1. Which of the following is a common complication of bacterial endocarditis?

   - A. Abscesses in brain, kidneys and spleen
   - B. Pulmonary emboli
   - C. Polyarteritis nodosa
   - D. Chronic pericarditis
   - E. Systemic lupus erythematosus

2. Microscopic examination of the myocardial infarction in a patient who expired 24-48 hours following the occlusion of the coronary artery shows:

   - A. Well-developed granulation tissue
   - B. Necrosis of myocardium and infiltrates of polymorphonuclear leukocytes
   - C. Plasma cell infiltrates
   - D. Fibroblastic proliferation
   - E. Extensive infiltration of myocardium with mononuclear cells

3. A 60 year old man is admitted to the hospital with a chief complaint of substernal chest pain and perspiration. Examination reveals an obese man with a long history of angina and intermittent claudication. A blood test after 4 hours would usually reveal elevated levels of:

   - A. Aspartate transaminase
   - B. Acid phosphatase
   - C. Creatine kinase
   - D. Lactate dehydrogenase
   - E. Glucagon

4. Hematuria and flank pain are observed in a patient with a seven-day history of trans-mural myocardial infarction. What is the most likely underlying cause?

   - A. Emboli from ventricular mural thrombi
   - B. Emboli from atrial mural thrombi
   - C. Emboli from aortic valve vegetations
   - D. Acute pyelonephritis
   - E. Emboli from mitral valve vegetation

5. Purulent pericarditis is a complication of:

- A. Angina pectoris
- B. Bacterial sepsis
- C. Calcific aortic stenosis
- D. Bicuspid aortic valve
- E. Viral myocarditis

6. Sterile fibrinous pericarditis is a common complication of:

- A. Subendocardial myocardial infarction
- B. Transmural myocardial infarction
- C. Mycotic emboli
- D. Bacterial endocarditis
- E. Mural thrombi

7. A patient with a massive myocardial infarction dies suddenly on the sixth hospital day. Autopsy reveals:

- A. Lymphocytic infiltrate of myocardium
- B. Plasma cell infiltrate of coronary arteries
- C. Bilateral occlusions of coronary sinuses
- D. Fibrotic lesion in right ventricular wall
- E. Rupture of left ventricle and hemopericardium

8. A lateral left ventricular myocardial infarction is due to the occlusion of:

- A. Perforating arteries
- B. Right coronary artery
- C. Left anterior descending
- D. Right marginal branch
- E. Left circumflex artery

9. A newborn infant is noted to have a holosystolic murmur. The infant is not cyanotic. Which of the following congenital abnormalities is most likely to be present.

- A. Ebstein's anomaly
- B. Complete transposition of the great vessels
- C. Ventricular septal defect

- D. Atrial septal defect
- E. Endocardial fibroelastosis

10. In addition to pulmonary stenosis and ventricular septal defect, Tetralogy of Fallot includes:

    - A. Dextroposition of aorta and right ventricular hypertrophy
    - B. Dextroposition of aorta and left ventricular hypertrophy
    - C. Right ventricular hypertrophy and left atrial dilatation
    - D. Right ventricular hypertrophy and aortic stenosis
    - E. Aortic stenosis and left ventricular hypertrophy

11. Aneurysmal dilatation of the left ventricle:

    - A. Leads to aortic stenosis
    - B. Is a late complication of myocardial infarction
    - C. Follows a subendocardial myocardial infarction
    - D. Is associated with pulmonary stenosis
    - E. Occurs in the first week following a massive myocardial infarction

12. ''Marantic'' endocarditis is best characterized by one of the following:

    - A. Affects primarily the tricuspid valve
    - B. Results in value perforation
    - C. Associated with terminal cancer
    - D. Leads to severe chest pain
    - E. Leads to papillary muscle necrosis

13. Thyroid hyperfunction leads to:

    - A. Mitral stenosis
    - B. Marked tachycardia
    - C. Decreased cardiac output
    - D. Right-sided heart failure
    - E. Increased peripheral vascular resistance

14. Endomyocardial biopsy is indicated in the workup of a cardiac patient for:

- A. Endocarditis
- B. Coronary artery disease
- C. Tetralogy of fallot
- D. Aortic stenosis
- E. Amyloidosis

15. The major manifestations of rheumatic fever include all the following except:

- A. Chorea
- B. Pancarditis
- C. Subcutaneous nodules
- D. Ankylosing spondylitis
- E. Arthritis

16. Typical Aschoff nodules are composed of:

- A. Polymorphonuclear neutrophilic leukocytes
- B. Monocytes/macrophages
- C. Eosinophils
- D. Basophils
- E. Plasma cells

17. All of the following are complications of myocardial infarction except:

- A. Cor pulmonale
- B. Cerebral emboli
- C. Dissecting aortic aneurysm
- D. Cardiac tamponade
- E. Arrythmia

18. Hypertensive cerebral hemorrhage is a typical complication of

- A. Pulmonary stenosis
- B. Coarctation of the aorta
- C. Transposition of great vessels
- D. Interventricular septal defect, with a left to right shunt

- E. Patent foramen ovale

19. Myocardial infarction that developed during a cardiopulmonary bypass operation is typically limited to

- A. The apex of the left ventricle
- B. The lateral wall of the left ventricle
- C. The anterior wall of the left ventricle
- D. The posterior wall of the left ventricle
- E. The subendocardial zone of myocardium

20. Hemopericardium is a typical complication of

- A. Transmural infarct
- B. Subendocardial infarct
- C. Papillary muscle rupture
- D. Septal rupture resulting in a left to right shunt
- E. Mural thrombosis

21. A typical complication of kyphoscoliosis, also found in patients with pulmonary fibrosis, is

- A. Left ventricular hypertrophy
- B. Mitral insufficiency
- C. Right ventricular hypertrophy
- D. Aortic stenosis
- E. Pulmonary stenosis

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1) The correct answer is: A
Explanation: Infected thromboemboli from a bacterial endocarditis travel to multiple systemic sites, causing infarcts or abscesse in many organs including the brain, kidneys, intestine and spleen.

2) The correct answer is: B
Explanation: Twenty four-forty eight hours often the onset of a myocardial infarction, microscopical examination reveals deeply eosinopilic myocytes with the characteristic changes of coagualative necrosis and a infiltrate of polymorphonuclear leukocutes.

3) The correct answer is: C
Explanation: Elevated creatine kinase is found early (4 hours) in the serum following myocardial necrosis.

4) The correct answer is: A
Explanation: Trans-mural myocardial infarction may lead to mural thrombus formation in the left ventricle. They can lead to systemic embolization with infarcts in intestine and kidneys.

5) The correct answer is: B
Explanation: Purulent pericarditis is a complication of bacterial sepsis.

6) The correct answer is: B
Explanation: Fibrinous pericarditis is often observed in transmural myocardial infarction.

7) The correct answer is: E
Explanation: Cardiac rupture and hemopericardium usually occur within the first 10 days after a transmural myocardial infarction, when the infarcted wall is at its weakest.

8) The correct answer is: E
Explanation: Occlusion of the left circumflex coronary artery is the least common cause of a myocardial infarct, and leads to an infarct of the lateral wall of the left ventricle.

9) The correct answer is: C
Explanation: The natural history of a large ventricular septal defect includes pulmonary hypertension and reversal of the shunt. Complications include secondary polycythemia, clubbing of fingers, paradoxical emboli, endocarditis and right ventricular hypertrophy.

10) The correct answer is: A
Explanation: Tetralogy of Fallot includes pulmonary stenosis, ventricular septal defect, dextroposition (overriding) of the aorta and right ventricular hypertrophy

11) The correct answer is: B
Explanation: Aneurysmal dilatation of the left ventricleis a late complication of transmural myocardial infarction

12) The correct answer is: C
Explanation: Marantic endocarditis is a nonbacterial thrombotic endocarditis occurring in patients with hypercoagulable states such as found in wasting diseases, including cancer. It does not produce significant valvular damage

13) The correct answer is: B
Explanation: Hyperthyroidism leads to tachycardia and increased cardiac output and a concomitant decrease in peripheral resistance. This eventually leads to high output failure

14) The correct answer is: E
Explanation: The heart is often involved in generalized amyloidosis. A biopsy will reveal congo red-positive, birefringent amyloid deposits in the myocardium and interstitium

15) The correct answer is: D
Explanation: Ankylosing spondylitis is not a manifestation of rheumatic fever.

16) The correct answer is: B
Explanation: Typical Aschoff nodules are composed of monocytes/macrophages.

17) The correct answer is: C
Explanation: Complications of myocardial infarction do not include dissecting aortic aneurysm.

18) The correct answer is: B
Explanation: Hypertensive cerebral hemorrhage is a typical complication of coarctation of the aorta.

19) The correct answer is: E
Explanation: Myocardial infarction that developed during cardiopulmonary bypass in the operating room is typically subendocardial and multifocal

20) The correct answer is: A
Explanation: Hemopericardium is a typical complication of a transmural infarct.

21) The correct answer is: C
Explanation: Right ventricular hypertrophy is a typical complication of kyphoscoliosis and pulmonary fibrosis.

Thrombus, Mural Atrial (Endocardium)	
Etiology	**•Only rare hypercoaguable states due to genetic deficiencies of anticoagulants (antithrombin III, protein C and protein S) are known specific causes.** **•Multiple factors involved in the pathogenesis of most thromboses, including a probable state of hypercoaguability, due to causes unknown. In contrast to hypocoaguable states, there are no current objective quantitative measures of hypercoaguability available.**
Pathogenesis	**•Endothelial injury: Thrombi on atheromatous plagues, overlying myocardial infarcts, valvular endocarditis, hemodynamic trauma due to high pressures, or stenosis of valves.** **•Stasis: Leg DVT's begin in valve pockets where eddies persist in upright position and washed out by elevation of legs. Abetted by immobility. Atrial thrombi with mitral stenosis and /or AF.** **•Hypercoaguable states: See Etiology. Metastatic cancers, smoking, obesity, advanced age, systemic lupus erythematosus.,**
Epidemiology	**•Deep vein thrombosis (DVT) and pulmonary emboli (PE). Massive PE cause 50,000 deaths per year. Actual incidence much higher, with 60% of autopsies showing PE (1963), which are mostly asymptomatic. Incidence probably rising with increasing surgical interventions, advances in intensive care, and longevity.** **•Epidemiology of other effects of thrombosis, i.e. arterial thrombi complicating atherosclerosis & mural thrombi, vary with associated syndrome.**
General Gross Description	**•Venous: A dark red clot forming a cast, equivalent to clotted blood in a test tube, due to stasis. Postmortem clots are ruled out by gross features, lacking cast form, wall and valve impressions.** **•Mural thrombi: Friable brown discrete adherent mounds with typical uniformly wrinkled surfaces, the lines of Zahn due to genesis in flowing blood. Occur in cardiac chambers, aorta, and iliacs.** **•Arterial: Usually a completely occlusive, dark red clot. Postmortem clots are cord like and elastic.**

General Microscopic Description	**•Venous: Sheets of red cells. Fibrin component not visible. Outer rims may show a few lines of Zahn. •Mural thrombi: Classical lines of Zahn with even layers of ridges of platelets with adherent wbc's separated by valleys of red cells. This is proof of antemortem genesis because blood flow needed. •Arterial: Mostly venous-like when due to injuries of atherosclerosis. But, meticulous study of total thrombus will reveal focus of endothelial injury with nidus of platelet and fibrin thrombus.**
Clinical Correlation	**•Venous: May be asymptomatic or have leg edema and/or calf tenderness due to distension of veins. Pulmonary emboli may be asymptomatic or cause unexplained dyspnea and/or sudden death. •Mural thrombi: Can embolize to brain, spleen, kidneys and limbs with associated syndromes. Vegetations of endocarditis can also embolize to coronary arteries with myocardial infarction. •Arterial: Common cause of acute syndromes of visceral infarction and gangrene of extremities**

The table below depicts blood pressure values taken from six adults. Which set of values is most consistent with aortic regurgitation?

	Systolic pressure (mm Hg)	**Diastolic pressure (mm Hg)**
(A)	50	Undetectable
(B)	95	80
(C)	120	80
(D)	160	50
(E)	170	100
(F)	220	130

51. The correct answer is D. A patient with aortic regurgitation, caused by insufficiency of the aortic valve, has a wide pulse pressure (the difference between systolic and diastolic pressure). In fact, during diastole, the systemic pressure precipitously drops as the blood flows from the aorta back into the left ventricle through the incompetent aortic valve. Systolic pressure remains relatively normal since it depends on the left ventricular ejection.

Aortic stenosis is associated with reduced systolic pressure and relatively preserved diastolic pressure, such as 95/80 mm Hg **(choice B)**, since the left ventricle is unable to pump a normal amount of blood through a stenotic valvular orifice.

A blood pressure of 50/undetectable mm Hg **(choice A)** is characteristic of acute shock.

A blood pressure of 120/80 mm Hg **(choice C)** is considered within normal limits in healthy adults, whereas 160/95 mm Hg is definitely in the range of hypertension, although mild.

A blood pressure of 220/130 mm Hg **(choice E)** is typical of malignant hypertension, a severe condition that may lead to life-threatening complications if not promptly treated.

52. In a hospital cardiac care unit, there are three patients with different cardiac conditions: a 52-year-old man with dilated cardiomyopathy, an 18-year-old girl with mitral valve prolapse, and a 30-year-old man with infective endocarditis of the mitral valve. Which of the following features do all these patients most likely share?

(A) Decreased compliance

(B) Depressed myocardial contractility

(C) Infectious etiology

(D) Mitral valve stenosis

(E) Risk of systemic thromboembolism

52. The correct answer is E. Systemic thromboembolism may develop in each of these patients. Vegetations associated with infective endocarditis may undergo fragmentation and result in systemic thromboembolism. Stasis develops in dilated ventricles, which predisposes to formation of thrombi attached to the ventricular walls (mural thrombi). Mural thrombi may also form within the left atrium in the presence of mitral valve prolapse. Thromboemboli may originate from mural thrombi.

Decreased compliance **(choice A)** is a pathophysiologic alteration present in a variety of cardiac disorders in which there is impediment to expansion or relaxation of ventricular walls, such as restrictive cardiomyopathy, hypertrophic cardiomyopathy, and constrictive pericarditis. This feature is not present in any of the conditions described in the question.

Depressed myocardial contractility **(choice B)** results from conditions that impair myocardial inotropism, such as dilated cardiomyopathy and ischemic heart disease. Depressed inotropism is not present in infective endocarditis or mitral valve prolapse.

Of the three conditions in the question stem, only infective endocarditis is definitely related to an infectious etiology **(choice C)**, usually bacteria. Recall that mitral valve prolapse is due to myxomatous degeneration of the mitral valve, sometimes associated with Marfan syndrome. The etiology of dilated cardiomyopathy is heterogeneous, and most cases are idiopathic. Of the remaining cases, viral infections, toxic insults (especially alcohol), metabolic disorders (hemochromatosis), pregnancy, and genetic influences are the underlying causes.

Mitral valve stenosis **(choice D)** may develop as a result of vegetations forming on the mitral valve and occluding the valvular orifice. Endocarditis of the mitral valve more often leads to mitral insufficiency because of destruction of valve leaflets or rupture of chordae tendineae. On the contrary, both mitral valve prolapse (usually clinically silent) and dilated cardiomyopathy may lead to mitral valve insufficiency and regurgitation.

53. A 68-year-old man sustains a myocardial infarct resulting from thrombotic occlusion at the origin of the left circumflex artery. Cardiac catheterization demonstrates that the patient has a left dominant coronary circulation. In which of the following areas of the heart has ischemic necrosis most likely occurred?

(A) Apex of left ventricle and anterior portion of septum

(B) Lateral left ventricular wall and posterior portion of the septum

(C) Lateral wall of the left ventricle only

(D) Posterior portion of the septum only

(E) Right ventricular wall

53. The correct answer is B. A right dominant coronary circulation is present when the posterior descending branch originates from the right coronary artery (80% of individuals). On the contrary, the posterior descending artery originates from the left circumflex artery in a left dominant circulation (20% of individuals). The posterior descending branch gives blood to the posterior half of the interventricular septum. Occlusion of the left circumflex artery in a left dominant circulation

will therefore lead to ischemic necrosis in the left ventricular wall and the posterior interventricular septum.

The apex of the left ventricle **(choice A)** is dependent on the anterior descending branch; thus, occlusion of the left circumflex does not affect this portion of the left ventricle.

Infarction of the lateral (free) wall alone **(choice C)** will result from occlusion of the circumflex in a right dominant circulation.

An isolated infarct of the posterior interventricular septum **(choice D)** arises from occlusion of the posterior descending branch.

Isolated infarcts of the right ventricular wall **(choice E)** are very rare and would be caused by occlusion of branches of the right coronary artery.

54. A patient arrives in the emergency department after having been stabbed. He has sustained a penetrating wound in the left fourth intercostal space immediately lateral to the sternal border. Which of the following thoracic structures is most likely to have been injured?

(A) Left atrium

(B) Left ventricle

(C) Right atrium

(D) Right ventricle

(E) Upper lobe of the left lung

54. The correct answer is D. The right ventricle forms most of the anterior wall of the heart and extends from approximately the right border of the sternum to approximately 2 inches to the left of the sternum at the level of the fourth intercostal space.

The left atrium **(choice A)** forms the posterior wall of the heart. The only portion of the left atrium seen on the anterior surface of the heart is the left auricular appendage, which is at the level of the second intercostal space on the left.

The left ventricle **(choice B)** forms most of the left border of the heart and the diaphragmatic surface of the heart. It forms the anterior wall of the heart in a region from approximately 2-3 inches from the left border of the sternum from the third to the fifth intercostal space.

The right atrium **(choice C)** forms the right border of the heart. Its anterior surface is on the right side of the sternum from approximately the third rib to the sixth rib.

The left lung **(choice E)** is displaced away from the sternum on the left side by the presence of the heart.

55. A 14-year-old boy has just moved with his family from Brazil to the U.S. He starts complaining of shortness of breath and palpitations. Chest x-ray films demonstrate pulmonary congestion, and EKG shows alterations in heart rhythm. Echocardiography reveals biventricular dilatation with massive cardiac enlargement. An endomyocardial biopsy shows diffuse interstitial fibrosis, myocyte necrosis, chronic inflammation, and the presence of intracellular protozoan parasites. The patient may also develop which of the following complications?

(A) Achalasia

(B) Chronic arthritis

(C) Cysts in the brain

(D) Pleuritis

(E) Splenomegaly

55. The correct answer is A. The patient has myocarditis due to Trypanosoma cruzi . This infectious condition, known as Chagas disease, is endemic in vast areas of South America and is transmitted from person to person by triatomids known as “kissing bugs.” Experts assess the

number of persons with Chagas disease at about 7 million, with about 35 million at risk in South America. *T. cruzi* is an intracellular protozoon that localizes mainly in the heart and nerve cells of the myenteric plexus, leading to myocarditis and dysmotility of hollow organs, such the esophagus, colon, and ureter. Cardiac involvement manifests with ventricular dilatation and congestive heart failure secondary to myocyte necrosis and fibrosis. Intracellular parasites can be visualized in tissue sections. Chagas disease is a cause of acquired achalasia, in which the distal third of the esophagus dilates because of loss of its intrinsic innervation. A similar pathologic mechanism accounts for megacolon and megaureter in Chagas disease.

The remaining choices refer to different infectious conditions that may also involve the myocardium:

Chronic arthritis **(choice B)** is a manifestation of the chronic stage of Lyme disease, which is caused by Borrelia burgdorferi and is transmitted to humans by deer ticks. Skin, CNS, and heart are the main targets of this infection.

Cysts in the brain (cysticerci; **choice C)** may develop as a consequence of infestation by the tapeworm *Taenia solium*. Humans acquire this parasite by ingesting the eggs from undercooked pork. Cysticercosis may also affect the heart, skeletal muscle, and skin.

Group B coxsackievirus infections cause pleuritis **(choice D)** and myocarditis, manifesting with fever, chest pain, and, if myocarditis is severe, congestive heart failure. As in any form of viral myocarditis, the myocardium is infiltrated by lymphocytes, but there are no morphologic markers specific for Coxsackievirus infection.

Splenomegaly **(choice E)**, often of massive proportions, is seen in patients with malaria. *Plasmodium* organisms can also invade the myocardium, leading to myocarditis.

56. A 65 year-old man is admitted to the coronary care unit with a diagnosis of a large myocardial infarct (MI) of the left ventricle. On his 6th postinfarct day, he goes into shock and dies, manifesting signs and symptoms of cardiac tamponade. Which of the following complications is the most likely cause of this patient's death?

(A) Aortic dissection

(B) Extension of previous MI

(C) Fatal arrhythmia

(D) Rupture of the left ventricular wall

(E) Rupture of papillary muscle

56. The correct answer is D. Rupture of the free left ventricular wall is a frequently fatal complication that may occur in the first week after myocardial infarction (MI). At this stage, the infarcted area is composed of friable necrotic myocardium and early granulation tissue. It is during this crucial phase, therefore, that rupture usually occurs. Blood rushes out, filling the pericardial sac and causing compression of the left ventricle. Cardiac tamponade ensues, and the patient usually dies of acute cardiogenic shock.

Aortic dissection **(choice A)** is not a complication of MI, although cardiac tamponade may also follow this acute condition when dissection works its way back toward the aortic root. Aortic dissection usually develops in aortas affected by *cystic medial degeneration* (CMD), which is due to fragmentation of elastic laminae with accumulation of myxoid material in the aortic media. CMD may be either sporadic or associated with Marfan syndrome.

Extension of a previous MI **(choice B)** may occur in the first few hours or days after MI. It may aggravate or precipitate cardiogenic shock and/or arrhythmias, but it does not cause cardiac tamponade.

Arrhythmias **(choice C)** are frequent complications of MI and are often fatal, producing cardiac arrest (ventricular fibrillation) or aggravating cardiac dysfunction.

If infarction involves papillary muscles, these may rupture **(choice E)**. This complication is followed by valvular dysfunction and may manifest with signs of mitral regurgitation and acute congestive heart failure.

57. A 15-year-old is brought to the emergency department in a coma. An alert ambulance attendant notes that the patient's breath smells like acetone. This observation is most consistent with which of the following diagnoses?

(A) Alcohol intoxication

(B) Diabetic hyperosmolar coma

(C) Diabetic ketoacidosis

(D) Heroin overdose

(E) Profound hypoglycemia

57. The correct answer is C. The smell of acetone on the breath of a comatose patient is an important, rapid diagnostic clue that strongly suggests ketoacidosis and is usually seen in patients with poorly controlled type 1 diabetes. Other features of diabetic ketoacidosis include high blood glucose, increased serum osmolality, hypovolemia, acidosis, and electrolyte imbalance.

In alcohol intoxication **(choice A)**, the breath will smell like alcohol.

Diabetic hyperosmolar coma **(choice B)** usually is seen in older patients with type 2 diabetes and is not characterized by ketoacidosis. Since there is no acetone production, there is no specific scent to the breath.

In heroin overdose **(choice D)**, no acetone production occurs and there is no specific scent to the breath.

In hypoglycemic coma **(choice E)**, which can occur in diabetics with insulin overdose, no acetone production occurs and there is no specific scent to the breath.

58. A 24-year-old woman in her third trimester of pregnancy presents with urinary frequency and burning for the past few days. She denies fever, nausea, vomiting, or chills. She takes no medications besides prenatal vitamins and is generally in good health. Physical examination is remarkable for mild suprapubic tenderness, and a urine dipstick is positive for white blood cells, protein, and a small amount of blood. Culture produces greater than 100,000 colonies of gram-

negative bacilli. Which of the following attributes of this uropathogenic organism is most strongly associated with its virulence?

(A) Bundle-forming pili

(B) GVVPQ fimbriae

(C) Heat labile toxins

(D) Heat stable toxins

(E) P pili

(F) Type 1 pili

58. The correct answer is E. Urinary tract infections are the most common bacterial infections encountered during pregnancy, and Escherichia coli is the most commonly isolated organism. In the U.S., 70% of cases are caused by P pili-positive strains.

Bundle-forming pili **(choice A)** are found in enteroaggregative E. coli (EAEC).

GVVPQ fimbriae **(choice B)** are found in EAEC.

Heat labile toxins **(choice C)** are pathogenic factors in enterotoxic strains (ETEC).

Heat stable toxins **(choice D)** are pathogenic factors in ETEC or EAEC.

Type 1 pili **(choice F)** are a major pathogenic factor in ETEC.

59. A 12-year-old girl has a temperature of 102.5 F and a sore throat. Two days later, she develops a diffuse erythematous rash and is taken to her pediatrician. On physical examination,

there is circumoral pallor, and an erythematous rash with areas of desquamation is noted. The myocardial damage that can follow this infection is produced in a manner similar to the damage associated with which of the following disorders?

(A) Atopic allergy

(B) Contact dermatitis

(C) Graft-vs-host disease

(D) Graves disease

(E) Idiopathic thrombocytopenic purpura

(F) Myasthenia gravis

(G) Rheumatoid arthritis

(H) Serum sickness

(I) Systemic lupus erythematosus

59. The correct answer is E. This is a case of rheumatic fever, which is an immunologically mediated sequela to *Streptococcus pyogenes* pharyngitis. It is a type II cytotoxic hypersensitivity, involving antibodies that bind to cardiac tissue, activate complement, and thereby cause cell destruction. It is therefore most similar to idiopathic thrombocytopenic purpura, which is also a form of type II cytotoxic hypersensitivity, in this case mediated by antibodies against platelets producing complement fixation and causing the clotting dyscrasia.

Atopic allergy **(choice A)** is a form of type I hypersensitivity, mediated by IgE antibodies and basophils and mast cells.

Contact dermatitis **(choice B**) is a form of type IV hypersensitivity mediated by T cells and macrophages.

Graft-vs-host disease **(choice C)** is a form of type IV hypersensitivity mediated by T cells and macrophages.

Graves disease **(choice D)** is a form of type II hypersensitivity, but it is NOT cytotoxic in its action. Instead, antibodies to the TSH receptors on thyroid cells cause overstimulation of the gland and its eventual exhaustion.

Myasthenia gravis **(choice F)** is a form of type II hypersensitivity, but NOT of the cytotoxic variety. In this case, antibodies to the acetylcholine receptors on neurons diminish neurotransmission.

Rheumatoid arthritis **(choice G)** is a form of type III hypersensitivity, caused by immune complex deposition in joints and subsequent activation of complement.

Serum sickness **(choice H)** is a form of type III hypersensitivity, caused by immune complex deposition.

Systemic lupus erythematosus **(choice I)** is a form of type III hypersensitivity, caused by immune complex deposition.

60. A 45-year-old man with cirrhosis due to alpha1-antitrypsin deficiency receives a liver transplant. Although currently in good health, he is at increased risk of developing which of the following types of emphysema?

(A) Centriacinar

(B) Compensatory

(C) Interstitial

(D) Panacinar

(E) Paraseptal

60. The correct answer is D. There are two main morphologic forms of emphysema, centriacinar and panacinar. The panacinar variant is related to alpha1-antitrypsin deficiency; the entire acinus is enlarged, from the respiratory bronchiole to the distal alveoli.

Centriacinar emphysema **(choice A)** is characterized by enlargement of the central portions of the acinus, i.e., the respiratory bronchiole, and its pathogenesis is related to exposure to tobacco products and coal dust.

Interstitial emphysema **(choice C)** is not a true form of emphysema. It results from penetration of air into the pulmonary interstitium. This may occur when alveolar tears develop because of a combination of coughing and airway obstruction (e.g., children with whooping cough) or a chest wound that injures the underlying lung parenchyma (e.g., a fractured rib).

Compensatory emphysema **(choice B)** and paraseptal emphysema **(choice E)** are associated with scarring. Both are frequent but usually clinically silent. Paraseptal emphysema, however, may lead to spontaneous pneumothorax in young patients. In fact, this form is more severe in areas adjacent to the pleura, where large, cyst-like structures may develop and rupture into the pleural cavity.

A 57-year-old woman with a history of hypertension and arthritis is referred to a rheumatologist for evaluation. A complete blood count (CBC) is normal, and a mini-chem panel shows no electrolyte abnormalities. Her erythrocyte sedimentation rate (ESR) is elevated, and an antinuclear antibody test (ANA) is positive. Further antibody studies are performed, and the results are shown below.

Anti-histones	high titer
Anti-double stranded DNA	not detected
Anti-single stranded DNA	not detected
Anti-SSA	not detected
Anti-SSB	not detected
Anti-SCI-70	not detected
Anti-Smith	not detected
Anti-centromere	not detected
Anti-RNP	not detected

Which of the following diseases is suggested by these results?

(A) CREST syndrome

(B) Diffuse form of scleroderma

(C) Drug-induced lupus

(D) Sjögren syndrome

(E) Systemic lupus erythematosus (SLE)

41. The correct answer is C. The single finding of high autoantibody titers to histones, without any other autoantibodies, is characteristic of drug-induced lupus. The most commonly implicated drugs are procainamide, hydralazine (given for hypertension), and isoniazid. Patients typically have milder disease than in systemic lupus erythematosus (SLE) and tend to have arthritis, pleuropericardial involvement, and, less commonly, rash. CNS and renal disease are not usually observed.

CREST syndrome **(choice A)** is a milder variant of scleroderma characterized by calcinosis, Raynaud phenomenon, esophageal dysmotility, sclerodactyly and telangiectasia. Anti-centromere antibodies are diagnostic.

The diffuse form of scleroderma **(choice B)**, also known as systemic sclerosis, causes fibrosis of the skin and internal viscera. This disorder is characterized by anti-SCI-70 and often low titers of many other autoantibodies.

Sjögren syndrome **(choice D)** is characterized by dry eyes and dry mouth. Sjögren syndrome in isolation is characteristically positive for anti-SS-A and anti-SS-B. If it accompanies rheumatoid arthritis, anti-RNP will be positive as well.

SLE **(choice E)** is a multisystem disorder that is distinguished from drug-induced lupus by the presence of a wide variety of autoantibodies, including anti-double stranded DNA (Anti dsDNA).

42. A 55-year-old hypertensive man develops sudden onset of excruciating pain beginning in the anterior chest, and then radiating to the back. Over the next 2 hours, the pain moves downward toward the abdomen. Which of the following is the most likely diagnosis?

(A) Aortic dissection

(B) Aortic valve stenosis

(C) Atherosclerotic aneurysm

(D) Myocardial infarction

(E) Syphilitic aneurysm

42. The correct answer is A. This patient has an aortic dissection (formerly called dissecting aneurysm), a potentially fatal condition that is too often confused clinically with myocardial infarction. The most important clinical clue is that the pain shifts with time. Noninvasive techniques, such as transesophageal echocardiography, CT, and MRI, are increasingly useful in making this diagnosis.

Aortic valve stenosis **(choice B)** would not be expected to produce severe chest pain of acute onset.

This patient's clinical history does not suggest either an atherosclerotic **(choice C)** or a syphilitic **(choice E)** aneurysm. Even if he had one of either of these types of aneurysms and it had begun to rupture, the distinctive feature of severe pain moving downward would probably not be present.

Myocardial infarction **(choice D)** is the major diagnosis most often confused with this patient's condition. The movement of the pain is the major clinical tip-off suggesting that this is not the correct answer.

43. A 22-year-old woman presents to her physician with amenorrhea, weight loss, anxiety, tremor, heat intolerance, and palpitations. Laboratory examination is consistent with hyperthyroidism, and the physician prescribes propylthiouracil. The patient's response to propylthiouracil is disappointing, and the symptoms recur, then worsen. Subtotal thyroidectomy is successfully performed, but following the surgery, the woman is extremely hoarse, and can barely speak above a whisper. This hoarseness is most probably related to damage to a branch which of the following cranial nerves?

(A) Facial

(B) Glossopharyngeal

(C) Hypoglossal

(D) Trigeminal

(E) Vagus

43. The correct answer is E. The recurrent laryngeal nerves are branches of the vagus (CN X) and supply all intrinsic muscles of the larynx except the cricothyroid. The right recurrent laryngeal nerve recurs around the right subclavian artery. The left recurrent laryngeal nerve recurs in the thorax around the arch of the aorta and ligamentum arteriosum. Both nerves ascend to the larynx by passing between the trachea and esophagus, near the thyroid gland. The recurrent laryngeal nerves are therefore particularly vulnerable during thyroid surgery, and damage may cause extreme hoarseness.

The facial nerve **(choice A)** innervates the muscles of facial expression, the stapedius muscle, and the lacrimal, submandibular and sublingual glands. It also mediates taste sensation from the anterior two thirds of the tongue.

The glossopharyngeal nerve **(choice B)** innervates the stylopharyngeus muscle and the parotid gland. Visceral afferents supply the carotid sinus baroreceptors and carotid body chemoreceptors, and mediate taste from the posterior one third of the tongue. Somatosensory fibers supply pain, temperature, and touch information from the posterior one third of the tongue, upper pharynx, middle ear, and eustachian tube.

The hypoglossal nerve **(choice C)** innervates the intrinsic muscles of the tongue, the genioglossus, hypoglossus, and styloglossus muscles.

The trigeminal nerve **(choice D)** receives sensory information from the face and innervates the muscles of mastication.

44. A 54-year-old African-American woman undergoes a routine insurance physical examination. Chest x-ray film reveals bilateral hilar masses. Biopsy of the masses shows granulomata, but

acid-fast and fungal stains are negative for organisms. Which of the following is the most likely diagnosis?

(A) Caroli disease

(B) Raynaud disease

(C) Sarcoidosis

(D) Scleroderma

(E) Systemic lupus erythematosus

44. The correct answer is C. Sarcoidosis is a multisystem disease characterized by noncaseating granulomata in a variety of organs. The disease may be symptomatic (respiratory and constitutional symptoms) or may be discovered incidentally when chest x-ray or autopsy reveals bilateral hilar adenopathy. Definitive diagnosis is based on biopsy, which reveals noncaseating granulomata that are negative for fungi or acid-fast bacilli. Sarcoidosis is more common in individuals of African-American descent.

Caroli disease **(choice A)** is a congenital malformation of the bile duct system.

Raynaud disease **(choice B)** is a vasospasm of vessels that causes temporary ischemia in the hands.

Scleroderma **(choice D)**, or progressive systemic sclerosis, is characterized by progressive fibrosis of skin and internal organs.

Systemic lupus erythematosus **(choice E)** is an autoimmune disease characterized by vasculitis (which may produce a variety of symptoms depending on the site of the lesion), rash, renal disease, hemolytic anemia, and neurologic disturbances.

45. A 67-year-old man is evaluated for persistent shooting pains, lower limb ataxia, and bladder dysfunction. Physical examination demonstrates small irregular pupils that constrict with

accommodation but not in response to light. A VDRL test is positive. A CT scan of the spinal cord would most likely demonstrate atrophy of which of the following structures?

(A) Dorsal column

(B) Dorsal horn

(C) Lateral column

(D) Ventral column

(E) Ventral horn

45. The correct answer is A. The patient has tabes dorsalis, which is a form of neurosyphilis seen 10 to 25 years or longer after primary disease. The pupils described are Argyll Robertson pupils and are considered diagnostic for neurosyphilis. Characteristically, the dorsal columns, which contain the ascending tracts for sensory information, become atrophic, probably as a result of damage to the dorsal root ganglion cells.

The dorsal gray horn **(choice B)** contains neurons that respond to sensory input.

The lateral column **(choice C)** contains both descending (e.g., lateral corticospinal, rubrospinal tracts) and ascending (e.g., spinocerebellar tracts, spinothalamic tracts) tracts.

The ventral column **(choice D)** contains both descending (e.g., anterior corticospinal, tectospinal) and ascending (e.g., spinothalamic) tracts.

The ventral horn **(choice E)** contains lower motor neurons.

46. An oncologist tells his patient that her laboratory results support a diagnosis of advanced malignant melanoma with multiple metastases to the liver and brain. He also advises her that the prognosis is poor. Which of the following is most likely to be the first statement that the patient will make?

(A) "Can you keep me alive until my daughter graduates from medical school?"

(B) "Damn you doctor, you should have caught this earlier!"

(C) "Doctor, you must be wrong."

(D) "I think it is time that I make a will and say good-bye to everyone."

(E) "It's no use, I always lose and get the short end of the stick."

46. The correct answer is C. Kubler-Ross's Death and Dying sequence is a stepwise process with five identified stages, which occur in the following order: 1) Denial, 2) Anger, 3) Bargaining, 4) Sadness, and 5) Acceptance. "Doctor you must be wrong" is the correct answer since it reflects the patient's inability to accept the information and indicates the denial of the first stage.

"Can you keep me alive until my daughter graduates from medical school" **(choice A)**, is a statement from the third, or bargaining, stage.

"Damn you doctor, you should have caught this earlier" **(choice B)** is a statement from the second, or anger, phase.

"I think it is time that I make a will and say good-bye to everyone" **(choice D)** reflects the patient's acceptance of the reality and is a statement from the fifth phase (acceptance).

"It's no use, I always lose and get the short end of the stick" **(choice E)** is a statement from the fourth phase (sadness).

47. A 44-year-old businessman presents to a physician because of a markedly inflamed and painful right great toe. He states that he just returned from a convention, and noticed increasing pain in his right foot during his plane trip home. Physical examination is remarkable for swelling and erythema of the right great toe as well as small nodules on the patient's external ear. Aspiration of the metatarsal-phalangeal joint of the affected toe demonstrates needle-shaped negatively birefringent crystals. Which of the following agents would provide the most immediate relief for this patient?

(A) Allopurinol

(B) Aspirin

(C) Colchicine

(D) Probenecid

(E) Sulfinpyrazone

47. The correct answer is C. The patient has gout, which is due to precipitation of monosodium urate crystals in joint spaces (notably the great toe) and soft tissues (causing tophi, which are often found on the external ears). Colchicine reduces the inflammation caused by the urate crystals by inhibiting leukocyte migration and phagocytosis secondary to an effect on microtubule assembly.

Allopurinol **(choice A)** and its metabolite, oxipurinol, inhibit xanthine oxidase, the enzyme that forms uric acid from hypoxanthine. Therapy with this agent should be begun 1-2 weeks after the acute attack has subsided.

Aspirin **(choice B)** competes with uric acid for tubular secretion, thereby decreasing urinary urate excretion and raising serum uric acid levels. At high doses (more than 2 gm daily) aspirin is a uricosuric.

Probenecid **(choice D)** and sulfinpyrazone **(choice E)** are uricosuric agents, increasing the urinary excretion of uric acid, hence decreasing serum levels of the substance. Therapy with these agents should be begun 1-2 weeks after the acute attack has subsided.

48. A Guatemalan child with a history of meconium ileus is brought to a clinic because of a chronic cough. The mother notes a history of respiratory tract infections and bulky, foul-smelling stools. After assessment of the respiratory tract illness, the practitioner should also look for signs of

(A) cystinuria

(B) hypoglycemia

(C) iron deficiency anemia

(D) sphingomyelin accumulation

(E) vitamin A deficiency

48. The correct answer is E. The child likely has cystic fibrosis. In this disorder, an abnormality of chloride channels causes all exocrine secretions to be more viscous than normal. Pancreatic secretion of digestive enzymes is often severely impaired, with consequent steatorrhea and deficiency of fat-soluble vitamins, including vitamin A.

Cystinuria **(choice A)** is a relatively common disorder in which a defective transporter for dibasic amino acids (cystine, ornithine, lysine, arginine; *COLA*) leads to saturation of the urine with cystine, which is not very soluble in urine, and precipitates out to form stones.

Hypoglycemia **(choice B)** is not a prominent feature of children with cystic fibrosis who are on a normal diet. Hyperglycemia may occur late in the course of the disease.

Iron deficiency anemia **(choice C)** is not typically found in children with cystic fibrosis.

Sphingomyelin accumulation **(choice D)** is generally associated with deficiency of sphingomyelinase, as seen in Niemann-Pick disease.

49. During a fight, a 32-year-old man is hit on the back of the neck with a chair. A CT scan reveals a bony fragment that penetrated the lateral portion of the dorsal columns. Which of the following functions would most likely be affected by a lesion at this site?

(A) Fine motor control of the ipsilateral fingers

(B) Motor control of the contralateral foot

(C) Proprioception from the ipsilateral leg

(D) Sweating of the ipsilateral face

(E) Vibratory sense from the ipsilateral arm

49. The correct answer is E. At this level, the lateral portion of the dorsal columns (funiculus) is composed of the fasciculus cuneatus. Axons carrying tactile, proprioceptive, and vibratory information from the ipsilateral arm enter the spinal cord via the dorsal root, ascend the cord in the fasciculus cuneatus, and synapse in the nucleus cuneatus of the caudal medulla. Secondary neurons from this nucleus give rise to internal arcuate fibers, which decussate and ascend to the thalamus (ventral posterolateral nucleus, VPL) as the medial lemniscus. Tertiary neurons from the VPL project to the ipsilateral somatosensory cortex. Therefore, damage to the fasciculus cuneatus would result in a deficit in tactile, proprioceptive, and vibratory sense in the ipsilateral arm, because the fibers that carry this information do not cross until they reach the medulla.

Fine motor control of the fingers **(choice A)** would be carried principally by the ipsilateral lateral corticospinal tract in the lateral funiculus of the cord.

Motor control of the contralateral foot **(choice B)** is carried by the ipsilateral corticospinal tract in the lateral funiculus of the cord.

Proprioception from the ipsilateral leg **(choice C)** is carried by the fasciculus gracilis in the medial part of the dorsal columns.

Hemianhidrosis (lack of sweating) of the face **(choice D)** could be produced by interruption of sympathetic innervation to the face. The hypothalamospinal tract projects from the hypothalamus to the intermediolateral cell column at levels T-1 to T-2. It descends the cord in the lateral funiculus of the cord. Interruption of this tract results in Horner syndrome (miosis, ptosis, hemianhidrosis).

50. A 61-year-old man presents with a chief complaint of difficulty swallowing. To evaluate his dysphagia, the physician orders a barium swallow with fluoroscopy, as well as an esophagogram. She finds that the anterior wall of the esophagus in the mid-thorax is being compressed. Which of the following structures is most likely responsible for this compression?

(A) Left atrium

(B) Left ventricle

(C) Pulmonary trunk

(D) Right atrium

(E) Right ventricle

50. The correct answer is A. The left atrium forms most of the posterior wall of the heart. The esophagus passes immediately posterior to the heart. Enlargement of the left atrium may compress the esophagus and cause dysphagia.

The left ventricle **(choice B)** forms most of the left border of the heart and most of the diaphragmatic surface of the heart. The left ventricle is not related to the esophagus.

The pulmonary trunk **(choice C)** emerges from the right ventricle on the anterior surface of the heart. The pulmonary trunk is not related to the esophagus.

The right atrium **(choice D)** forms the right border of the heart. It is not related to the esophagus.

The right ventricle **(choice E)** forms most of the anterior wall of the heart and a small portion of the diaphragmatic surface of the heart. It is not related to the esophagus.

31. A patient presents with cervical lymphadenopathy. Biopsy demonstrates a nodular lymphoma with follicle formation. This lesion would most likely be associated with which of the following?

(A) bcr-c-abl

(B) bcl-2 activation

(C) c-myc activation

(D) t(8, 14)

(E) t(9, 22)

31. The correct answer is B. Nodular lymphomas of all types are derived from the B-cell line. The translocation t(14, 18), with bcl-2 activation, is associated with these lymphomas.

An abl-bcr hybrid (bcr-c-abl; **choice A**) and t(9, 22) translocation **(choice E)** are associated with chronic myeloid leukemia (CML).

c-myc activation **(choice C)** and t(8, 14) **(choice D)** are associated with Burkitt lymphoma.

32. A 25-year-old woman presents with pain and tenosynovitis of the wrists and ankles, and arthralgias of other joints. She notes two prior episodes similar to the present one. She just had her menstrual period during the previous week. Physical examination reveals ulcerated lesions overlying the wrists and ankles. These symptoms are likely due to deficiency of which of the following?

(A) C1 esterase inhibitor

(B) Ciliary function

(C) Complement (C6-C8) components

(D) Endothelial adhesion molecules

(E) Eosinophils

32. The correct answer is C. This patient has disseminated gonococcemia. Gonococcal arthritis and tenosynovitis typically involve both the upper and lower extremities equally. Vesicular skin lesions are characteristic of disseminated gonococcal disease. Females are at particular risk of gonococcemia during menstruation, since sloughing of the endometrium allows access to the blood supply, necrotic tissue enhances the growth of Neisseria gonorrhoeae, and there is an alteration of the pH. Patients who have a C6-8 deficiency have an increased risk of disseminated gonococcemia and tend to have multiple episodes. These patients are also at risk for bacteremia from *Neisseria meningitidis*.

C1 esterase inhibitor deficiency **(choice A)** can occur as an autosomal dominant disorder or is acquired. Patients have angioedema without urticaria. The syndrome is also associated with recurrent attacks of colic and episodes of laryngeal edema.

Ciliary dysfunction **(choice B)** is a marker of Kartagener syndrome (immotile cilia syndrome). The syndrome includes infertility, bronchiectasis, sinusitis, and situs inversus. It is an autosomal recessive disorder caused by abnormalities in the dynein arm of the cilia.

Endothelial adhesion molecule deficiency **(choice D)**, or beta 2 integrin deficiency, is characterized by failure of neutrophils to express CD18 integrins on their surface. Patients have impaired phagocyte adherence, aggregation, chemotaxis, and phagocytosis of C3b-coated particles. Clinically, there is delayed separation of the umbilical cord, sustained agranulocytosis, recurrent infections of skin and mucosa, gingivitis, and periodontal disease.

Eosinophil deficiency **(choice E)**, or eosinopenia, occurs with stressors such as acute bacterial infection and following administration of glucocorticoids. There is no known adverse effect of eosinopenia.

33. A 5-year-old girl is thoroughly evaluated because of growth failure. The child has been complaining of headaches, which are exacerbated when she tries to read. Funduscopic examination reveals papilledema. CT scan demonstrates a mass involving the area above and within the sella turcica. Surgical resection of the mass yields a multiloculated cystic and solid tumor containing dark brown, oily fluid. This tumor is thought to arise from epithelial rests derived from which of the following structures?

(A) Hypothalamus

(B) Pineal gland

(C) Posterior pituitary gland

(D) Rathke’s pouch

(E) Superior colliculus

33. The correct answer is D. The tumor described is a craniopharyngioma, which is one of the more common brain tumors of children. These tumors arise from epithelial rests derived from Rathke's pouch, which is an oral invagination that gives rise to the cells that form the anterior pituitary gland. Histologically, craniopharyngiomas can resemble ameloblastomas, which are tumors derived from dental epithelium.

Note that this question could also have been answered very simply by noting that the hypothalamus, pineal gland, pituitary gland, and the superior colliculus are all adult structures; only Rathke's pouch is an embryonic structure. Therefore, only Rathke's pouch could be the source of epithelial rests, which are remnants of embryonic tissues that persist in the adult.

Although craniopharyngiomas often occur near the hypothalamus **(choice A)** and posterior portion of the pituitary gland **(choice C)**, they do not arise from neural tissue.

The pineal gland **(choice B)** and superior colliculus **(choice E)** are found on the posterior aspect of the brain stem.

34. A new antifungal medication is being tested in Phase I clinical trials. Examination of the pharmacokinetic properties of the drug reveals that the half-life of the drug is 6 hours. If a continuous intravenous infusion of this drug were started on a research subject, how long would it take to reach 75% of steady state?

(A) 3 hours

(B) 6 hours

(C) 9 hours

(D) 12 hours

(E) 18 hours

(F) 24 hours

34. The correct answer is D. The rule of thumb is that the plasma concentration will reach 50% in one half-life, 75% in two half-lives, 87.5% in three half-lives, etc., so that the difference

between the current drug level and 100% halves with each half-life. In this instance, it takes two half-lives to reach 75%. The half-live of this drug is 6 hours, so two half-lives is 12 hours.

35. A patient presents to a physician with jaundice. Physical examination reveals a nodular, enlarged liver. CT of the abdomen shows a cirrhotic liver with a large mass. CT-guided biopsy of the mass demonstrates a malignant tumor derived from hepatic parenchymal cells. Infection with which of the following viruses would most likely be directly related to the development of this tumor?

(A) Epstein-Barr virus (EBV)

(B) Hepatitis B virus (HBV)

(C) Human herpesvirus type 8 (HHV 8)

(D) Human papillomavirus (HPV)

(E) Human T-lymphocyte virus (HTLV-1)

35. The correct answer is B. The tumor is hepatocellular carcinoma, which usually develops in the setting of cirrhosis owing to a variety of damaging agents, including hepatitis B virus (HBV) infection, alcohol use, and hemachromatosis.

Epstein-Barr virus (EBV; **choice A**) is associated with Burkitt lymphoma and nasopharyngeal carcinoma.

Human herpesvirus type 8 (HHV 8; **choice C**), a member of the herpes family, is associated with Kaposi sarcoma.

Human papillomavirus (HPV; **choice D**) is associated with cervical, penile, and anal carcinoma.

Human T-lymphocyte virus (HTLV-1; **choice E**) is associated with adult T-cell leukemia.

36. A man brings his 45-year-old wife to the emergency department. He states she has been ill for 3 days and has been running a temperature of 99.8 to 100.5 F. Today she is having difficulty staying awake, is talking to persons who are not there, and at times appears to be frightened of something. She is restless and somewhat combative when restrained. What is the most likely diagnosis?

(A) Acute stress disorder

(B) Bipolar I disorder, manic type

(C) Brief psychotic disorder

(D) Delirium

(E) Dementia

36. The correct answer is D. This is a psychotic level disorder (the patient is hallucinating). The patient has a fluctuating level of consciousness and is disoriented. Also, there is a clear history of a febrile condition that developed rather rapidly, all of which suggest delirium.

In acute stress disorder **(choice A)** a traumatic event occurs that precipitates an anxiety-type reaction, not a change in the sensorium.

In both bipolar I disorder, manic type **(choice B)** and brief psychotic disorder **(choice C)**, patients may reach a level of behavioral disruption of psychotic proportion. They do not, however, demonstrate changes in level of consciousness or major disorientation.

Persons with dementia **(choice E)** demonstrate a clear sensorium with no fluctuations in the level of consciousness. In addition, persons with dementia predominantly show symptoms of impairment of cognitive functions (e.g., memory impairment).

37. A patient consults a physician because of a small lesion on the lips that, on biopsy, proves to be a mucosal neuroma. The patient's mother had medullary carcinoma of the thyroid. In addition to medullary carcinoma of the thyroid, to which of the following conditions would this patient be particularly vulnerable?

(A) Gastrinoma

(B) Insulinoma

(C) Parathyroid adenoma

(D) Pheochromocytoma

(E) Pituitary adenoma

37. The correct answer is D. You should recognize this as a probable case of multiple endocrine neoplasia, specifically, MEN III (formerly MEN II b). Features of this autosomal dominant condition include medullary carcinoma of the thyroid, pheochromocytoma, and oral and intestinal ganglioneuromatosis (including mucosal neuromas).

Gastrinomas **(choice A)**, insulinomas **(choice B),** and pituitary adenomas **(choice E)** are found in MEN I.

Parathyroid adenomas **(choice C)** are found in MEN I and II.

38. A 2-year-old boy has a CT scan of the head performed after a pediatrician notices a disproportionate growth in his head circumference compared with the rest of the body. The scan demonstrates a large choroid plexus papilloma involving the body of the right lateral ventricle. Which of the following brain structures might be affected by direct extension of this tumor?

(A) Caudate nucleus

(B) Cerebellum

(C) Hippocampus

(D) Hypothalamus

(E) Pons

38. **The correct answer is A.** Tumors of the ventricular system of the brain can affect the brain tissue either directly, via pressure on or invasion into a physically close structure, or indirectly, by obstructing CSF flow and causing hydrocephalus. Choroid plexus papillomas are highly differentiated, benign tumors that can involve any ventricle but have a predilection for involving the lateral ventricles of small children, particularly boys. The caudate nucleus is a C-shaped structure that comprises part of the wall of the lateral ventricle throughout its extent. The only structure listed that is adjacent to the body of the lateral ventricle, and would therefore be directly affected by the large tumor described in the question, is the caudate nucleus.

The cerebellum **(choice B)** overlies the fourth ventricle.

The hippocampus **(choice C)** is adjacent to the inferior (temporal) horn of the lateral ventricle.

The hypothalamus **(choice D)** abuts the third ventricle.

The pons **(choice E)** forms part of the floor of the fourth ventricle.

39. A premature infant develops progressive difficulty breathing over the first few days of life. Deficient surfactant synthesis by which of the following cell types may be contributing to the infant's respiratory problems?

(A) Alveolar capillary endothelial cells

(B) Bronchial mucous cells

(C) Bronchial respiratory epithelium

(D) Type I pneumocytes

(E) Type II pneumocytes

39. The correct answer is E. The child has neonatal respiratory distress syndrome (hyaline membrane disease). This condition is caused by the inability of the immature lungs to synthesize adequate amounts of surfactant. Surfactant, which reduces surface tension, helps keep alveoli dry, and aids in expansion of the lungs, is synthesized by type II pneumocytes.

Alveolar capillary endothelial cells **(choice A)** are important in maintaining the capillary structure and permitting flow of gases into and out of the bloodstream.

Bronchial mucous cells **(choice B)** produce the usually thin (in healthy individuals) coat of mucus that lines the bronchi.

The ciliated bronchial respiratory epithelium **(choice C)** is responsible for moving the dust-coated mucus layer out of the bronchi.

Type I pneumocytes **(choice D)** are the squamous cells that line alveoli and permit easy gas exchange. These cells tend to be immature (and thick) in premature infants but are not the producers of surfactant.

40. A 67-year-old woman who has been in very good health is brought to her physician's office by her husband. He states that over the course of the past 5 years she has had difficulty recognizing her grandchildren, she has not been able to plan their daily activities, she has forgotten things left cooking on the stove, and at night she has been wandering through the house with an “absent” look on her face. She is beginning to demonstrate difficulty in recalling the names of common objects, and her speech is limited to simple two- or three-word sentences. Which of the following is the most likely diagnosis?

(A) Alzheimer disease

(B) Amnestic disorder

(C) Pseudodementia

(D) Substance-induced persisting dementia

(E) Vascular dementia

40. The correct answer is A. This woman has dementia of the Alzheimer type. A gradual onset of symptoms, general pervasive memory deficit, difficulties with language, and inability to plan, leading to severe impairment of daily functioning, are all characteristic of this dementia.

Amnestic disorder **(choice B)** is limited to memory problems, and this woman is demonstrating cognitive dysfunction, such as alterations in language and the loss of the ability to plan.

Pseudodementia **(choice C)** is incorrect since it is a major depressive disorder rather than a dementing condition. There is no evidence for a depressive syndrome in this patient's presentation.

The diagnosis of substance-induced persisting dementia **(choice D)** requires evidence of a history of substance abuse. However, it is the second most likely diagnosis and should be carefully explored with the husband and other close relatives and friends.

Vascular dementia **(choice E)** is generally characterized by a stepwise deterioration, not the gradual presentation of this case.

An adult patient presents with persistent headaches. A CT scan of the head demonstrates a 2-cm spherical mass at the junction of the white and gray matter of the lateral aspect of the cerebral hemisphere. Which of the following would most likely produce this lesion?

(A) Astrocytoma

(B) Ependymoma

(C) Glioblastoma multiforme

(D) Meningioma

(E) Metastatic carcinoma

21. The correct answer is E. Seventy percent of adult brain tumors occur above the tentorium (70% of childhood tumors occur below the tentorium). Statistically, metastases > astrocytomas

(including glioblastoma) > meningioma > pituitary tumor. Location at the junction of cortical gray and white matter is also typical for metastatic disease, as is the round shape.

Astrocytomas **(choice A)** typically arise in the white matter and have an irregular shape.

Ependymomas **(choice B)** are uncommon and arise from the ependymal lining of the ventricles.

Glioblastoma multiforme **(choice C)** is an aggressive form of astrocytoma that can cause a "butterfly lesion," crossing between the cerebral hemispheres.

Meningiomas **(choice D)** can cause spherical lesions and are usually located on the surface of the brain.

22. A 37-year-old woman presents to the emergency department with a fever. Chest x-ray film shows multiple patchy infiltrates in both lungs. Echocardiography and blood cultures suggest a diagnosis of acute bacterial endocarditis limited to the tricuspid valve. Which of the following is the most probable etiology?

(A) Congenital heart disease

(B) Illicit drug use

(C) Rheumatic fever

(D) Rheumatoid arthritis

(E) Systemic lupus erythematosus

22. The correct answer is B. The most probable etiology of bacterial endocarditis involving the tricuspid valve is illicit IV drug use, which can introduce skin organisms into the venous system that then attack the tricuspid valve. Staphylococcus aureus accounts for between 60% and 90% of cases of endocarditis in IV drug users.

The endocarditis associated with congenital heart disease **(choice A)** typically involves either damaged valves or atrial or ventricular septal defects. The tricuspid valve is not particularly vulnerable.

Rheumatic fever **(choice C)** most commonly damages the mitral and aortic valves, and tricuspid damage is usually less severe and seen only when the mitral and aortic valves are heavily involved. Consequently, secondary bacterial endocarditis involving only the tricuspid valve in a patient with history of rheumatic fever would be unusual.

Rheumatoid arthritis **(choice D)** is not associated with bacterial endocarditis.

Systemic lupus erythematosus **(choice E)** can produce small, aseptic vegetations on valves, but is not associated with bacterial endocarditis.

23. A 5-year-old child, who has not had routine pediatric care, develops a febrile disease with cough and a blotchy rash and is brought to the emergency department. On physical examination, there is cervical and axillary lymphadenopathy. Also noted is an erythematous, maculopapular rash behind the ears and along the hairline, involving the neck and, to a lesser extent, the trunk. Examination of this patient's oropharynx would most likely reveal which of the following lesions?

(A) Adherent thin, whitish patch on gingiva

(B) Cold sores on the lips

(C) Curdy white material overlying an erythematous base on the oral mucosa

(D) Large shallow ulcers on the oral mucosa

(E) Multiple small white spots on the buccal mucosa

23. The correct answer is E. The question stem describes the typical presentation of measles (rubeola), which is caused by a *Morbillivirus*, an RNA virus belonging to the Paramyxovirus family. Koplik spots, which are pathognomonic for measles, are small, bluish-white spots on the buccal

mucosa in the early stages of the disease. These lesions appear just before the onset of the characteristic rash (which can also involve the extremities) and fade as the rash develops.

Leukoplakia is a premalignant condition characterized by adherent whitish patches on the gingiva **(choice A)** and other sites in the oral cavity.

Cold sores of the lips **(choice B)** are due to infection with Herpes viruses.

Candida infection (thrush) produces curdy white material loosely attached to an erythematous base **(choice C)**.

Aphthous ulcers are large shallow ulcers of the oral mucosa **(choice D)**, commonly known as canker sores.

24. A 57-year-old man is brought to the emergency room for a suspected myocardial infarction. An electrocardiogram indicates the appearance of a wide-complex ventricular tachycardia with a rate of 126 beats per minute. The physician prescribes a drug to decrease SA node automaticity, increase AV node refractoriness, and decrease AV node conduction velocity. Which of the following agents was most likely prescribed?

(A) Amiodarone

(B) Disopyramide

(C) Lidocaine

(D) Propranolol

(E) Verapamil

24. The correct answer is D. The patient has a ventricular tachycardia as indicated by the electrocardiogram: the appearance of a wide-complex ventricular tachycardia with a rate of 126 beats per minute. Propranolol is a Type II antiarrhythmic agent that acts by decreasing SA node automaticity, increasing AV nodal refractoriness, and decreasing AV nodal conduction velocity.

Propranolol is indicated for the treatment of ventricular tachycardias, supraventricular arrhythmias, and for slowing the ventricular rate during atrial fibrillation and atrial flutter.

Amiodarone **(choice A)** is a Type III antiarrhythmic that acts by prolonging the action potential duration in tissue with fast-response action potentials. Amiodarone is indicated for treatment of refractory ventricular arrhythmias that are unresponsive to other antiarrhythmics.

Disopyramide **(choice B)** is a Type IA antiarrhythmic that reduces the maximal velocity of phase 0 depolarization by blocking the inward sodium current in tissue with fast-response action potentials. It also increases the action potential duration. Disopyramide is indicated for the treatment of atrial and ventricular extrasystoles and atrial and ventricular tachyarrhythmias.

Lidocaine **(choice C)** is a Type IA antiarrhythmic that reduces the maximal velocity of phase 0 depolarization by blocking the inward sodium current in tissue with fast-response action potentials. Lidocaine is indicated for the treatment of atrial and ventricular extrasystoles, and atrial and ventricular tachyarrhythmias.

Verapamil **(choice E)**, a Type IV antiarrhythmic agent, blocks calcium channels, thereby decreasing conduction velocity and increasing refractoriness in tissue with slow-response action potentials. Verapamil is indicated for the treatment of atrial fibrillation and flutter as well as other atrial tachycardias.

25. While performing a subtotal thyroidectomy, a surgeon inadvertently sections the recurrent laryngeal nerve. Which of the following muscles would retain its innervation subsequent to this injury?

(A) Cricothyroid

(B) Lateral cricoarytenoid

(C) Posterior cricoarytenoid

(D) Thyroarytenoid

(E) Vocalis

25. The correct answer is A. The recurrent laryngeal nerve is a branch of the vagus nerve, which innervates all the intrinsic laryngeal muscles except the cricothyroid muscle. The cricothyroid is attached to the cricoid cartilage and the thyroid cartilage; contraction of this muscle tends to stretch and adduct the vocal ligament. The cricothyroid is innervated by the external laryngeal nerve.

The lateral cricoarytenoid muscle **(choice B)** is innervated by the recurrent laryngeal nerve and is attached to the cricoid cartilage and the arytenoid cartilage. Its contraction causes adduction of the vocal ligament.

The posterior cricoarytenoid muscle **(choice C)** is innervated by the recurrent laryngeal nerve and is attached to the cricoid cartilage and the arytenoid cartilage. Its contraction causes abduction of the vocal ligament.

The thyroarytenoid muscle **(choice D)** is innervated by the recurrent laryngeal nerve and is attached to the thyroid cartilage and the arytenoid cartilage. Its contraction causes slackening of the vocal ligament.

The vocalis muscle **(choice E)** is the most medial part of the thyroarytenoid muscle. It attaches either to the thyroid cartilage and the vocal ligament, or to the arytenoid cartilage and the vocal ligament. It is innervated by the recurrent laryngeal nerve. Its contraction causes tension on segments of the vocal ligament.

26. A newborn infant who was apparently healthy at birth develops aspiration pneumonia in the first 2 days of life. All attempts to feed the infant cause it to cough and choke. Which of the following abnormalities is the most likely cause of the infant's difficulties?

(A) Bronchogenic cysts

(B) Congenital pulmonary cysts

(C) Posterior deviation of the tracheoesophageal septum

(D) Pulmonary immaturity

(E) Pulmonary sequestration

26. The correct answer is C. The infant probably has esophageal atresia, which is typically caused by posterior deviation of the tracheoesophageal septum. Attempts at feeding cause fluid to spill into the trachea, and secondarily cause aspiration pneumonia. Emergent surgical correction is usually required.

Bronchogenic cysts **(choice A)** are centrally located cysts that are often asymptomatic and may be associated with cysts of other organs.

Congenital pulmonary cysts **(choice B)** are often multiple and located in the lung periphery without connection to the bronchi; they are vulnerable to infection and rupture complicated by pneumothorax and/or hemoptysis.

Pulmonary immaturity **(choice D)** produces progressive difficulty in breathing beginning in the first few hours of life.

Pulmonary sequestration **(choice E)** represents extrapulmonary lung tissue supplied by systemic blood vessels rather than by pulmonary arteries.

27. A 46-year-old man sustains a spider bite on his upper eyelid, and an infection develops. The physician is very concerned about spread of the infection to the dural venous sinuses of the brain via emissary veins. With which of the following dural venous sinuses does the superior ophthalmic vein directly communicate?

(A) Cavernous sinus

(B) Occipital sinus

(C) Sigmoid sinus

(D) Straight sinus

(E) Superior petrosal sinus

27. The correct answer is A. The anterior continuation of the cavernous sinus, the superior ophthalmic vein, passes through the superior orbital fissure to enter the orbit. Veins of the face communicate with the superior ophthalmic vein. Because of the absence of valves in emissary veins, venous flow may occur in either direction. Cutaneous infections may be carried into the cavernous sinus and result in a cavernous sinus infection, which may lead to an infected cavernous sinus thrombosis. The cavernous sinus is lateral to the pituitary gland and contains portions of cranial nerves III, IV, V1, V2 and VI, and the internal carotid artery.

The occipital sinus **(choice B)** is at the base of the falx cerebelli in the posterior cranial fossa. It drains into the confluence of sinuses.

The sigmoid sinus **(choice C)** is the anterior continuation of the transverse sinus in the middle cranial fossa. The sigmoid sinus passes through the jugular foramen and drains into the internal jugular vein.

The straight sinus **(choice D)** is at the intersection of the falx cerebri and the falx cerebelli in the posterior cranial fossa. The straight sinus connects the inferior sagittal sinus with the confluence of sinuses.

The superior petrosal sinus **(choice E)** is at the apex of the petrous portion of the temporal bone and is a posterior continuation of the cavernous sinus. The superior petrosal sinus connects the cavernous sinus with the sigmoid sinus.

28. A 15-year-old high school student and several of her friends ate lunch at a local Chinese restaurant. They all were served the daily luncheon special, which consisted of sweet and sour pork with vegetables and fried rice. All the girls developed nausea, vomiting, abdominal pain, and diarrhea within 6 hours of eating lunch. Which of the following is the most likely cause of these symptoms?

(A) Bacillus cereus

(B) Clostridium botulinum

(C) Clostridium perfringens

(D) EHEC (Enterohemorrhagic Escherichia coli)

(E) Staphylococcus aureus

(F) Vibrio cholerae

28. The correct answer is A. Bacillus cereusproduces a self-limited diarrhea due to ingestion of the preformed enterotoxin in contaminated fried rice and seafood. The incubation period is typically around 4 hours. The degree of vomiting is greater than the diarrhea. B. cereus is also associated with keratitis, producing a corneal ring abscess.

Clostridium botulinum **(choice B)** produces a neurotoxin that blocks the release of acetylcholine, resulting in a symmetric descending paralysis that may lead to respiratory complications causing death. Symptoms include blurred vision, photophobia, dysphagia, nausea, vomiting, and dysphonia. Most cases are associated with the ingestion of contaminated home-canned food.

Clostridium perfringens **(choice C)** produces a severe diarrhea with abdominal pain and cramping (sometimes called “church picnic” diarrhea). The incubation period is 8-24 hours after ingesting contaminated meat, meat products, or poultry. The meats have usually been cooked, allowed to cool, and then warmed, which causes germination of the clostridial spores.

EHEC, enterohemorrhagic Escherichia coli **(choice D)**, produces a bloody, noninvasive diarrhea due to the ingestion of verotoxin found in undercooked hamburger at fast food restaurants. The 0157:H7 serotype typically produces this syndrome. Some patients develop a life-threatening complication called hemolytic-uremic syndrome.

Staphylococcus aureus **(choice E)** produces a self-limited food poisoning syndrome with nausea, vomiting, and abdominal pain followed by diarrhea beginning 1-6 hours after ingestion of the enterotoxin. The organism is found in foods such as potato salad, custard, milk shakes, and mayonnaise.

Vibrio cholerae **(choice F)** typically produces a watery, nonbloody diarrhea with flecks of mucus (rice-water stools). Abdominal pain is not a feature. Massive fluid loss and electrolyte imbalance are complications. In the U.S., cases of cholera (El Tor 01 strain) are associated with the Gulf coast and ingestion of poorly cooked or poorly stored crabs, shrimp, or oysters. A strain of *V. cholerae,* called non-01, is also found along the Gulf coast. Patients who ingest contaminated shellfish experience fever, copious watery diarrhea, and abdominal cramps within 48 hours after eating.

29. A 24-year-old woman with a history of allergic rhinitis is involved in an automobile accident and sustains a splenic laceration. She undergoes abdominal surgery and is then transfused with four units of blood of the appropriate ABO and Rh type. As the transfusion progresses, she becomes rapidly hypotensive and develops airway edema, consistent with anaphylaxis. Which of the following pre-existing conditions best accounts for these symptoms?

(A) AIDS

(B) C1 esterase inhibitor deficiency

(C) DiGeorge syndrome

(D) Selective IgA deficiency

(E) Wiskott-Aldrich syndrome

29. The correct answer is D. Patients with selective IgA deficiency may have circulating antibodies to IgA. Fatal anaphylaxis may ensue if they are transfused with blood products with serum containing IgA, although many patients with selective IgA deficiency are asymptomatic and never diagnosed. Symptomatic patients may have recurrent sinopulmonary infections and diarrhea, as well as an increased incidence of autoimmune and allergic diseases.

AIDS **(choice A)** predisposes for infections and neoplasms, but not anaphylaxis.

C1 esterase inhibitor deficiency **(choice B)** is an autosomal dominant disease characterized by recurrent attacks of colic and episodes of laryngeal edema, without pruritus or urticarial lesions. This disorder is also known as hereditary angioedema.

DiGeorge syndrome **(choice C)** is characterized by thymic aplasia and, sometimes, hypoparathyroidism. The disorder is due to abnormal development of the third and fourth pharyngeal arches.

Wiskott-Aldrich syndrome **(choice E)** is a form of immunodeficiency associated with thrombocytopenia and eczema.

30. A couple presents to a clinic for workup of infertility after 5 years of unprotected intercourse. The wife denies any medical problems and notes regular menstrual cycles. The husband states that he has had chronic sinusitis and lower respiratory tract infections. Physical examination of the woman is unremarkable. Examination of the man is remarkable for dextrocardia. Further workup of the husband will most likely reveal

(A) azoospermia

(B) germinal cell aplasia

(C) immotile sperm

(D) isolated gonadotropin deficiency

(E) varicocele

30. The correct answer is C. The husband is suffering from Kartagener syndrome, an autosomal recessive disorder characterized by infertility, situs inversus, chronic sinusitis, and bronchiectasis. The underlying cause of these varied manifestations is a defect in the dynein arms, which are spokes of microtubule doublets of cilia in the airways and the reproductive tract. Since sperm motility is dependent on the functioning of cilia, infertility frequently accompanies this disorder. Situs inversus occurs because ciliary function is necessary for cell migration during embryonic development.

Azoospermia **(choice A)** is not a feature of Kartagener syndrome, as sperm production or survival is not affected in this disorder.

Germinal cell aplasia **(choice B)**, also known as Sertoli-only syndrome, is characterized by oligospermia or azoospermia.

Isolated gonadotropin deficiency **(choice D)** is characterized by delayed or incomplete pubertal maturation.

Varicocele **(choice E)** results in an increased testicular temperature, decreasing the count of normal, viable sperm.

A 2-month-old child is evaluated for failure to thrive. During the examination, the child has a seizure. Stat serum chemistries demonstrate severe hypoglycemia, hyperlipidemia, lactic acidosis, and ketosis. Physical examination is remarkable for hepatomegaly, a finding confirmed by CT scan, which also reveals renomegaly. Which of the following diseases best accounts for this presentation?

(A) Gaucher disease

(B) McArdle disease

(C) Niemann-Pick disease

(D) Pompe disease

(E) Von Gierke disease

11. The correct answer is E. Von Gierke disease is a glycogen storage disease caused by a deficiency of glucose-6-phosphatase. It typically presents with neonatal hypoglycemia, hyperlipidemia, lactic acidosis, and ketosis. Failure to thrive is common in early life; convulsions may occur because of profound hypoglycemia. The glycogen accumulation in von Gierke disease occurs primarily in the liver and kidneys, accounting for the enlargement of these organs. Gout may develop later because of the derangement of glucose metabolism.

Even if you do not remember all the details of the presentation of these genetic diseases, you should be able to narrow the choices:

Gaucher disease **(choice A)** and Niemann-Pick disease **(choice C)**

are lipid storage diseases and would not be expected to produce hypoglycemia.

The other diseases are glycogen storage diseases, but both McArdle **(choice B)** and Pompe **(choice D)** diseases affect muscle rather than liver and would not be expected to produce profound hypoglycemia, since the liver is the major source for blood glucose.

12. The parents of a 7-year-old boy divorce. The boy lives with the mother and sees his father every-other weekend. During these visits, the boy is sullen and angry with the father, but when it

is time to return home, he clings to the father and cries in a desperate manner while saying “I’m sorry! I want you and mom to live together again.” Which of the following is the most helpful statement that the father can make to the son?

(A) “Big boys don’t cry.”

(B) “I left your mother, I didn’t leave you.”

(C) “I’ll see you in 2 weeks.”

(D) “You’re the man of the house now.”

(E) “Your mother was too hard to live with.”

12. The correct answer is B. This statement from the father would reflect his understanding of the egocentric nature of school-aged children. That is, the child is assuming that he is responsible for the divorce between his parents. The anger and withdrawal reflect the child’s frustration with the situation, but the tears and apology suggest the child’s fear and assumed responsibility for the breakup.

“Big boys don’t cry” **(choice A)** is a demeaning and belittling statement.

“I’ll see you in 2 weeks”**(choice C)** ignores the child’s felt responsibility for the divorce.

“You’re the man of the house now” **(choice D)** places too much responsibility on a 7-year-old child.

“Your mother was too hard to live with” **(choice E)** places all the blame and responsibility for the divorce on the parent, with whom the boy lives on a daily basis. It ignores the reality that divorce is usually due to difficulties that both parents have with each other.

13. A letter carrier is severely bitten by a pit bull guarding a junkyard. The wound is cleansed, and the letter carrier receives a booster injection of tetanus toxoid and an injection of penicillin G. Several days later, the wound is inflamed and purulent. The exudate is cultured on blood agar

and yields gram-negative rods. Antibiotic sensitivity tests are pending. The most likely agent to be isolated is

(A) Bartonella henselae

(B) Brucella canis

(C) Clostridium tetani

(D) Pasteurella multocida

(E) Toxocara canis

13. The correct answer is D. Pasteurella multocida is a gram-negative rod that is normal flora of the oral cavity of dogs and cats. It often causes a local abscess following introduction under the skin by an animal bite. Most cases occur in children who are injured while playing with a pet.

Bartonella henselae **(choice A)** is a very small, gram-negative bacterium that is closely related to the rickettsia, although it is able to grow on lifeless media. It is the cause of cat-scratch disease (a local, chronic lymphadenitis most commonly seen in children) and bacillary angiomatosis (seen particularly in AIDS patients). In this latter patient population, the organism causes proliferation of blood and lymphatic vessels causing a characteristic “mulberry” lesion in the skin and subcutaneous tissues of the afflicted individual.

Brucella canis **(choice B)** is a gram-negative rod that is a zoonotic agent. Its normal host is the dog. When it gains access to humans, however, it causes an undulating febrile disease with malaise, lymphadenopathy and hepatosplenomegaly. The normal route of exposure is via ingestion of the organism.

Clostridium tetani **(choice C)** is a gram-positive spore-forming anaerobic rod. It causes tetanus [a spastic paralysis caused by tetanospasmin, which blocks the release of the inhibitory neurotransmitters glycine and gamma-aminobutyric acid (GABA)]. There may be no lesion at the site of inoculation, and exudation would be extremely rare.

Toxocara canis **(choice E)**, a common intestinal parasite of dogs, is a metazoan parasite that causes visceral larva migrans. Young children are most likely to be affected, as they are most likely to ingest soil contaminated with eggs of the parasite.

14. A 25-year-old man presents to a rheumatologist with complaints of joint pain involving the large joints of the legs. On questioning, the patient indicates that exacerbations in the joint pain are frequently accompanied by diarrhea. Which of the following is the most likely diagnosis?

(A) Amebic colitis

(B) Chronic appendicitis

(C) Diverticulosis

(D) Pseudomembranous colitis

(E) Ulcerative colitis

14. The correct answer is E. Several gastrointestinal diseases are associated with rheumatologic complaints. The most frequent of these are the chronic inflammatory bowel diseases, ulcerative colitis, and Crohn disease, which can be associated with sacroiliitis (related to HLA-B27) or lower limb arthritis. Other gastrointestinal diseases associated with arthropathy include bypass surgery, Whipple disease, Behcet syndrome, and celiac disease.

Amebic colitis **(choice A)** is caused by ingestion of infectious cysts (typically from Entamoeba histolytica). Symptoms include abdominal pain and diarrhea; malaise and weight loss also may occur. Cecal amebiasis can resemble acute appendicitis.

Chronic appendicitis **(choice B)** may be asymptomatic or cause poorly defined abdominal pain.

Diverticulosis **(choice C)** is usually a disease of older adults. It is often asymptomatic unless inflammation supervenes.

Pseudomembranous colitis **(choice D)** is a severe form of diarrhea usually seen in the setting of prior antibiotic use. The causative organism is almost always Clostridium difficile.

15. A couple has a daughter who is ataxic and has a seizure disorder. She also has a strange affect characterized by excessive laughter at inappropriate times. Cytogenetic analysis demonstrates a normal genotype with 46 chromosomes and no apparent deletions. These symptoms are most likely due to

(A) confined placental mosaicism

(B) expansion of a trinucleotide repeat

(C) a point mutation in an autosome

(D) random inactivation of the X chromosome

(E) uniparental disomy

15. The correct answer is E. The child described is exhibiting the features of Angelman (happy puppet) syndrome. This disorder is generally caused by a deletion of band q12 in the maternal copy of chromosome 15, i.e., [(del (15)(q11q13)]. A similar deletion in the paternal chromosome 15 produces Prader-Willi syndrome. The disparate expression of the effects of deletions in the paternal vs. the maternal chromosomes, called genomic imprinting, implies that the same genetic loci are expressed quite differently in maternal and paternal chromosomes. Angelman syndrome can also occur if uniparental disomy occurs for chromosome 15, such that the embryo receives two copies of the maternal chromosome 15 without the paternal chromosome 15 to "balance" the maternal contribution.

Confined placental mosaicism **(choice A)** is due to a mutation occurring within trophoblast or extraembryonic precursor cells of the inner cell mass and is an important cause of intrauterine growth retardation.

Expansion of a trinucleotide repeat **(choice B)** is associated with Fragile X syndrome and Huntington disease.

Point mutation in autosomes **(choice C)** has not been associated with Angelman syndrome.

Random inactivation of the X chromosome **(choice D)** occurs normally, as postulated in the Lyon hypothesis.

16. A 65-year-old man develops oliguria and peripheral edema over a period of weeks. Urinalysis reveals hematuria and proteinuria; examination of the urinary sediment reveals red cell casts. Radiologic and ultrasound studies fail to demonstrate an obstructive lesion. Renal biopsy shows many glomerular crescents. This presentation is most suggestive of which of the following conditions?

(A) Anti-glomerular basement membrane disease

(B) Diabetic nephropathy

(C) Hypertensive nephropathy

(D) Lupus nephritis

(E) Minimal change disease

16. The correct answer is A. The two principal causes of rapidly progressive glomerulonephritis are anti-glomerular basement membrane (including both Goodpasture syndrome and isolated anti-glomerular basement disease) and primary systemic vasculitis (including Wegener granulomatosis, microscopic polyarteritis, idiopathic rapidly progressive glomerulonephritis, Churg-Strauss syndrome, polyarteritis nodosa, giant-cell arteritis, and Takayasu arteritis). A very large variety of other systemic and primary glomerular disease may occasionally cause rapidly progressive glomerulonephritis, but this is usually not the typical presentation for these diseases.

Diabetic nephropathy **(choice B)** typically begins with microalbuminuria and hypertension and progresses over a 10- to 20-year period to renal failure.

Hypertensive nephropathy **(choice C)** due to essential hypertension typically presents with slowly rising BUN and creatinine; hypertensive nephropathy due to malignant hypertension presents with more rapidly rising BUN and creatinine.

Lupus nephritis **(choice D)** can have many presentations, but the most typical is proteinuria, which may be severe enough to cause nephrotic syndrome. Also, 90% of cases of systemic lupus erythematosus occur in women, usually of child-bearing age.

Minimal change disease **(choice E)** typically presents with nephrotic syndrome and is not consistently associated with recognizable glomerular changes by light microscopy. Podocyte foot-process fusion can be seen by electron microscopy.

17. A 75-year-old woman presents to the physician with a chief complaint of vaginal spotting. She has been postmenopausal for 25 years and does not take hormones. An ultrasound shows a mass in the uterine fundus. A hysterectomy is performed, and pathologic examination of the removed uterus reveals a malignant tumor of the endometrial glands and stroma. Which of the following is the most likely diagnosis?

(A) Endolymphatic stromal myosis

(B) Endometrial carcinoma

(C) Endometrial stromal sarcoma

(D) Leiomyosarcoma

(E) Malignant mixed mullerian tumor

17. The correct answer is E. Malignant mixed mullerian tumor is a tumor with two components, stromal and epithelial (endometrial glands), both of which are malignant. This is a rare and highly aggressive tumor that has a 25% 5-year survival rate. It usually affects older patients and presents with postmenopausal bleeding. The stromal component can contain metaplastic components such as cartilage and bone. Interestingly, usually only the epithelial component metastasizes.

Endolymphatic stromal myosis **(choice A)** is a type of endometrial stromal tumor of intermediate malignancy. It appears as small pieces of stroma between myometrial bundles that infiltrate lymph channels. Patients may have pain or bleeding, or may be asymptomatic. Recurrences happen late in the course of the disease (years) in 50% of patients, and metastasis occurs in 15%. There is no epithelial component, so this is an incorrect choice.

Endometrial carcinoma **(choice B)** is a malignancy of the epithelial glandular component of the endometrium. Abnormal bleeding is the usual presentation. High estrogen states cause this tissue to proliferate. There is no stromal component of this tumor, so this is an incorrect choice.

Endometrial stromal sarcoma **(choice C)** is a true sarcoma arising from the endometrial stroma that infiltrates the myometrium and invades vessels. There is no epithelial component.

Leiomyosarcoma **(choice D)** is a true sarcoma arising from the uterine smooth muscle. It commonly has satellite lesions within the uterus. Leiomyosarcomas usually recur after removal; survival is greater with well-differentiated lesions. Poorly differentiated lesions have a 10% to 15% 5-year survival rate. Distant metastasis is via blood vessels. There is no epithelial component.

18. A neonate does not pass meconium until 48 hours after his birth. Two weeks later his mother reports that he has not been passing stool regularly. Anorectal manometry reveals increased internal anal sphincter pressure on rectal distention with a balloon. Radiographic studies reveal massive dilation of the colon proximal to the rectum. The findings in this case indicate a developmental abnormality of which of the following embryonic tissues?

(A) Ectoderm

(B) Endoderm

(C) Neural crest

(D) Neural ectoderm

(E) Splanchnic mesoderm

18. The correct answer is C. The infant has Hirschsprung disease, which is due to an absence of ganglion cells in the wall of the colon. Neural crest cells contribute to the formation of many adult structures. Among these are all of the postganglionic neurons of the autonomic nervous system and the sensory neurons of the peripheral nervous system.

Ectoderm **(choice A)** forms the epidermis of the skin and the parenchymal cells of glands associated with the skin, such as the sweat glands, sebaceous glands, and mammary glands.

Endoderm **(choice B)** forms the epithelial lining of the gut tube and the parenchymal cells of glands associated with the gut tube, such as the liver and pancreas.

Neural ectoderm **(choice D)** forms the CNS, the somatic motor neurons of the peripheral nervous system, and the preganglionic neurons of the autonomic nervous system.

Splanchnic mesoderm **(choice E)** forms the visceral peritoneum, the visceral pleura, the visceral pericardium, and the stroma and muscle of the wall of the gut, among other structures.

19. A 2-year-old child with uncomplicated coarctation of the aorta appears to be in good health. Growth and development are normal. The constriction is located just distal to the subclavian arteries. Which of the following is decreased in this patient?

(A) Blood flow in the lower body

(B) Blood flow in the upper body

(C) Blood pressure in the upper body

(D) Vascular resistance in the lower body

(E) Vascular resistance in the upper body

19. The correct answer is D. In fully compensated aortic coarctation, blood flow is normal in the lower and upper body **(choices A and B)** despite an increased arterial pressure (about 50% higher) in the upper body **(choice C)** compared with the pressure in the lower body. Because resistance = pressure/blood flow, it is clear that resistance must be lower in the lower portions of the body. The mechanism of this decrease in resistance below the constriction (and increased resistance above the constriction) is autoregulation of blood flow. The small arteries and arterioles dilate (or constrict) in accordance with the metabolic needs of the tissues, ensuring that each tissue receive an adequate amount of blood flow. Thus, the increase in blood pressure in the upper body leads to constriction of the arterioles, which increases vascular resistance **(choice E)**, and the lower pressure below the coarctation leads to dilation of the arterioles, which decreases vascular resistance.

20. A 75-year-old man presents to his physician with complaints of nocturia, urinary urgency, and a feeling that he could not completely empty his bladder. A digital rectal exam reveals a firm,

enlarged prostate. A bone scan is ordered and shows positivity in multiple vertebral bodies. Elevation of which of the following substances would be most strongly associated with the development of bone lesions?

(A) Prostatic acid phosphatase

(B) Prostate-specific antigen

(C) Serum alkaline phosphatase

(D) Tartrate-resistant acid phosphatase

(E) Urinary hydroxyproline

20. The correct answer is C. The patient has prostate cancer causing osteoblastic bone lesions. Osteoblastic cells respond to metastatic prostate carcinoma by forming bone (osteoid) and secreting alkaline phosphatase, which is thought to either initiate or facilitate mineralization.

Prostatic acid phosphatase **(choice A)** and prostatic-specific antigen **(choice B)** are not correct because they do not answer the question being asked. The question asks for bone metabolites related to the patients skeletal metastasis. These two markers are synthesized by the tumor and would most likely be elevated in this case; however, they are elevated because of the prostatic cancer, independent from the bony metastasis.

Tartrate-resistant acid phosphatase **(choice D)** and urinary hydroxyproline **(choice E)** are metabolic markers of osteoclastic (not osteoblastic) cell activity. Lytic tumor metastasis (lung, kidney, gastrointestinal tract, melanoma) would be associated with increased levels of these markers. Tartrate-resistant acid phosphatase is secreted by the osteoclast during bone resorption. Hydroxyproline is associated with collagen breakdown, and increased levels are excreted in the urine.

. A 32-year-old construction worker arrives in the emergency department after an accident on the job. The tendon of the biceps brachii at the elbow has been severed by a laceration that extends 2 cm medially from the tendon. Which of the following structures is likely to have been injured by medial extension of the laceration?

(A) Brachial artery

(B) Musculocutaneous nerve

(C) Profunda brachii artery

(D) Radial nerve

(E) Ulnar nerve

1. The correct answer is A. The brachial artery is immediately medial to the tendon of the biceps brachii at the elbow. As the artery enters the forearm, it is covered by the bicipital aponeurosis, a broadening of the biceps tendon.

The musculocutaneous nerve **(choice B)** does not cross the elbow. The musculocutaneous nerve gives off all of its muscular branches to muscles in the arm. The remainder of the nerve is then renamed the lateral cutaneous nerve of the forearm, which passes the elbow lateral to the tendon of the biceps.

The profunda brachii artery **(choice C)** arises from the brachial artery in the proximal part of the arm. It accompanies the radial artery in the musculospiral groove and then divides into the radial collateral artery and middle collateral artery, which cross the elbow lateral to the tendon of the biceps.

The radial nerve **(choice D)** lies within the musculospiral groove along the back of the humerus, then passes between the brachioradialis muscle and the brachialis muscle at the elbow, lateral to the tendon of the biceps.

The ulnar nerve **(choice E)** crosses the elbow posterior to the medial epicondyle of the humerus. It then passes between the two heads of the flexor carpi ulnaris and courses through the forearm deep to this muscle.

2. A genotypic male (XY) is born with feminized external genitalia. The testes are retained within the abdominal cavity, and the internal reproductive tracts exhibit the normal male phenotype. Which of the following could account for this abnormal development?

(A) Complete androgen resistance

(B) 5a-reductase deficiency

(C) 17a-hydroxylase deficiency

(D) Sertoli-only syndrome

(E) Testicular dysgenesis

2. The correct answer is B. In utero differentiation of the Wolffian ducts into the normal male phenotypic internal reproductive tract requires testosterone, but not dihydrotestosterone. On the other hand, differentiation of the indifferent external genital slit into the penis, prostate, and scrotum does require dihydrotestosterone. A congenital absence of 5a-reductase in these tissues will result in feminization. If left untreated, the affected individuals are generally phenotypic females until puberty, at which time increased amounts of testosterone result in virilization ("penis-at-twelve" syndrome). If discovered early, a male gender assignment can be supported with administration of dihydrotestosterone to increase penis size. If discovered after infancy, a female gender assignment can be supported with estrogen substitution therapy and prophylactic orchiectomy.

With complete androgen resistance **(choice A)**, the external genitalia are feminized, but neither the male-type nor the female-type internal tracts develop. In the absence of the androgen receptor, the Wolffian ducts will degenerate. The Müllerian ducts will also degenerate because of the normal effect of testicular Müllerian regression factor.

With 17a-hydroxylase deficiency **(choice C)**, the testes cannot synthesize testosterone, resulting in feminization of the external genitalia and degeneration of the Wolffian ducts. Normal secretion of Müllerian regression factor should also cause the degeneration of the Müllerian ducts. Because of the excessive secretion of deoxycorticosterone by the adrenal cortex, these individuals are usually hypertensive.

The Sertoli-only syndrome **(choice D)** refers to the situation in which only the Sertoli cells of the seminiferous tubules are present (germinal cell aplasia). Spermatogenesis is absent in these individuals, who also show increased plasma levels of FSH because of decreased Sertoli cell secretion of inhibin. They may exhibit both male-type and female-type internal tracts because of the absence of Müllerian regression factor. The Leydig cells, however, have normal function and result in normal secretion of testosterone, so that both male-type internal tracts and external genitalia develop.

Testicular dysgenesis **(choice E)** results in poor in utero development of the testes with concomitantly decreased secretion of testosterone and Müllerian regression factor. The Wolffian duct structures may degenerate, and the external genitalia may be feminized. Female-type internal tracts may develop because of the decreased secretion of Müllerian regression factor.

3. A 24-year-old AIDS patient develops chronic abdominal pain, low-grade fever, diarrhea, and malabsorption. Oocysts are demonstrated in the stool. Which of the following organisms is most likely to be the cause of the patient's diarrhea?

(A) Diphyllobothrium latum

(B) Entamoeba histolytica

(C) Giardia lamblia

(D) Isospora belli

(E) Microsporidia

3. The correct answer is D. All the organisms listed are protozoa. There are two intestinal protozoa specifically associated with AIDS that can cause transient diarrhea in immunocompetent individuals but can cause debilitating, and potentially life-threatening, chronic diarrhea in AIDS patients. These organisms are Isospora belli, treated with trimethoprim-sulfamethoxazole or other folate antagonists) and Cryptosporidium parvum (no treatment currently available).

Diphyllobothrium latum **(choice A)** is the fish tapeworm and occasionally causes diarrhea.

Entamoeba histolytica **(choice B)** and Giardia lamblia **(choice C)** are both causes of diarrhea, but they are not specifically associated with AIDS.

Microsporidia **(choice E)** are a protozoan cause of diarrhea but produce spores rather than oocysts.

4. A 28-year-old man decides to donate a kidney to his brother, who is in chronic renal failure, after HLA typing suggests that he would be a suitable donor. He is admitted to the hospital, and his right kidney is removed and transplanted into his brother. Which of the following indices would be expected to be decreased in the donor after full recovery from the operation?

(A) Creatinine clearance

(B) Creatinine production

(C) Daily excretion of sodium

(D) Plasma creatinine concentration

(E) Renal excretion of creatinine

4. The correct answer is A. Because creatinine is freely filtered by the glomerulus, but not secreted or reabsorbed to a significant extent, the renal clearance of creatinine is approximately equal to the glomerular filtration rate (GFR). In fact, creatinine clearance is commonly used to assess renal function in the clinical setting. When a kidney is removed, the total glomerular filtration rate decreases because 50% of the nephrons have been removed, which causes the creatinine clearance to decrease. In turn, the plasma creatinine concentration **(choice D)** increases until the rate of creatinine excretion by the kidneys **(choice E)** is equal to the rate of creatinine production by the body. Recall that creatinine excretion = GFR x plasma creatinine concentration. Therefore, creatinine excretion is normal when GFR is decreased following removal of a kidney because the plasma concentration of creatinine is elevated.

Creatinine is a waste product of metabolism. Creatinine production **(choice B)** is directly related to the muscle mass of an individual, but is independent of renal function.

The daily excretion of sodium **(choice C)** is unaffected by the removal of a kidney. The amount of sodium excreted each day by the remaining kidney exactly matches the amount of sodium entering the body in the diet.

5. Bilateral ovarian masses are identified on pelvic examination of a 40-year-old woman. Ultrasound examination reveals multiloculated cystic masses involving both ovaries. The patient is treated with total abdominal hysterectomy with removal of both adnexa. Pathologic examination demonstrates papillary carcinoma producing serous fluid. Which of the following tumor markers would be most useful in monitoring for recurrence?

(A) Alpha-fetoprotein

(B) Bombesin

(C) CA-125

(D) PSA

(E) S-100

5. The correct answer is C. The tumors are serous papillary cystadenocarcinomas of the ovaries. These tumors express CA-125 and are apparently derived from the surface epithelium of the ovaries.

Alpha-fetoprotein **(choice A)** is not produced by this type of ovarian tumor but can be produced by testicular tumors and, less commonly, by ovarian tumors with a yolk sac tumor component.

Bombesin **(choice B)** is a marker for neuroblastoma, small cell carcinoma, gastric carcinoma, and pancreatic carcinoma.

PSA **(choice D)** is a marker for prostatic carcinoma.

S-100 **(choice E)** is a marker for melanoma, neural tumors, and astrocytomas.

6. In a normal individual, a tube with a transducer at its tip is swallowed and passed an unknown distance down the esophagus. Between swallows it records a pressure of 25 mm Hg. A small amount of water is swallowed. Within 2 seconds, the pressure falls to 5 mm Hg, where it remains until returning to its resting pressure 6 seconds later. In a patient with achalasia, the transducer is advanced to the same location. Between swallows, it records a pressure of 30 mm Hg. After swallowing, the pressure fails to decrease at all. In which of the following sites is the transducer most likely located?

(A) Esophageal body distal to the diaphragm

(B) Esophageal body proximal to the diaphragm

(C) Lower esophageal sphincter

(D) Pharynx

(E) Upper esophageal sphincter

6. The correct answer is C. Achalasia is an acquired esophageal motility disorder that is characterized by loss of enteric inhibitory neurons. The lower esophageal sphincter may exhibit increased tone in between swallows and fail to relax normally with a swallow. Peristalsis in the

esophageal body is also abnormal. A swallow may not induce any peristalsis in the esophageal body or may produce simultaneous contractions along its entire length.

The esophageal body distal to the diaphragm **(choice A)** is relaxed in between swallows. The intraesophageal pressure at this point reflects the intra-abdominal pressure, which is slightly positive (5 mm Hg). During inspiration, the pressure inside the distal esophagus rises along with the intra-abdominal pressure; during expiration this pressure falls. The pressure in the esophageal body proximal to the diaphragm **(choice B)** reflects the intrathoracic pressure. It is slightly negative at the end of inspiration and slightly positive at the end of expiration.

Since the mouth and pharynx are open to the atmosphere, in between swallows, the pressure within the pharynx **(choice D)** is atmospheric (0 mm Hg). The pressure rises abruptly to a maximum of 100 mm Hg at the start of a swallow and returns to baseline within 0.5 seconds.

At rest, the pressure in the upper esophageal sphincter **(choice E)** can be as high as 60 mm Hg. It is maintained by the normal elasticity of the sphincteric structures, as well as by active contraction of the cricopharyngeal muscle, which composes most of the sphincter. Shortly after the pharyngeal muscles contract during a swallow, the upper esophageal sphincter relaxes as the tonic neural input to the cricopharyngeal muscle (skeletal muscle) is inhibited as part of the swallowing program. Function of this sphincter is unaffected by achalasia.

7. A 54-year-old man with extensive, severe atherosclerosis sustains a thrombotic occlusion of the celiac trunk. The organs that receive their blood supply from this artery continue to function normally. Anastomoses between which of the following pairs of arteries would explain this phenomenon?

(A) Left gastric artery and right gastric artery

(B) Left gastroepiploic artery and right gastroepiploic artery

(C) Proper hepatic artery and gastroduodenal artery

(D) Right colic artery and middle colic artery

(E) Superior pancreaticoduodenal artery and inferior pancreaticoduodenal artery

7. The correct answer is E. The superior pancreaticoduodenal artery is a branch of the gastroduodenal artery, which is a branch of the common hepatic artery, itself a branch of the celiac trunk. The inferior pancreaticoduodenal artery is a branch of the superior mesenteric artery. Occlusion of the celiac trunk would allow blood from the superior mesenteric artery to reach the branches of the celiac trunk via the connections between the superior and inferior pancreaticoduodenal arteries.

Both the left and right gastric arteries **(choice A)** receive their blood from the celiac trunk. The left gastric artery is a direct branch of the celiac trunk. The right gastric artery is usually a branch of the proper hepatic artery, which is a branch of the common hepatic artery (a branch of the celiac trunk).

Both the left and right gastroepiploic arteries **(choice B)** receive their blood supply from the celiac trunk. The left gastroepiploic artery is a branch of the splenic artery, which is a branch of the celiac trunk. The right gastroepiploic artery is a branch of the gastroduodenal artery, which is a branch of the common hepatic artery (a branch of the celiac trunk).

The proper hepatic and gastroduodenal arteries **(choice C)** are branches of the common hepatic artery, which is a branch of the celiac trunk.

The right colic and middle colic arteries **(choice D)** are both branches of the superior mesenteric artery.

8. A 54-year-old man presents to the emergency department with intense pain in his right eye. Examination reveals a red ring surrounding his iris and elevated intraocular pressure in the same eye. After obtaining a careful history with the aid of the man's wife, the emergency room physician concludes that this episode was triggered by which of the following agents?

(A) Amitriptyline

(B) Cimetidine

(C) Diazepam

(D) Malathion

(E) Propranolol

8. The correct answer is A. There are three facts that are necessary to answer this question: what disease the patient is suffering from, what pharmacological properties can trigger an attack, and what drug has these pharmacological properties. The patient described is suffering from an attack of acute or narrow angle glaucoma. These attacks can be precipitated by drugs with anticholinergic actions because muscarinic receptors on the pupillary constrictor muscle of the iris are blocked. This causes pupillary dilation, which further "narrows" the angle in the anterior chamber of the eye. Amitriptyline is a tricyclic antidepressant with significant anticholinergic side effects.

Cimetidine **(choice B)** is an H_2 antagonist that reduces gastric acid release. Its trade name is Tagamet and it is now available over the counter. It has no significant anticholinergic side effects.

Diazepam **(choice C)** is a benzodiazepine. Its trade name is Valium and it has no significant anticholinergic side effects.

Malathion **(choice D)** is an organophosphorus cholinesterase inhibitor that is used as an insecticide. This agent would increase levels of acetylcholine, thereby widening the angle.

Propranolol **(choice E)** is a non-selective, beta-adrenergic antagonist. If anything, it would help to prevent an attack by blocking beta-receptors on the ciliary body, thereby diminishing aqueous humor production.

9. While lying supine in bed eating, a child aspirates a peanut. Which of the following bronchopulmonary segments would this foreign object most likely enter?

(A) Apical segment of the left upper lobe

(B) Apical segment of the right upper lobe

(C) Medial segment of the right middle lobe

(D) Posterior basal segment of the left lower lobe

(E) Superior segment of the right lower lobe

9. The correct answer is E. Because the right main bronchus is wider and more vertical than the left, foreign objects are more likely to be aspirated into the right main bronchus. The superior segmental bronchus of the lower lobar bronchus is the only segmental bronchus that exits from the posterior wall of the lobar bronchi. Therefore, if a patient is supine at the time of aspiration, the object is most likely to enter the superior segmental bronchus of the lower lobe.

None of the segmental bronchi of the left lung **(choices A and D)** are likely to receive the object because the object is less likely to enter the left main bronchus.

The apical segment of the right upper lobe **(choice B)** is not likely to receive the foreign object because of the sharp angle that the upper lobar bronchus makes with the right main bronchus, and the sharp angle that the apical segmental bronchus makes with the lobar bronchus.

The medial segmental bronchus of the right middle lobe **(choice C)** arises from the anterior wall of the right middle lobar bronchus. Therefore, when the patient is supine, the effect of gravity will tend to prevent the object from entering this segmental bronchus.

10. A 47-year-old man with a history of sickle cell disease has had numerous hospitalizations requiring the placement of IV lines. The patient has poor peripheral venous access, and a catheter is placed in right subclavian vein. The patient subsequently develops right arm discomfort and swelling and a temperature of 40.1 C with chills. Multiple blood cultures are taken, and gram-positive cocci are isolated. The organism is catalase positive and grows on mannitol salt agar, but does not turn the agar yellow; the colonies are gamma-hemolytic on a sheep blood agar plate. Which of the following organisms is the most likely cause of this patient's symptoms?

(A) Enterococcus faecalis

(B) Staphylococcus aureus

(C) Staphylococcus epidermidis

(D) Streptococcus agalactiae

(E) Streptococcus pyogenes

10. The correct answer is C. The patient has developed bacteremia; the description of the causative agent is consistent with a staphylococcal organism (catalase positive, gram-positive cocci that grow on mannitol salt agar). The organism is most likely Staphylococcus epidermidis as it was not able to ferment mannitol and was not hemolytic. Both of these characteristics tend to rule out *Staphylococcus aureus* **(choice B).** Two other tests that are commonly used are coagulase production and excretion of DNAse from colonies. S. aureus is positive in both tests, S. epidermidis is negative.

Enterococcus faecalis**(choice A)** might grow on the mannitol salt agar as it is relatively haloduric but these organisms are catalase negative. The enterococci are extremely variable in hemolytic ability so this characteristic is not useful in species identification.

Both streptococcal organisms **(choices D and E)** are catalase negative and beta-hemolytic on sheep blood agar plates. Also, neither would grow on the mannitol salt agar. *Streptococcus pyogenes* is sensitive to growth inhibition by bacitracin, whereas Streptococcus agalactiae (group B streptococci) is not.