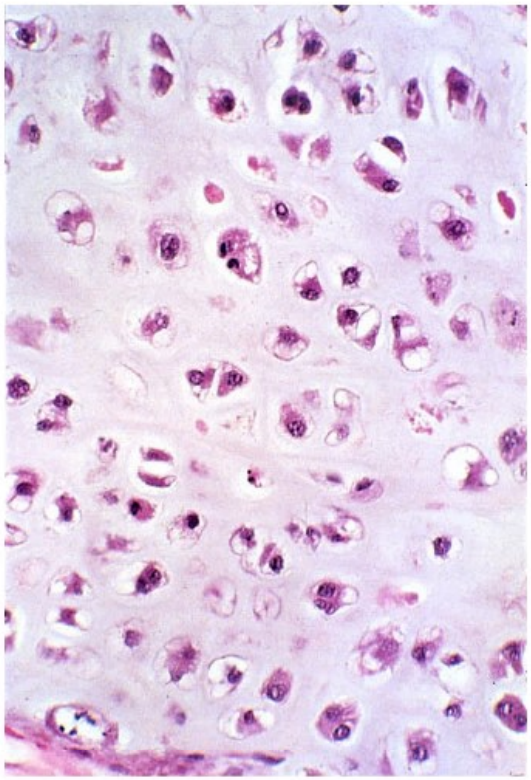
1. A 24-year-old man with a history of drug abuse has nausea, rhinorrhea, hypertension, and tachycardia. The most likely cause is withdrawal from which of the following agents?

- A) Alcohol
- B) Amphetamine
- C) Cocaine
- D) Heroin
- E) Nicotine

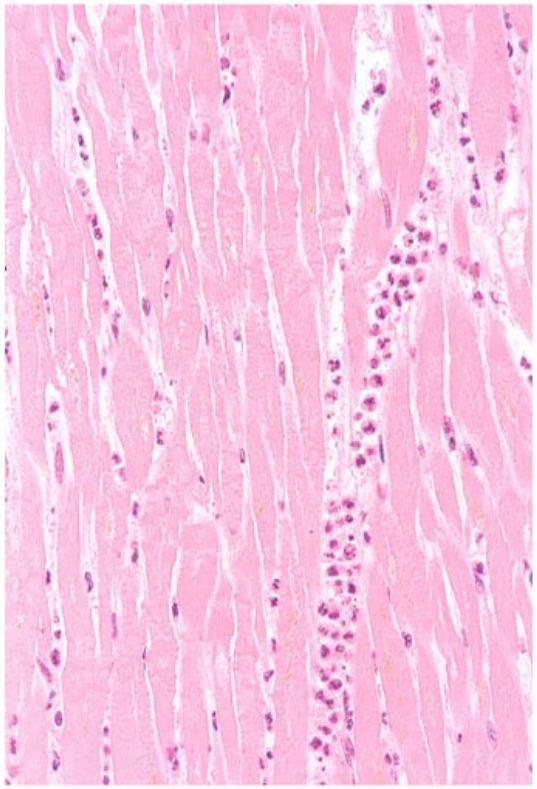
38. A 45-year-old man comes to the physician because of progressively worsening, constant pain in his left thigh over the past 3 months. He is a long-distance runner. An x-ray of the femur shows thickening of the diaphysis and disruption of the cortex with focal areas of increased calcification. A glistening mass containing several cysts is surgically excised. A photomicrograph of tissue from the mass is shown. Which of the following is the most likely diagnosis?

- A) Atypical stress fracture
- B) Chondrosarcoma
- C) Enchondroma
- D) Ewing sarcoma
- E) Giant cell carcinoma
- F) Multilobulated bone cyst
- G) Osteosarcoma



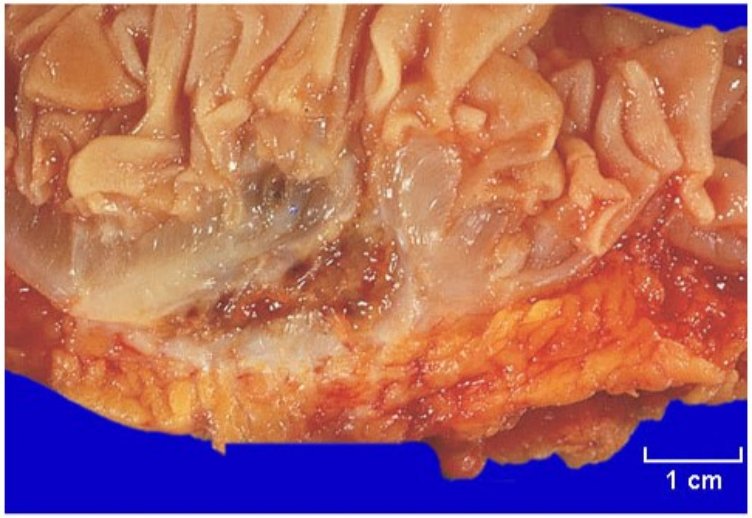
42. A 50-year-old man is found dead in bed at home. His family states that he had chest pain for 3 weeks prior to his death. At autopsy, examination shows severe atherosclerosis of all three major coronary arteries, with myocardial softening and mottling involving the anterolateral wall of the left ventricle. A photomicrograph of a section from this area is shown. Which of the following is the most likely mechanism of death?

- A) Arrhythmia
- B) Cardiogenic shock
- C) Myocardial rupture
- D) Papillary muscle dysfunction
- E) Reperfusion injury



34. A 70-year-old woman is found to have persistent fever despite intravenous broad-spectrum antibiotic therapy 3 days after undergoing operative excision of the anterior pelvic organs for recurrent cervical carcinoma. Her temperature is 38.5°C (101.3°F). Physical examination shows the presence of a central venous catheter that was placed on the day of the operation. There is also a well-healing abdominal wound without erythema and with two drains in place. Blood cultures and cultures of the tip of the central catheter on a sheep blood agar plate grow the organism shown in the photograph. A Gram stain of one of the colonies shows 4-µm, elliptical, purple, budding organisms. Which of the following is the most likely causal organism?

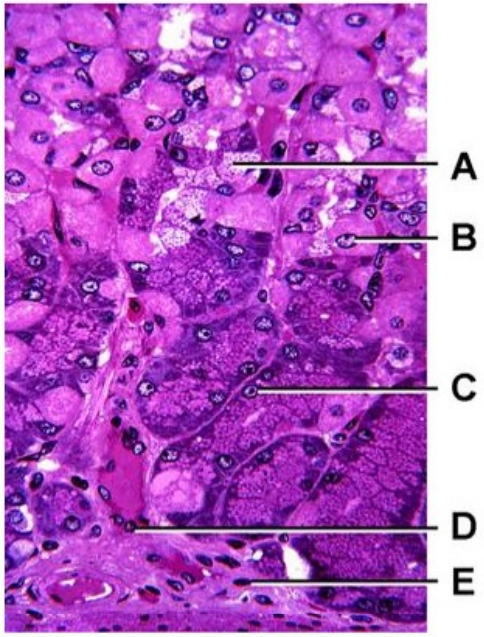
- A) *Candida albicans*
- B) *Cryptococcus neoformans*
- C) *Escherichia coli*
- D) *Sporothrix schenckii*
- E) *Staphylococcus aureus*



43. A 66-year-old woman comes to the physician because of fever, chills, and left lower abdominal pain for 1 day. She has had increasingly severe constipation over the past 5 years. A barium study of the lower gastrointestinal tract shows three separate, poorly delimited regions of narrowing of the lumen of the distal sigmoid. A photograph of one of the lesions in the resected large intestine is shown. Which of the following is the most likely diagnosis?

- A) Angiodysplasia
- B) Diverticulitis
- C) Granulomatous colitis
- D) Ischemic colitis
- E) Ulcerative colitis

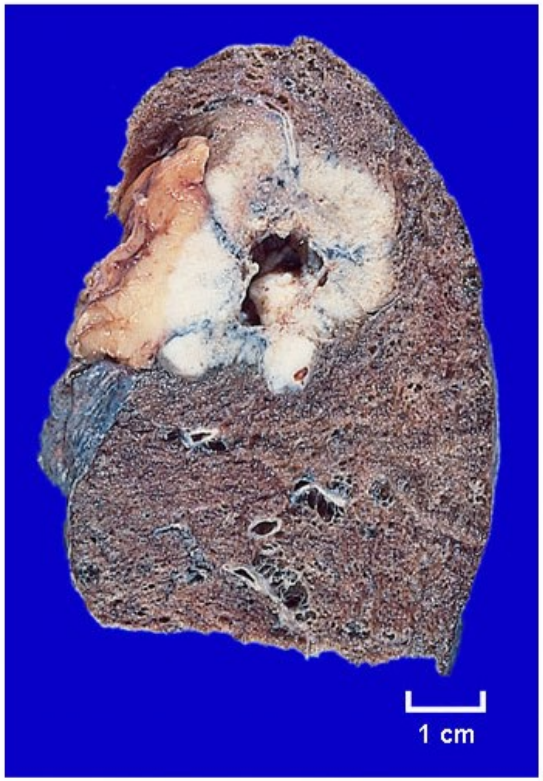
8. A 51-year-old woman comes to the physician because of a 6-month history of burning abdominal pain that occurs 1 to 2 hours after eating. She sweats profusely and has light-headedness when she stands. Her blood pressure is 105/70 mm Hg while standing. Physical examination shows epigastric tenderness. A CT scan of the abdomen shows a 2-cm mass on the proximal duodenum. Gastrin released by the tumor cells stimulates which of the following labeled cells in the photomicrograph shown to release hydrogen ions?



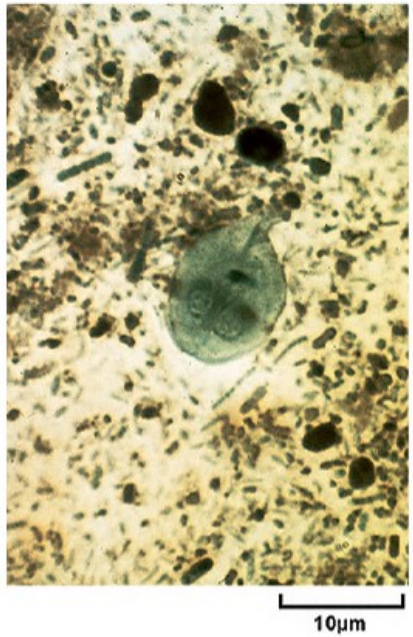
A) B) C) D) E)

5. A 65-year-old man dies in a motor vehicle collision. A photograph of a lung as seen at autopsy is shown. Which of the following is the most likely diagnosis?

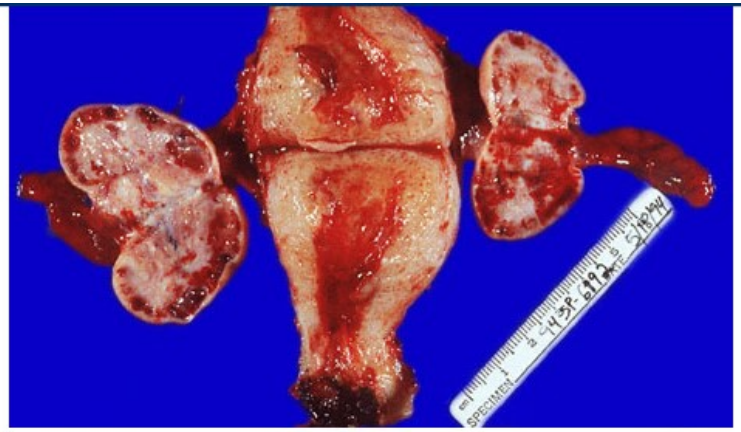
- A) Abscess
- B) Hamartoma
- C) Infarct
- D) Malignant lymphoma
- E) Mesothelioma
- F) Squamous cell carcinoma



10. A 22-year-old man comes to the physician because of a 2-month history of foul-smelling, watery diarrhea with significant flatulence; he also has had a 4.5-kg (10-lb) weight loss during this period. He recently returned from a trip to rural Indonesia, where he did not always have access to clean water. He appears thin. Physical examination shows a soft, mildly distended abdomen with active bowel sounds. A photomicrograph of a stool specimen is shown. The most appropriate pharmacotherapy has which of the following mechanisms of action?



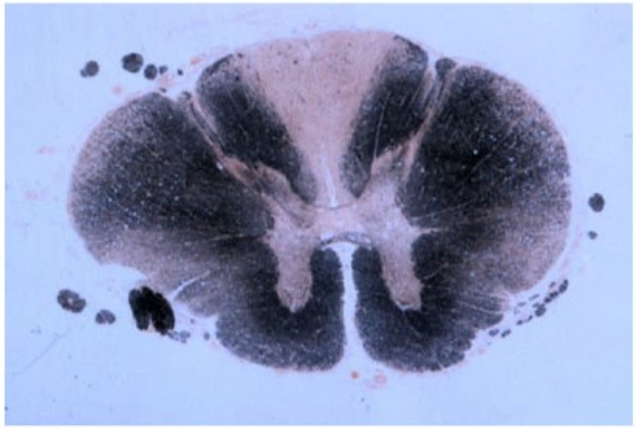
- A) Enhancement of cell membrane permeability to chloride ions
- B) Formation of destructive free radicals
- C) Inhibition of DNA polymerase
- D) Inhibition of protein synthesis
- E) Prevention of microtubule assembly



38. A 25-year-old nulligravid woman comes to the physician because she and her husband have not been able to conceive a child for 3 years. Previous evaluation of the husband showed no abnormalities in spermatogenesis. Menarche was at the age of 13 years. Menses occur at irregular 60- to 90-day intervals. She is 157 cm (5 ft 2 in) tall and weighs 68 kg (150 lb); BMI is 28 kg/m^2. Physical examination shows hirsutism. Ultrasonography shows ovaries with numerous cysts beneath the capsule. A photograph of the uterus and the ovaries from a woman with a similar condition is shown. This patient is at greatest risk for developing which of the following conditions?

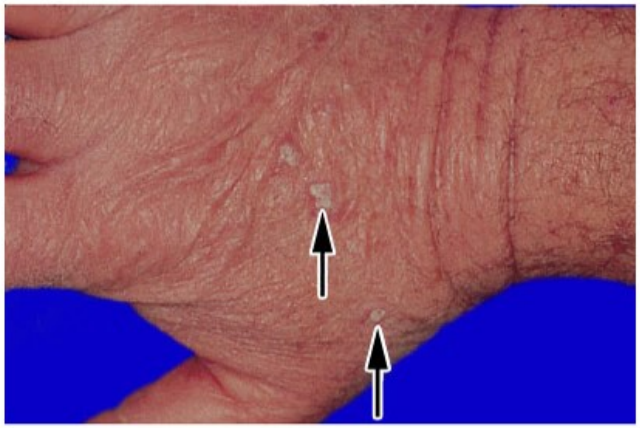
- A) Adenomyosis
- B) Dermoid cyst
- C) Ectopic pregnancy
- D) Endometrial hyperplasia
- E) Endometriosis
- F) Hydatidiform mole
- G) Leiomyomata uteri
- H) Meigs syndrome
- I) Placenta previa

10. A photograph is shown of a myelin-stained cross section of a spinal cord obtained at autopsy from a 50-year-old woman. She sustained a spinal cord injury in a motor vehicle collision 15 years prior to her death. Which of the following symptoms would most likely have been present in this patient as a result of the damage indicated in the photograph?



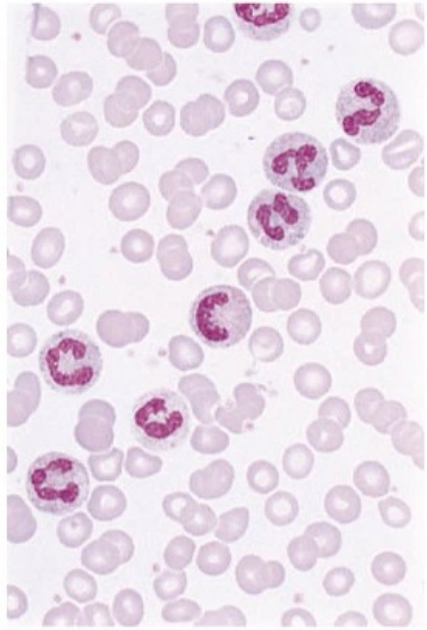
- A) Atrophy of the arm muscles
- B) Atrophy of the thigh muscles
- C) Hyperreflexia of the quadriceps deep tendon reflex
- D) Hyperreflexia of the triceps deep tendon reflex
- E) Loss of sensation to vibration over both feet
- F) Loss of sensation to vibration over both hands

37. A 62-year-old man who is a farmer comes to the physician because of an 8-year history of the lesions indicated by the arrows shown in the photograph. Although there is no itching, he occasionally picks at the lesions, which causes some bleeding. Physical examination shows numerous similar rough plaques on the scalp, face, ears, and forearms. Which of the following is the most likely diagnosis?



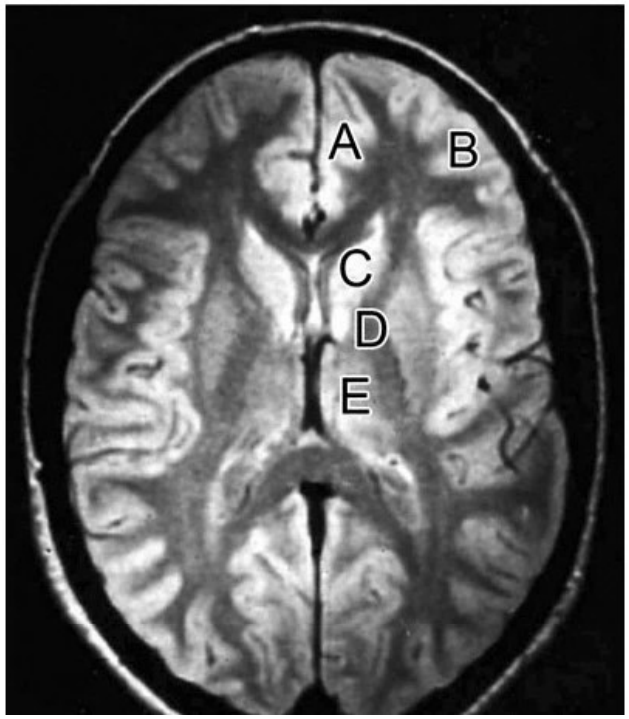
- A) Actinic keratosis
- B) Basal cell carcinoma
- C) Hand dermatitis
- D) Psoriasis
- E) Seborrheic keratosis
- F) Squamous cell carcinoma
- G) Tinea corporis
- H) Verruca vulgaris

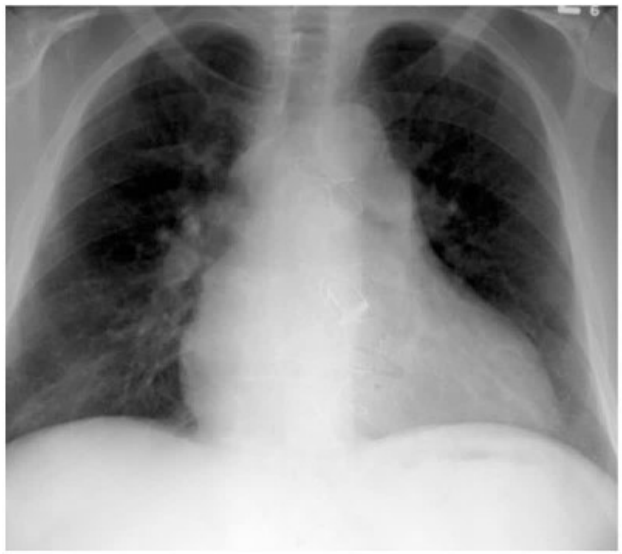
14. A 68-year-old woman has had a fever and shortness of breath for the past week. X-rays of the chest show a right lower lobe infiltrate. Leukocyte count is 38,000/mm^3. A peripheral blood smear is shown. Which of the following best describes her peripheral blood smear?

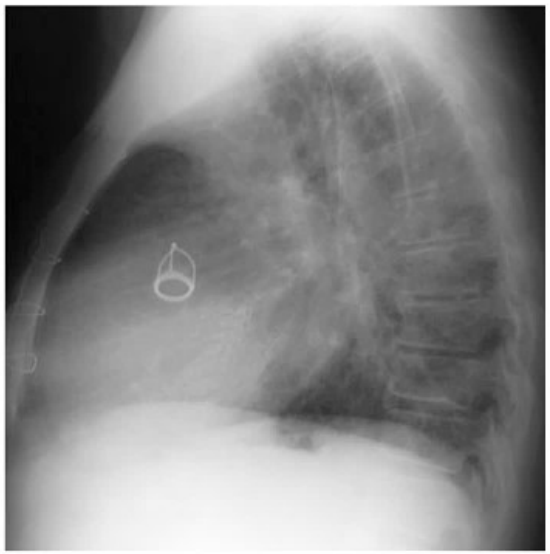


- A) Acute lymphoid leukemia
- B) Acute myeloid leukemia
- C) Chronic lymphocytic leukemia
- D) Reactive granulocytosis
- E) Reactive lymphocytosis

5. A 43-year-old woman dies after a 10-year illness characterized by irregular jerking movements of the extremities and a disjointed gait. She had profound dementia during the last 2 years of her life. Her father had a similar disorder and died at the age of 65 years. At autopsy, examination of this patient's brain is most likely to show severe atrophy of which of the following labeled structures in the MRI of the normal brain?







29. A 43-year-old man comes to the physician for a follow-up examination. Ten years ago, he underwent cardiac valve replacement. Chest x-rays are shown. Based on these findings, which of the following valves was most likely replaced in this patient?

- A) Aortic
- B) Mitral
- C) Pulmonic
- D) Tricuspid

21. A 37-year-old man is brought to the emergency department 45 minutes after sustaining injuries in a motor vehicle collision. He has severe, sharp, right-sided chest pain. His respirations are 30/min and labored. Physical examination shows numerous areas of trauma to the right side of the head and thorax. Breath sounds are decreased on the right, and there is hyperresonance in the right thorax. Physical examination shows decreased tactile fremitus, and adventitious sounds are absent. X-rays confirm multiple rib fractures. A CT scan of the chest is shown. The most likely afferent pathway of this patient's chest pain is carried in which of the following nerves?

- A) Greater thoracic splanchnic
- B) Intercostal
- C) Phrenic
- D) Pulmonary parasympathetic
- E) Vagus

37. A 14-year-old girl is brought to the physician by her mother because of a 2-month history of hair loss on her head. The mother says that her daughter has been trying to imitate the hairstyles of several pop music stars by using various ties, rubber bands, and curlers, but she is not sure whether any chemical treatments have been used. The mother reports that the patient has been sad since her grandmother died unexpectedly 3 months ago. Vital signs are normal. Physical examination shows decreased hair density over several irregular patches temporally and frontally, but no denuded areas. The underlying skin is normal. The remaining hair shafts in these thinned areas are of varying lengths. There is no frontotemporal recession. A photograph of the affected area is shown. Which of the following is the most likely explanation for this patient's hair loss?

- A) Alopecia areata
- B) Androgenetic alopecia
- C) Telogen effluvium
- D) Tinea capitis
- E) Trichotillomania

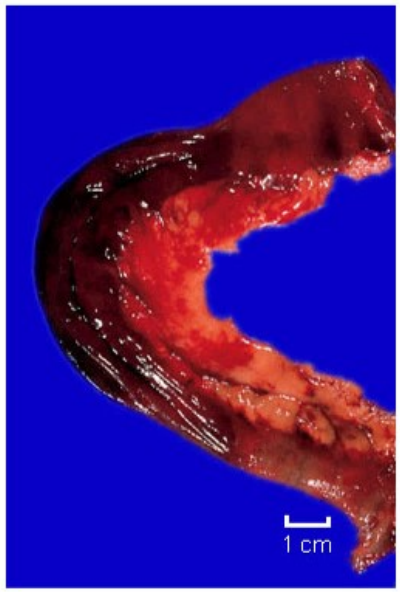
47. A 27-year-old primigravid woman at 34 weeks' gestation is admitted to the hospital because of nausea and vomiting, and abdominal pain for 12 hours. Her pregnancy has been otherwise unremarkable. Prior laboratory studies, including a complete blood count and serologic tests for HIV and hepatitis, have shown no abnormalities. Her blood pressure now is 164/102 mm Hg. Abdominal examination shows right upper quadrant tenderness. Laboratory studies show:

Hemoglobin	7.4 g/dL
Hematocrit	24%
Platelet count	72,000/mm^3
Serum	
Creatinine	1.2 mg/dL
Total bilirubin	2.3 mg/dL
AST	112 U/L
ALT	126 U/L

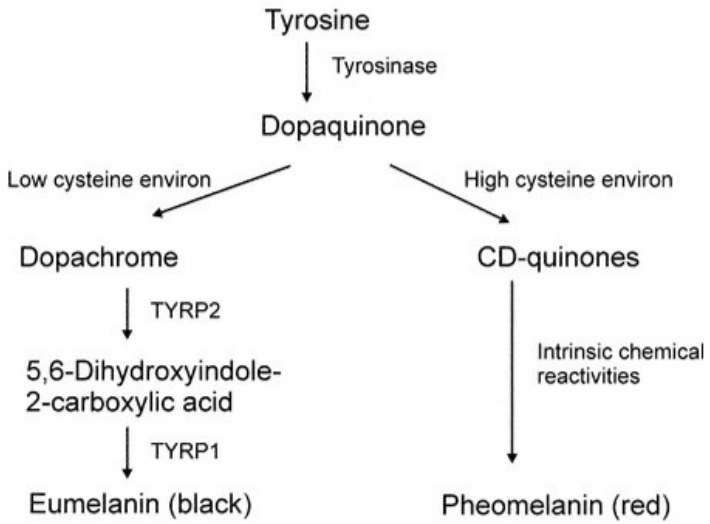
Examination of a peripheral blood smear is most likely to show a predominance of which of the following in this patient?

- A) Acanthocytes
- B) Heinz bodies
- C) Howell-Jolly bodies
- D) Schistocytes
- E) Spherocytes
- F) Target cells

26. While lifting weights, a 24-year-old man develops a painful swelling in the right inguinal region that cannot be reduced. The photograph shows a segment of the small intestine resected at exploratory laparotomy. Which of the following is the most likely diagnosis?



- A) Adhesions
- B) Embolism
- C) Intussusception
- D) Strangulation
- E) Volvulus



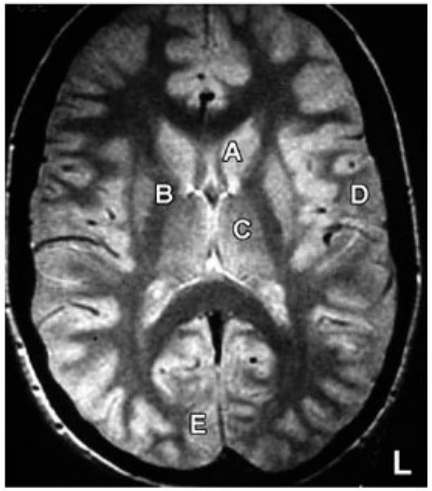
21. A 5-year-old boy is brought to the physician for a well-child examination. He recently immigrated to the USA from Nigeria with his parents. He has no history of major medical illness. He is at the 40th percentile for height and weight. His vital signs are within normal limits. Physical examination shows red-bronze skin, red hair, and continual horizontal nystagmus. Laboratory studies show a complete blood count that is within the reference range and normal leukocyte and platelet morphology. Genetic testing shows compound heterozygosity of the TYRP1 gene in the figure shown, with the presence of both a frame-shift (368delA) and a nonsense (S166X) mutation. These genetic changes most likely caused which of the following in this patient?

- A) Absence of tyrosinase in the affected cells
- B) Decreased concentrations of 5,6-dihydroxyindole-2-carboxylic acid
- C) Decreased reactive oxygen species in pigmented cells
- D) Increased photoprotection of the prevalent melanin form
- E) Lack of choroidal pigment deposition in the macula

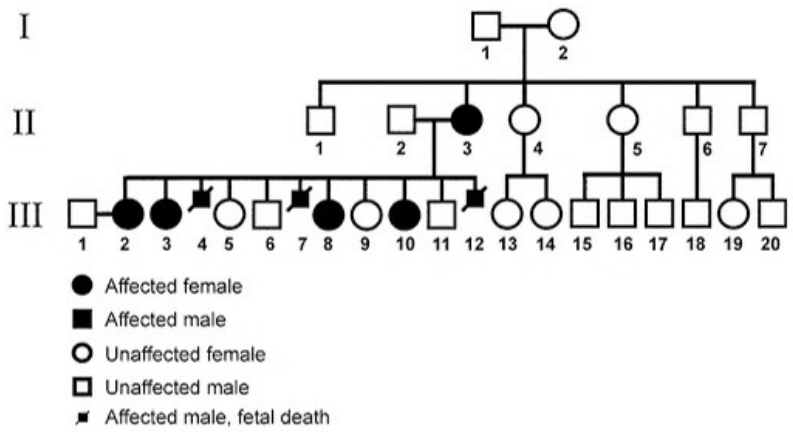
28. A 19-year-old woman is brought to the emergency department 30 minutes after falling on her outstretched right hand during a gymnastics competition. Physical examination shows tenderness of the anatomical snuff-box. An x-ray of the right wrist is shown. The most likely diagnosis is fracture of which of the following carpal bones?

- A) Capitate
- B) Hamate
- C) Lunate
- D) Scaphoid
- E) Triquetrum

22. A 66-year-old right-handed woman develops the acute onset of spastic left hemiparesis and weakness of the lower two thirds of the face on the left. The most likely cause of her condition is a lesion at which of the following labeled areas on the MRI of the brain shown?



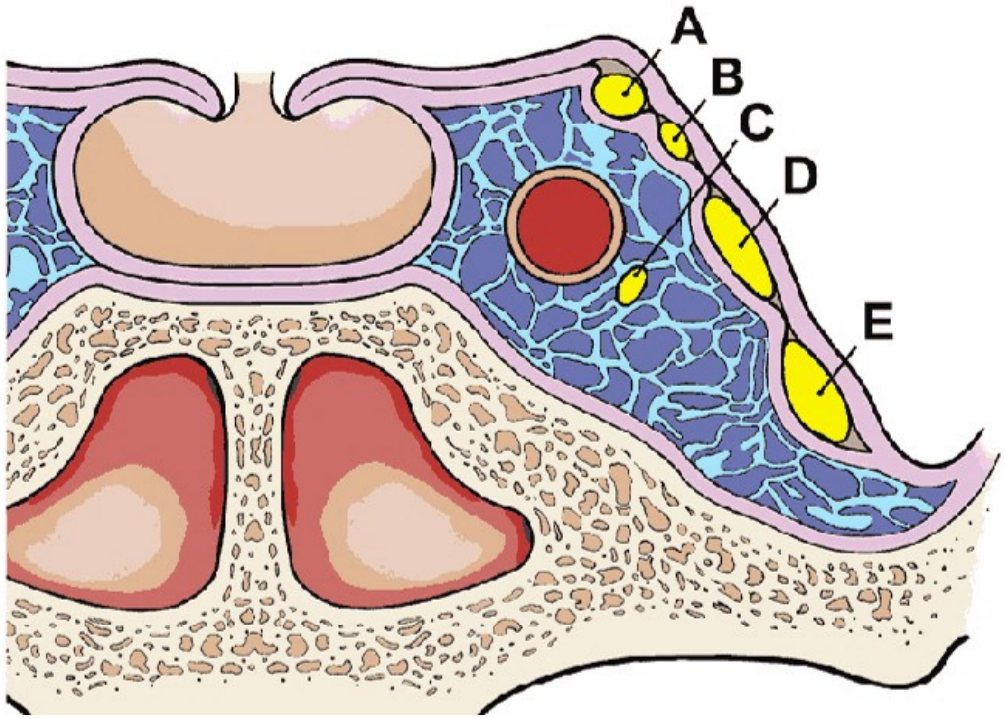
○ A) ○ B) ○ C) ○ D) ○ E)



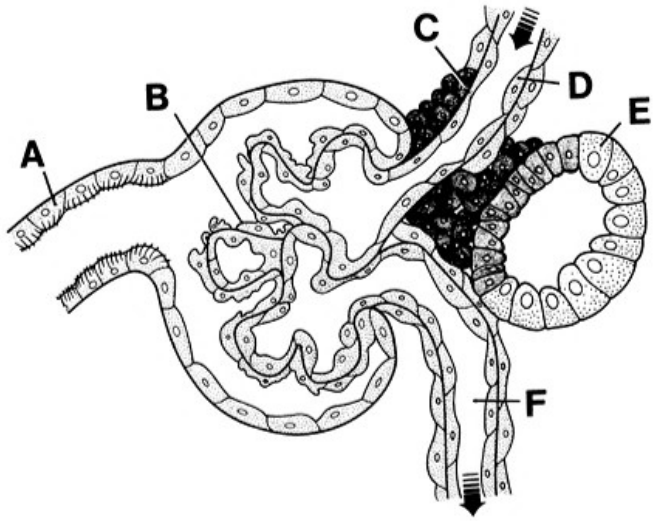
17. A 26-year-old woman (III-2) comes to the physician for counseling prior to conception. Many members of her family had blistering of the skin in infancy and now have unusual marbled pigmentation of the skin. The underlying inherited condition is uniformly fatal to males in utero. A pedigree is shown. Which of the following is the most likely risk that this patient's live-born offspring will be affected?

- A) 25% in females but near 0 in males
- B) 25% in males but near 0 in females
- C) 25% regardless of the sex of the child
- D) 50% in females but near 0 in males
- E) 50% in males but near 0 in females
- F) 50% regardless of the sex of the child
- G) Nearly 100%
- H) Not increased over the general population risk

50. A 65-year-old woman undergoes surgical repair of an aneurysm of the right internal carotid artery in the cavernous sinus. Three days later, physical examination shows that the right pupil is larger than the left pupil. There is also weakness with movement of the eye. A diagram of a coronal section through the middle cranial fossa, including the cavernous sinus and associated structures, is shown. Which of the following labeled nerves is most likely damaged in this patient?



41. A 54-year-old man comes to the physician for a routine health maintenance examination. His pulse is 80/min, respirations are 14/min, and blood pressure is 140/95 mm Hg. Physical examination shows no other abnormalities. An angiotensin I-converting enzyme inhibitor is prescribed. Which of the following labeled regions in the illustration of the kidney shown will be most affected by the administration of this drug?



A) B) C) D) E) F)

33. A study is conducted on patients with asthma to compare a new asthma treatment with a placebo. After 12 weeks of therapy, the mean (± standard error of the mean) symptom scores were 2.8 ± 0.1 in the treated group (n=103) as compared to 3.1 ± 0.1 in the placebo group (n=100). The *p*-value is 0.035. The investigators of this study state that they chose a sample size of about 100 subjects in each group to have an 80% power of detecting a mean difference of 0.4 at a significance level of 5%. When planning a study, which of the following is the meaning of "80% power"?

- A) If 80% of the subjects improve with the drug, there is a 95% chance that a study of this size will find a *p*-value ≥ 0.05
- B) If 80% of the subjects improve with the drug, there is a 95% chance that a study of this size will find a *p*-value ≤ 0.05
- C) If the treatment decreases the asthma score by 0.4 in 80% of the subjects, there is a 95% chance that a study of this size will find a *p*-value ≥ 0.05
- D) If the treatment decreases the asthma score by 0.4 in 80% of the subjects, there is a 95% chance that a study of this size will find a *p*-value ≤ 0.05
- E) If the treatment really changes the mean asthma score by 0.4, there is an 80% chance that a study of this size will find a *p*-value ≥ 0.05
- F) If the treatment really changes the mean asthma score by 0.4, there is an 80% chance that a study of this size will find a *p*-value ≤ 0.05

12. A 52-year-old woman is admitted to the hospital because of shortness of breath due to malignant ascites and pleural effusion. She has had ovarian cancer for 3 years. Treatment has included several courses of aggressive chemotherapy including intraperitoneal chemotherapy and sclerotherapy for her recurrent pleural effusion. During prior hospitalizations, she has undergone debulking procedures. She has been discouraged by the ineffectiveness of therapy, and she feels emotionally and physically exhausted. Her primary care gynecologist suggests a palliative care consultation, but her gynecologic oncologist says he is "absolutely opposed to giving up" and is recommending referral for inclusion in a clinical trial. This disagreement between the two physicians is disconcerting to the patient. Following thoracentesis and paracentesis, the patient calls her primary care internist to help address this conflict between the two physicians. Which of the following is the most appropriate next step for the internist to address the patient's concerns?

- A) Contact a representative from the hospital risk management department
- B) Speak with the chair of the hospital ethics committee
- C) Speak with the two gynecologists to attempt to coordinate care
- D) Refer the patient for pastoral counseling
- E) Refer the patient for a psychiatric consultation to deal with her anxiety about the conflict

12. A 65-year-old woman is being treated in the hospital for widely metastatic breast cancer unresponsive to chemotherapy. She has never married and has no children or siblings. Throughout her illness, another woman she had introduced as "my close friend," has been with her during hospitalizations and office visits. The patient is moved to an inpatient hospice after she decides she wants no further curative therapy. She and her friend appear very distressed when they read a sign outside the hospice unit that states only family members are permitted to stay after visiting hours. Her friend says, "We can't bear to be apart. It would be cruel to separate us now." Which of the following responses by the physician is most appropriate?

A) "Don't worry. I'll call you right away if something happens to your friend. Just leave your number with the nurses."
B) "I'm sorry, but only family is allowed to stay with patients in the hospital. You will have to leave after your 15 minutes are up."
C) "The two of you seem to have a very important relationship. Of course you may stay together."
D) "Visiting hours are posted outside. You are welcome during any of those times. I'm sorry, but an exception cannot be made in your case."
E) "Well, I guess we could bend the rules just this time, but if anyone asks, you're her sister. Does that sound OK?"

25. A 34-year-old woman comes to the physician because she has been feeling weepy and overwhelmed since delivering a healthy male newborn 6 weeks ago. She has had fatigue and irritability during this period, and she has had no interest in engaging in activities she used to enjoy prior to the birth of the baby. She also has had difficulty sleeping because she is always listening for sounds indicating that her baby is awake. She says, "My husband doesn't help me at all with the baby. We argue all the time now." She then says, "I feel guilty because I'm not enjoying my baby more. I don't know if I will be a good mother or not." Physical examination shows no abnormalities. Which of the following statements by the physician is most appropriate?

A) "Has it come as a surprise to you how hard parenting is? Many people feel that way."
B) "I'm concerned about how bad you've been feeling lately. Have you had any thoughts about death or wanting to be dead?"
C) "I'm sure that you'll feel better soon. After all, look at your beautiful baby."
D) "Most new mothers feel this way, and sometimes it helps to see a therapist. Would you like me to give you a referral?"
E) "Your relationship with your husband sounds strained. I don't blame you for being angry with him."

11. A 75-year-old man with dementia, Alzheimer type, is brought to the hospital by his wife because of cough, difficulty breathing, and agitation that began after he ate breakfast 2 hours ago. He has been a resident of a skilled nursing care facility for 7 years. His wife visits the facility daily to feed him his midday meals. His two adult children visit him several times weekly. His wife mentions that the patient has been coughing during his meals for several weeks. He also has been taking longer to finish even smaller portions of food. Results of imaging studies are consistent with aspiration pneumonia with a developing compromised swallowing function. His medical records show no advance directives. In speaking with the patient's family, it is most appropriate for the physician to address the issue of a feeding tube in which of the following manners?

- A) Encourage the family to come to a consensus based on their perception of the patient's wishes
- B) Explain that a feeding tube is difficult to monitor and may not prevent aspiration
- C) Follow only the wishes of the wife
- D) Help the adult children encourage the wife to start a gradual withdrawal from the patient
- E) Recommend a tube, because feeding will be more efficient and prevent starvation

15. A 25-year-old woman has a 3-week history of bleeding gums while brushing her teeth and easy bruising. She appears anxious but alert. There is no lymphadenopathy or organomegaly. Irregular bruises are noted on her legs, thighs, and arms. Numerous petechiae are noted on the left arm distal to where the blood pressure cuff is used. She delivered a healthy child 9 months ago and is not taking any medications except for an oral contraceptive. Laboratory studies show:

Hemoglobin	12.5 g/dL
Mean corpuscular volume	80 μm^3
Leukocyte count	8500/mm^3
Differential	normal
Erythrocyte morphology	normal
Platelets	rare but large
Platelet count	18,500/mm^3
Urinalysis	unremarkable

Which of the following is the most likely cause of her condition?

- A) Acquired antibodies against platelet antigen $P1^{A1}$
- B) Autoantibodies against platelet glycoproteins
- C) Folic acid deficiency
- D) Viral suppression of marrow megakaryocytes
- E) Widespread damage to endothelial cells

22. A 34-year-old woman is brought to the emergency department 30 minutes after she fell unconscious on a downtown sidewalk of apparent alcohol intoxication. At the scene, her companion tells the emergency medical technicians that the patient regularly ingests alcoholic beverages but "can usually hold her liquor better." On arrival, she is intubated. Physical examination shows no other abnormalities except for mild cyanosis. Laboratory studies show:

Serum	
Na^+	140 mEq/L
K^+	5.3 mEq/L
Cl^-	105 mEq/L
HCO_3^-	10 mEq/L
Arterial blood gas analysis on room air:	
pH	7.25
Pco_2	23 mm Hg
Po_2	78 mm Hg

Which of the following is the most likely interpretation of the arterial blood gas findings in this patient?

- A) Mixed respiratory acidosis and metabolic acidosis
- B) Primary metabolic acidosis with increased anion gap
- C) Primary metabolic acidosis with normal anion gap
- D) Primary respiratory acidosis with increased anion gap
- E) Primary respiratory acidosis with normal anion gap

7. A healthy 8-year-old boy is brought to the physician by his parents because of a long history of disruptive behavior at school and poor academic performance. During class, he talks out of turn, wanders around the room, and pesters classmates. He is easily distracted and cannot keep his attention on a topic very long. His homework is sloppy and usually incomplete; he often explains that he leaves segments of assignments undone because he "just didn't notice them." He has had similar problems since kindergarten. He has normal developmental milestones. He is bright and cheerful and has a caring family. A drug with which of the following actions is most likely to be useful for this patient?

- A) Stimulation of the release of excitatory amino acid neurotransmitters
- B) Blockade of postsynaptic excitatory amino acid neurotransmitter receptors
- C) Stimulation of the release of biogenic amine neurotransmitters
- D) Blockade of postsynaptic biogenic amine neurotransmitter receptors
- E) Stimulation of the release of inhibitory amino acid neurotransmitters
- F) Blockade of postsynaptic inhibitory amino acid neurotransmitter receptors

25. A 61-year-old woman is brought to the physician by her 62-year-old husband because of a 9-month history of increasing forgetfulness. Her husband says, "I'm worried because she forgets about dinner on the stove and it ends up burned. Once she even left the bathtub running, and it overflowed and flooded the bathroom." He adds that she had always been a meticulous gardener, but now the flowerbeds have become uneven, with some areas flourishing and others seemingly untouched. Physical examination shows no abnormalities. During the mental status examination, the patient is pleasant and cooperative. She describes her mood as good. She admits to being forgetful and feels badly about upsetting her husband and burning the food so often. Her Mini-Mental State Examination score is 22/30. Which of the following is the most appropriate pharmacotherapy?

- A) Donepezil
- B) Fluoxetine
- C) Imipramine
- D) Melatonin
- E) Risperidone
- F) Vitamin B_1 (thiamine)
- G) Vitamin E

13. A 45-year-old woman is brought to the emergency department 45 minutes after she was involved in a motor vehicle collision. Her temperature is 37.4°C (99.3°F), pulse is 100/min, respirations are 28/min and shallow, and blood pressure is 105/74 mm Hg. Physical examination shows numerous lower extremity lacerations. There are multiple fractures that require deep sedation before treatment because of pain. She is intubated with a cuffed endotracheal tube and mechanically ventilated with supplemental oxygen (F_{IO_2}=1.0). The patient's ventilator settings are adjusted to deliver a tidal volume of 400 mL and 18 breaths/min, and a positive end-expiratory pressure (PEEP) of 10 cm H_2O is applied. Application of PEEP will most likely prevent which of the following complications in this patient?

- A) Absorption atelectasis
- B) Cardiogenic edema
- C) Pleural effusion
- D) Pulmonary hypertension
- E) Tension pneumothorax
- F) Tracheal dissection

2. An investigator is studying the regulation of pulmonary lymphatic flow using an animal model. Catheters are implanted in the femoral vein, pulmonary artery, and main lymphatic vessel draining the lungs in anesthetized, intubated, mechanically ventilated animals. Drugs may be injected directly into the pulmonary artery catheter and inspired gas mixtures altered at the ventilator; timed collection of lymph from the catheters is used to calculate lymphatic flow. Which of the following interventions will most likely increase the flow of pulmonary lymph in these animals?

- A) Administration of endothelin-1 into the pulmonary artery
- B) Administration of phenylephrine into the pulmonary artery
- C) Decreasing the inspired oxygen concentration from 21% to 10%
- D) Increasing the inspired carbon dioxide concentration from 0.3% to 3%
- E) Intravenous infusion of 0.9% saline for 5 minutes
- F) Intravenous infusion of 20% albumin solution (20 g/100 mL saline) for 5 minutes

14. A 55-year-old woman comes to the physician because of a 6-month history of bone pain. She has a 20-year history of type 2 diabetes mellitus and has been receiving hemodialysis for the past 5 years. She cannot recall which medications she is taking, but she admits that she often forgets to take all of them. Physical examination shows no abnormalities. Serum studies show:

Ca^{2+}	8.2 mg/dL
Creatinine	9.5 mg/dL
Phosphorus	8 mg/dL
Alkaline phosphatase	180 U/L

This patient's bone pain is most likely caused by which of the following changes in serum concentrations?

- A) Decreased 25-hydroxycholecalciferol
- B) Decreased parathyroid hormone
- C) Decreased parathyroid hormone-related protein
- D) Increased 25-hydroxycholecalciferol
- E) Increased parathyroid hormone
- F) Increased parathyroid hormone-related protein

43. A 35-year-old man is brought to the emergency department because of a 2-hour history of severe fatigue and dizziness. He has had profuse, watery diarrhea for 8 hours despite a lack of oral intake. He recently returned from a medical relief trip to a remote village in Honduras. His temperature is 36.7°C (98°F), pulse is 122/min, and blood pressure is 90/50 mm Hg. Physical examination shows dry skin and decreased capillary refill. Test of the stool for occult blood is negative; the stool is gray and turbid. A Gram stain of the stool shows predominant gram-negative, comma-shaped bacteria; there are no erythrocytes or leukocytes. Which of the following best describes the mechanism of the toxin that caused these findings?

- A) Activation of adenylyl cyclase
- B) Activation of guanylyl cyclase
- C) Activation of Na^+–K^+ ATPase
- D) Activation of phosphodiesterase
- E) Deactivation of ADP-ribosylation factors

26. A 74-year-old woman with mild dementia is admitted to the hospital because of congestive heart failure and angina pectoris that has progressed despite maximal medical therapy. She has had three myocardial infarctions during the past 3 years. The physician recommends coronary angiography and angioplasty. The patient states that she wants to go home and does not want any medical procedures. On questioning, the patient does not know the date, the name of the hospital, or the name of her nurse who had just introduced himself. It would be most appropriate for the physician to question this patient's capacity to make a decision regarding her medical care if mental status examination showed which of the following findings?

- A) Disorientation to place and time
- B) Inability to do serial sevens
- C) Inability to recall three objects after 5 minutes
- D) Inability to understand the severity and prognosis of her medical condition
- E) Presence of depressed mood

7. A 3-year-old boy who recently immigrated to the USA is brought to the physician by his parents because of skeletal deformities and failure to thrive. He has had listlessness, irritability, and muscle weakness most of his life. Physical examination shows frontal bossing and flattening of the back of the skull, and defects in the enamel of the teeth. The chest wall has a groove that extends from the xiphoid process transversely toward the axillae, with flaring of the rib cage below the groove. The sternal ends of the ribs bulge at their costochondral junctions. The legs are bowed. Serum calcium and phosphorus concentrations are below the reference range. If the bone were examined, which of the following findings would be most likely?

- A) Absence of cartilage in the epiphyseal plates
- B) Absence of osteoblasts
- C) Enlarged osteoclasts with increased numbers of nuclei
- D) Increased proportions of osteoid
- E) Osteosarcoma

50. A 50-year-old woman is admitted to the hospital because of a 3-day history of nausea, vomiting, and upper abdominal pain that radiates to her back. She was diagnosed with HIV infection 3 months ago and has been adherent with her antiretroviral medication regimen. Her CD4+ T-lymphocyte count is 400/mm^3 (N≥500), and plasma HIV viral load is 50 copies/mL. She appears acutely ill and diaphoretic. Her temperature is 36.8°C (98.2°F), pulse is 135/min, respirations are 30/min, and blood pressure is 95/55 mm Hg. Physical examination shows epigastric tenderness, abdominal distention, and absent bowel sounds. Results of laboratory studies show serum amylase activity of 450 U/L. The most likely cause of these findings is an adverse effect of which of the following drugs?

- A) Abacavir
- B) Acyclovir
- C) Didanosine (ddI)
- D) Lamivudine (3TC)
- E) Ribavirin
- F) Zidovudine (AZT)

44. During an experiment, an investigator observes that glutamate depolarizes cells through both *N*-methyl-D-aspartate (NMDA) and non-NMDA receptors. She finds that the initial depolarization phase of a glutamate-induced fast excitatory postsynaptic potential is generally mediated by activation of non-NMDA-type glutamate receptors rather than NMDA-type glutamate receptors. Which of the following best explains this finding?

A) NMDA receptors are blocked by Mg^{2+} at the resting membrane potential
B) NMDA receptors are more permeable to Ca^{2+}
C) NMDA receptors can be activated only if the cell membrane is hyperpolarized
D) Non-NMDA receptors are more permeable to Ca^{2+}
E) Non-NMDA receptors are permeable only to Na^{+}
F) Non-NMDA receptors have faster gating kinetics at the resting membrane potential

19. A 55-year-old African American man with hypertension is asked by the public relations representative of a hospital if he will allow filming of his next visit with the physician for a future broadcast designed to raise public awareness of hypertension. After full disclosure of the plan, the patient consents to filming and broadcasting. Immediately after filming is completed, the patient tells the physician that he does not want his medical condition made public. Which of the following is the most appropriate response by the physician?

- A) Ask the patient why he consented in the first place if he had concerns
- B) Explain to the patient the importance of raising social awareness of treatable medical conditions
- C) Explain to the patient that his consent cannot be rescinded at this point since the filming is completed
- D) Tell the patient that he can change his mind about participating
- E) Tell the patient that he will have to speak to the hospital public relations representative to cancel his participation

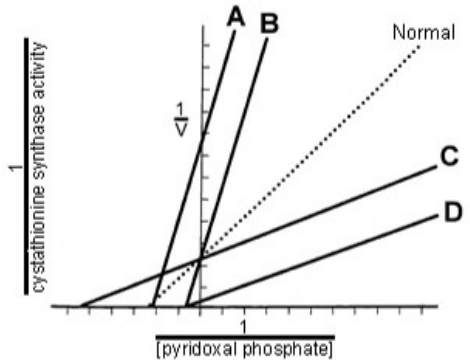
17. A 44-year-old man comes to the physician because of increasingly severe pain and swelling of his knuckles and knees during the past month. Physical examination shows tenderness, swelling, and warmth of the involved joints. Laboratory studies show an increased erythrocyte sedimentation rate and serum rheumatoid factor. The patient improves clinically after treatment with ibuprofen for 2 weeks. Which of the following sets of findings in plasma is most likely after 2 weeks of this therapy?

	Leukotriene C_4	Arachidonic Acid	Prostaglandin H_2	Prostaglandin E_2
A)	Increased	increased	increased	decreased
B)	Increased	increased	decreased	decreased
C)	Increased	decreased	increased	decreased
D)	Increased	decreased	decreased	increased
E)	Decreased	increased	decreased	decreased
F)	Decreased	decreased	increased	increased
G)	Decreased	decreased	increased	decreased

23. An 8-year-old girl is brought to the physician for a well-child examination. Her mother says that she has been well except for an occasional cold. Her immunizations are up to date. She is at the 50th percentile for height and 60th percentile for weight. Physical examination shows breast bud development and a few pubic hairs. The mother asks whether her daughter's development is normal. Which of the following is the most appropriate initial response by the physician?

- A) "I am concerned that your daughter may have precocious puberty."
- B) "I think that your daughter is likely to begin menstruating in the next few months."
- C) "I would like to order laboratory studies to ensure that your daughter's development is normal."
- D) "Your daughter's breast development is somewhat less than might be expected for her age."
- E) "Your daughter's development is normal."

3. A 5-year-old boy who has homocystinuria improves with high-dose oral pyridoxine therapy. Cystathionine synthase activity is 95% deficient in his cultured fibroblasts, but activity increases to normal after the fibroblasts are incubated with higher concentrations of pyridoxal phosphate. When cystathionine synthase activity is measured in the presence of pyridoxal phosphate, which of the following Lineweaver-Burk plots would be most consistent with this patient's findings compared with the kinetics of the enzyme in a normal individual?



A) B) C) D)

28. A 52-year-old man is brought to the emergency department 30 minutes after the sudden onset of substernal chest pain. The pain has persisted despite self-administration of three doses of sublingual nitroglycerin. His pulse is 90/min, and blood pressure is 114/70 mm Hg. Physical examination shows diaphoresis. The lungs are clear to auscultation. Cardiac examination shows an S_4. An ECG shows ST-segment elevation in the inferior leads. Intravenous morphine is administered, and he develops generalized pruritus and warmth 1 minute later. His pulse now is 120/min, and blood pressure is 90/50 mm Hg. Physical examination shows facial flushing. Which of the following substances is the most likely cause of the new symptoms and findings in this patient?

- A) Epinephrine
- B) Histamine
- C) Nitric oxide
- D) Serotonin
- E) Thromboxane A_2

6. A 24-year-old woman with sickle cell disease comes to the physician because of malaise and generalized fatigue for 1 week. She had previously felt well since her last sickle cell crisis more than 1 year ago. She has had no pain. Physical examination shows no abnormalities. Her baseline hematocrit is usually 25% to 30%. Laboratory studies now show a hematocrit of 13%, mean corpuscular volume of 105 μm^3, and reticulocyte count of less than 1%. Which of the following diagnostic tests is most likely to explain this patient's symptoms and decreased hematocrit?

- A) Direct antiglobulin (Coombs test)
- B) Hemoglobin electrophoresis
- C) Measurement of serum haptoglobin concentration
- D) Serum parvovirus B19 IgM antibody test
- E) Bone marrow biopsy with examination of iron stores

24. A 45-year-old woman comes to the emergency department because of a 1-week history of severe abdominal pain. She has a history of gallstones. Current medications are atorvastatin and hydrochlorothiazide. Her temperature is 37.2°C (99.0°F), pulse is 70/min, respirations are 20/min, and blood pressure is 130/90 mm Hg. Abdominal examination shows tenderness to palpation. Serum studies show increased activities of amylase and lipase. A CT scan of the abdomen shows enlargement of the pancreas and dilation of the pancreatic ducts. The most likely underlying cause of these findings is a gallstone lodged in which of the following locations in this patient?

- A) Bile duct (common)
- B) Common hepatic duct
- C) Cystic duct
- D) Hepatopancreatic ampulla
- E) Second part of the duodenum
- F) Uncinate process

29. A 9-year-old boy has mild mental retardation and a 4-year history of increasingly frequent major motor seizures. Physical examination shows normal vital signs, clear lungs, a moderate systolic ejection murmur, and discrete pink-to-yellow papules in a butterfly distribution on the bridge of his nose, the malar prominences, and along his nasolabial folds. A CT scan shows multiple, occasionally calcified nodules on the crests of some gyri in the subependymal regions. Echocardiography shows left ventricular hypertrophy associated with marked narrowing of the aortic valvular outflow tract due to a subvalvular mass arising from the septum. Which of the following is the most likely diagnosis of the cardiac lesion?

- A) Glycogen storage disease
- B) Hypertrophic cardiomyopathy
- C) Leiomyosarcoma
- D) Myxoma
- E) Rhabdomyoma

13. A 48-year-old man comes to the physician because of increasing bronzing of his skin, weakness, and fatigue during the past 3 months. Physical examination shows bronzing of the skin, hepatomegaly, and small testes. Serum studies show:

AST	increased
ALT	increased
Iron	increased
Transferrin saturation	increased
Ferritin	increased
Testosterone	decreased
Luteinizing hormone	decreased
Follicle-stimulating hormone	decreased

Which of the following best explains the findings in this patient?

- A) Ferrochelatase deficiency
- B) Increased erythropoietin production
- C) Increased intestinal iron absorption
- D) Ineffective erythropoiesis
- E) Transferrin deficiency

14. A 35-year-old woman comes to the physician because of a 2-day history of blistering lesions on the sun-exposed areas of her face, arms, and hands. She has had recurrent episodes of these skin lesions for several years. She has been taking a combined oral contraceptive for 15 years. Physical examination shows fluid-filled vesicles and bullae on the face and upper extremities. Laboratory studies show:

Serum	
AST	increased
ALT	increased
Total porphyrin	increased
Urine uroporphyrin III	increased

Deficiency of which of the following enzymes is the most likely cause of this patient's disorder?

- A) Porphobilinogen deaminase
- B) Protoporphyrinogen oxidase
- C) Uroporphyrinogen decarboxylase
- D) Uroporphyrinogen synthase

48. A 65-year-old woman comes to the emergency department because of a 4-hour history of vomiting bright red blood; she also has had dizziness and nausea during this period. Her pulse is 140/min, and blood pressure is 70/30 mm Hg. Physical examination shows pale, clammy skin, diaphoresis, and decreased capillary refill time. A diagnosis of hypovolemic shock is made. Placement of a catheter in the internal jugular vein for blood transfusions is planned. Improper insertion of the catheter is most likely to result in damage to which of the following sets of underlying structures?

- A) Common carotid artery and pulmonary artery
- B) Esophagus and common carotid artery
- C) Esophagus and pulmonary artery
- D) Lung and common carotid artery
- E) Lung and esophagus

30. A 38-year-old woman comes to the physician because of a 10-week history of epigastric pain and frequent stools. She has had two episodes of renal calculi during the past 2 years. Physical examination shows multiple superficial lipomata and mild epigastric tenderness. Upper endoscopy shows two large, nonbleeding duodenal ulcers. Her gastric pH is 2.3, and serum gastrin concentration obtained immediately after the procedure is 2000 pg/mL (N<100). Proton pump inhibitor therapy is begun. Measurement of which of the following is the most appropriate next step in management?

A) Serum calcium concentration
B) Serum cortisol concentration
C) Serum tissue transglutaminase activity
D) Stool α_1-antitrypsin concentration
E) Urine 5-hydroxyindoleacetic acid concentration

7. A 32-year-old woman comes to the emergency department because of fever, intense headaches, and excruciating pains in the joints and muscles of the arms and legs that began 4 days ago when she returned from a Caribbean cruise. During the trip, she visited Cancun and the Yucatan region. Her temperature is 40°C (104°F), respirations are 32/min, and blood pressure is 130/80 mm Hg. Physical examination shows a mild macular rash over the trunk. The remainder of the examination shows no abnormalities. Which of the following is the most likely route of transmission of the causal organism?

- A) Arthropod vector
- B) Blood transfusion
- C) Contact with respiratory secretions
- D) Fecal-oral
- E) Maternal-fetal
- F) Sexual contact
- G) Small airborne droplets

23. A 59-year-old man comes to the physician because of a 3-month history of progressive difficulty swallowing; he has had a 6.8-kg (15-lb) weight loss during this period. He has smoked 1 pack of cigarettes daily for 40 years and consumes four to six beers daily. He is cachectic. Bilateral wheezes are heard on auscultation of the chest. A chest x-ray shows enlargement of the paratracheal and hilar lymph nodes. Subsequent endoscopy shows a 6-cm mass in the mid esophagus. The mass is centrally ulcerated with an elevation of the surrounding mucosal rim. Examination of a biopsy specimen of the mass is most likely to show neoplastic cells with which of the following?

- A) Acinar formation
- B) Foci of keratinization
- C) Intracytoplasmic pigment
- D) Neuroendocrine granules
- E) Smooth muscle differentiation

46. A 55-year-old woman is brought to the emergency department by police 1 hour after she was found wandering around the city park at midnight, appearing confused. She told the police that she is a prominent physician and a member of the city council. She is unwashed, malodorous, and disheveled. She is 160 cm (5 ft 3 in) tall and weighs 55 kg (121 lb); BMI is 21 kg/m^2. Her pulse is 82/min, and blood pressure is 110/82 mm Hg. Physical examination shows a broad-based gait and nystagmus. She is not oriented to person, place, or time, but she is pleasant and cooperative. Results of alcohol and drug screening are negative. An MRI of the brain is most likely to show atrophy of which of the following?

- A) Amygdala
- B) Hippocampus
- C) Hypothalamus
- D) Mammillary bodies
- E) Parietal lobe

47. A 16-year-old boy is brought to the physician because of a 3-month history of shortness of breath while playing sports. He has no shortness of breath at rest. He says, "Whenever I run around I cough, so I don't want to be on the basketball team anymore." He takes no medications and has no known allergies. There is a family history of hypertension and asthma. He is 165 cm (5 ft 5 in) tall and weighs 68 kg (150 lb); BMI is 25 kg/m^2. His respirations are 12/min, and blood pressure is 115/75 mm Hg. Cardiac examination shows no abnormalities except for a midsystolic click at the apex. The lungs are clear to auscultation of the chest. Which of the following best explains this patient's symptoms?

- A) Deconditioning
- B) Exercise-induced asthma
- C) Malingering
- D) Mitral valve prolapse
- E) Thyroid disease

39. Diastolic blood pressures are obtained in two groups of 100 asymptomatic men (group X and group Y) above the age of 40 years. Results are shown in the table.

Diastolic Blood Pressure (mm Hg)	Group X Number	Group Y Number
50	8	2
60	12	8
70	32	10
80	18	20
90	12	18
100	10	17
110	8	15
120	0	10
Total	100	100

Compared with group X, which of the following best represents the median and mode of group Y?

	Median of Group Y	Mode of Group Y
A)	Higher	higher
B)	Higher	lower
C)	Lower	higher
D)	Lower	lower
E)	Lower	same
F)	Same	higher
G)	Same	lower
H)	Same	same

23. A 55-year-old man comes to the physician because of a 2-month history of fatigue and a 3-day history of nausea and diarrhea. He has had a 5.4-kg (12-lb) weight loss during the past 2 weeks. His temperature is 37.8°C (100°F), pulse is 110/min, respirations are 24/min, and blood pressure is 98/60 mm Hg. Physical examination shows dry skin with hyperpigmentation and delayed capillary refill. Serum studies show:

Na^+	125 mEq/L
K^+	6.1 mEq/L
Urea nitrogen (BUN)	21 mg/dL
Glucose	60 mg/dL
Creatinine	1.5 mg/dL

Which of the following serum hormone concentrations is most likely decreased in this patient?

- A) ACTH
- B) ADH (vasopressin)
- C) Cortisol
- D) Glucagon
- E) Norepinephrine

23. A clinical trial is conducted to compare the efficacy of a surgical procedure versus medical management of gastroesophageal reflux disease. In the study, 800 patients are randomly assigned to either the surgical procedure group or the medical management group; each group consists of 400 patients. Of the patients assigned to the surgical procedure group, 75 do not undergo the operation during the study period. Of the patients assigned to the medical management group, 50 undergo the operation during the study period. In an intention-to-treat analysis, which of the following most accurately represents how many patients would be analyzed in the surgical procedure and medical management groups, respectively?

	Surgical Procedure Group	Medical Management Group
A)	325	350
B)	375	425
C)	400	400
D)	425	350
E)	450	325

4. A 4-year-old boy with chronic granulomatous disease is brought to the physician by his parents for a follow-up examination. He has a 2-year history of recurrent catalase-positive fungal and bacterial granulomatous infections that have been inconsistently responsive to trimethoprim-sulfamethoxazole, dicloxacillin, and itraconazole. Physical examination shows no additional abnormalities. Treatment with interferon gamma is begun. Activity of which of the following cells is most likely to be significantly increased in this patient after exposure to this drug?

- A) B lymphocytes producing immunoglobulin
- B) CD4+/CD25+ lymphocytes producing tumor necrosis factor-α
- C) Macrophages producing interleukin-1 (IL-1)
- D) Natural killer cells producing IL-3
- E) T lymphocytes producing IL-4, IL-5, and IL-6

8. A 30-year-old woman comes to the office because she is concerned she may be pregnant. Her last menstrual period was 10 weeks ago. She has been receiving thyroxine (T_4) for 2 years because of hypothyroidism and autoimmune thyroiditis. Physical examination shows a uterus consistent in size with a 10-week gestation. Serum studies show thyroid-stimulating hormone (TSH) and free thyroxine (FT_4) concentrations that are in the reference ranges for that stage of gestation, and an increased β-human chorionic gonadotropin concentration. The fetus is at greatest risk for which of the following if the mother's TSH concentration increases during pregnancy?

- A) Abnormal brain development
- B) Deafness
- C) Inadequate growth
- D) Pituitary atrophy
- E) Thyroid gland enlargement

6. A 48-year-old woman comes to the physician because of a 3-month history of fatigue, weakness, loss of appetite, and weight loss. Her serum parathyroid hormone concentrations are increased. X-rays of the skeletal system show generalized osteopenia, with subperiosteal resorption of bone within the phalanges. Which of the following mechanisms is the most likely cause of the skeletal changes observed in this patient?

- A) Impaired calcification of preformed osteoid
- B) Paracrine stimulation of osteoclasts by osteoblasts
- C) Parathyroid hormone-mediated induction of calcitonin
- D) Parathyroid hormone-mediated induction of interleukin-1 (IL-1)
- E) Parathyroid hormone-mediated production of transforming growth factor-β_1

29. A 63-year-old man with bladder cancer starts treatment with paclitaxel. Three weeks later, cystoscopy shows a significant decrease in tumor size. Which of the following best describes the mechanism of action of paclitaxel in this patient?

- A) Bcr-abl–associated tyrosine kinase competitive inhibition
- B) DNA polymerase competitive inhibition
- C) DNA polymerase noncompetitive inhibition
- D) DNA topoisomerase competitive inhibition
- E) DNA topoisomerase noncompetitive inhibition
- F) Epidermal growth factor receptor-associated tyrosine kinase competitive inhibition
- G) RNA polymerase competitive inhibition
- H) Tubulin polymerization stabilization

30. A 1-year-old girl is admitted to the hospital because of a fracture of the right femur and bone deformities. She had bilateral clavicle fractures at birth. Oral examination shows six erupted gray-to-translucent, pointed teeth. X-rays of the long bones show generalized osteopenia. Genetic studies show a substitution of an alanine for a glycine residue in type I collagen. Which of the following has most likely occurred in this patient as a result of this mutation?

- A) Decreased hydrogen-bond formation between collagen molecules
- B) Decreased proline hydroxylation
- C) Disruption of the secondary structure of collagen molecules
- D) Increased rate of collagen degradation
- E) Weakened interaction between collagen and proteoglycan

34. A 30-year-old primigravid woman at 22 weeks' gestation comes to the physician because of a 1-day history of fever, chills, and muscle aches. Her temperature is 39.4°C (102.9°F), pulse is 114/min, respirations are 15/min, and blood pressure is 104/72 mm Hg. Physical examination shows a uterus consistent in size with a 22-week gestation. Fetal heart sounds are heard. Her leukocyte count is 12,000/mm^3. Blood cultures grow gram-positive rods. Which of the following is the most likely causal organism?

- A) *Bacillus cereus*
- B) *Clostridium perfringens*
- C) *Listeria monocytogenes*
- D) *Staphylococcus aureus*
- E) *Streptococcus agalactiae* (group B)

39. A 40-year-old man is brought to the emergency department 45 minutes after his wife found him unresponsive. His temperature is 37°C (98.6°F). Laboratory studies show:

Hemoglobin	15 g/dL
Arterial blood gases on room air	
Pco_2	60 mm Hg
Po_2	50 mm Hg
HCO_3^-	12 mEq/L

Which of the following best describes the acid-base status in this patient?

- A) Metabolic acidosis only
- B) Metabolic acidosis and respiratory acidosis
- C) Metabolic alkalosis and respiratory alkalosis
- D) Respiratory acidosis only
- E) Respiratory acidosis and metabolic alkalosis
- F) Respiratory alkalosis only

12. A 47-year-old woman with psoriasis comes to the physician for follow-up care. At her last appointment she was given several topical creams, which must be used in a specified sequence twice daily. No improvement is apparent at this appointment. Which of the following is the most appropriate way for the physician to begin the discussion of this patient's compliance with therapy?

A) "Did you use the creams twice daily?"
B) "How many tubes did you use in the last month?"
C) "How often did you skip treatments?"
D) "Most people find it difficult to stick to a routine. How did you do?"
E) "Using something twice daily can be difficult. I assume you are like most patients who miss at least 10% of treatments."

38. A 42-year-old woman comes to the physician because of a 3-year history of an intermittent facial rash, including the forehead, eyelids, nose, and cheeks. She says that the rash seems to be getting worse since she moved from New York to Florida last year. She notes that she has always blushed easily. Spicy foods also precipitate a flushing reaction that seems to exacerbate the rash. Occasionally, her face burns and stings, and her skin feels dry. Physical examination shows erythema over the nose and cheeks, with scattered telangiectasias and a few papules. Which of the following is the most likely diagnosis?

- A) Acne vulgaris
- B) Carcinoid syndrome
- C) Pityriasis rosea
- D) Rosacea
- E) Seborrheic dermatitis

18. A 40-year-old man with type 2 diabetes mellitus comes to the physician for a follow-up examination. Treatment with glyburide and metformin has been ineffective in controlling his disease. The decision is made to try pioglitazone. This drug produces a beneficial effect through which of the following mechanisms of action?

A) Blockade of ATP-sensitive potassium channels in the pancreatic β cells
B) Increased insulin synthesis by promoting the effect of physiologic insulin secretagogues
C) Increased insulin uptake by muscle and adipose tissue, thus making the insulin more effective
D) Promotion of insulin action interfering with the synthesis of endogenous antagonists, primarily glucagons
E) Stimulation of the peroxisome proliferator-activated receptor γ

16. A 33-year-old woman, gravida 4, para 4, is admitted to the hospital after she sustained a splenic laceration in a motor vehicle collision. Three units of packed red blood cells are administered. Five hours later, she develops shortness of breath. Her respirations are 29/min. Crackles are heard throughout both lung fields. A chest x-ray shows bilateral lung infiltrates. Arterial blood gas analysis on room air shows a Po_2 of 55 mm Hg. Which of the following is the most likely cause of this patient's condition?

- A) Anaphylactic reaction induced by IgA antibodies
- B) Hemolytic transfusion reaction
- C) Postoperative bronchopneumonia
- D) Pulmonary embolus with pulmonary infarction
- E) Transfusion-related acute lung injury

39. A 47-year-old man is brought to the emergency department by his wife because of severe chest pain for 2 hours. His pulse is 110/min and thready, and blood pressure is 90/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 85%. Physical examination shows cold, clammy skin. Crackles are heard bilaterally on auscultation. An ECG shows 4-mm ST-segment elevation in leads V_4 through V_6. Cardiac output is 2 L/min (N=4–5). Which of the following is most likely to be decreased in this patient?

- A) Arterial lactate concentration
- B) Hemoglobin concentration
- C) Mixed venous oxygen tension
- D) Pulmonary vascular resistance
- E) Systemic vascular resistance

11. An 18-year-old man comes to the physician because of a 2-week history of extreme fatigue. Physical examination shows scleral icterus. Laboratory studies show:

Hemoglobin	9 g/dL
Reticulocyte count	22.5%
Erythrocyte 2,3-bisphosphoglycerate	10,270 nmol/mL (N=4082)
Serum	
Bilirubin, total	10 mg/dL
Indirect	8.5 mg/dL

This patient most likely has a deficiency of the activity of which of the following enzymes in erythrocytes?

- A) Glyceraldehyde-3-phosphate dehydrogenase
- B) Hexokinase
- C) Phosphofructokinase
- D) Pyruvate kinase
- E) Triose-phosphate isomerase

12. A 27-year-old primigravid woman at 39 weeks' gestation is admitted to the hospital in labor. She has a 5-year history of type 2 diabetes mellitus currently treated with insulin. During the pregnancy, she has had difficulty controlling her serum glucose concentration. At a previous examination 1 week ago, her hemoglobin A_{1c} was 8.4%. There is no family history of serious illness. On admission, the cervix is 100% effaced and 7 cm dilated; the vertex is at +1 station. Fetal weight is estimated at 4100 g (9 lb 1 oz). Which of the following is the most likely obstetric complication?

- A) Amniotic fluid embolism
- B) Diabetic ketoacidosis
- C) Preeclampsia
- D) Retained placenta
- E) Shoulder dystocia

19. A 50-year-old man with rheumatoid arthritis comes to the physician because of recent worsening of symptoms as well as increasing fatigue 1 month after starting therapy. Laboratory studies show:

Hemoglobin	9.6 g/dL
Hematocrit	29%
Mean corpuscular volume	77 μm^3
Platelet count	200,000/mm^3
Serum	
Iron	30 µg/dL
Total iron-binding capacity	150 µg/dL (N=250–400)

Which of the following is the most likely diagnosis?

- A) Anemia of chronic disease
- B) Autoimmune hemolytic anemia
- C) Lead intoxication
- D) Sideroblastic anemia
- E) β-Thalassemia minor

47. A 64-year-old woman with type 2 diabetes mellitus and hypertension comes to the physician because of soreness and muscle pain for 3 weeks. She says the pain is in most large muscle groups and usually occurs at night. She began rosuvastatin therapy 4 weeks ago for dyslipidemia. Her medication regimen also includes gemfibrozil, hydrochlorothiazide, losartan, and metformin. Physical examination shows mild tenderness of the quadratus femoris muscle bilaterally. Her serum creatine kinase activity is five times the upper limit of the reference range. The most likely cause of this patient's current condition is an interaction between rosuvastatin and which of the following drugs?

- A) Aspirin
- B) Gemfibrozil
- C) Hydrochlorothiazide
- D) Losartan
- E) Metformin

32. A 23-year-old woman comes to the student health center because of a 2-week history of a vaginal sore. She has been sexually active with a new partner, and they use condoms inconsistently. Pelvic examination shows a nontender ulcer on the vulva. Dark-field examination of a scraping of the lesion is positive for spirochetes. Which of the following histologic changes is most likely to be seen on a biopsy specimen of this lesion?

- A) Acute inflammation with abscess formation
- B) Granulomas with caseation and plasma cell infiltration
- C) Granulomas with suppuration
- D) Obliterative endarteritis with lymphocytes and plasma cells
- E) Pyogranulomatous inflammation with edema

48. A 40-year-old woman comes to the physician for an initial examination. She says that she is health conscious and eats only natural organic foods. Fasting serum laboratory studies show a triglyceride concentration of 380 mg/dL; a complete blood count and serum electrolyte concentrations are within the reference ranges. The physician suggests that the patient try taking fish oil and a supplement to treat her dyslipidemia. Which of the following best describes the mechanism of action of the most appropriate vitamin for this patient?

- A) Antagonizes VLDL-cholesterol secretion
- B) Increases catabolism of LDL-cholesterol
- C) Inhibits cholesterol uptake
- D) Inhibits HMG CoA
- E) Stimulates PPAR-α receptors

30. A 62-year-old woman is brought to the physician by her husband for a routine follow-up examination. She was diagnosed with dementia, Alzheimer type, 4 months ago and is in the early stages of the disease. She is retired and lives at home with her husband, who is also retired. Which of the following interventions is most likely to help this patient maintain her present functional level for as long as possible?

- A) Instruct the patient to keep notes and lists to help her memory
- B) Suggest that the patient enter individual supportive therapy
- C) Suggest that the couple go to a therapist together
- D) Suggest that the couple move to an assisted living facility
- E) Start the patient on ginkgo biloba

9. A 5-year-old boy is admitted to the hospital because of recurrent pancreatitis since the age of 2 years. Physical examination shows eruptive xanthomas over the upper and lower extremities and hepatosplenomegaly. His fasting plasma appears turbid. His serum total cholesterol concentration is 235 mg/dL (N<190) and triglyceride concentration is 1875 mg/dL (N<90). After receiving an injection of heparin, his lipoprotein lipase activity is within the reference range. A deficiency of which of the following is the most likely cause of the findings in this patient?

- A) ApoC-II
- B) Cholesterol ester transfer protein
- C) Hormone-sensitive lipase
- D) LDL receptor
- E) Pancreatic lipase

45. A 14-year-old boy is brought to the physician by his mother because of daily headaches for 2 months. The headaches are described as a bilateral aching in the temples. His mother states that he also "has not been himself" for the past few months. He seems more confused, often forgetting names, dates, and places, and he is clumsy with frequent falls. His school performance also has declined over the past quarter. Physical examination shows a broad-based, ataxic gait. He is alert and oriented to person, place, and time, but he is slow to answer questions. Chronic abuse of which of the following substances is the most likely cause of this patient's condition?

- A) Cocaine
- B) Ethanol
- C) Inhaled glue
- D) Methamphetamines
- E) PCP (phencyclidine)

2. A 66-year-old man is brought to the emergency department because of a 1-day history of fever. He underwent transurethral resection of the prostate 1 week ago. His temperature is 39.5°C (103°F), and blood pressure is 75/40 mm Hg. Physical examination shows no other abnormalities. Blood cultures grow lactose-positive, gram-negative rods. Which of the following best describes the initial event in the development of hypotension in this patient?

- A) Hemolysin lysis of erythrocytes
- B) Induction of histamine release
- C) Invasion of segmented neutrophils
- D) Lipopolysaccharide stimulation of toll-like receptor
- E) Toxic activity of an ADP ribosyltransferase

22. A 68-year-old man comes to the physician because of a 1-month history of not being able to sustain an erection for sexual intercourse, although he has no difficulty during masturbation. His wife of 40 years died 2 years ago after a prolonged illness. He began dating recently. He has a multinodular goiter but takes no medications. His serum thyroid-stimulating hormone concentration is 4.0 µU/mL, and serum testosterone concentration is within the reference range. He does not have any symptoms of major depressive disorder. Which of the following pairs of additional findings is most likely to be found on history taking?

	Libido	Nocturnal Erections
A)	Decreased	decreased
B)	Decreased	normal
C)	Normal	decreased
D)	Normal	normal

26. A 33-year-old woman comes to the physician because of fever, malaise, burning on urination, and a scant vaginal discharge for the past 4 days. She has been having unprotected sex with a new partner. She appears acutely ill. Her temperature is 38.3°C (101°F). Pelvic examination shows a swollen labium with multiple, extremely tender vesicles and ulcers. Which of the following is the most likely diagnosis?

- A) Bacterial vaginosis
- B) Candidiasis
- C) Chancroid
- D) *Chlamydia trachomatis* infection
- E) Condyloma acuminata
- F) Genital herpes
- G) Gonorrhea
- H) Lymphogranuloma venereum
- I) Syphilis
- J) Trichomoniasis

29. The immunosuppressive agent cyclosporin A (CsA) is a potent inhibitor of T-lymphocyte function that has been successfully used to prevent graft rejection. Graft rejection is most likely prevented by an action of CsA on which of the following steps in T-lymphocyte recognition/activation?

- A) Class I and II MHC protein expression
- B) Costimulatory molecule-dependent signaling
- C) Interleukin-2 (IL-2) gene transcription
- D) Intracellular Ca^{2+} mobilization
- E) Phospholipase C γ-phosphorylation
- F) T-lymphocyte antigen receptor engagement
- G) T-lymphocyte antigen receptor ζ-chain phosphorylation

4. A 76-year-old man comes to the physician because of a 2-week history of constant, intense pain of his right arm. There has been no trauma to the arm. Seven months ago, he had a cerebral infarction that resulted in lack of sensation on the right side of the body. Muscle strength and deep tendon reflexes are normal throughout. Sensation to light touch, vibration, pain, and temperature is decreased over the right side of the body. The most likely cause of this patient's pain is damage to which of the following regions of the nervous system?

- A) Left internal capsule
- B) Left postcentral gyrus
- C) Left thalamus
- D) Right internal capsule
- E) Right postcentral gyrus
- F) Right thalamus

50. A 28-year-old man is brought to the emergency department 30 minutes after the sudden onset of shortness of breath. He has a 3-year history of cocaine abuse. His temperature is 38.1°C (100.6°F), pulse is 100/min, and blood pressure is 150/45 mm Hg. Physical examination shows diminished pulses in the left upper extremity. Crackles are heard over all lung fields. A grade 2/6 diastolic murmur is heard best at the left sternal border. A chest x-ray shows a widened aortic arch. Which of the following is the most likely diagnosis?

- A) Atherosclerotic aneurysm
- B) Dissecting aneurysm
- C) Mycotic aneurysm
- D) Pseudoaneurysm
- E) Saccular aneurysm

43. A 14-year-old girl is brought to the physician for a follow-up examination. She has been regularly undergoing imaging and other studies for approximately 10 years because of a family history of early-onset cancers. Her older brother was diagnosed with a high-grade brain stem glioma at the age of 19 years. Her younger sister was diagnosed with a malignant choroid plexus tumor at the age of 2 years, and a paternal cousin was diagnosed with adrenocortical carcinoma at the age of 7 years. All three individuals have since died from their malignancies. A mutation in which of the following genes is the most likely cause of this family's predisposition to cancer?

- A) *APC*
- B) *BRCA1*
- C) *RB1*
- D) *RET*
- E) *TP53*

21. A 63-year-old woman comes to the physician because of a 5-day history of shortness of breath and swollen legs. Her respirations are 25/min and labored, and blood pressure is 130/50 mm Hg. She has a large subclavian arteriovenous fistula caused by a stab wound to the left supraclavicular area 15 years ago. Physical examination shows 2+ edema of the lower extremities. Which of the following findings is most likely in this patient?

- A) Decreased arterial oxygen saturation
- B) Decreased mixed venous oxygen saturation
- C) Decreased stroke volume
- D) Increased resting cardiac output
- E) Increased systemic vascular resistance

31. A 57-year-old woman is brought to the emergency department because of a 6-hour history of increasingly severe shortness of breath. Her temperature is 38.3°C (101.0°F), pulse is 80/min, respirations are 30/min, and blood pressure is 130/70 mm Hg. Pulse oximetry on room air shows an oxygen saturation of 90%. Physical examination shows decreased breath sounds and dullness to percussion on the right. A chest x-ray shows a large pleural effusion on the right. Thoracentesis is planned. With the patient in a seated position, it is most appropriate to position the needle in which of the following intercostal spaces in the midaxillary line?

- A) First
- B) Third
- C) Fifth
- D) Seventh
- E) Ninth

5. A 30-year-old woman comes to the office for a follow-up examination. During the past 4 months, she has had a 9-kg (20-lb) weight loss after initiating a low-carbohydrate, low-fat diet. She has no history of major medical illness and takes no medications. She is 157 cm (5 ft 2 in) tall and now weighs 62 kg (138 lb); BMI is 26 kg/m^2. Her vital signs are within normal limits. Physical examination shows no abnormalities. It is most appropriate for the physician to counsel this patient to include which of the following in her current diet to maintain good nutrition?

- A) Linoleic acid
- B) Oleic acid
- C) Palmitic acid
- D) Palmitoleic acid
- E) Stearic acid

17. A 7-month-old boy is brought to the physician 2 days after his mother felt a lump in his groin while she was bathing him. Physical examination shows a normal-sized penis, but there are no palpable testicles within the scrotum. A hernia is palpated in the right external inguinal ring. Two days later, an operation is done in which the testes are brought down to the scrotum and the hernia is repaired. A fallopian tube and uterus are found within the hernial sac. Morphologic studies of a biopsy specimen of the testes show no abnormalities. Karyotype analysis is most likely to show which of the following in this patient?

- A) 45,X
- B) 46,XX
- C) 46,XY
- D) 47,XXY
- E) 47,XYY

30. A 30-year-old man develops urinary incontinence 2 weeks after successful treatment of a fracture of the left pelvis that was sustained at work. He was pinned against a loading dock by a truck moving in reverse. Physical examination shows a distended bladder. Cystometrography shows absence of micturition reflexes. After the bladder fills to capacity, overflow of urine occurs through the urethra a few drops at a time. This patient most likely sustained additional injury to which of the following during his initial accident?

- A) External urinary sphincter
- B) Hypogastric nerve
- C) Pelvic nerves
- D) Pudendal nerves
- E) Skeletal motor fibers

33. A 29-year-old woman comes to the physician because of a 10-day history of difficulty walking. Two years ago, she had loss of vision in the left eye, which improved during the next 2 months. Ophthalmologic examination shows decreased visual acuity in the left eye with pallor of the optic disc. There is past pointing on finger-nose testing. She also has a broad-based gait and spasticity. An MRI of the brain shows lesions in the white matter of the cerebellum. Treatment with which of the following agents is most likely to improve the spasticity in this patient?

- A) Atropine
- B) Baclofen
- C) Bethanechol
- D) Mecamylamine
- E) Pyridostigmine

6. A 28-year-old man is brought to the emergency department after being struck in the right eye by a baseball. He has diplopia, periorbital swelling, and enophthalmos. Upward gaze is impaired, and sensation is decreased over the right zygoma. X-rays of the face show fractures involving the orbital floor. These clinical findings are best explained by entrapment of which of the following muscles within the fracture?

- A) Inferior rectus and inferior oblique
- B) Lateral rectus and superior oblique
- C) Levator palpebrae and superior oblique
- D) Medial rectus and inferior oblique
- E) Superior rectus and superior oblique

1. A 44-year-old man is admitted to the hospital because of altered mental status. His blood pressure is 210/145 mm Hg. Funduscopic examination shows papilledema and retinal hemorrhages. Urinalysis shows 15–20 erythrocytes/hpf. A drug with which of the following effects on vascular smooth muscle is most likely to decrease his blood pressure?

- A) Decreasing activity of membrane K^+ channels
- B) Decreasing cAMP
- C) Decreasing synthesis of nitric oxide
- D) Increasing activity of membrane Ca^{2+} channels
- E) Increasing cGMP
- F) Increasing release of Ca^{2+} from sarcoplasmic reticulum

27. The FOXO transcription factor responds to insulin signaling by altering the transcription of several metabolic genes. FOXO can respond rapidly to changes in insulin signaling because it is reversibly modified. Which of the following best describes the reversible ways in which the insulin signaling regulates FOXO activity?

	Nuclear/Cytoplasmic Shuttling	Serine Phosphorylation	Ubiquitin-mediated Proteolysis
A)	Yes	yes	yes
B)	Yes	yes	no
C)	Yes	no	yes
D)	Yes	no	no
E)	No	yes	yes
F)	No	yes	no
G)	No	no	yes
H)	No	no	no

27. A 40-year-old African American woman comes to the physician because of a 2-week history of fever, malaise, and dyspnea. Her temperature is 36.7°C (98°F), and respirations are 20/min. Physical examination shows erythema nodosum, parotid enlargement, and hepatosplenomegaly. Her serum calcium concentration is 16 mg/dL. A CT scan of the chest shows bilateral hilar adenopathy. Serum studies are most likely to show an increased concentration of which of the following?

- A) Calcitonin
- B) Cholecalciferol
- C) 1,25-Dihydroxycholecalciferol
- D) 24,25-Dihydroxycholecalciferol
- E) Parathyroid hormone

28. A 22-year-old woman, gravida 1, para 1, is brought to the emergency department because of a 2-day history of fever and severe vaginal bleeding. Four days ago, she delivered a healthy male newborn spontaneously at term. Her temperature is 38.1°C (100.6°F). Pelvic examination shows an open cervix and heavy vaginal bleeding. Ultrasonography of the uterus shows no retained placental tissue or large thrombi. If an operation is required to control the bleeding, ligation of a branch of which of the following arteries is most appropriate?

- A) External iliac
- B) Internal iliac
- C) Internal pudendal
- D) Median sacral
- E) Obturator

13. An 11-year-old boy has had persistent pain in his right knee since he twisted it in a soccer game 3 weeks ago. Physical examination shows a tender area in the distal femur but no perceptible mass. An x-ray of the femur shows an osteolytic mass that has eroded through the cortex and elevated the periosteum; the mass is surrounded by reactive bone in some areas. Biopsy of the mass shows atypical cells with hyperchromatic pleomorphic nuclei. The cells are surrounded by an eosinophilic matrix, some of which is calcified. This tumor is most likely to spread first to which of the following areas?

- A) Brain
- B) Cervical lymph nodes
- C) Liver
- D) Lung
- E) Vertebrae

36. A 28-year-old man develops a temperature of 39.9°C (103.8°F) and rigors after receiving high-dose chemotherapy for acute leukemia. Laboratory studies show:

Hemoglobin	8.8 g/dL
Leukocyte count	400/mm^3
Mean corpuscular volume	88 µm^3
Platelet count	60,000/mm^3

After appropriate cultures are done, antibiotic therapy is started. Administration of which of the following is most appropriate at this time?

- A) Erythropoietin
- B) Granulocyte colony-stimulating factor
- C) Interferon-γ
- D) Interleukin-8 (IL-8)
- E) Thrombopoietin

18. A 65-year-old man comes to the physician because of a 1-month history of decreased urine output and difficulty starting and stopping urine flow. Physical examination shows an enlarged prostate. His serum prostate-specific antigen concentration is 12 ng/mL (N<4). A prostate biopsy specimen confirms prostate cancer. Screening shows metastatic disease to the L1 vertebra. The patient elects to have an orchiectomy. Which of the following changes in this patient's prostate is most likely to be increased secondary to the orchiectomy?

- A) Bromodeoxyuridine staining
- B) Cell size
- C) DNA fragmentation
- D) Mitotic rate
- E) Size of the prostate gland

31. A 34-year-old man comes to the physician because of a 2-week history of daily episodes of severe, unilateral, periorbital headaches. The headaches, which develop rapidly and last 60 to 90 minutes, are often accompanied by lacrimation and nasal stuffiness on the same side as the headache. The patient had similar symptoms 2 years ago. He is currently asymptomatic. Vital signs are within normal limits. Physical examination shows no abnormalities. Which of the following is the most likely diagnosis?

- A) Cluster headache
- B) Common migraine
- C) Ophthalmoplegic migraine
- D) Sinus headache
- E) Trigeminal neuralgia

20. A 25-year-old man develops shortness of breath after moving from sea level to a mining town at 3350 m (11,000 ft). Evaluation shows no abnormalities, but at rest, pulmonary hypertension with normal cardiac output is noted. Pulmonary function tests are normal. Which of the following best explains the pulmonary hypertension?

- A) Decreased alveolar Po_2
- B) Decreased mixed venous Po_2
- C) Decreased regional ventilation
- D) Increased pulmonary J receptor nerve traffic
- E) Increased pulmonary vagal activity
- F) Increased sympathetic nervous system activity

17. A 75-year-old woman is brought to the emergency department comatose 16 hours after the onset of left arm and leg weakness. Physical examination shows left hemiplegia. A CT scan of the head shows an edematous right hemisphere. There is no evidence of hemorrhage, but there is sparing of the right occipital and midline frontal cortices. One hour later, she dies. At autopsy, microscopic examination of the right lateral frontal lobe is most likely to show which of the following?

- A) Numerous lymphocytes
- B) Numerous macrophages
- C) Numerous neutrophils
- D) Shrunken eosinophilic (red) neurons
- E) No abnormalities

8. A study is conducted to assess the normal mean serum urea nitrogen concentration in men ages 65 years and older to be used as reference values in a laboratory. Random selection of which of the following will provide an inaccurate but precise estimate of the mean serum urea nitrogen concentration in this group?

- A) 10 Men from a list of patients scheduled to be examined by a urologist
- B) 10 Men from a list of patients undergoing routine health screening at a local shopping center
- C) 500 Men from a list of patients scheduled to be examined by a urologist
- D) 500 Men from a list of patients undergoing routine health screening at a local shopping center

32. Left radial arterial and venous blood samples are drawn from 10 chimpanzees breathing room air while resting quietly. The results indicate that the total carbon dioxide concentration average is 21.5 mM in the arterial samples and 24.3 mM in the venous samples. Which of the following accounts for the larger amount of carbon dioxide in these venous blood samples?

- A) CO_2 bound as carbaminohemoglobin
- B) Dissolved CO_2 in the plasma
- C) Dissolved CO_2 within erythrocytes
- D) HCO_3^- transported in the plasma
- E) HCO_3^- transported within erythrocytes

3. A 48-year-old man is brought to the emergency department because of a 1-hour history of vomiting blood. One year ago, he was diagnosed with bleeding esophageal varices and cirrhosis. Variceal banding was ineffective in controlling the bleeding from the varices. Physical examination shows ascites. A surgical shunt between which of the following veins is most likely to relieve the esophageal bleeding in this patient?

- A) Hepatic and inferior phrenic
- B) Ileocolic and inferior mesenteric
- C) Splenic and left renal
- D) Superior epigastric and inferior epigastric
- E) Superior rectal and superior mesenteric

45. A 35-year-old man comes to the physician because of a 1-day history of pain and swelling of his right great toe. Examination of the toe shows erythema, swelling, warmth, and tenderness. Movement of the toe is limited by pain. Microscopic examination of aspirate from the affected joint shows numerous neutrophils and many needle-like crystals. Which of the following is the most likely cause of this patient's swelling?

- A) Complement activation
- B) Histamine release
- C) Increased vascular permeability
- D) Release of lipopolysaccharide
- E) T-lymphocyte-mediated cytotoxicity

42. An investigator is studying the efficacy of distinct vaccine formulations directed against the capsular polysaccharides of *Neisseria meningitidis*. The carbohydrates are chemically conjugated to various compounds and injected into laboratory mice. Titers of anticapsular IgG antibodies are then measured. Which of the following compounds is most likely to induce increased titers of these antibodies when conjugated to the polysaccharides?

- A) Dinitrophenol
- B) Flagellin
- C) Lactose
- D) Lipopolysaccharide
- E) Palmitic acid
- F) Polyinosinic acid-polycytidylic acid

9. A 21-year-old man is brought to the emergency department 45 minutes after sustaining multiple injuries in a motor vehicle collision. His blood pressure is 90/50 mm Hg. Physical examination shows diffuse abdominal tenderness. He is diagnosed with laceration of the spleen and undergoes splenectomy. The splenectomy most likely predisposes this patient to develop future infection with which of the following causal organisms?

- A) *Candida albicans*
- B) Cytomegalovirus
- C) *Escherichia coli*
- D) Herpes simplex virus
- E) *Streptococcus pneumoniae*

40. A 17-year-old boy has the acute onset of lethargy, sore throat, and fever. Physical examination shows symmetrical, nontender cervical lymphadenopathy, an exudative erythematous pharynx, palatal petechiae, and splenomegaly. No rash is present. Serologic studies are positive for antibody to Epstein-Barr viral capsid antigen. In addition to a slightly decreased platelet count, the peripheral blood will most likely show an increased number of which of the following?

A) Lymphocytes
B) Monocytes
C) Myeloblasts
D) Nucleated erythrocytes
E) Reticulocytes

16. A 22-year-old man has had frequent episodes of cutaneous urticaria and occasional episodes of laryngospasm over the past year. An allergy evaluation fails to find any allergic cause for his urticaria. Based on this history, which of the following complement proteins is most likely to be deficient in his serum?

- A) C1 esterase inhibitor (binds activated C1r, C1s)
- B) C4 binding protein (binds C4b displacing C2b)
- C) Complement receptor 1 (binds C4b displacing C2b)
- D) Factor H (binds C3b displacing Bb)
- E) Factor I (serine protease cleaves C3b and C4b)

13. A 4-year-old girl is conscious but unable to breathe spontaneously for 3 hours following uncomplicated removal of a branchial cleft cyst. The procedure was done under general anesthesia with sevoflurane. Succinylcholine was administered for intubation. Which of the following is the most likely cause of the prolonged apnea in this patient?

- A) Idiosyncratic reaction to sevoflurane anesthesia
- B) Intraoperative vagus nerve injury during the operation
- C) Overdose with midazolam used as preoperative sedation
- D) Pseudocholinesterase deficiency
- E) Ryanodine receptor defect

20. A 64-year-old man with bronchospastic pulmonary disease continues to have wheezing in spite of increasing doses of a β-adrenergic agonist inhaler. He is hospitalized and systemic prednisone is added to the regimen. Which of the following best explains the action of prednisone in enhancing the response to the β-adrenergic agonist?

- A) Enhanced absorption of agonist
- B) Enhanced action of the agonist at β-adrenergic receptors
- C) Inhibited excretion of the nonmetabolized agonist
- D) Inhibited metabolism of the agonist
- E) Inhibited metabolism of metabolites of the agonist

24. A 67-year-old man comes to the emergency department because of a 2-day history of fever, sore throat, and difficulty swallowing. He has lived in various homeless shelters during the past year. His temperature is 38.9°C (102°F). Physical examination shows erythematous tonsils with a small area of gray exudate. A throat culture grows *Corynebacterium diphtheriae*. This pathogen produces diphtheria toxin, which blocks which of the following cellular processes?

- A) DNA repair
- B) Glucose uptake
- C) β-Oxidation
- D) Transcription
- E) Translation

33. A 7-year-old boy is brought to the physician by his mother because he has difficulty concentrating in school. The mother says that he feels tired all the time. Physical examination shows normal development. Laboratory studies show a mild hypochromic anemia and an increased serum creatinine concentration. Further laboratory studies are most likely to show which of the following additional abnormal concentrations in this patient?

- A) Decreased serum magnesium
- B) Decreased serum vitamin B_{12} (cobalamin)
- C) Increased blood lead
- D) Increased serum vitamin D
- E) Increased serum zinc

10. A 55-year-old man with hypertension comes to the physician because of severe headaches and confusion during the past week. He has smoked 1½ packs of cigarettes daily for 30 years. His blood pressure is 190/110 mm Hg. A faint bruit is heard over the left abdomen. A captopril renal radionuclide scan shows delayed function in the left kidney. Which of the following findings is most likely on abdominal aortography?

- A) Aortitis
- B) Left renal artery aneurysm
- C) Left renal artery atherosclerosis
- D) Left renal artery dysplasia
- E) Left renal cell carcinoma

46. A 60-year-old woman with psoriasis comes to the physician because of progressive joint swelling and pain of her hands during the past 6 months. Physical examination shows joint tenderness and effusion. She asks for treatment with methoxsalen and ultraviolet A light (PUVA), which worked well for her similarly afflicted sister. This therapy would be contraindicated in this patient if she were to have which of the following conditions?

- A) Cataracts
- B) Congestive heart failure
- C) Porphyria cutanea tarda
- D) T-cell lymphoma
- E) Type 2 diabetes mellitus
- F) Vitiligo

16. An 83-year-old man comes to the physician because of a 3-day history of painful blisters on his torso. His pulse is 72/min, and blood pressure is 125/85 mm Hg. Physical examination shows numerous 0.5- to 1-cm, clear-fluid-filled, tense blisters over the trunk. Histopathologic examination of a biopsy specimen from the affected area shows a subepidermal blister. Production of autoantibodies directed against which of the following structures best explains the findings in this patient?

- A) Bullous pemphigoid antigen
- B) Collagen, type VII
- C) Cytokeratin
- D) Desmoplakin
- E) Plakoglobin

11. A 3-year-old boy is brought to the emergency department because of a nosebleed that cannot be stopped. Platelet count and thrombin time are within the reference range; partial thromboplastin and prothrombin times are prolonged. Which of the following coagulation processes is most likely to be affected?

- A) Activation of factor XII (Hageman factor)
- B) Hydrolysis of phosphatidylinositol 4,5-bisphosphate
- C) Synthesis of factor VIII (antihemophilic factor)
- D) Synthesis of factor IX (plasma thromboplastin component)
- E) Synthesis of factor X (Stuart factor)

45. A 41-year-old man comes to the physician because of a 6-week history of numbness of his right hand. He works in construction. Sensation to pinprick is decreased in the thumb and over a portion of the anterior forearm. The physician suspects that there is compression of the C5 and C6 spinal nerves as they exit the spinal canal. Weakness of which of the following movements on the right is most likely to confirm the diagnosis?

- A) Abduction of the upper extremity
- B) Adduction of the index finger
- C) Elevation of the shoulder
- D) Extension of the index finger
- E) Flexion of the wrist

37. A 4-month-old boy is diagnosed with a rare autosomal recessive skeletal dysplasia involving abnormal endochondral bone formation. Genetic analysis shows null mutations in a gene for a protein that controls the traffic of vesicles into the Golgi complex. Electron microscopy of this patient's cells will most likely show which of the following findings?

- A) Decreased rough endoplasmic reticulum
- B) Decreased smooth endoplasmic reticulum
- C) Dilated rough endoplasmic reticulum
- D) Increased smooth endoplasmic reticulum
- E) Large lysosomes
- F) Small lysosomes

19. An 80-year-old woman comes to the emergency department because of a 2-day history of "feeling funny." She says, "I have lost my pep." She has never been admitted to the hospital, but she has a history of poorly controlled hypertension. She just started a medication 2 weeks ago but does not recall the name. Her blood pressure is 130/85 mm Hg. Physical examination shows no abnormalities. Her serum potassium concentration is 3 mEq/L. Which of the following drugs is the most likely cause of this patient's condition?

- A) Clonidine
- B) Hydrochlorothiazide
- C) Lisinopril
- D) Metoprolol
- E) Triamterene

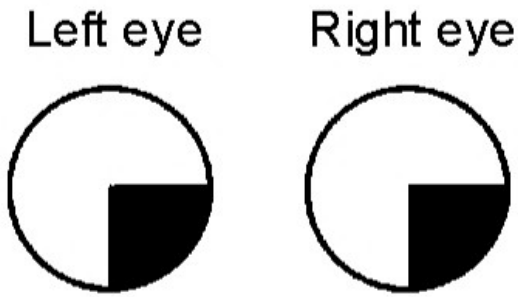
31. The gene that codes for a protein normally found in the endoplasmic reticulum is mutated, and the protein produced by the mutated gene remains in the cytoplasm. Which of the following mutations is most likely to impair the transport of the protein into the endoplasmic reticulum?

- A) Conversion of a proline residue to a hydroxyproline residue
- B) Deletion of a hydrophobic amino acid sequence from the N terminus
- C) Disruption of a lysine-rich amino acid sequence near the middle of the protein
- D) Loss of a glycosylation site
- E) Premature termination of the polypeptide chain near the C terminus

41. A study was performed that evaluated the relationship between television exposure and the development of learning disability in children. Children were divided into two groups based on the presence or absence of learning disabilities. The investigators asked many questions about the children's exposure to television. By comparing the likelihood of television exposure in these two groups, the investigators estimated the relationship between learning disability and television exposure using which of the following measures?

- A) Attack rate
- B) Incidence
- C) Odds ratio
- D) Prevalence
- E) Relative risk

26. A 75-year-old man has the sudden onset of partial loss of vision. The visual fields are shown. The most likely explanation for the visual field defect is a lesion in which of the following?



- A) Occipital lobe, left
- B) Occipital lobe, right
- C) Optic chiasm
- D) Optic nerve, left
- E) Optic nerve, right
- F) Parietal lobe, left
- G) Parietal lobe, right
- H) Temporal lobe, left
- I) Temporal lobe, right

40. A 64-year-old man is evaluated for cough, dyspnea, and chest pain. He is afebrile. An x-ray of the chest shows an abnormal density in the hilar region. Lung tissue biopsy shows round cells with little cytoplasm that are about twice the size of lymphocytes. These cells are arranged in infiltrating sheets that have neither glandular nor squamous organization. Which of the following abnormalities in serum is most likely in this patient?

- A) Hyperkalemia
- B) Hyperlipidemia
- C) Hypermagnesemia
- D) Hypoalbuminemia
- E) Hypoglycemia
- F) Hyponatremia

45. Scientists have identified the flawed gene that causes about 1 in 6 cases of colon cancer. When the gene is working correctly, the gene product acts in the repair process that discriminates between the template and the newly synthesized DNA strand, correcting mistakes in the newly synthesized strand after replication. In which of the following processes is this gene product most likely to be involved?

- A) Base-excision repair
- B) Mismatch repair
- C) Nucleotide-excision repair
- D) Photo-induced repair
- E) Recombinational repair

36. A 34-year-old woman comes to the physician because of a 6-week history of fatigue and shortness of breath. Physical examination shows mild cyanosis and clubbing. Cardiac examination shows fixed splitting of S_2. A midsystolic pulmonary ejection murmur is heard. Echocardiography shows a congenital heart defect, and the patient undergoes surgical repair. The patient is at greatest risk for intraoperative injury to which of the following?

- A) Atrioventricular bundle
- B) Coronary plexus
- C) Coronary sinus
- D) Purkinje fibers
- E) Sinoatrial node

6. Which of the following best explains why the use of an anti-idiotypic antibody is inappropriate as a therapeutic reagent for the treatment of a patient with multiple myeloma?

- A) An insufficient quantity of the immunogen is available to generate the reagent
- B) Myeloma cells are not susceptible to antibody-dependent cell-mediated cytotoxicity
- C) Myeloma cells can be killed only in vivo by cytotoxic lymphocytes
- D) Myeloma cells do not have membrane-bound surface immunoglobulin
- E) Myeloma cells do not have tumor-specific antigens on their surfaces

14. A 70-year-old woman has had recurrent pneumonia, fatigue, and weight loss for the past 3 months. Serum thyroxine (T_4) and thyroid-stimulating hormone (TSH) concentrations are within the reference range, and serum triiodothyronine (T_3) concentration is decreased. Serum TSH concentration increases after the administration of thyrotropin-releasing hormone. Which of the following is the most likely diagnosis?

- A) Euthyroid sick syndrome
- B) Hypopituitarism
- C) Hypothalamic abnormality
- D) Primary hypothyroidism
- E) Thyroid neoplasm

44. A 39-year-old woman with rheumatoid arthritis develops proteinuria following treatment with penicillamine. Examination of a specimen obtained on renal biopsy shows diffuse fine granular deposits of IgG and C3 in the glomerular basement membrane. Which of the following is the most likely diagnosis?

- A) Acute poststreptococcal glomerulonephritis
- B) Goodpasture syndrome
- C) IgA nephropathy
- D) Membranoproliferative glomerulonephritis
- E) Membranous glomerulonephritis
- F) Minimal change disease

49. A 78-year-old woman is brought to the emergency department by her husband 1 hour after the sudden onset of severe pain in her left leg. She does not recall any trauma to the area. Physical examination shows the left lower extremity to be cool and pale, with absence of pulses. An ECG shows an irregularly irregular rhythm. Which of the following treatments is most appropriate to provide effective relief from these symptoms?

- A) Oral aspirin therapy
- B) Oral bosentan therapy
- C) Oral clopidogrel therapy
- D) Embolectomy
- E) Fasciotomy

4. A 19-year-old woman comes to the office because of a 1-month history of abdominal pain and severe diarrhea; she has had a 5.4-kg (12-lb) weight loss during this period. She is 168 cm (5 ft 6 in) tall and now weighs 57 kg (126 lb); BMI is 20 kg/m^2. Physical examination shows no abnormalities. Colonoscopy shows a cobblestone appearance of the colonic mucosa. In addition, a stricture is found in a retroperitoneal portion of the bowel. Which of the following is the most likely location of this stricture?

- A) Cecum
- B) Descending colon
- C) Sigmoid colon
- D) Transverse colon

48. A 10-year-old girl develops fever, malaise, and loss of appetite, followed by excess salivation 6 weeks after exploring a cave with her friends. Over the next week, she develops delirium, seizures, paralysis, and hyperexcitability. The most likely cause of her condition is a virus that has reached the brain by which of the following routes?

- A) Direct spread from olfactory system
- B) Retrograde transport through nerves
- C) Spread from subarachnoid space
- D) Transport via bloodstream
- E) Transport via lymphatics

15. A 27-year-old man comes to the physician for an examination before starting employment at a plastics factory. He has no history of major medical illness. He has never been sexually active. He has minimal contact with his parents and siblings and has no hobbies. When asked if he feels depressed, he says no. He shrugs in response to congratulations about his new job. Physical examination shows a flat affect. This patient most likely has which of the following types of personality disorders?

- A) Antisocial
- B) Avoidant
- C) Borderline
- D) Schizoid
- E) Schizotypal

33. A 6-year-old girl is brought to the physician by her mother because of a 4-day history of round shiny bumps in areas where she has eczema. Her mother remembers seeing similar bumps on a playmate when they attended a pool party 3 weeks ago. The patient has no other symptoms. Physical examination shows firm, smooth, umbilicated papules 2 to 4 mm in diameter in clusters. The causal organism most likely belongs to which of the following viral groups?

- A) Adenovirus
- B) Flavivirus
- C) Herpesvirus
- D) Paramyxovirus
- E) Poxvirus

35. A 35-year-old woman undergoes flexible nasopharyngoscopy because of chronic episodes of bacterial sinusitis. Purulent discharge from the right sphenoethmoidal recess is noted during the procedure. Which of the following best describes the location of this structure?

- A) Anterior to the nasolacrimal duct
- B) Distal to the vestibule
- C) Inferior to the hiatus semilunaris
- D) Posterior to the middle concha
- E) Proximal to the fusion of the hard and soft palates
- F) Superior to the superior concha

32. A 30-year-old man comes to the physician because of a pruritic rash on his lower back for the past week. He underwent liver transplantation 1 year ago and has been maintained on immunosuppressive drugs since then. Physical examination shows vesicles containing clear fluid associated with ulcerated and crusted lesions. Which of the following is the most likely diagnosis?

- A) Bullous pemphigoid
- B) Dermatitis herpetiformis
- C) Erythema multiforme
- D) Secondary syphilis
- E) Varicella-zoster virus infection

8. A 25-year-old woman develops increasing shortness of breath with exertion 2 weeks after the birth of her first child. Physical examination shows jugular venous distention, evidence of edema in the lung bases, mild hepatomegaly, and mild pitting edema in the lower extremities. Which of the following cardiac abnormalities is most likely present at this time?

- A) Asymmetric septal hypertrophy
- B) Endocardial fibroelastosis
- C) Four-chamber dilation
- D) Lymphocytic infiltration of the myocardium
- E) Myocardial disarray

3. A 20-year-old primigravid woman at 12 weeks' gestation comes to the physician for genetic counseling. She underwent repair of a unilateral cleft lip as an infant; she had no other abnormalities. Her maternal great-uncle had a bilateral cleft lip and palate; he also had no other abnormalities. She is concerned that her child might have the same condition. Which of the following is the most likely mode of inheritance of this disorder in this patient's family?

- A) Autosomal dominant
- B) Autosomal recessive
- C) Mitochondrial
- D) Multifactorial
- E) X-linked

10. A 53-year-old woman with gastroesophageal reflux disease comes to the physician for a follow-up examination. Dietary changes and stress reduction have had no effect on the frequency or intensity of her symptoms. Physical examination shows mild epigastric tenderness. Which of the following drugs is most likely to be effective in both relieving this patient's symptoms and promoting healing of her esophageal mucosa?

- A) Bethanechol
- B) Famotidine
- C) Metoclopramide
- D) Misoprostol
- E) Omeprazole

27. An 18-year-old woman comes to the office because of a 2-week history of pain in her right elbow. She is on the tennis team at her high school and has practiced for 5 hours daily during the past month. Physical examination shows tenderness over the lateral aspect of the right elbow. This patient most likely has inflammation at the origin of which of the following muscles?

- A) Abductor pollicis longus
- B) Extensor carpi radialis brevis
- C) Flexor digitorum superficialis
- D) Palmaris longus
- E) Pronator teres

22. A 38-year-old woman comes to the physician because of a swollen, painful calf for 2 days. She gave birth to a healthy term newborn 5 days ago. Physical examination shows pitting edema and tenderness with dorsiflexion of the foot. One day later, she has a cerebral infarction with hemiplegia. Passage of an embolus into the systemic circulation is most likely to occur at which of the following locations?

- A) Bronchial artery
- B) Patent foramen ovale
- C) Pulmonary artery
- D) Pulmonary vein
- E) Uterine vein

27. A 50-year-old man has had progressive dyspnea on exertion over the past 6 months. He now has dyspnea at rest. He has had a persistent dry cough since having an upper respiratory tract bacterial infection 1 year ago. Examination of lung tissue obtained on biopsy shows chronic inflammation and fibrous thickening of the alveolar septa. Which of the following is the most likely diagnosis?

- A) Chronic bronchitis
- B) Diffuse alveolar damage
- C) Emphysema
- D) Sarcoidosis
- E) Usual interstitial pneumonitis

15. A screening program is instituted for detection of vaginal *Chlamydia trachomatis* infection among first-year women college students. At the initial screening, evidence of *C. trachomatis* infection is found in 500 of 2500 students. One year later, screening shows vaginal *C. trachomatis* infection in an additional 200 students. Which of the following is the annual incidence of *C. trachomatis* infection in this population of women students?

- A) 8%
- B) 10%
- C) 16%
- D) 20%
- E) 28%

34. A 75-year-old man has fever, back pain, and pain on urination. He has a long-standing history of prostatitis. Gram stain of urine shows gram-positive cocci in chains. Which of the following bacteria is the most likely cause of his illness?

- A) *Enterococcus faecalis*
- B) *Escherichia coli*
- C) *Klebsiella pneumoniae*
- D) *Proteus mirabilis*
- E) *Staphylococcus aureus*
- F) *Streptococcus pyogenes* (group A)

16. A 46-year-old man comes to the physician because of a 2-month history of prolonged bleeding from minor cuts. Physical examination shows hepatosplenomegaly. Laboratory studies show mild anemia, thrombocytopenia, and leukopenia. A bone marrow biopsy specimen shows accumulations of lipid-laden macrophages. If the incidence of this disease among Ashkenazi Jews is 1/900, which of the following is the approximate carrier frequency of this mendelian trait in this population?

- A) 1/15
- B) 1/30
- C) 1/60
- D) 1/120
- E) 1/240

21. A normal-appearing 17-year-old girl has never had a menstrual period. The vagina ends blindly and no uterus or ovaries are palpated. A buccal smear shows chromatin-negative nuclei. Which of the following is the most likely diagnosis?

- A) Androgen insensitivity syndrome
- B) Congenital adrenal hyperplasia
- C) Gonadal dysgenesis 45,X (Turner syndrome)
- D) Prenatal exposure to excess androgen
- E) Prenatal exposure to excess estrogen

4. A 60-year-old man is brought to the emergency department after being thrown from his car and striking a guardrail in a high-speed automobile collision. He was the unrestrained driver. Physical examination shows blood at the urethral meatus and fractures of the pelvis and the left femur. A Foley catheter is unable to be inserted. Which of the following is the most likely explanation?

- A) Hypospadias
- B) Prostatic hypertrophy
- C) Ruptured bladder
- D) Urethral disruption
- E) Urethral stricture

18. A 66-year-old man with stage IV colon cancer comes to the physician because of a 3-day history of severe diarrhea after receiving chemotherapy with fluorouracil, leucovorin, and irinotecan. The physician prescribes an opioid antidiarrheal agent with little or no ability to produce central nervous system effects, even when given in relatively high doses. Which of the following agents was most likely prescribed?

- A) Buprenorphine
- B) Codeine
- C) Hydrocodone
- D) Loperamide
- E) Morphine

47. A 48-year old man is referred for evaluation of possible hypertension. On the basis of ten measurements, the patient's average diastolic blood pressure is 113 mm Hg, and the standard deviation is 8 mm Hg. If four rather than ten measurements of the mean blood pressure are made, which of the following is the expected impact on the size of the 95% confidence interval about the mean blood pressure?

- A) Change, but the direction cannot be predicted
- B) Decrease in width
- C) Increase in width
- D) Remain the same

11. A 75-year-old woman comes to the physician's office because of poor concentration and decreased energy for the past month. For 6 months, she has been waking up at 4 AM and been unable to get back to sleep. Physical examination shows no abnormalities. Which of the following is the most likely cause of the sleep disturbance in this patient?

A) Major depressive disorder
B) Narcolepsy
C) Paroxysmal nocturnal dyspnea
D) Periodic leg movements
E) Sleep apnea

1. A 23-year-old woman develops persistent sneezing each year in the spring. Her sneezing worsens when she works in her garden. A drug with which of the following mechanisms of action is most likely to be effective in treating this patient?

- A) Inhibition of histaminergic (H_2) receptors
- B) Inhibition of phosphodiesterases
- C) Stabilization of lymphocyte membranes
- D) Stabilization of mast cell membranes
- E) Stimulation of β_2-adrenergic receptors

39. A female newborn delivered at 26 weeks' gestation is found to have hyaline membrane disease. She is intubated and mechanically ventilated. Her vital signs are continuously monitored, and inspired oxygen is maintained at a level that will sustain an oxygen saturation between 92% and 95%. The primary goal of this treatment is protection of which of the following structures?

- A) Basal ganglia
- B) Choroid plexus
- C) Cochlea
- D) Ductus arteriosus
- E) Retina

43. A 35-year-old man with diabetic ketoacidosis has a decrease in plasma glucose concentration from 900 mg/dL to 270 mg/dL during treatment with insulin and volume repletion. Which of the following additional laboratory values is most likely to decrease with the insulin therapy?

A) Serum calcium concentration
B) Serum potassium concentration
C) Serum sodium concentration
D) Urinary ammonia excretion
E) Urinary potassium excretion

36. A 7-year-old girl is brought to a clinic in a developing country where lack of adequate good-quality protein has been identified as a critical issue. She is at the 70th percentile for height and 90th percentile for weight. Her vital signs are within normal limits. Physical examination shows no abnormalities. Which of the following amino acids is most critical in the analysis of this child's diet at this time?

- A) Alanine
- B) Aspartic acid
- C) Glycine
- D) Methionine
- E) Tyrosine

9. A 72-year-old man comes to the physician because of a 2-week history of a nonproductive cough. He has non-Hodgkin lymphoma treated with a variety of antineoplastic drugs. Physical examination shows hyperpigmentation around the elbows. A chest x-ray shows diffuse infiltrates. Which of the following drugs is the most likely cause of this patient's symptoms?

- A) Bleomycin
- B) Carboplatin
- C) Chlorambucil
- D) Prednisone
- E) Vincristine

9. A 26-year-old man with HIV infection comes to the physician because of a 3-day history of generalized reddening skin involving the palms, arms, legs, and soles. A rapid plasma reagin (RPR) test result is positive. Treatment with which of the following antibiotics is most likely to eradicate the causal organism?

- A) Acyclovir
- B) Aztreonam
- C) Caspofungin
- D) Fluconazole
- E) Nystatin
- F) Oseltamivir
- G) Penicillin

49. A 30-year-old man has had intermittent severe lower abdominal pain, right flank tenderness, and hematuria for 1 day. His brother has a history of recurrent renal calculi. The patient's urine turns cherry red when tested with nitroprusside. Hexagonal crystals are present in the urinary sediment. Which of the following substances is most likely to be found in an increased concentration in this patient's urine?

- A) Calcium
- B) Copper
- C) Cysteine
- D) Tyrosine
- E) Uric acid

28. A 32-year-old woman comes to the physician because her sister recently died of melanoma. Other first-degree family members have been similarly affected, and other family members also have large pigmented skin lesions. Which of the following lesions is most likely on both sun-exposed and nonsun-exposed areas of this patient's skin?

- A) Acanthosis nigricans
- B) Basal cell carcinoma
- C) Blue nevi
- D) Dysplastic nevi
- E) Pigmented seborrheic keratosis

46. A 53-year-old woman who underwent an operation for breast cancer begins taking tamoxifen. Which of the following best represents the effects of tamoxifen on estrogen receptors in breast and uterine tissue in this woman?

	Tissue	
	Breast	**Uterus**
A)	Agonist	agonist
B)	Antagonist	antagonist
C)	Antagonist	partial agonist
D)	Partial agonist	antagonist
E)	Partial agonist	partial agonist

40. A 66-year-old woman with pancreatic cancer comes to the office because of a 2-day history of black, tarry stools. Physical examination shows pallor and diaphoresis. Upper endoscopy shows gastric varices. A CT scan of the abdomen shows thrombosis of the splenic vein. Which of the following veins is most likely the source of bleeding in this patient?

- A) Esophageal
- B) Left gastric
- C) Right gastric
- D) Right gastroepiploic
- E) Short gastric

41. An undernourished 70-year-old man has fever, night sweats, and a productive cough. X-ray of the chest shows a cavitary lesion in the right lung. Numerous acid-fast bacilli are seen on microscopic examination of sputum. Which of the following cytokines plays the dominant role in the inflammatory response in this patient's lung?

- A) Granulocyte-macrophage colony-stimulating factor (GM-CSF)
- B) Interferon-α
- C) Interferon-γ
- D) Interleukin-4 (IL-4)
- E) IL-5

20. A previously healthy 4-week-old male newborn is brought to the emergency department because of persistent nonbilious projectile vomiting after eating. Physical examination shows visible abdominal peristalsis and a 2-cm, firm, ovoid mass in the right upper quadrant. Which of the following is the most likely diagnosis?

- A) Duodenal atresia
- B) Hepatoblastoma
- C) Pancreas divisum
- D) Pyloric stenosis
- E) Reflux esophagitis

7. A test has been developed to screen for human papillomavirus infections of the uterine cervix. If the prevalence of the disease increases by 50%, which of the following features of the test will increase?

- A) False-negative rate
- B) False-positive rate
- C) Predictive value of a positive test
- D) Predictive value of a negative test
- E) Sensitivity of the screening test
- F) Specificity of the screening test

35. A 6-month-old girl is brought to the physician because her parents think she is weak and has an exaggerated reaction to loud noises. Examination shows muscle weakness, an increased startle reflex, and cherry-red spots on the retinas. The most likely cause of this disorder is accumulation of which of the following lipids in the patient's lysosomes?

- A) Ceramide
- B) Glucocerebroside
- C) GM_1
- D) GM_2
- E) GM_3
- F) Lactosylceramide

41. A 36-year-old woman undergoes a total hysterectomy and bilateral salpingo-oophorectomy for extensive endometriosis of the pelvis. Following the operation, she decides that she does not want to begin hormone replacement therapy. Which of the following changes is most likely to occur in the gonadotrophs if this patient refuses this postoperative treatment?

- A) Apoptosis
- B) Atrophy
- C) Hyperplasia
- D) Metaplasia
- E) Necrosis

19. A 56-year-old man undergoes a renal transplant. Five minutes after the graft blood vessels are anastomosed to host vessels, he develops hemorrhage and thrombotic occlusion of the graft vessels. Which of the following is the most likely mediator of this process?

- A) CD4+ T lymphocytes
- B) CD8+ T lymphocytes
- C) IgA plus complement
- D) IgG plus complement
- E) Macrophages
- F) Mast cells

18. A 4-month-old female infant is brought to the emergency department by her parents because she had a seizure 1 hour ago. She has had diarrhea for the past 3 days. She has consumed nothing but water for the past 24 hours because her parents ran out of formula. She is most likely to have which of the following electrolyte abnormalities?

- A) Hyperchloremia
- B) Hyperglycemia
- C) Hypoglycemia
- D) Hypernatremia
- E) Hyponatremia

37. A 28-year-old woman at 18 weeks' gestation has palpitations. Laboratory studies show an increased serum total thyroxine (T_4) concentration. Which of the following tests is best to confirm a diagnosis of hyperthyroidism in this patient?

- A) Fine-needle aspiration biopsy of the thyroid gland
- B) Free T_4
- C) Radioactive iodine uptake
- D) Serum total triiodothyronine (T_3)
- E) Thyroid antibodies

35. An 80-year-old woman cannot concentrate her urine above 450 mOsmol/kg H_2O. She accumulates 450 mOsmol/day of solute, which must be excreted by the kidneys. She loses 900 mL of water insensibly and 100 mL of water in sweat and feces. Which of the following best represents the minimum volume of water that this woman must ingest in food and drink daily (in L) to prevent an increase in plasma osmolality?

- A) 0.5
- B) 1.0
- C) 1.5
- D) 2.0
- E) 2.5

44. A newborn has female external genitalia and a 46,XY karyotype. An MRI shows male genital ducts. The most likely cause of this anomaly is a gene mutation resulting in the absence of expression of which of the following hormones or factors?

A) Antimüllerian hormone
B) Dihydrotestosterone
C) Estrogen
D) Sex-determining region of the Y chromosome (SRY) protein
E) Testosterone

25. A 40-year-old woman who had pneumonia due to *Streptococcus pneumoniae* 6 months ago comes to the physician for a follow-up examination. X-rays of the chest show no abnormalities. Which of the following is produced by the cell type most likely responsible for the restitution of near-normal lung structure?

- A) Factor VIII (antihemophilic factor)
- B) Histamine
- C) P-selectin
- D) Surfactant
- E) Type I collagen

24. A 34-year-old man is evaluated after becoming light-headed after running 12 miles of a marathon on a hot day. His pulse is 130/min and his blood pressure is 80/60 mm Hg. Which of the following sets of changes in his autonomic nervous system is most likely?

	Number of Impulses From Carotid Baroreceptor	Sympathetic Efferent Activity	Parasympathetic Efferent Activity
A)	↑	↑	↑
B)	↑	↑	↓
C)	↑	↓	↑
D)	↓	↑	↓
E)	↓	↓	↑
F)	↓	↓	↓

20. A 30-year-old woman develops "dimness of vision," loss of color vision, and constriction of visual fields 1 month after beginning combination therapy including isoniazid, rifampin, pyrazinamide, ethambutol, and cycloserine for pulmonary tuberculosis. Which of the following drugs is most likely responsible for these adverse effects?

- A) Cycloserine
- B) Ethambutol
- C) Isoniazid
- D) Pyrazinamide
- E) Rifampin

3. A physician prescribes a recently marketed drug for 20 patients. After several months, five patients develop increased serum AST and ALT activities and show clinical symptoms of hepatotoxicity. The physician discontinues the drug for all patients and reports the adverse effects to the FDA. The physician has participated in which of the following phases of clinical drug testing?

- A) Phase 1
- B) Phase 2
- C) Phase 3
- D) Phase 4

50. A 75-year-old woman has the sudden onset of Horner syndrome on the right, dysphagia, and difficulty speaking. Pain and temperature sensations are decreased on the right side of her face and left side of her body. Which of the following arteries is most likely to have been occluded?

- A) Anterior inferior cerebellar
- B) Basilar
- C) Posterior cerebral
- D) Posterior inferior cerebellar
- E) Superior cerebellar

15. A 23-year-old man drinks alcohol heavily on a weekend. Which of the following cellular changes is most likely to occur in his liver?

- A) Acute cellular swelling
- B) Agenesis
- C) Apoptosis
- D) Atrophy
- E) Fatty change
- F) Hyperplasia
- G) Hypertrophy
- H) Hypoplasia
- I) Metaplasia

24. A healthy 32-year-old woman at 35 weeks' gestation is participating in a study of normal pregnancy. During her labor, oxytocin concentrations are noted to increase. Which of the following is the most likely underlying cause of this finding?

- A) Birth canal reflex
- B) Estrogen
- C) Human chorionic gonadotropin
- D) Progesterone
- E) Prolactin
- F) Prostaglandin E_2

36. A 56-year-old man undergoes surgical resection of the duodenum after injuring his small intestine in a motor vehicle collision. Which of the following is most likely expected to decrease after this procedure?

- A) Release of cholecystokinin
- B) Release of gastrin
- C) Secretion of intrinsic factor
- D) Secretion of pepsin
- E) Secretion of vasoactive intestinal polypeptide

46. A 2-week-old male newborn has a patent ductus arteriosus. Which of the following findings is most likely present in this newborn?

- A) Higher than normal left ventricular cardiac output
- B) Higher than normal peripheral vascular resistance
- C) Higher than normal right ventricular Po_2
- D) Lower than normal pulmonary capillary blood flow
- E) Lower than normal systemic arterial Po_2

35. A 55-year-old woman with a benign nodule in the left lobe of the thyroid gland is undergoing a partial thyroidectomy in the hospital. A branch of the thyrocervical trunk is ligated to interrupt the blood supply of the resected specimen. It is most appropriate to also ligate a direct branch of which of the following arteries in this patient?

- A) Brachiocephalic
- B) Deep cervical
- C) External carotid
- D) Lingual
- E) Vertebral

2. A 28-year-old man comes to the physician for evaluation of infertility. Physical examination shows no abnormalities. His serum concentrations of testosterone, follicle-stimulating hormone, luteinizing hormone, and prolactin are within the reference ranges. Which of the following is most likely to be found in an abnormal concentration on semen analysis?

- A) Fructose
- B) 5α-Reductase
- C) Selenium
- D) Sodium
- E) Zinc

2. A 17-year-old boy is evaluated for constitutional delay in growth and puberty. Serum gonadotropin concentrations are in the low-normal range. X-ray of the skull shows suprasellar calcifications. Which of the following is the most likely explanation for his condition?

- A) Craniopharyngioma
- B) Histiocytosis X
- C) Idiopathic
- D) Optic glioma
- E) Prolactinoma

25. A 47-year-old man has jaundice. Laboratory findings include an increased serum bilirubin concentration and a positive urine bilirubin test. Which of the following is most likely associated with the positive urine bilirubin test?

- A) Bleeding ulcer
- B) Folic acid deficiency
- C) Hemolysis
- D) Hemophilia
- E) Obstruction of the bile duct
- F) Pernicious anemia

40. A 36-year-old man with AIDS elects to participate in a clinical study designed to test the effects of CCR5-receptor inhibitors on viral replication in patients with AIDS. Which of the following molecules is the natural ligand for this HIV coreceptor?

- A) Chemokine
- B) Complement protein
- C) Immunoglobulin
- D) Low-density lipoprotein
- E) Protease

31. A healthy 25-year-old man is participating in a study of blood glucose. During the study, he is found to have a serum glucose concentration of 100 mg/dL after 20 hours of fasting. Which of the following precursors would contribute to the normal glycemia in this man at this time?

- A) Acetoacetate
- B) Alanine
- C) β-Hydroxybutyrate
- D) Stearic acid
- E) Valine

32. A 55-year-old man is diagnosed with renal artery stenosis. The stenosis results in a 50% reduction in arcuate artery pressure. Which of the following regions of the kidney is most likely to have the highest concentration of renin in response to the reduction in arcuate artery pressure?

- A) Cortex
- B) Inner medulla
- C) Outer medulla
- D) Papilla
- E) Renal pelvis

38. A 40-year-old man with interstitial pulmonary fibrosis has a greater maximal expiratory flow rate than predicted. Which of the following best explains this finding?

- A) Hypercapnic bronchodilatation
- B) Hyperinflation of the lungs
- C) Hypoxic bronchodilatation
- D) Increased radial traction on airways
- E) Increased surfactant secretion

44. An investigator is conducting a study of antiretroviral agents. The plan is to identify which agents inhibit entry of the HIV virus into the CD4+ T lymphocytes. Which of the following antiretroviral agents is most likely to be identified in this study?

- A) Didanosine (ddI)
- B) Enfuvirtide
- C) Lamivudine (3TC)
- D) Nevirapine
- E) Tenofovir

34. A 19-year-old college student says he "hears voices." He was treated in the hospital 2 years ago for a similar problem. Which of the following drugs is most appropriate for treatment of this patient?

- A) Benztropine
- B) Diazepam
- C) Lithium carbonate
- D) Methylphenidate
- E) Nortriptyline
- F) Risperidone

49. A 47-year-old man is treated with colchicine for acute gouty arthritis. The drug acts by inhibiting which of the following in this patient's leukocytes?

- A) Cyclooxygenase activity
- B) Lipoxygenase activity
- C) Tubulin polymerization
- D) Urokinase activity
- E) Xanthine oxidase activity

48. A 28-year-old woman with chronic renal failure (creatinine clearance less than 20 mL/min) requires treatment for volume overload and pulmonary edema. Which of the following is the most appropriate pharmacotherapy?

- A) Acetazolamide
- B) Amiloride
- C) Furosemide
- D) Hydrochlorothiazide
- E) Spironolactone

49. A 47-year-old woman with aplastic anemia is being treated for disseminated aspergillosis with an antifungal drug that binds to specific sterols in the plasma membrane. This patient is most likely taking which of the following drugs?

- A) Amphotericin B
- B) Caspofungin
- C) Fluconazole
- D) Terbinafine
- E) Tolnaftate

1. A 17-year-old boy returns to the locker room after football practice on an especially warm day. His uniform is soaked with sweat. The characteristic odor associated with his sweat is most likely the result of secretion by which of the following glands?

- A) Apocrine
- B) Ceruminous
- C) Eccrine
- D) Sebaceous
- E) Tarsal

42. A 4-year-old boy falls and lacerates his lower leg to the subdermal connective tissue. Which of the following is the first step in the tissue repair process?

- A) Angiogenesis
- B) Formation of fibrin clot
- C) Formation of granulation tissue
- D) Influx of macrophages
- E) Proliferation of fibroblasts

5. A 50-year-old woman has azotemia. Renal ultrasonography shows bilateral hydroureters and hydronephrosis. The most likely cause of these findings is primary carcinoma of which of the following?

- A) Colon
- B) Kidney
- C) Ovary
- D) Ureter
- E) Uterine cervix

42. Acetaminophen and nonsteroidal antiinflammatory agents reduce fever by decreasing the synthesis of which of the following factors in the hypothalamus?

A) Interleukin-1 (IL-1)
B) IL-6
C) Leukotriene C_4
D) Prostaglandin E_2
E) Tumor necrosis factor-α