USMLE®
Content Outline

A Joint Program of the Federation of State Medical Boards of the United States, Inc., and the National Board of Medical Examiners®
This outline provides a common organization of content across all USMLE examinations. Each Step exam will emphasize certain parts of the outline, and no single examination will include questions on all topics in the outline. Examinees should refer to the test specifications for each examination for more information about which parts of the outline will be emphasized in the examination for which they are preparing. See the USMLE website (www.usMLE.org) for more detail.
**Table of Contents**

General Principles of Foundational Science 2

Immune System 5

Blood & Lymphoreticular System 6

Behavioral Health 7

Nervous System & Special Senses 8

Skin & Subcutaneous Tissue 9

Musculoskeletal System 10

Cardiovascular System 11

Respiratory System 12

Gastrointestinal System 13

Renal & Urinary System 14

Pregnancy, Childbirth, & the Puerperium 15

Female Reproductive & Breast 16

Male Reproductive 17

Endocrine System 18

Multisystem Processes & Disorders 19

Biostatistics, Epidemiology/Population Health, & Interpretation of the Medical Literature 20

Social Sciences 22
General Principles of Foundational Science

Biochemistry and molecular biology

Gene expression: DNA structure, replication, exchange, and epigenetics (eg, imprinting, X-activation, DNA methylation)

Gene expression: transcription

Gene expression: translation, post-translational processing, modifications, and disposition of proteins (degradation), including protein/glycoprotein synthesis, intra-extracellular sorting, and processes/functions related to Golgi complex and rough endoplasmic reticulum

Structure and function of proteins and enzymes (eg, enzyme kinetics and structural/regulatory proteins)

Energy metabolism (eg, ATP generation, transport chain)

Biology of cells

Adaptive cell responses and cellular homeostasis (eg, hypertrophy)

Mechanisms of injury and necrosis, including pathologic processes (eg, liquefactive necrosis, free radical formation)

Apoptosis

Cell cycle and cell cycle regulation (eg, mitosis)

Mechanisms of dysregulation

Cell/tissue structure, regulation, and function, including cytoskeleton, organelles, glycolipids, channels, gap junctions, extracellular matrix, and receptors

Human development and genetics

Principles of pedigree analysis

Population genetics: Hardy-Weinberg law, founder effects, mutation-selection equilibrium

Principles of gene therapy

Genetic testing and counseling

Genetic mechanisms (eg, penetrance, genetic heterogeneity)
Biology of tissue response to disease

- Acute inflammatory responses (patterns of response)
- Chronic inflammatory responses (eg, tumor necrosis factor)
- Reparative processes

Pharmacodynamic and pharmacokinetic processes: general principles

- Pharmacokinetics: absorption, distribution, metabolism, excretion, dosage intervals
- Mechanisms of drug action, structure-activity relationships (eg, anticancer drugs, antibiotics)
- Concentration and dose-effect relationships (eg, efficacy, potency), types of agonists (eg, full, partial, inverse) and antagonists and their actions
- Individual factors altering pharmacokinetics and pharmacodynamics (eg, age, gender, disease, tolerance, compliance, body weight, metabolic proficiency, pharmacogenetics)
- Mechanisms of drug adverse effects, overdosage, toxicology
- Mechanisms of drug interactions
- Signal transduction, including structure/function of all components of signal transduction pathways such as receptors, ligands (eg, general principles of nitric oxide, autocrine and paracrine signaling)

Microbial biology

- Microbial identification and classification, including principles, microorganism identification, and non-immunologic laboratory diagnosis
  - Bacteria
  - Viruses
  - Fungi
  - Parasites
  - Prions

Normal age-related findings and care of the well patient

- Infancy and childhood (0-12 years)
- Adolescence (13-17 years)
Adulthood (18-64 years)

Senescence (65 years and older)
Immune System

Normal processes

Development of cells of the adaptive immune response, including positive and negative selection during immune development

Structure, production, and function

Cellular basis of the immune response and immunologic mediators

Basis of immunologic diagnostics (eg, antigen-antibody reactions used for diagnostic purposes, ELISA, immunoblotting, antigen-antibody changes over time, ABO typing)

Principles of immunologic protection

Effect of age on the function of components of the immune system

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Disorders associated with immunodeficiency

HIV/AIDS

Immunologically mediated disorders

Adverse effects of drugs on the immune system
**Blood & Lymphoreticular System**

**Normal Processes**

- Embryonic development, fetal maturation, and perinatal changes
- Organ structure and function
- Cell/tissue structure and function
- Repair, regeneration, and changes associated with stage of life

**Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis**

- Infectious and immunologic
- Neoplasms
- Anemia, cytopenias, and polycythemia
- Coagulation disorders (hypocoagulable and hypercoagulable conditions)
- Traumatic, mechanical, and vascular disorders
- Congenital disorders
- Adverse effects of drugs on the hematologic and lymphoreticular systems
Behavioral Health

**Normal Processes**

Psychodynamic and behavioral factors, related past experience (eg, transference, personality traits)

Adaptive behavioral responses to stress and illness (eg, coping mechanisms)

Maladaptive behavioral responses to stress and illness (eg, drug-seeking behavior, sleep deprivation)

Patient adherence

**Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis**

Psychotic disorders

Anxiety disorders

Mood disorders

Somatoform disorders

Factitious disorders

Eating disorders and impulse control disorders

Disorders originating in infancy/childhood

Personality disorders

Psychosocial disorders/behaviors

Sexual and gender identity disorders

Substance abuse disorders

Adverse effects of drugs
Nervous System & Special Senses

Normal Processes

Embryonic development, fetal maturation, and perinatal changes, including neural tube derivatives, cerebral ventricles, and neural crest derivatives

Organ structure and function

Cell/tissue structure and function, including neuronal cellular and molecular biology

Repair, regeneration, and changes associated with stage of life

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Infectious, immunologic, and inflammatory disorders

Neoplasms (cerebral, spinal, and peripheral)

Cerebrovascular disease

Disorders relating to the spine, spinal cord, and spinal nerve roots

Cranial and peripheral nerve disorders

Neurologic pain syndromes

Degenerative disorders/amnestic syndromes

Global cerebral dysfunction

Neuromuscular disorders

Movement disorders

Metabolic disorders

Paroxysmal disorders

Sleep disorders

Traumatic and mechanical disorders and disorders of increased intracranial pressure

Congenital disorders

Adverse effects of drugs on the nervous system

Disorders of the eye, eyelid, and ear
Skin & Subcutaneous Tissue

Normal Processes

Embryonic development, fetal maturation, and neonatal changes

Organ structure and function, including barrier function, thermal regulation

Cell/tissue structure and function, eccrine function

Repair, regeneration, and changes associated with stage of life (eg, senile purpura, male pattern baldness, postmenopausal hair changes)

Skin defense mechanisms and normal flora

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Infectious, immunologic, and inflammatory disorders

Neoplasms

Adnexal disorders (hair and hair follicles, nails, sweat glands, sebaceous glands, oral mucous membranes)

Oral disease

Disorders of pigmentation

Traumatic and mechanical disorders

Congenital disorders

Adverse effects of drugs on skin and subcutaneous tissue
Musculoskeletal System

Normal processes

- Embryonic development, fetal maturation, and perinatal changes
- Organ structure and function
- Cell/tissue structure and function
- Repair, regeneration, and changes associated with stage of life

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

- Infectious, inflammatory, and immunologic disorders
- Neoplasms
- Degenerative and metabolic disorders
- Traumatic and mechanical disorders
- Congenital disorders
- Adverse effects of drugs on the musculoskeletal system
Cardiovascular System

Normal Processes

- Embryonic development, fetal maturation, and perinatal transitional changes
- Organ structure and function
- Cell/tissue structure and function
- Repair, regeneration, and changes associated with stage of life

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

- Infectious, immunologic, and inflammatory disorders
- Neoplasms
- Dysrhythmias
- Heart failure
- Ischemic heart disease
- Diseases of the myocardium
- Diseases of the pericardium
- Valvular heart disease
- Hypotension
- Hypertension
- Dyslipidemia
- Vascular disorders
- Traumatic and mechanical disorders
- Congenital disorders, including disease in adults
- Adverse effects of drugs on the cardiovascular system
Respiratory System

Normal Processes

Embryonic development, fetal maturation, and perinatal changes

Organ structure and function

Cell/tissue structure and function, including surfactant formation, and alveolar structure

Repair, regeneration, and changes associated with stage of life

Pulmonary defense mechanisms and normal flora

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Infectious, immunologic, and inflammatory disorders

Neoplasms

Obstructive airway disease

Pneumoconiosis/fibrosing/restrictive pulmonary disorders/interstitial lung disease

Respiratory failure/respiratory arrest and pulmonary vascular disorders

Metabolic, regulatory, and structural disorders

Disorders of the pleura, mediastinum, and chest wall

Traumatic and mechanical disorders

Congenital disorders

Adverse effects of drugs on the respiratory system
Gastrointestinal System

Normal Processes

Embryonic development, fetal maturation, and perinatal changes

Organ structure and function

Cell/tissue structure and function

Repair, regeneration, and changes associated with stage of life

Gastrointestinal defense mechanisms and normal flora

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Infectious, immunologic, and inflammatory disorders

Neoplasms

Signs, symptoms, and ill-defined disorders

Disorders of the oral cavity, salivary glands, and esophagus

Disorders of the stomach, small intestine, colon, rectum, anus

Disorders of the liver and biliary system, noninfectious

Disorders of the pancreas

Disorders of the peritoneal cavity

Traumatic and mechanical disorders

Congenital disorders

Adverse effects of drugs on the gastrointestinal system
Renal & Urinary System

Normal Processes

- Embryonic development, fetal maturation, and perinatal changes
- Organ structure and function
- Cell/tissue structure and function
- Repair, regeneration, and changes associated with stage of life

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

- Infectious, immunologic, and inflammatory disorders
- Neoplasms
- Signs, symptoms, and ill-defined disorders
- Metabolic and regulatory disorders
- Vascular disorders
- Traumatic and mechanical disorders
- Congenital disorders
- Adverse effects of drugs on the renal and urinary system
Pregnancy, Childbirth, & the Puerperium

Normal Processes

Organ structure and function: pregnancy, including fertilization, implantation, development of embryo, labor and delivery, the puerperium, lactation, gestational uterus, placenta

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Prenatal care

Obstetric complications

Labor and delivery

Puerperium, including complications

Newborn (birth to 4 weeks of age)

Congenital disorders, neonatal

Adverse effects of drugs on pregnancy, childbirth, and the puerperium

Systemic disorders affecting pregnancy, labor and delivery, and puerperium
Female Reproductive & Breast

Normal Processes

Embryonic development, fetal maturation, and perinatal changes, gametogenesis

Organ structure and function

Cell/tissue structure and function, including hypothalamic-pituitary-gonadal axis, sex steroids, and gestational hormones

Reproductive system defense mechanisms and normal flora

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Breast

Female reproductive system
Male Reproductive

Normal Processes

Embryonic development, fetal maturation, and neonatal changes, gametogenesis

Organ structure and function

Cell/tissue structure and function, including hypothalamic-pituitary-gonadal axis, sex steroids, and gestational hormones

Reproductive system defense mechanisms and normal flora

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Infectious, immunologic, and inflammatory disorders

Neoplasms

Metabolic and regulatory disorders, including sexual dysfunction

Traumatic and mechanical disorders

Congenital disorders of the male reproductive system

Adverse effects of drugs on the male reproductive system
Endocrine System

Normal Processes

Embryonic development, fetal maturation, and perinatal changes

Organ structure and function

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

Repair, regeneration, and changes associated with stage of life

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Diabetes mellitus and other disorders of the endocrine pancreas

Thyroid disorders

Parathyroid disorders

Adrenal disorders

Pituitary disorders

Hypothalamic endocrine disorders

Multiple endocrine neoplasia (MEN1, MEN2)

Congenital disorders

Adverse effects of drugs on the endocrine system
Multisystem Processes & Disorders

Normal Processes

Principles of nutrition

Electrolyte and water metabolism

Intracellular accumulations (eg, pigments, fats, proteins, carbohydrates, minerals, inclusions, vacuoles, lysosomal/glycogen storage disease and structures related to storage diseases, glycogen phosphorylase deficiency, Zellweger syndrome)

Abnormal Processes: Health and Health Maintenance, Screening, Diagnosis, Management, Risks, Prognosis

Infectious, immunologic, and inflammatory disorders

Neoplasms and related disorders

Signs, symptoms, and ill-defined disorders

Nutrition

Response to environmental extremes

Venomous bites and stings

Fluid, electrolyte, and acid-base balance disorders

Abuse

Multiple trauma (eg, prioritization, blast injury)

Shock, cardiogenic, hypovolemic, neurogenic, septic, systemic inflammatory response syndrome (SIRS), refractory, multiorgan dysfunction syndrome

Genetic metabolic and developmental disorders

Adverse effects of drugs on multisystem disorders
Biostatistics, Epidemiology/Population Health, & Interpretation of the Medical Literature

Epidemiology/population health

- Measures of disease frequency: incidence/prevalence
- Measures of health status
- Survival analysis interpretation (e.g., Kaplan-Meier curve)
- Composite health status indicators, measures of population impact
- Population pyramids and impact of demographic changes
- Disease surveillance and outbreak investigation
- Communicable disease transmission
- Points of intervention

Study design, types and selection of studies (includes dependent/independent variables)

- Descriptive studies (case report [one person]/case series [more than one])
- Analytical studies: observational
- Analytical studies: interventional
- Systematic reviews and meta-analysis
- Obtaining and describing samples, matching, inclusion/exclusion criteria, selecting appropriate controls for studies, lack of controls, concealed allocation, randomization, stratification
- Methods to handle noncompliance
- Qualitative analysis

Measures of association

- Relative risk
- Odds ratio, hazard ratio
- Other measures of association
Distributions of data

Correlation and regression, uses and interpretation

Principles of testing and screening

   Properties of a screening test
   Sensitivity and specificity; predictive value, positive and negative
   ROC curves
   Probability

Study interpretation, drawing conclusions from data

   Causation
   Chance
   Interpretation of graphs/tables and text
   Bias, confounding, and threats to validity (includes methods to address)
   Internal vs. external validity
   Statistical vs. clinical significance; clinical and surrogate outcome/end-point

Clinical decision making, interpretation and use of evidence-based data and recommendations

Research ethics

   Informed consent for research
   Privacy of patient data (HIPAA)
   Roles of institutional review boards (IRBs)
   Intervention analysis
   Regulatory issues
   Other issues related to research ethics
Social Sciences

Communication and interpersonal skills, including health literacy and numeracy, cultural competence

- Patient interviewing, consultation, and interactions with the family (patient-centered communication skills)
- Use of an interpreter

Medical ethics and jurisprudence, include issues related to death and dying palliative care

- Consent/informed consent to treatment, permission to treat (full disclosure, risks and benefits, placebos, alternative therapies, conflict of interest, and vulnerable populations)
- Determination of medical decision-making capacity/informed refusal
- Involuntary admission
- Legal issues related to abuse (child, elder, and intimate partner)
- Birth-related issues (eg, prenatal diagnosis, abortion, maternal-fetal conflict)
- Death and dying and palliative care
- Physician-patient relationship (boundaries, confidentiality including HIPAA, privacy, truth-telling, other principles of medical ethics, eg, autonomy, justice, beneficence)
- Impaired physician, including duty to report impaired physician
- Negligence/malpractice, including duty to report negligence and malpractice
- Physician misconduct, including duty to report physician misconduct
- Referrals
- Cultural issues not otherwise coded

Systems-based practice (including health systems, public health, community, schools) and patient safety (including basic concepts and terminology)