Pathology Team 435

Pathology review questions/cases

This file is only to help you review; please attempt all these questions after you have finished studying.

Good luck

Review Questions:

1. In subjects with osteogenesis imperfecta; there is abnormal synthesis of type I collagen:
    A. True
    B. False
2. In subjects with osteogenesis imperfecta; the sclera may appear blue:
    A. True
    B. False
3. In subjects with osteogenesis imperfecta; multiple fractures may occur in utero:
    A. True
    B. False
4. In subjects with osteogenesis imperfecta; the pattern of inheritance is always autosomal recessive:
    A. True
    B. False
5. In subjects with osteogenesis imperfecta; there is an increased incidence of hearing loss:
    A. True
    B. False
6. Rheumatoid arthritis is usually associated with a negative test for the rheumatoid factor during the active phase of the disease:
    A. True
    B. False
7. Rheumatoid arthritis is associated with rheumatoid nodules in nearly all cases:
    A. True
    B. False
8. Rheumatoid arthritis gives rise to _____ deviation of the fingers.
    A. Humeral
    B. Radial
    C. Ulnar
    D. None of the above
9. Rheumatoid arthritis usually has a microscopic appearance of villous hypertrophy of the synovium with inflammatory cells
    A. True
    B. False
10. Rheumatoid arthritis affects about 3% of the female population in Britian
    A. True
    B. False
11. Acute osteomyelitis is most commonly caused by Staphylococcus aureus:
    A. True
    B. False

12. Acute osteomyelitis may be complicated by septicaemia:
    A. True
    B. False
13. Acute osteomyelitis may result in the formation of:
    A. Sequestrum
    B. Involucrum
    C. Both A & B
    D. None of the above
14. Accumulation of large amounts of pus under the periosteum can cause thrombosis of a nutrient artery:
    A. True
    B. False
15. Compression fractures occur at the:
    A. Humerus
    B. Radius
    C. Scapula
    D. Vertebra
16. Osteoarthritis is a:
    A. Metabolic disease
    B. Degenerative disease
    C. Autoimmunity disease
    D. Septic disease
17. The hallmark of osteoporosis is:
    A. Loss of muscle mass
    B. Loss of osteoclastic activity
    C. Loss of bone mass
    D. Loss of bone mineral content
18. Abnormalities of bone or cartilage are called:
    A. Neoplasias
    B. Metaplasias
    C. Hyperplasias
    D. Dysplasias
19. Increased production of PTH (hyperparathyroidism) results in increased:
    A. Increased bone resorption
    B. Increased Osteoclast activity
    C. Increased Osteoblast activity
    D. A & B

20. Vitamin D is important in the maintenance of adequate serum calcium and phosphorus levels
    A. True
    B. False
21. Osteomyelitis can be treated by:
    A. Hormone replacement therapy
    B. Oral bisphosphonates
    C. Vitamin D tablets
    D. All of the above
22. Osteoporosis affects:
    A. Calcification of bone
    B. Ossification of bone
    C. Bone mass reduction
    D. None of the above
23. Osteogenesis imperfecta type II is:
    A. Usually more compatible with life than type I
    B. Usually more severe than type I
    C. The same as type I
    D. Asymptomatic
24. Osteoblast deposit osteoid collagen in a haphazard pattern in:
    A. Woven bone
    B. Trabecular bone
    C. Spongy bone
    D. All of the above
25. A compound fracture is a fracture that extends into the overlaying skin; it is sometimes called:
    A. An open fracture
    B. A greenstick fracture
    C. A closed simple fracture
    D. A comminuted fracture

26. Which one of the following is due to wear and tear (aging)
    A. Primary osteoarthritis.
    B. Secondary osteoarthritis.
    C. Rheumatoid arthritis.
27. The heberden's node found in:
    A. Proximal interphalangeal joint
    B. Distal interphalangeal joint
    C. Wrist joint

28. Which one of the following is the most specific test for Rheumatoid arthritis ?

A. Rheumatoid factor (RF) test
B. Anti - CCP
C. ESR

29. Which of these makes it more likely to get osteoarthritis?

A. Young age
B. Excess body weight
C. Back pain
D. None of the above

30. osteoarthritis increase when you:

A. Move
B. At rest

31. A 27 year old man who's obese came to a clinic complaining from pain in his joints, accompanied with limited range of movement. He was diagnosed with osteoarthritis. Which type of osteoarthritis could he have?

A. Primary
B. Secondary
C. Rheumatoid
D. Wear and tear.

32. Early osteoarthritis is marked by:

A. Degenerating cartilage containing less water and more proteoglycan
B. Compromised cartilage tensile strength and resilience
C. Increase in chondrocyte necrosis
D. Increase in chondroblasts apoptosis

33. What type of disease Osteoarthritis is:

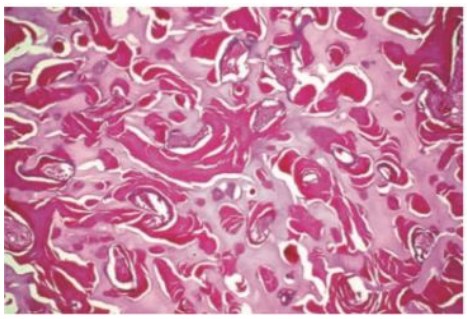
A. Chronic inflammation.
B. Autoimmune disease.
C. Degenerative arthritis.
D. Infectious disease.

34. Which of the following statements is true about osteoarthritis:

A. It usually affects hips in men.
B. Primary osteoarthritis makes up 5% of cases.
C. Cannot be seen on x ray imaging.
D. Heberden nodes appear in fingers of men.

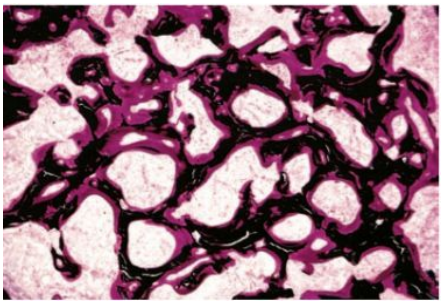
Clinical Questions:

1. A 30-year-old man with dwarfism is admitted to the hospital for hip replacement due to severe osteoarthritis. He has short arms and legs and a relatively large head. His parents do not show signs of this congenital disease. This patient most likely has a spontaneous mutation in the gene encoding which of the following proteins?
   A. Collagen type I □
   B. Dystrophin □
   C. Fibroblast growth factor receptor □
   D. Growth hormone receptor □
2. A 2-year-old boy is treated for recurrent fractures of his long bones. Physical examination reveals blue sclerae, loose joints, abnormal teeth, and poor hearing. Molecular diagnostic studies will most likely demonstrate a mutation in the gene encoding which of the following proteins?
   A. Collagen □
   B. Dystrophin □
   C. Lysyl hydroxylase □
   D. Fibrillin □
   E. Fibroblast growth factor receptor □
3. A 6-year-old child with mild hydrocephalus suffers chronic infections and dies of intractable chronic anemia. At autopsy, his bones are dense and misshapen. The femur, in particular, shows obliteration of the marrow space. Histologically, the bones demonstrate disorganization of bony trabeculae by retention of primary spongiosa and further obliteration of the marrow spaces by secondary spongiosa (shown in the image). Hematopoietic bone marrow cells are sparse. The disorder is caused by mutations in genes that regulate which of the following cell types?



   A. Fibroblasts
   B. Myofibroblasts
   C. Normoblasts
   D. Osteoblasts
   E. Osteoclasts □

4. A 33-year-old woman presents with a spontaneous fracture of her femoral head. She has suffered from Crohn disease for 20 years. Multiple surgical procedures have resulted in the removal of much of her small bowel. She has had profound weight loss over the last 10 years. The bone is pinned. Histologically, the resected femoral head shows bony trabeculae that are covered by a thicker-than-normal layer of osteoid (shown in the image). In this section, the osteoid is stained red, and mineralized bone is stained black. Which of the following best describes the pathogenesis of this lesion?



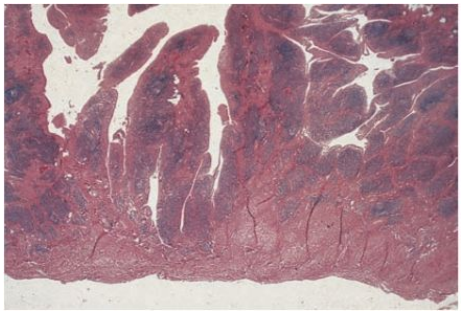
   A. Degenerative changes in the subchondral bone
   B. Enhanced osteoblast activity
   C. Impaired mineralization of osteoid
   D. Inflammatory synovium with pannus formation

5. A 10-year-old boy complains of increasing pain in his left hip. He began limping shortly after playing a baseball game at school. He is afebrile. An X-ray of the femoral head shows a fracture and irregular densities of the cancellous bone. You make a diagnosis of Legg-Calvé-Perthes disease. Which of the following best describes the pathologic findings in this patient?
   A. Avascular osteonecrosis
   B. Chondroma
   C. Fibrous dysplasia
   D. Osteitis fibrosa cystica
   E. Osteopetrosis

6. A 50-year-old man presents with a 2-day history of left leg pain. His temperature is 38.7°C (103°F). He has a harsh systolic murmur and echocardiographic evidence of bacterial endocarditis. If this patient has developed hematogenous osteomyelitis, his bone infection would most likely be found in which of the following anatomic locations?
   A. Body of a flat bone
   B. Diaphysis of a long bone
   C. Epiphysis of a long bone
   D. Metaphysis of a long bone
   E. Periosteum of a long bone

7. A 74-year-old, obese women (BMI = 33 kg/m2) complains of chronic pain in her back, knees, and fingers. The pain typically subsides at rest. On physical examination, the distal interphalangeal joints are enlarged and tender. Which of the following best describes the pathogenesis of joint pain in this patient?
   A. Acute inflammation of the ligaments □
   B. Degeneration of articular cartilage □
   C. Degenerative changes of cortical bone □
   D. Inflammatory synovium with pannus formation □
   E. Reduction of the volume of synovial fluid □
8. A 60-year-old woman with arthritis suffers a massive stroke and expires. At autopsy, the proximal phalangeal joint tissue shows pannus, synovial cell hyperplasia, and lymphoid follicles. Which of the following best describes the pathogenesis of pannus formation in this patient?
   A. Calcification of the synovium □
   B. Chronic inflammation of synovium □
   C. Degeneration of cartilage □
   D. Dislocation of a portion of bone □
   E. Necrosis of fibroadipose tissue □
9. A 9-year-old boy complains of 2 weeks of pain in the hip. **16** His temperature is 38°C (101°F). Laboratory studies show□an elevated erythrocyte sedimentation rate. An X-ray reveals□a mottled radiolucent defect in the upper femur, with abundant periosteal new bone formation. Fine-needle aspiration returns numerous neutrophils and cocci. *Staphylococcus aureus* is cultured from the bone lesion. A biopsy shows a fragment of necrotic bone embedded in fibrinopurulent exudate. Which of the following terms best describes the necrotic bone?
   A. Brodie abscess
   B. Cloaca□
   C. Involucrum
   D. Osteophyte□
   E. Sequestrum □

10. A 40-year-old woman complains of morning stiffness in her hands. On physical examination, her finger joints are painful, swollen, and warm. X-ray examination of the hands shows narrowing of the joint spaces and erosion of joint surfaces of the metacarpal/phalangeal joints. The adjacent bones show osteoporosis. A synovial biopsy reveals prominent lymphoid follicles, synovial hyperplasia, and villous folds (shown in the image). Laboratory studies conducted on a blood sample from this patient will most likely show polyclonal antibodies directed against which of the following proteins? ▫

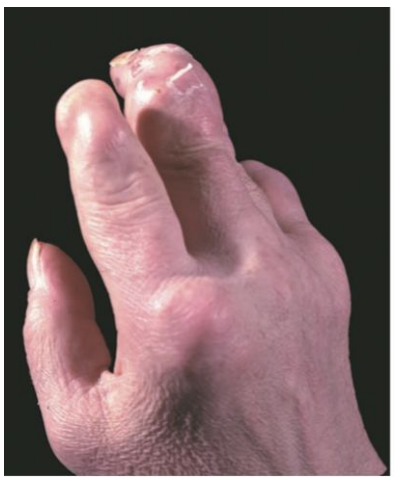


    A. Double-stranded DNA ▫
    B. Fab2 portion of IgM ▫
    C. Fc portion of IgG ▫
    D. Ribonucleoprotein ▫
    E. Topoisomerase I ▫

11. A 55-year-old man presents with pain in the left arm. Labo- ratory studies show elevated serum levels of calcium and parathyroid hormone. An X-ray of the left arm reveals mul- tiple small bone cysts and pathologic fractures. Biopsy of the affected bone discloses numerous giant cells in a cellu- lar and fibrous stroma. The patient undergoes removal of a parathyroid adenoma. Which of the following best describes the pathogenesis of bone pain and pathologic fractures in this patient?

    A. Enhanced osteoblast activity ▫
    B. Impaired mineralization of osteoid ▫
    C. Increased bone resorption ▫
    D. Increased mineralization of bone ▫
    E. Osteoporosis ▫

12. A 60-year-old man with a history of gout presents with multiple rubbery nodules on his hands (shown in the image). Which of the following best explains the pathogenesis of this patient's underlying condition?



    A. Autoimmune relapsing polychondritis ▫
    B. High dietary intake of purine-rich foods ▫
    C. Hypercalcemia and chondrocalcinosis ▫
    D. Impaired renal excretion of uric acid ▫
    E. Increased calcium hydroxyapatite deposition

13. An 85-year-old man presents with a 3-week history of painful swelling of his right knee. Aspiration of joint fluid returns numerous neutrophils and crystals, which are described as rhomboid and “coffin-like.” Chemical analysis shows that these crystals are composed of calcium pyrophosphate. Which of the following is the most likely diagnosis?
    A. Ankylosing spondylitis
    B. Gout
    C. Infectious arthritis
    D. Pseudogout
    E. Rheumatoid arthritis
14. 58-year-old woman fractures her hip after slipping on an icy sidewalk. An X-ray shows generalized osteopenia. A bone biopsy reveals attenuated bony trabeculae and a normal ratio of mineral-to-matrix. Serum calcium and phosphorus levels are normal. Which of the following best explains the pathogenesis of osteopenia in this postmenopausal woman?
    A. Impaired mineralization of osteoid
    B. Increased osteoblast activity
    C. Increased mineralization of bone
    D. Increased osteoclast activity
    E. Mosaic bone formation
15. A 50-year-old man complains of fever and severe pain in his great toe of 24 hours in duration. The pain developed in the morning and became so severe that he could not walk. Laboratory findings include leukocytosis, hyperuricemia, and hyperlipidemia. An X-ray of the affected joint reveals punched-out lesions in the juxta-articular bone. An aspirate of joint fluid returns urate crystals and neutrophils. Which of the following would be the most likely pathologic finding within the periarticular soft tissue of this patient?
    A. Osteophyte
    B. Pannus
    C. Reactive bone
    D. Rheumatoid nodule
    E. Tophus
16. A 24-year-old man on chronic corticosteroid therapy for severe asthma presents with a 6-month history of increasing hip pain. This patient most likely exhibits symptoms of which of the following metabolic bone diseases?
    A. Gaucher disease
    B. Osteomalacia
    C. Osteopetrosis
    D. Osteoporosis
    E. Paget disease

Answer key:

1. A
2. A
3. A
4. B
5. A
6. B
7. B
8. C
9. A
10. A
11. A
12. A
13. C
14. A
15. C
16. B
17. C
18. D
19. D
20. A
21. D
22. C
23. B
24. D
25. A
26. A
27. B
28. B
29. B
30. A
31. B: Secondary because he's young and obese.
32. B
33. C
34. A

Clinical questions answers:

1. **The answer is C:**

   Fibroblast growth factor receptor. Achondroplasia refers to a syndrome of short-limbed dwarfism and macrocephaly and represents a failure of normal epiphyseal cartilage formation. It is the most common genetic form of dwarfism and is inherited as an autosomal dominant trait. However, most cases represent new mutations. Achondroplasia is caused by an activating mutation in the fibroblast growth factor-3 receptor. This mutation negatively regulates chondrocyte proliferation and differentiation and arrests the development of the growth plate. A defective growth hormone receptor (choice D) is responsible for rare cases of dwarfism (Laron dwarfism). Mutations in dystrophin (choice B) are encountered in cases of Duchenne muscular dystrophy. Congenital deficiency of insulin-like growth factor (choice E) has not been reported as a cause of achondroplasia.

   Diagnosis: Achondroplasia

2. **The answer is A: Collagen.**

   Osteogenesis imperfecta (OI) refers to a group of mainly autosomal dominant, heritable disorders of connective tissue, caused by mutations in the gene for type I collagen; this affects the skeleton, joints, ears, ligaments, teeth, sclerae, and skin. The pathogenesis of OI involves mutations of *COL1A1* and *COL1A2* genes, which encode the a1 and a2 chains of type I procollagen, the major structural protein of bone. Mutations in lysyl hydroxylase gene (choice C) are seen in patients with Ehlers-Danlos syndrome, and mutations in the fibrillin gene (choice D) account for Marfan syndrome. Mutations in the dystrophin gene (choice B) cause Duchenne muscular dystrophy. Mutations in the fibroblast growth factor receptor gene (choice E) may result in achondroplasia.

   Diagnosis: Osteogenesis imperfecta

3. **The answer is E: Osteoclasts.**

   Osteopetrosis, also known as “marble bone” disease or Albers-Schönberg disease, is a group of rare, inherited disorders. The most common autosomal recessive form is a severe, sometimes fatal disease affecting infants and children. The sclerotic skeleton of osteopetrosis is the result of failed osteoclastic bone resorption. The disease is caused by mutations in genes that govern osteoclast formation or function. Because osteoclast function is arrested, osteopetrosis is characterized by (1) the retention of the primary spongiosum with its cartilage cores, (2) lack of funnelization of the metaphysis, and (3) a thickened cortex. The result is short, block-like, radiodense bones, and hence the term marble bone disease. Choices A, B, and C do not regulate bone organization. Increased osteoblast activity (choice D) has not been demonstrated in patients with osteopetrosis.

   Diagnosis: Osteopetrosis, Albers-Schönberg disease.

4. **The answer is C:**

Osteomalacia (soft bones) is a disorder of adults characterized by inadequate mineralization of newly formed bone matrix. Diverse conditions associated with osteomalacia and rickets include abnormalities in vitamin D metabolism, phosphate deficiency states, and defects in the mineralization process itself. In osteomalacia, the bony trabeculae are rimmed by broad layers of osteoid, whereas the bone spicules in osteoporosis are thin but normally mineralized. Intrinsic diseases of the small intes- tine, cholestatic disorders of the liver, biliary obstruction, and chronic pancreatic insufficiency are the most frequent causes of osteomalacia in the United States. Malabsorption of vitamin D and calcium complicates a number of small intestinal diseases, including celiac disease, Crohn disease, and scleroderma. Enhanced osteoblast activity (choice B) is encountered in new bone formation. Inflammatory synovium with pannus formation (choice D) is a feature of rheumatoid arthritis.

Diagnosis: Osteomalacia

5. **The answer is A:**

Osteonecrosis, also known as avascular necrosis, refers to the death of bone and marrow in the absence of infection. Such bone infarcts may be caused by a variety of conditions, such as trauma, thrombi, emboli, and corticosteroids. Growing bones of children and adolescents are often affected, and in most instances, the cause of such infarctions is not evident. Legg-Calvé-Perthes disease refers to osteonecrosis in the femoral head in children. Collapse of the femoral head may lead to joint incongruity.

6. **The answer is D:**

Hematogenous osteomyelitis primarily affects the metaphyseal area of the long bones (knee, ankle, hip) because of the unique vascular supply in this region. Normally, arterioles enter the calcified portion of the growth plate, form a loop, and then drain into the medullary cavity without establishing a capillary bed. This vascu- lar loop permits slowing and sludging of blood flow, allowing bacteria time to penetrate the walls of the blood vessels and establish an infective focus within the bone marrow. Osteomyelitis may break into the periosteum (choice E) but does not originate there. Vascular loops do not reach the epiphysis (choice C). Choices A and B would be distinctly uncommon.

Diagnosis: Osteomyelitis

7. **The answer is B:**

Osteoarthritis is a slowly progressive destruction of the articular cartilage that is manifested in the weight-bearing joints and fingers of older persons or in the joints of younger persons subjected to trauma. Osteoarthritis is the single most common form of joint disease. The disorder is not a single nosologic entity but rather a group of conditions that have in common the mechanical destruction of a joint. Inflammation of synovium with pannus formation (choice D) occurs in patients with rheumatoid arthritis.

Diagnosis: Osteoarthritis

8. **The answer is B:**

Rheumatoid arthritis (RA) is a systemic, chronic inflammatory disease in which chronic polyarthritis involves diarthrodial joints symmetrically and bilaterally. Synovial lining cells undergo hyperplasia. The result is a synovial lining thrown into numerous villi and frond-like folds that fill the peripheral recesses of the joint. As the synovium undergoes hyperplasia and hypertrophy, it creeps over the surface of the articular cartilage and adjacent structures. This inflammatory synovium is termed a pannus (cloak). The pannus covers the articular cartilage and isolates it from the synovial fluid. Synovial calcification (choice A) does not occur in RA. Pannus may destroy cartilage (choice C) by depriving it of nourishment.

Diagnosis: Rheumatoid Arthritis.

9. **The answer is E: Sequestrum.**

Infectious organisms may reach the bone through the bloodstream. If the infection is not contained, pus and bacteria extend into the endosteal vascular channels that supply the cortex and spread throughout the Volkmann and Haversian canals of the cortex. Eventually, pus forms underneath the periosteum, shearing off the perforating arteries of the periosteum and further devitalizing the cortex. This expansion may shear off the perforating arteries that supply the cortex with blood, leading to necrosis of the cortex. The necrotic bone is called a sequestrum. Brodie abscess (choice A) consists of reactive bone from the periosteum and the endosteum that surrounds and contains the infection. Cloaca (choice B) is the hole found in the bone during formation of a draining sinus. Involucrum (choice C) refers to a lesion in which periosteal new bone formation forms a sheath around the necrotic sequestrum. Osteophytes (choice D) are bone nodules appearing on the peripheral portion of the joint surface that are complications of osteoarthritis.

Diagnosis: Osteomyelitis

10. **The answer is C:**

Immunologic mechanisms play an important role in the pathogenesis of rheumatoid arthritis (RA). Lymphocytes and plasma cells accumulate in the synovium, where they produce immunoglobulins, mainly of the IgG class. Some 80% of patients with classic RA are positive for rheumatoid factor (RF). This factor actually represents multiple antibodies, principally IgM, but sometimes IgG or IgA, directed against the Fc fragment of IgG. Significant titers of RF are also found in patients with related collagen vascular diseases, such as systemic lupus erythematosus, scleroderma, and dermatomyositis. The presence of RF in high titer is associated with severe and unremitting disease, many systemic complications, and a serious prognosis. Antibodies against choices A, D, and E are seen in patients with other collagen vascular/systemic autoimmune diseases.

Diagnosis: Rheumatoid arthritis

11. **The answer is C:**

In patients with primary hyperparathyroidism, osteoclasts are stimulated to resorb bone. From the subperiosteal and endosteal surfaces, osteoclasts bore their way into the cortex as cutting cones. This process is termed dissecting osteitis. As the disease progresses, the trabecular bone is resorbed, and the marrow is replaced by loose fibrosis. Cystic degeneration ultimately occurs, leading to areas of fibrosis that contain reactive woven bone, and hemosiderin-laden macrophages often dis- play many giant cells, which are actually osteoclasts. Because of its macroscopic appearance, this lesion has been termed a brown tumor. This is not a true tumor, but rather a repair reaction. Impaired mineralization of osteoid (choice B) is a feature of osteomalacia. Osteoporosis (choice E) is characterized by decreased but otherwise normally mineralized bone.

Diagnosis: Hyperparathyroidism, osteitis fibrosa cystica.

12. **The answer is D: Impaired renal excretion of uric acid.**

Gout is a heterogeneous group of diseases in which the common denominator is an increased serum uric acid level and deposition of urate crystals in the joints and kidneys. A tophus (shown in the photograph) is an extracellular soft tissue deposit of urate crystals surrounded by foreign-body giant cells and mononuclear cells. Most cases (85%) of idiopathic gout result from an as yet unexplained impairment of uric acid excretion by the kidneys. When sodium urate crystals precipitate from supersaturated body fluids, they absorb fibronectin, complement, and a number of other proteins on their surfaces. Neutrophils that have ingested urate crystals release activated oxygen species and lysosomal enzymes, which mediate tissue injury and promote an inflammatory response. A high dietary intake of purine-rich foods (choice B) does not lead to gout, although endogenous overproduction of purines is associated with this condition.

Diagnosis: Gout

13. **The answer is D: Pseudogout.**

Calcium pyrophosphate dihydrate (CPPD)–deposition disease refers to the accumulation of this compound in synovial membranes (pseudogout), joint cartilage (chondrocalcinosis), ligaments, and tendons. CPPD- deposition disease is principally a condition of old age, with half of the population older than 85 years being afflicted. Pseudogout refers to self-limited attacks of acute arthritis lasting from 1 day to 4 weeks and involving one or two joints. Some 25% of patients with CPPD-deposition disease have an acute onset of gout-like symptoms, manifesting as inflammation and swelling of the knees, ankles, wrists, elbows, hips, or shoulders. The synovial fluid exhibits abundant leukocytes containing CPPD crystals. Gout (choice B) features deposition of urate crystals. Crystal deposition does not occur in rheumatoid arthritis (choice E).

Diagnosis: Chondrocalcinosis, pseudogout

14. **The answer is D:**

Osteoporosis is a metabolic bone disease characterized by diffuse skeletal lesions in which normally mineralized bone is decreased in mass to the point that it no longer provides adequate mechanical support. The remaining bone exhibits a normal ratio of mineralized to non mineralized (osteoid) matrix (therefore, not choices A and C). Bone loss and eventually fractures are the hallmarks of osteoporosis. Primary osteoporosis occurs principally in postmenopausal women (type 1) and elderly persons of both sexes (type 2). Type 1 primary osteoporosis is due to an absolute increase in osteoclast activity. The increased number of osteoclasts that appear in the early postmenopausal skeleton is the direct result of estrogen withdrawal. Type 2 osteoporosis reflects decreased osteoblast activity (therefore, not choice B). Mosaic bone formation (choice E) is a feature of Paget disease.

Diagnosis: Osteoporosis, osteopenia

15. **The answer is E: Tophus.**

Chronic accumulation of uric acid crystals leads to the formation of nodules (tophi) that contain granuloma-like aggregates of macrophages. These granuloma-like areas are found in cartilage, in any of the soft tissues around joints, and even in the subchondral bone marrow adjacent to joints. Osteophytes (choice A) are a complication of osteoarthritis. Pannus (choice B) is featured in rheumatoid arthritis. Rheumatoid nodules (choice D) are found in extra- articular locations. **Diagnosis:** Gout

16. **The answer is D: Osteoporosis.**

Risk factors for osteoporosis include smoking, vitamin D deficiency, low body mass index, hypogonadism, a sedentary lifestyle, and glucocorticoid therapy (seen in this patient). Bone loss and fractures are the hallmarks of osteoporosis, regardless of the underlying cause. Choices A and C are congenital disorders that are not related to corticosteroid therapy. Choices B and E are acquired conditions but they are not related to corticosteroid therapy.

Diagnosis: Osteoporosis