognizable uterine tubes. Which of the following processes was most likely disturbed during the embryonic period?

- (A) Production of estrogen by the embryonic testes
- (B) Production of müllerian-inhibitory substance by the embryonic testes
- (C) Production of testosterone by the embryonic testes
- (D) Response of the paramesonephric (müllerian) ducts to estrogen
- (E) Response of the paramesonephric (müllerian) ducts to testosterone

66. A 20-year-old man is brought to the emergency department with frightening visual hallucinations. He is confused, disoriented to time and place, and difficult to understand because of slurred speech. Which of the following is the most likely diagnosis?

- (A) Brief reactive psychosis
- (B) Delirium
- (C) Mania
- (D) Psychotic depression
- (E) Schizophrenia

67. A patient with an aneurysm of the aortic arch develops hoarseness. Paralysis of which of the following muscles on the left side is most likely?

- (A) Anterior belly of the digastric
- (B) Cricothyroid
- (C) Omohyoid
- (D) Posterior belly of the digastric
- (E) Posterior cricoarytenoid

68. Large amounts of the artificial sweetener aspartame should be avoided in children who have which of the following metabolic disorders?

- (A) Diabetes mellitus
- (B) Hereditary fructose intolerance
- (C) Lactose intolerance
- (D) Maple syrup urine disease
- (E) Phenylketonuria

69. 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. She is most likely to have a deficit in which of the following?

- (A) Adduction and abduction of the fingers
- (B) Extension of the index finger
- (C) Flexion of the ring and little fingers
- (D) Sensation over the base of the little finger
- (E) Opposition of the thumb and other digits

70. A 34-year-old man has anorexia and nausea for 1 week followed by sudden darkening of his urine to a brownish color. Laboratory data are consistent with acute viral hepatitis. Screening serologic studies for hepatitis A and B virus (HAV, HBV) infections show:

| | |
|----------------------|----------|
| IgM anti-HAV Ab | negative |
| HBV surface Ag | positive |
| IgM anti-HBV core Ab | positive |
| Anti-HBV surface Ab | negative |

Which of the following mechanisms best explains the hepatic injury?

- (A) Direct injury of hepatocyte membranes by viral surface antigen
- (B) Hepatocyte lysis by cytotoxic IgM antibody to viral core antigen
- (C) Inhibition of hepatocyte DNA replication
- (D) Inhibition of hepatocyte mRNA translation
- (E) T lymphocyte-mediated lysis of infected hepatic cells

71. An inherited metabolic disorder of carbohydrate metabolism is characterized by an abnormally increased concentration of hepatic glycogen with normal structure and no detectable increase in serum glucose concentration after oral administration of fructose. These two observations suggest that the disease is a result of the absence of which of the following enzymes?

- (A) Fructokinase
- (B) Glucokinase
- (C) Glucose 6-phosphatase
- (D) Phosphoglucomutase
- (E) UDPG-glycogen transglucosylase

72. Compared with normal persons, the dosage regimen of a drug for a patient known to be a “rapid metabolizer” is modified most rationally by which of the following loading and maintenance doses?

| | Loading | Maintenance |
|-----|-----------|-------------|
| (A) | Increased | increased |
| (B) | Increased | normal |
| (C) | Decreased | normal |
| (D) | Normal | decreased |
| (E) | Normal | increased |

73. An asymptomatic 50-year-old woman has hypertension. Urinary excretion of catecholamines is increased. A CT scan shows a suprarenal mass. Which of the following is the most likely cause?

- (A) Benign neoplasm of the adrenal cortex
- (B) Benign neoplasm of the adrenal medulla
- (C) Malignant neoplasm of the adrenal cortex
- (D) Malignant neoplasm of the adrenal medulla
- (E) Diffuse hyperplasia of the adrenal cortex
- (F) Diffuse hypoplasia of the adrenal medulla

74. An otherwise healthy 55-year-old Asian-American man is given isoniazid and vitamin B₆ (pyridoxine) after conversion of his PPD skin test. An x-ray film of the chest shows no abnormalities. Four weeks later he develops abdominal pain and jaundice. Which of the following is the most likely explanation?

- (A) Hepatic tuberculosis
- (B) Hepatitis B
- (C) Isoniazid-induced hepatitis
- (D) Pyridoxine-induced cholecystitis
- (E) Tuberculous pancreatitis

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

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

76. While smoking crack cocaine, a 16-year-old boy develops substernal chest pain. An ECG is consistent with anterior wall myocardial ischemia. The drug most likely had which of the following effects on the heart?

- (A) Direct inhibition of β -adrenergic receptors
- (B) Direct stimulation of adenosine receptors
- (C) Direct stimulation of β -adrenergic receptors
- (D) Indirect stimulation of α -adrenergic receptors
- (E) Indirect inhibition of α -adrenergic receptors

77. After treatment of nuclear DNA with micrococcal nuclease, the majority of DNA is protected from digestion. It remains as doubled-stranded DNA fragments bound to which of the following?

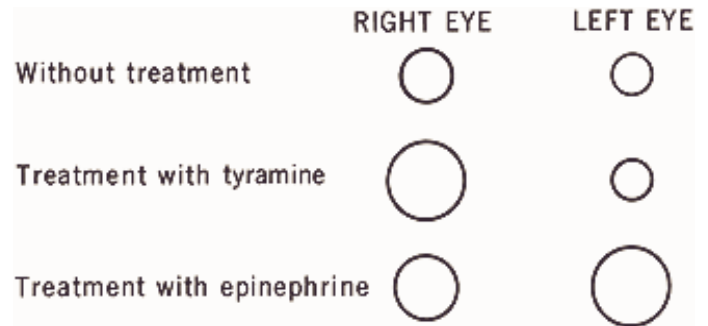
- (A) Histone H₁
- (B) Nuclear membrane
- (C) Nucleolus
- (D) An octamer of basic histones

78. A 37-year-old woman who is being treated for promyelocytic leukemia develops septicemia followed by widespread ecchymoses and bleeding from mucous membranes and venipuncture sites. Disseminated intravascular coagulopathy (DIC) is suspected. Which of the following is the most specific laboratory test to confirm the diagnosis?

- (A) D-dimer assay for fibrin split products
- (B) Partial thromboplastin time
- (C) Plasma fibrinogen concentration
- (D) Platelet count
- (E) Prothrombin time

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

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



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

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

81. An asymptomatic 26-year-old man has a scrotal mass. When he is standing, the left scrotal sac is enlarged with a tubular, worm-like, freely movable, nontender mass. The mass is not palpable when he is supine. The most likely diagnosis is

- (A) cystocele
- (B) ectasia of the spermatic duct
- (C) indirect inguinal hernia
- (D) spermatocele
- (E) varicocele

82. During a prenatal visit, a 25-year-old woman who is 10 weeks' pregnant comments that she feels too nauseated and fatigued to be interested in sex, and her husband wonders if they will ever be sexually active again. The most appropriate next step is to advise her that sexual interest often returns during which of the following periods?

- (A) Second trimester
- (B) Third trimester
- (C) First week postpartum
- (D) First month postpartum

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

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

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

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

84. Infection of macrophages with viruses (eg, dengue) or bacterial pathogens (eg, *Listeria monocytogenes*) that escape from the phagosome to the cytoplasm results in the stimulation of which of the following classes of lymphocytes?

| | Antigen-specific restricted MHC class | T lymphocyte |
|-----|--|----------------|
| (A) | I | CD4+ cytotoxic |
| (B) | I | CD8+ cytotoxic |
| (C) | I | CD8+ helper |
| (D) | II | CD4+ helper |
| (E) | II | CD8+ cytotoxic |

85. A 60-year-old man has a 10-day history of nonproductive cough and dyspnea on exertion. In addition to a normal left lung base, physical examination of his chest in the area of the right lung base discloses:

| | |
|---------------------|-----------|
| Breath sounds | bronchial |
| Percussion note | dull |
| Tactile fremitus | increased |
| Adventitious sounds | crackles |

The most likely diagnosis is

- (A) asthmatic bronchitis
- (B) bullous emphysema
- (C) chronic bronchitis
- (D) congestive heart failure
- (E) lobar pneumonia
- (F) pleural effusion
- (G) pleuritis
- (H) pneumothorax
- (I) pulmonary embolism

86. A 30-year-old woman with a 1-week history of severe diarrhea feels dizzy when she stands up. Blood pressure (supine) is 112/76 mm Hg with a pulse of 88/min; blood pressure (on 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

- (A) desmopressin
- (B) 5% dextrose in water
- (C) fresh frozen plasma
- (D) isotonic saline
- (E) methoxamine
- (F) verapamil

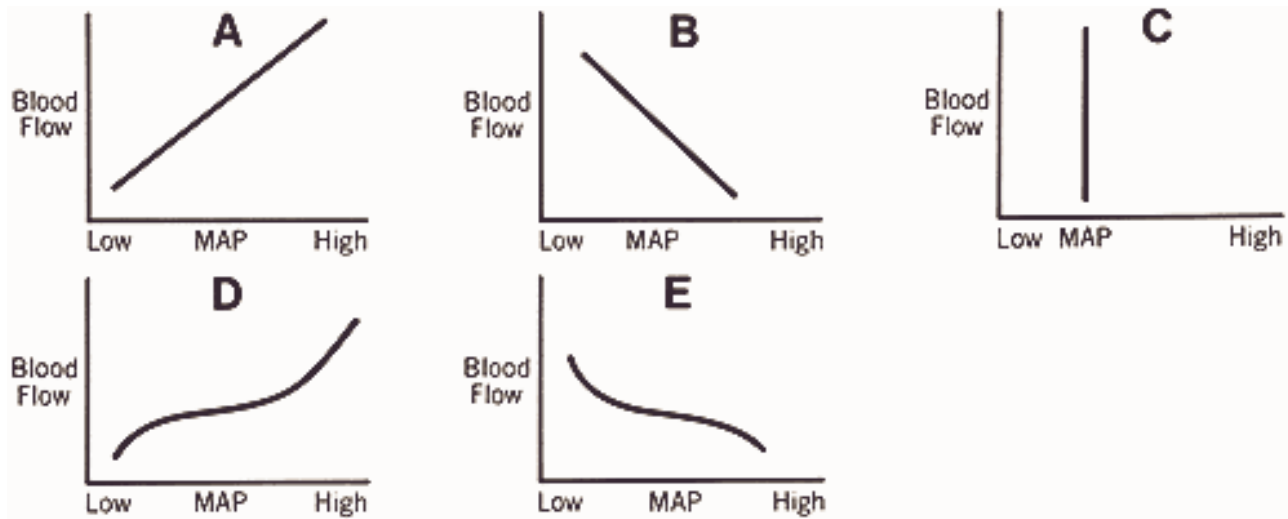
87. A 74-year-old man has colicky abdominal pain in the left lower quadrant, leukocytosis, and fever. He has not had diarrhea or constipation. The most likely diagnosis is

- (A) carcinoma of the sigmoid colon
- (B) diverticulitis
- (C) familial adenomatous polyposis
- (D) ulcerative colitis
- (E) villous adenoma of the upper rectum

88. A 75-year-old man with a history of constipation and episodic abdominal pain has diverticulosis. He is at increased risk for which of the following conditions?

- (A) Angiodysplasia
- (B) Carcinoma of the colon
- (C) Gastrointestinal hemorrhage
- (D) Granulomatous colitis
- (E) Malabsorption

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



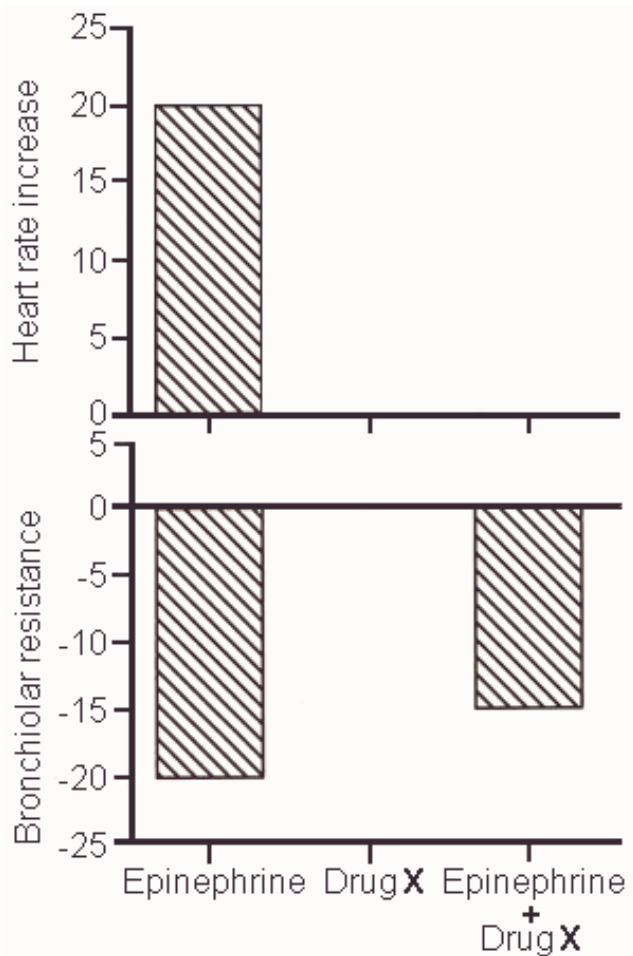
90. A 24-year-old woman who breast feeds her infant develops a warm, painful mass and erythema of the overlying skin in the upper outer quadrant of the right breast. The pain and redness resolve with antibiotic therapy. Several months later, the same area is firm and the overlying skin is dimpled. Which of the following is the most likely cause of these findings?
- (A) Breast abscess with scarring
 (B) Fibroadenoma
 (C) Fibrocystic change
 (D) Infiltrating mammary carcinoma
 (E) Traumatic fat necrosis
91. 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 film 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
92. A 4-year-old girl has been unable to eat for 2 days because of a gastrointestinal tract disorder. Which of the following is the major source of fuel being oxidized by her skeletal muscles?
- (A) Muscle creatine phosphate
 (B) Muscle glycogen
 (C) Muscle triglycerides
 (D) Serum fatty acids
 (E) Serum glucose
93. Which of the following is the best example of regression as a normal response to illness?
- (A) A patient, after receiving a diagnosis of a potentially fatal illness, becomes apathetic and listless
 (B) A patient appears quite suspicious about his physician's diagnosis of a myocardial infarct
 (C) A patient becomes angry when the dietician delivers the wrong food
 (D) A patient in the cardiac care unit with a myocardial infarct continues to make phone calls to his office
 (E) A patient, previously quite independent, seeks frequent reassurance and advice about his condition

94. The parents of a 2-year-old boy are concerned because he has been having frequent temper tantrums in public. The physician should recommend which of the following?
- (A) Distracting him by offering him a treat
 - (B) Ignoring the tantrums as much as possible
 - (C) Spanking him when the tantrums occur
 - (D) Threatening to leave him alone in the place where the tantrums occur
95. 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 isotonic saline contains 150 mmol of NaCl and weighs 1 kg, how much will he weigh (in kg) at the end of day 4?
- (A) 66
 - (B) 68
 - (C) 70
 - (D) 72
 - (E) 74
96. A 38-year-old man reports with some embarrassment that he is unable to urinate in a public urinal, but at home he experiences no difficulty. The most likely diagnosis is
- (A) agoraphobia without history of panic disorder
 - (B) generalized anxiety disorder
 - (C) obsessive-compulsive disorder
 - (D) prostatism
 - (E) social phobia
97. The intracellular domain of the insulin receptor has which of the following enzyme activities?
- (A) Adenylyl cyclase
 - (B) Phosphodiesterase
 - (C) Phospholipase C
 - (D) Phosphoprotein phosphatase
 - (E) Tyrosine kinase
98. Which of the following characteristics of amphetamines is most likely to be responsible for increasing blood pressure?
- (A) Indirect release of endogenous catecholamines
 - (B) Inhibition of catecholamine metabolism
 - (C) Metabolism to false neurochemical transmitters
 - (D) Potent α_1 -adrenergic agonism
 - (E) Potent β_2 -adrenergic agonism
99. A 35-year-old man sustains a full-thickness burn over the dorsum of his forearm. A local flap of normal skin and subcutaneous tissue is rotated into the defect. This skin will survive because of small, horizontally oriented vessels in the
- (A) basal layer
 - (B) deep dermis
 - (C) stratum corneum
 - (D) stratum lucidum
 - (E) subcutaneous fat
100. A neonate develops abdominal distention. X-ray films of the abdomen show markedly dilated loops of small bowel and colon. Which of the following is the most likely diagnosis?
- (A) Aganglionosis in the rectum
 - (B) Atrophy of the colonic mucosa
 - (C) Hypertrophic pyloric stenosis
 - (D) Meckel's diverticulum
 - (E) Multiple polyps in the colon

Sample Questions

Block 3 (Questions 101-150)

101. Following infection with measles virus, a 6-year-old boy produces antibodies to all eight viral proteins. The following year he is again exposed to measles virus. Antibodies to which viral protein are most likely to be protective?
- (A) Hemagglutinin
 - (B) Matrix
 - (C) Nonstructural
 - (D) Nucleocapsid
 - (E) Polymerase
102. Which of the following best explains why neonates with sickle cell disease do not have symptoms at birth?
- (A) The concentration of hemoglobin S is too low
 - (B) Maternal antibodies coat the neonatal cells and inhibit the sickling phenomenon
 - (C) Maternal erythrocytes protect neonatal erythrocytes from sickling
 - (D) Neonatal erythrocytes are exposed to a higher concentration of oxygen than adult erythrocytes
 - (E) The spleen of the neonate can effectively filter out the sickled cells
103. The procedure for measuring cardiac output using the Fick principle involves measuring oxygen uptake by the lungs and measuring the arterial-to-venous oxygen tension difference. Because of differences in the oxygen content of blood emerging from different organs, which of the following is the best source of venous blood for this measurement?
- (A) Jugular vein
 - (B) Pulmonary artery
 - (C) Pulmonary vein
 - (D) Saphenous vein
 - (E) Superior vena cava
104. 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 limbs. The most likely cause of these findings is a deficiency of which of the following nutrients?
- (A) Folate
 - (B) Vitamin A
 - (C) Vitamin B₁ (thiamine)
 - (D) Vitamin B₆ (pyridoxine)
 - (E) Vitamin B₁₂ (cyanocobalamin)
105. Several contiguous cells are labeled with a fluorescent dye that cannot cross cell membranes. One cell is experimentally bleached with light that destroys the dye, but the cell soon recovers dye fluorescence. This recovery is best explained by the presence of which of the following structures between the bleached cell and its fluorescent neighbors?
- (A) A basal lamina
 - (B) Desmosomes (maculae adherentes)
 - (C) Gap junctions
 - (D) Glycosaminoglycans
 - (E) Tight junctions (zonulae occludentes)
106. In sensitized persons, immediate (type I) hypersensitivity responses are primarily the result of liberation of vasoactive substances by the action of which of the following?
- (A) Activated T lymphocytes on smooth muscle cells
 - (B) IgA on basophils and mast cells
 - (C) IgA on neutrophils and eosinophils
 - (D) IgE on basophils and mast cells
 - (E) IgE on neutrophils and eosinophils



107. The histograms show changes in heart rate and bronchiolar resistance produced by the administration of epinephrine alone, drug X alone, and epinephrine together with drug X. Drug X is most likely to be

- (A) isoproterenol
- (B) metoprolol
- (C) nadolol
- (D) pindolol
- (E) propranolol

108. A 4-week-old infant has a loud systolic murmur with a systolic thrill; otherwise, the infant appears healthy. There is no cyanosis. The most likely cause of the murmur is

- (A) atrial septal defect
- (B) coarctation of the aorta
- (C) patent ductus arteriosus
- (D) tetralogy of Fallot
- (E) ventricular septal defect



109. The figure shows the base pairing of a short duplex DNA molecule; circles represent the phosphorus molecules, and the letters represent each of the four common bases present in DNA. The type II restriction endonuclease *Bc/I* will cut symmetrically within the six base-pair palindrome of dyad symmetry that occurs within which of the following portions of the DNA molecule?

- (A) CCCGGT GGGCCA
- (B) CCGGTT GGCCAA
- (C) CGGTTG GCCAAC
- (D) TGATCA ACTAGT
- (E) TTGATC AACTAG

110. A 36-year-old woman has a hysterectomy and bilateral salpingo-oophorectomy because of uncontrolled hemorrhage. She is very concerned because her mother has vertebral compression fractures due to osteoporosis. Which of the following is the most appropriate single treatment to prevent bone loss?

- (A) Calcium, orally
- (B) Estrogen
- (C) Prednisone
- (D) Progesterone
- (E) Vitamin D

111. A 21-year-old woman who smokes 1 pack of cigarettes per day is concerned that she will develop a lethal cancer. Which of the following is most likely to reduce her cumulative net risk for dying from cancer?

- (A) Cessation of smoking
- (B) Having annual mammography
- (C) Having annual tests for blood in the stool
- (D) Having annual Pap tests
- (E) Moving away from her home, which is ¼ mile from a nuclear power plant
- (F) Using sunscreen

112. A mother brings her 2-year-old daughter to the emergency department after finding her bottle of iron pills spilled on the floor and noticing that her daughter's mouth was discolored. The child's plasma iron concentration is 400 $\mu\text{g/dL}$. Which of the following agents is most appropriate for chelation therapy?

- (A) Acetylcysteine
- (B) Calcium disodium edetate (EDTA)
- (C) Deferoxamine
- (D) Dimercaprol
- (E) Penicillamine

113. A patient with end-stage renal disease who is undergoing hemodialysis has normocytic normochromic anemia. Which of the following is the most appropriate therapy?

- (A) Erythropoietin
- (B) Ferrous sulfate
- (C) Folate
- (D) Vitamin B₆ (pyridoxine)
- (E) Vitamin B₁₂ (cyanocobalamin)

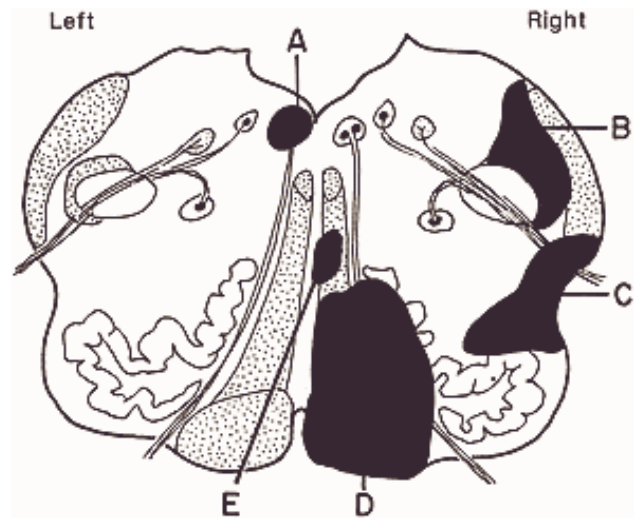
114. A 58-year-old man with chronic congestive heart failure requires ongoing hydrochlorothiazide therapy. His monthly serum chemistry profile shows persistent hypokalemia. The most appropriate next step is to add which of the following diuretics to the regimen?

- (A) Acetazolamide
- (B) Amiloride
- (C) Furosemide
- (D) Mannitol
- (E) Metolazone

115. Moderate alcohol consumption may protect against coronary artery disease by which of the following mechanisms?

- (A) Decreasing serum concentration of LDLs
- (B) Decreasing serum concentration of triglycerides
- (C) Increasing contractile proteins in coronary arteries
- (D) Increasing serum concentration of HDLs
- (E) Increasing thromboxane B₂ release from platelets

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



117. Failure of an endonuclease to recognize the sequence AAUAAA in the 3' end of heterogeneous nuclear RNA will cause a defect in which of the following processes involving mRNA?

- (A) Capping
- (B) Hybridization
- (C) Polyadenylation
- (D) Splicing
- (E) Transport

118. A 16-year-old girl is incoherent and has a fever, severe lower abdominal pain, and a foul-smelling cervicovaginal discharge. A self-induced abortion is suspected. Which of the following methods should be used to collect a sample of the cervical discharge for bacterial culture?

- (A) Inoculating the specimen on mammalian epithelial cells
- (B) Placing a swab in transport medium at room temperature
- (C) Taking samples of the discharge with a syringe and transferring them directly into an anaerobic transport medium
- (D) Using a calibrated inoculating loop to enable direct enumeration of the bacteria in the specimen

119. Patients X and Y both have respirations of 12/min and tidal volumes of 500 mL. However, patient X has an arterial PCO₂ of 35 mm Hg, while patient Y has an arterial PCO₂ of 45 mm Hg. The difference in PCO₂ between these patients is best explained by a difference in which of the following?

- (A) Cardiac output
- (B) Dead space ventilation
- (C) Forced expiratory volume in 1 sec (FEV₁)
- (D) Functional residual capacity
- (E) Lung compliance

120. An 18-year-old female athlete reports easy fatigability and weakness. Findings on physical examination are unremarkable. Laboratory data are:

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

The most likely diagnosis is

- (A) aldosterone deficiency
- (B) anxiety reaction with hyperventilation
- (C) diabetes mellitus with ketoacidosis
- (D) ingestion of anabolic steroids
- (E) surreptitious use of diuretics

121. A 30-year-old woman whose mother and grandmother have died from carcinoma of the breast refuses to have mammography. She says she knows she is at risk but says, "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 have mammograms?

- (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

122. A 38-year-old woman has congestive heart failure, premature ventricular contractions, and repeated episodes of ventricular tachycardia. Her blood pressure is normal and there are no murmurs. Her heart is markedly enlarged. Coronary angiography shows no abnormalities. Which of the following is the most likely diagnosis?

- (A) Acute rheumatic fever
- (B) Congenital fibroelastosis
- (C) Constrictive pericarditis
- (D) Myocardial infarction
- (E) Primary cardiomyopathy

123. A 53-year-old woman dies 4 days after an automobile collision. She sustained multiple injuries including a femoral fracture. Widespread petechiae are found in the cerebral white matter at autopsy. Which of the following is the most likely cause of these findings?

- (A) Adult respiratory distress syndrome
- (B) Contrecoup injury
- (C) Fat embolization
- (D) Septicemia
- (E) Subdural hematoma

124. A 52-year-old man with chronic obstructive pulmonary disease who has been taking theophylline for 14 years now requires treatment for hypertension, peptic ulcer, and tuberculosis. After 2 weeks of therapy, he has a toxic plasma theophylline concentration. The drug most likely to have caused the theophylline toxicity is

- (A) cimetidine
- (B) hydrochlorothiazide
- (C) prazosin
- (D) rifampin

125. A 38-year-old woman with hypertension and hypokalemia is suspected of having hyperaldosteronism. In addition to serum aldosterone measurement, initial evaluation of this patient should include measurement of which of the following?

- (A) Plasma ACTH
- (B) Plasma cortisol
- (C) Plasma prolactin
- (D) Plasma renin
- (E) Urinary sodium

126. A 17-year-old girl sustains a contaminated deep puncture wound while helping repair a barn. Her immunization record indicates that her last tetanus immunization was 12 years ago. In addition to wound care, which of the following is the most appropriate management?
- (A) Tetanus antitoxin
 - (B) Tetanus toxoid
 - (C) Tetanus antitoxin plus toxoid
 - (D) Tetanus toxoid plus adjuvant
 - (E) No intervention
127. Which of the following structural proteins enables the erythrocyte to withstand the stress on its plasma membrane as it presses through narrow capillaries?
- (A) Integrin
 - (B) Myosin
 - (C) Spectrin
 - (D) Tubulin
128. A 26-year-old man who is seropositive for HIV has a decreased CD4+ T lymphocyte count ($250/\text{mm}^3$). After 5 weeks of therapy with a nucleoside polymerase inhibitor and a protease inhibitor, he feels weak and is easily fatigued. 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?
- (A) Decreased formation of erythrocytes
 - (B) Folate deficiency
 - (C) Increased formation of erythrocyte antibodies
 - (D) Increased fragility of erythrocytes
 - (E) Iron deficiency
129. Chronic ingestion of ethanol decreases the rate of gluconeogenesis because of decreased formation of
- (A) ATP and 3-phosphoglycerate from 1,3-bisphosphoglycerate
 - (B) fructose 1,6-bisphosphate from fructose 6-phosphate
 - (C) glyceraldehyde 3-phosphate from fructose 1,6-bisphosphate
 - (D) pyruvate from lactate
 - (E) pyruvate from phosphoenolpyruvate
130. A 23-year-old woman has a progressive increase in serum human chorionic gonadotropin (hCG) concentrations over an 8-week period. A hydatidiform mole is removed, but the hCG concentration continues to increase. The most likely diagnosis is
- (A) adrenal adenoma
 - (B) choriocarcinoma
 - (C) ectopic pregnancy
 - (D) pituitary insufficiency
 - (E) a second noninvasive mole
131. A 32-year-old man is unable to adduct his right eye during conjugate gaze but is able to adduct it during visual convergence. A lesion of which of the following structures on the right side is most likely to produce this finding?
- (A) Lateral rectus muscle
 - (B) Medial rectus muscle
 - (C) Medial forebrain bundle
 - (D) Medial longitudinal fasciculus
 - (E) Nucleus of the oculomotor nerve
132. 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
133. A patient with the classical phenotypic features of Down's syndrome has 46 chromosomes on each of 100 metaphase karyotypes. Which of the following best explains this finding?
- (A) Deletion
 - (B) Mosaicism
 - (C) Somatic mutation
 - (D) Translocation
 - (E) Undetected trisomy

134. Breast carcinomas often cause the skin of the breast to become puffy and pitted, resembling orange peel. The pits most likely correspond with which of the following?

- (A) Attachments of suspensory ligaments (retinacula cutis) to the dermis
- (B) Diffuse scarring in subcutaneous fibrous tissue
- (C) Focal invasion of the dermis by neoplastic cells
- (D) Openings of sebaceous glands
- (E) Openings of sweat glands

135. 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?

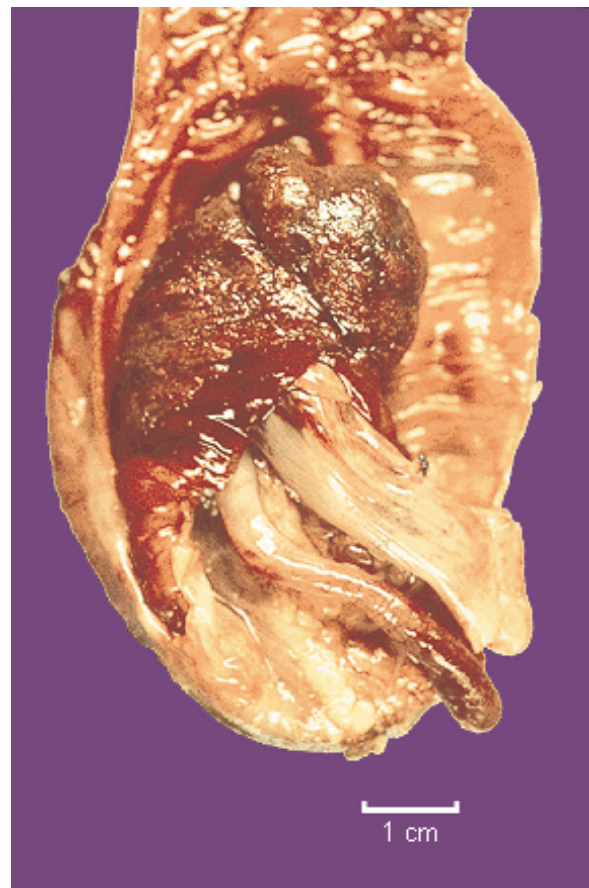
- (A) Decreased serum aldosterone concentration
- (B) Increased serum atrial natriuretic peptide concentration
- (C) Increased effective circulating volume
- (D) Increased serum ADH (vasopressin) concentration
- (E) Urine osmolality less than serum osmolality

136. A 56-year-old woman has adenocarcinoma of the colon that is surgically resected. Which of the following patterns of growth by the neoplasm most strongly suggests a poor prognosis?

- (A) Circumferential growth
- (B) Extension to the muscularis mucosa
- (C) Extension to the serosa
- (D) Polypoid growth
- (E) Surface ulceration

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

- (A) Cortisol
- (B) Erythropoietin
- (C) Insulin
- (D) Parathyroid hormone
- (E) Thyroxine (T_4)

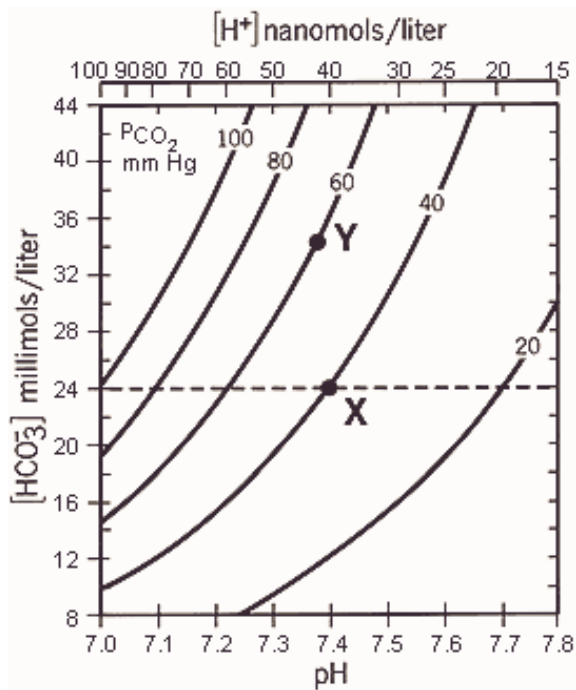


138. A 4-year-old girl has the sudden onset of abdominal pain and vomiting. She has a mass in the right lower quadrant and hyperactive bowel sounds. A segment of resected bowel is shown. Which of the following is the most likely diagnosis?

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

139. 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



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

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

147. A patient with an injury to the gluteal region has difficulty rising from a seated position and straightening his trunk but no difficulty walking on level ground or flexing his leg. Which of the following muscles is affected?

- (A) Gluteus maximus
- (B) Gluteus minimus
- (C) Hamstrings
- (D) Iliopsoas
- (E) Obturator internus

148. A 3-year-old boy with mental retardation has hepatosplenomegaly. Analysis of tissue obtained on biopsy of the liver shows unusually large amounts of glucocerebroside. Which of the following enzymes is most likely to be deficient?

- (A) Hormone-sensitive lipase
- (B) Lipoprotein lipase
- (C) Lysosomal hydrolase
- (D) Sphingolipid synthase
- (E) Tissue phospholipase

149. A 60-year-old man undergoes excision of an obstruction in the large intestine. Which of the following microscopic features in the obstructing lesion most strongly suggests malignant growth?

- (A) Focal areas of necrosis and acute inflammation
- (B) Formation of new vascular channels and hemorrhage
- (C) Hemosiderin-filled macrophages
- (D) Mucin within and outside epithelial cells
- (E) Sheets and cords of epithelial cells in the serosal layer

150. Lactation does not occur during pregnancy because the action of prolactin is blocked by increased concentrations of which of the following hormones?

- (A) Estrogen and progesterone
- (B) Growth hormone and oxytocin
- (C) Human chorionic somatomammotropin and prostaglandin
- (D) Insulin and cortisol
- (E) Thyroxine (T_4) and dopamine

Answer Key for Step 1 Sample Questions

Block 1 (Questions 1-50)

| | | | | |
|-------|-------|-------|-------|-------|
| 1. B | 11. E | 21. H | 31. A | 41. E |
| 2. E | 12. A | 22. D | 32. B | 42. F |
| 3. B | 13. A | 23. D | 33. J | 43. D |
| 4. E | 14. A | 24. E | 34. C | 44. C |
| 5. D | 15. C | 25. E | 35. A | 45. C |
| 6. C | 16. B | 26. B | 36. C | 46. A |
| 7. B | 17. E | 27. D | 37. A | 47. B |
| 8. D | 18. B | 28. D | 38. C | 48. B |
| 9. C | 19. D | 29. D | 39. A | 49. B |
| 10. A | 20. B | 30. A | 40. B | 50. D |

Block 2 (Questions 51-100)

| | | | | |
|-------|-------|-------|-------|--------|
| 51. C | 61. D | 71. C | 81. E | 91. B |
| 52. B | 62. D | 72. E | 82. A | 92. D |
| 53. D | 63. A | 73. B | 83. E | 93. E |
| 54. C | 64. D | 74. C | 84. B | 94. B |
| 55. D | 65. B | 75. C | 85. E | 95. D |
| 56. C | 66. B | 76. D | 86. D | 96. E |
| 57. B | 67. E | 77. D | 87. B | 97. E |
| 58. E | 68. E | 78. A | 88. C | 98. A |
| 59. E | 69. E | 79. C | 89. D | 99. B |
| 60. A | 70. E | 80. E | 90. A | 100. A |

Block 3 (Questions 101-150)

| | | | | |
|--------|--------|--------|--------|--------|
| 101. A | 111. A | 121. C | 131. D | 141. E |
| 102. A | 112. C | 122. E | 132. D | 142. A |
| 103. B | 113. A | 123. C | 133. D | 143. E |
| 104. C | 114. B | 124. A | 134. A | 144. C |
| 105. C | 115. D | 125. D | 135. D | 145. E |
| 106. D | 116. C | 126. C | 136. C | 146. B |
| 107. B | 117. C | 127. C | 137. A | 147. A |
| 108. E | 118. C | 128. A | 138. B | 148. C |
| 109. D | 119. B | 129. D | 139. C | 149. E |
| 110. B | 120. E | 130. B | 140. C | 150. A |