1. Which of the following philosophies in resuscitation of the polytrauma patient utilizes a lactate of < 4.0 mmol/L, a pH >= 7.25, or a base excess of >= -5.5 mmol/L to guide definitive fracture care and is associated with a decreased delay to surgery?
   A. Early Total Care
   B. Early Appropriate Care
   C. Damage Control Orthopaedics
   D. Early Definitive Care
   E. Life-Over-Limb
   Answer: B

2. A 25-year-old man is brought in with a Glasgow Coma Scale score of 3 and is intubated in the field following a motor vehicle collision. He is found to have Grade IV liver and splenic lacerations as well as an open book pelvic fracture, bilateral open tibia fractures, a closed left forearm fracture, and a left femoral shaft fracture. Which of the following variables is the most predictive of mortality?
   A. End tidal carbon dioxide = 47mmHg
   B. Hematocrit = 18.5
   C. Heart rate = 150 beats per minute
   D. Base excess = -12 mEq/L
   E. Blood pressure = 90/50 mmHg
   Answer: D

3. During cemented total hip arthroplasty, peak pulmonary embolization of marrow contents occurs when the
   A. hip is dislocated.
   B. femoral neck is osteotomized.
   C. acetabulum is prepared.
   D. acetabular component is inserted.
   E. femoral stem is inserted.
   Answer: E

4. A 20-year-old male sustains bilateral humeral shaft fractures and bilateral femoral shaft fractures from a motor vehicle collision. While awaiting surgery, the patient suddenly becomes tachycardic, hypoxemic and experiences mental status changes; physical exam demonstrates multiple petechiae in his bilateral axilla. CT angiography is ordered and is negative for pulmonary embolus. What is the most likely diagnosis?
   A. hypovolemic shock
   B. stroke
   C. fat embolism syndrome
   D. sundown syndrome
   E. narcotic overdose
   Answer: C

5. Which of the following most accurately defines the concept of reverse dynamization as it relates to fracture healing?
   A. Allowing micromotion to promote callus formation during early healing, followed by changing to more rigid fixation to accelerate the progression toward union
   B. Alternating between distraction and compression to promote healing of regenerate bone
   C. Gradually destabilizing the fixation in an effort to train the bone to accept more load
   D. Skeletal elements are strategically placed to optimize strength in relation to the distribution of applied load
   E. Remodeling of bone in response to electric charges
   Answer: A

6. What is the role of matrix metallopeptidase-13 (MMP-13) in the early callus phase of bone healing?
   A. Expressed by terminally differentiated chondrocytes to degrade the cartilaginous extracellular matrix
   B. Expressed by immature chondrocytes to degrade the calcified extracellular matrix
   C. Expressed by terminally differentiated chondrocytes to degrade the calcified extracellular matrix
   D. Expressed by terminally differentiated osteoclasts to degrade the calcified extracellular matrix
   E. Expressed by terminally differentiated osteoclasts to degrade the cartilaginous extracellular matrix
   Answer: A

7. As a diaphyseal fracture heals, peripheral callus forms about the shaft axis, creating a structure with a substantially larger diameter than the original diaphyseal shaft. What biomechanical properties does this callus impart to the healing fracture site?
   A. Callus decreases torsional stability and stiffness at the fracture site
   B. Callus formation is random and unstructured and does not affect the local biomechanical properties
   C. The callus decreases peak torque to failure with time
   D. The callus increases the moment of inertia, resulting in less strain at the fracture site
   E. The callus decreases the moment of inertia, increasing stress at the fracture site
   Answer: D

8. Direct (primary) bone healing occurs when a fracture is reduced and internally fixed with which of the following methods?
   A. Unlocked intramedullary nail
   B. Locked intramedullary nail
   C. External fixation
   D. Lag screw fixation and neutralization plate
   E. Percutaneously inserted locked 'bridge' plate
   Answer: D

9. Which bacterial stage describes free-floating bacteria that bind to an inert substrate allowing for apoptosis and the creation of a biofilm matrix?
   A. Planktonic
   B. Sessile
   C. Maturation
   D. Metabolic
   E. Dispersion
   Answer: A

10. Clinical staging of osteomyelitis using the Cierney-Mader classification system takes into account which of the following factors?
   A. Age and gender of patient
   B. Fracture type and type of bacteria
   C. Host status and extent of infected bone
   D. Immune status and chronicity of infection
   E. Bacterial resistance and source of infection
   Answer: C

11. A 45-year-old homeless hemophiliac male presents with chronic tibial osteomyelitis. Which of the following factors has been shown to predict a better prognosis?
   A. Polymicrobial infection
   B. Use of external fixation
   C. Infection with Methicillin-resistant Staphylococcus aureus
   D. Metaphyseal infection
   E. Contralateral lower extremity amputation
   Answer: D

12. You treat a skeletally immature patient for aspiration-proven septic arthritis of the right hip with an incision and debridement through an open anterior approach. Appropriate antibiotics were given following the I&D. Which of the following is the LEAST likely complication of delayed management of this condition:
   A. Limb length discrepancy with growth
   B. Persistent limping due to pain or muscle imbalances
   C. Chronic posterior hip instability and dislocations
   D. Osteonecrosis of the epiphysis and destruction of the articular cartilage
   E. Chronic osteomyelitis of the proximal femur
   Answer: C

13. A 5-year-old boy is seen in the emergency department with a 2-day history of refusing to walk. Examination shows that he has a temperature of 102.2 degrees F (39 degrees C) and limited range of motion of the right hip. The AP pelvic radiograph is normal. The WBC count is normal but the C-reactive protein and erythrocyte sedimentation rate (ESR) are elevated. What is the next step in management?
    A. IV antibiotics
    B. Oral antibiotics
    C. Ibuprofen
    D. Observation and repeat evaluation in 2 weeks
    E. Aspiration of the right hip
    Answer: E

14. An 8-month old infant is brought by his parents to your office for fever and malaise. Your inspection of the patient revealed that he is in FABER position. An oral temperature of greater than 38.5 has been found to be the best predictor of this child's condition. What is the second best predictor?
    A. Elevated neutrophil count
    B. Elevated ESR
    C. Elevated rheumatoid factor
    D. Elevated CRP
    E. Presence of bacteria on CSF gram stain
    Answer: D

15. An 18-year-old male is admitted for a diaphyseal, open, tibial shaft fracture after falling off a motorcycle. He has a past medical history of nicotine dependence and obesity. He undergoes provisional splinting by the resident on call and is noted to be "neurovascularly intact" following splint placement. Throughout the evening, however, the patient has an increasing narcotic requirement and develops pain with passive stretch of his toes. What factor listed below is most associated with his progressive symptoms overnight?
    A. Age < 20
    B. Male gender
    C. Body mass index >/ 30 kg/m^2
    D. Open fracture
    E. Nicotine use
    Answer: A

16. A 10-year-old girl suffers a displaced tibia fracture. Initial numbness over the dorsum of the the foot resolved following an anatomic closed reduction and placement in a long leg cast performed in the emergency room. The cast was placed with the the ankle dorsiflexed just above neutral to prevent equinus contracture and then the cast and padding was adequately bivalved. Overnight, the patient began experiencing recurrent numbness and paresthesias in her exposed toes and a slight increase in her pain at the fracture site. Your next best step would be:
    A. Repeat closed reduction under conscious sedation
    B. Selective compartment fasciotomies
    C. External fixation and compartment monitoring
    D. 4-compartment fasciotomies with fracture fixation done emergently
    E. Modify the cast to reposition the ankle into slight plantarflexion
    Answer: E

17. A 92-year-old female sustains a displaced femoral neck fracture after a ground-level fall. When treating these injuries in this patient population, which of the following variables has been associated with improved mobilization in the short and medium-term post-operative period?
    A. Use of general anesthesia
    B. Open reduction and internal fixation
    C. Cemented hemiarthroplasty
    D. Preoperative cardiac work-up
    E. Direct lateral approach
    Answer: C

18. A 37-year-old male presents to the trauma bay with left hip pain after falling 10 feet off a ladder. Radiographs demonstrate Left intracapsular neck of femur fracture. Which of the following is the most important predictor of fracture healing after operative stabilization?
    A. Surgery within 12 hours
    B. Quality of reduction
    C. Open reduction
    D. Capsular decompression
    E. Surgical approach
    Answer: B

19. The point on a stress-strain curve that separates the plastic and elastic regions is defined as which of the following:
    A. Necking region
    B. Ultimate strength
    C. Toughness
    D. Yield Point
    E. Toe region
    Answer: D

20. A 29-year-old male sustained an open distal third tibial shaft fracture after a motocross accident. Thorough irrigation and debridement followed by external fixation were performed on the day of admission. It is determined during the initial operation that flap coverage will ultimately be required. Which of the following represents the best choice for coverage in this patient?
    A. Gastrocnemius flap within 7 days
    B. Soleus flap within 7 days
    C. Free flap within 7 days
    D. Gastrocnemius flap within 11 days
    E. Free flap within 11 days
    Answer: C

21. A 78-year-old female falls and sustains 3 parts proximal humerus fracture. Surgical treatment is pursued with open reduction internal fixation with a lateral locking plate. What is the most common complication with this mode of fixation?
    A. Infection
    B. Osteonecrosis
    C. Axillary artery injury
    D. Screw cut-out
    E. Axillary nerve injury
    Answer: D

22. A patient reports hyperesthesia over the base of the thenar eminence following volar locked plating of a distal radius fracture. A standard volar approach of Henry was used. What is the most likely cause of the hyperesthesia?
    A. Complex regional pain syndrome
    B. Wartenberg's syndrome
    C. Carpal tunnel syndrome
    D. Palmar cutaneous nerve injury
    E. C7 radiculopathy
    Answer: D

23. A lateral wall thickness of 25 mm represents an independent risk factor for which of the following complications following fixation of an intertrochanteric femur fracture with a sliding hip compression screw?
    A. Anterior perforation of the distal femur
    B. Anterior spike malreduction
    C. Implant cut-out
    D. Postoperative lateral wall fracture
    E. None of the above
    Answer: E

24. To achieve the best outcome from an acute, purely ligamentous Lisfranc dislocation/subluxation, treatment should consist of
    A. closed reduction and percutaneous pin fixation.
    B. open reduction and pin fixation.
    C. open reduction and internal metallic cortical screw fixation.
    D. open reduction and bioabsorbable screw fixation.
    E. open reduction and primary arthrodesis with screw fixation
    Answer: E

25. A 34-year-old female presents to the emergency department after a motor vehicle collision. She is complaining primarily of ankle pain. Radiographs demonstrate a Hawkins II talar neck fracture. Appropriate initial management is undertaken in the trauma bay and she is consented for surgical fixation. Which of the following factors is correlated with an increased risk for osteonecrosis in this setting?
    A. Delay in fixation > 24 hours
    B. Degree of initial fracture displacement
    C. Utilization of dual medial and lateral approach
    D. Increased duration of surgery
    E. Presence of open fracture
    Answer: B