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THE JOURNAL OF BONE & JOINT SURGERY

CONTINUING MEDICAL EDUCATION

CME

REVIEW QUESTIONS

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JANUARY, FEBRUARY, MARCH  
2008

THIS CME EXAM IS ALSO AVAILABLE AT JBJS.ORG AS AN INTERACTIVE ONLINE EXAM.  
CREDITS EARNED BY COMPLETING AND SUBMITTING THIS EXAM ONLINE CAN BE  
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MANDATED BY THE ABOS MAINTENANCE OF CERTIFICATION (MOC) PROCESS.

THE DEADLINE TO SUBMIT YOUR ANSWERS FOR GRADING THIS SET OF QUESTIONS IS JULY 15, 2008.

## PURPOSE

The purposes of this CME program are:

- To provide the general orthopaedic surgeon with an ability to assess his or her continuing competence in orthopaedics through the acquisition of contemporary scientific information.
- To provide a broad-based review and update of the major subspecialty areas in orthopaedics.
- To make *The Journal* reader aware of new advances in orthopaedic surgical techniques and technology.

## INSTRUCTIONS

In order to benefit most from this educational experience and qualify for Continuing Medical Education credit, please observe the following instructions:

1. Read the learning objectives listed on the Response Form and be certain that they meet your individual learning needs.
2. These CME questions have been derived from the information presented in the January, February, and March issues of the 2008 American volume of *The Journal of Bone and Joint Surgery* (Vol. 90-A). A careful study of each article should yield the best response to each question.
3. Record your answers and complete all portions of the attached Response Form in the back of this document. Upon successful completion of the examination, you may claim up to ten category-1 CME credits. However, to claim up to ten credits to satisfy self-assessment examination requirements mandated by the Maintenance of Certification process, you must take the *online* JBJS quarterly examination.
4. In order for the American Academy of Orthopaedic Surgeons to document your participation in the CME activity, Academy Fellows must provide their AAOS membership number in the designated area on the Response Form.
5. In addition to providing the answers to the CME questions, you must complete the examination evaluation questions. These questions are found on the Response Form. The way you answer these evaluation questions will not in any way affect the score that you achieve.
6. All completed answer sheets will be graded, and you will be advised of the results of this examination within four weeks after it is received. In order to qualify for CME credit, a score of more than 50% correct must be achieved on the examination. A charge of \$45 per quarter, or \$165 per year, must be paid at the time that the answer sheet is submitted. **The deadline to submit your answers for grading this set of questions is July 15, 2008.**

1. **In a study comparing computer-assisted minimally invasive total knee arthroplasty with the conventional technique, which of the following was found to be the main advantage of using the computer-assisted technique?**
  - A. less intraoperative blood loss
  - B. shorter operative time
  - C. improved implant alignment as seen on postoperative radiographs
  - D. lower complication rate
  - E. improved clinical outcome at three months postoperatively
2. **In a study of factors affecting outcomes in a population of community-dwelling men who had undergone surgery for a hip fracture, which of the following was associated with an increased risk of death within thirty days after the operation?**
  - A. treatment with primary total joint arthroplasty
  - B. minimizing the number of blood transfusions
  - C. waiting at least four days after the fracture before performing the surgical intervention
  - D. using regional anesthesia
  - E. a younger age at the time of the fracture
3. **In a randomized, controlled trial of patients with chronic pain from the insertional form of Achilles tendinopathy, patients who received repetitive low-energy shock-wave therapy reported which of the following results in comparison with patients managed with twelve weeks of an eccentric loading regimen?**
  - A. more favorable pain scores and pain threshold as well as less tenderness
  - B. an increased prevalence of tendon rupture
  - C. an increased prevalence of weakness of the gastrocnemius-soleus complex
  - D. an increased prevalence of sural neuromas
  - E. lower satisfaction at four months after treatment
4. **The major factors causing hip arthritis secondary to acetabular dysplasia are mechanical stress and dynamic instability. Which of the following radiographic measurements correlated best with the magnitude of acceleration of hip instability?**
  - A. center-edge angle of Wiberg
  - B. vertical center-edge angle of Lequesne and de Seze
  - C. Sharp angle
  - D. acetabular roof angle
  - E. acetabular head index
5. **All of the following factors influence fat and/or bone-marrow-cell embolization during total knee arthroplasty performed with computer navigation without breaching of the femoral medullary canal except:**
  - A. preparation of the cancellous distal part of the femur and proximal part of the tibia
  - B. impaction of the tibial component broach and insertion of the prosthesis
  - C. impaction of the femoral and tibial components
  - D. a high preoperative level of triglyceride

- E. bilateral simultaneous total knee arthroplasty
- 6. Several methods have been proposed to diagnose distal radioulnar joint subluxation on computed tomography scans. Which of the following methods provides the most reliable criteria for predicting abnormal subluxation of the distal radioulnar joint?**
- A. radioulnar line described by Mino et al.  
 B. modified radioulnar line described by Nakamura et al.  
 C. epicenter method described by Wechsler et al.  
 D. congruency method described by Wechsler et al.  
 E. radioulnar ratio described by Lo et al.
- 7. When terminating a doctor-patient relationship, the physician should:**
- A. refuse to assist the patient in finding another treating physician  
 B. only notify the patient verbally of the termination, so as not to leave a paper trail  
 C. terminate all patient contact, even emergent care, immediately after notifying the patient of the intent to terminate the relationship  
 D. give written notice of termination, including an explanation of the reasons, and continue to provide care until another physician has been found  
 E. avoid transferring any medical records to the new treating physician
- 8. In your outpatient clinic, you evaluate a fifty-eight-year-old woman with a left distal radial fracture caused by a simple fall. The fracture is not displaced, and you explain that it can be treated conservatively with a plaster cast. The patient is worried about her recovery as her mother's health had deteriorated after a hip fracture. What other relevant information should you obtain?**
- A. whether she has other bone and fall-related risk factors for fracture  
 B. whether she can sleep with the cast elevated for the first twenty-four hours  
 C. whether there is a history of osteoporosis  
 D. what medications she is taking  
 E. whether dual x-ray absorptiometry has been performed to assess bone mineral density
- 9. Which statistic is the most appropriate for assessing the agreement between two ratings in a stable patient population (such as a test-retest situation)?**
- A. Pearson r  
 B. intraclass correlation coefficient  
 C. t test  
 D. Spearman rho  
 E. specificity
- 10. Which of the following situations is the most cost-effective indication for performing histologic examination of shoulder arthroscopic shavings?**
- A. adhesive capsulitis  
 B. hemophilic arthropathy  
 C. rheumatoid arthritis  
 D. atypical arthroscopic findings  
 E. all shoulder arthroscopic specimens
- 11. Nonoperative treatment of massive rotator cuff tears may permit active glenohumeral abduction if rehabilitation can achieve sufficient muscle strengthening in the remaining rotator cuff and deltoid. However, this strengthening may have the deleterious effect of producing a biomechanical environment that:**
- A. produces rotator cuff muscle fatigue  
 B. disrupts the transverse force couple  
 C. prevents spherical joint kinematics  
 D. leads to joint degeneration  
 E. promotes captured fulcrum kinematics
- 12. In which of the following situations is there the greatest risk for myelopathy in children with congenital anomalies of the upper cervical spine?**
- A. encroachment on the space available for the cord  
 B. atlanto-occipital instability  
 C. atlantoaxial instability  
 D. the presence of a genetic syndrome  
 E. os odontoideum
- 13. Which of the following factors is the best explanation for the fact that the supine pelvic tilt angle is a reasonable approximation of the standing pelvic tilt angle?**
- A. pelvic tilt is neutral and constant in the supine and standing positions  
 B. high mobility of the pelvis in all positions of the patient  
 C. the range of pelvic mobility between the supine and standing positions does not exceed 10° in most patients  
 D. the pelvic tilt angle is not measurable in the standing position  
 E. pelvic tilt is not neutral, but it does not differ between the supine and standing positions
- 14. Osteochondromas in patients who have fibrodysplasia ossificans progressiva are:**
- A. rare lesions that rarely undergo malignant degeneration  
 B. rare lesions that require biopsy  
 C. rare lesions that commonly undergo malignant degeneration  
 D. common lesions that rarely undergo malignant degeneration  
 E. common lesions that commonly undergo malignant degeneration
- 15. The signs and symptoms of pronator syndrome may be easily confused with those of carpal tunnel syndrome. Which of the following findings is present only in pronator syndrome?**
- A. weakness of the abductor pollicis brevis  
 B. weakness of lateral (key) pinch  
 C. decreased sensibility in the tips of the thumb and the index finger  
 D. decreased sensibility in the proximal radial aspect of the palm

- E. reproduction of symptoms with the "middle finger flexion test"
- 16. Which of the following factors increases the likelihood that an adolescent patient who sustained an acute patellar dislocation will have a recurrence of the dislocation?**
- A. conservative management rather than operative management  
 B. abnormal radiographic indices (e.g., Insall-Salvati ratio or sulcus angle)  
 C. positive family history  
 D. abnormal Tegner activity score  
 E. joint surface damage at the initial presentation
- 17. In a study that compared health-related quality of life between patients with end-stage ankle arthrosis and patients with end-stage hip arthrosis, those with end-stage ankle arthrosis had:**
- A. limited physical function, but it was not worse than that of patients with hip arthrosis  
 B. better health-related quality of life than that of patients with hip arthrosis  
 C. pain that was less severe than the pain experienced by patients with hip arthrosis  
 D. less impairment in performing occupational duties  
 E. severe pain, diminished health-related quality of life, and limited physical function that were as severe as those of patients with hip arthrosis
- 18. The radiographic finding most closely correlated with the beginning of the curve-acceleration phase (early adolescent rapid phase) of idiopathic scoliosis is:**
- A. the appearance of the scaphoid  
 B. fusion of the distal part of the ulna  
 C. closure of the distal radial physis  
 D. capping of the digital epiphyses  
 E. fusion of the distal phalangeal physes
- 19. Macrophage accumulation following tendon transplantation into a bone tunnel is hypothesized to lead to excessive scar tissue formation and delayed graft healing as a result of:**
- A. increased osteoclast activation  
 B. macrophage-induced transforming growth factor- $\beta$  (TGF- $\beta$ ) production  
 C. macrophage-induced platelet-derived growth factor production  
 D. increased collagen cross-linking  
 E. decreased fibrocartilage formation
- 20. What is a major advantage of using real-time polymerase chain reaction over traditional polymerase chain reaction for the detection of infection?**
- A. the analysis can be done with electrophoresis without the need for expensive machinery  
 B. synovial fluid samples can be analyzed directly without processing  
 C. the analysis provides rapid direct quantification of nucleic acid concentration and thus of the actual bacterial concentration that is present  
 D. real-time polymerase chain reaction can be easily done in any microbiological laboratory, and traditional polymerase chain reaction cannot  
 E. real-time polymerase chain reaction can quantify the time-dependent decrease in the bacterial population in a more sensitive way
- 21. Which of the following risk factors is most associated with fracture of the femoral neck following hip resurfacing arthroplasty?**
- A. female gender  
 B. valgus placement of the femoral component  
 C. bilateral simultaneous arthroplasties  
 D. notching of the inferior part of the femoral neck  
 E. a diagnosis of osteonecrosis
- 22. External fixation supplemented with percutaneous pinning is a commonly used method for the surgical treatment of intra-articular fractures of the distal part of the radius. Which of the following complications was not observed in patients who had undergone this procedure?**
- A. carpal tunnel syndrome  
 B. loss of fracture reduction  
 C. superficial radial nerve injury  
 D. ulnar nerve injury  
 E. complex regional pain syndrome
- 23. Surgical site infection is an important complication after spinal operations. Which of the following strategies reduces the risk of surgical site infection and is recommended by the Surgical Care Improvement Project (SCIP)?**
- A. use of oral prophylactic antibiotics until all drains are removed  
 B. administration of a single intravenous dose of prophylactic cefazolin to nonallergic patients within one hour before the incision  
 C. irrigation of the operative site with an antimicrobial solution  
 D. continuation of intravenous prophylactic antibiotics until the patient is discharged from the hospital  
 E. routine prophylaxis with vancomycin at least one hour before the incision
- 24. Which statement about the impact of trauma-center care on one-year functional outcomes following major limb trauma is most accurate?**
- A. all patients with major limb trauma benefit from treatment at a trauma center  
 B. patients who sustain a major lower-limb injury resulting from a high-energy force have better physical and psychosocial outcomes when they are treated at a level-I trauma center  
 C. regardless of where they are treated, patients with major lower-limb trauma generally return to levels of functioning consistent with those of the general population  
 D. patients who sustain a major lower-limb injury resulting from a high-energy force have better physical outcomes when treated at a level-I trauma center  
 E. none of the above

- 25. In a canine model, the effect of lubricin on tendon gliding resistance is:**
- reduction of gliding resistance initially, but not after 1000 repetitions
  - only evident in tendons initially pretreated with carbodiimide-derivatized gelatin
  - significantly greater than that of hyaluronic acid and gelatin
  - associated with a significant change in the appearance of the gliding surface histologically
  - significantly better than treatment of the tendons with saline solution alone
- 26. The American Orthopaedic Association's Own the Bone program demonstrated significant improvement in compliance with quality indicators for the care of individuals with low-energy fractures and osteoporosis. The most clinically relevant of these is:**
- increase in inpatient dual x-ray absorptiometry scans
  - increase in intravenous osteoporosis pharmacologic interventions
  - increase in calcium and vitamin D therapy at discharge
  - increase in home safety screening visits
  - increase in oral osteoporosis pharmacologic interventions
- 27. A seventy-five-year-old woman who underwent primary cruciate-retaining total knee arthroplasty three years ago presents with diffuse anterior knee pain that began within six months after the surgery. She has had intermittent effusion and reports particular difficulty ascending and descending stairs. The knee is stable to varus-valgus stress in full extension. A knee aspiration has been done and is negative for infection. Radiographs reveal no evidence of loosening, wear, or malalignment. The most likely diagnosis is:**
- infection
  - osteolysis
  - metal hypersensitivity
  - flexion instability
  - malingering
- 28. Osteoarthritis of the knee following anterior cruciate ligament reconstruction is:**
- rapidly progressive and presents as advanced disease
  - more common after patellar tendon autografting than after hamstring autografting
  - unrelated to the function of the quadriceps muscle complex
  - associated with the use of allografts and subsequent risk of infection
  - unrelated to associated meniscal injury
- 29. Abnormalities of the deep subgluteus maximus (trochanteric) bursa have long been considered a primary cause of so-called trochanteric bursitis. Which of the following is true with regard to the morphology of the deep subgluteus maximus bursa?**
- it communicates with the gluteofemoral bursa
  - it is either absent or found in isolation
  - it is located posterior to the apex of the greater trochanter
  - in most instances, it is accompanied by two or three other bursae in the same tissue plane
  - it is composed primarily of fibrous tissue
- 30. Which of the following has been shown to be an effective way to increase medical students' knowledge of, and clinical confidence in, musculoskeletal medicine?**
- ensuring that electives relevant to musculoskeletal medicine, such as clerkships in orthopaedics, physical medicine and rehabilitation, and rheumatology, are offered during clinical rotations
  - increasing the duration of currently offered clerkships relevant to musculoskeletal medicine from the national average of about two weeks to one month
  - requiring medical institutions to administer the National Board of Medical Examiners' (NBME's) recently developed musculoskeletal medicine pilot shelf examination to all medical students
  - requiring a structured orthopaedic clerkship during students' clinical years
  - offering additional electives in musculoskeletal medicine, such as clinical anatomy, physical diagnosis, and other orthopaedic rotations, during students' fourth year
- 31. According to the Krause and Brodsky classification, what is the preferred method of operative repair of a tear involving  $\leq 25\%$  of the peroneal tendon:**
- excision of the entire tendon
  - tendon transfer
  - primary repair and tubularization
  - débridement of the torn tendon
  - there is no preferred method for operative intervention
- 32. With regard to needle fasciotomy for Dupuytren contracture, which of the following statements is true:**
- there is no high-quality (level-I or level-II) evidence to support the practice
  - the rate of major complications in association with the needle procedure is higher than that associated with open fasciotomy
  - the results are similar regardless of the severity or location of the contracture
  - for joint contractures of  $< 90^\circ$ , the correction is similar to that achieved with open fasciotomy
  - patient satisfaction and return to function are no different than those following open fasciotomy
- 33. Neurovascular injury is a reported complication of external fixation. Which of the following structures is most at risk when an external fixation pin is passed from medial to lateral across the proximal bases of the first and sec-**

- ond metatarsals, traversing the first intermetatarsal space?**
- sural nerve
  - anterior tibial artery
  - deep plantar branch of the dorsalis pedis artery
  - superficial peroneal nerve
  - deep peroneal nerve
- 34. Which of the following factors contributes to the deficiency of the publication of studies with negative or neutral results in the orthopaedic literature?**
- investigators are more likely to abandon studies with negative or neutral results prior to completion
  - investigators are less likely to submit studies with negative or neutral results to journals for publication
  - orthopaedic journals are less likely to accept studies with negative or neutral results for publication
  - A and B
  - B and C
- 35. A thirty-one-year-old patient with rheumatoid arthritis underwent a semiconstrained total elbow arthroplasty. Five years later, on routine surveillance, a radiograph reveals focal osteolysis at the tip of the ulnar stem. A serial follow-up radiograph made six months later reveals progressive osteolysis. Appropriate treatment at this time includes which of the following?**
- counseling the patient about activity modification
  - ordering a radionuclide bone scan
  - making stress radiographs
  - initiating oral antibiotics and ordering laboratory studies including the measurement of the erythrocyte sedimentation rate and the C-reactive protein level
  - discussing surgical intervention with the patient
- 36. Which of the following factors most strongly influenced the accuracy of measurement of the mechanical axis deviation of the lower limb with use of an intraoperative fluoroscopic technique with an electrocautery cord?**
- body mass index
  - age
  - bilateral deformity
  - female gender
  - limb-length discrepancy
- 37. Rotator interval closure combined with both an anterior and a posterior capsular plication for treatment of multidirectional instability is associated with all of the following except:**
- decreased rotational range of motion
  - decreased anterior-posterior translation
  - inferior shift of the humeral head at 0° of abduction
  - increased superior-inferior translation
  - possible overtightening and changes in humeral head kinematics
- 38. If shoulder stiffness is the same at the joint positions of 0° of external rotation (neutral) and 90° of maximum external rotation (apprehension position), which of the following factors supports the theory of increased vulnerability and risk of injury in the apprehension position?**
- increased reliance on static structures
  - muscles have an optimal length-tension relationship
  - inability to reactively respond to load
  - amount of generalized joint laxity
  - preactivation of rotator cuff muscles
- 39. One factor that has been shown to be efficacious in decreasing the incidence of surgical site infections is:**
- administering prophylactic antibiotics three to four hours prior to the incision
  - waiting until after the surgical incision to administer antibiotics
  - administering antibiotics within one hour prior to the surgical incision
  - not administering antibiotics to patients unless they have a history of prior infection
  - administering antibiotics after the tourniquet is released at the end of a total knee arthroplasty procedure
- 40. The medial intercondylar ridge is an osseous prominence on the femoral footprint of the posterior cruciate ligament. What part of the border of the femoral footprint of the posterior cruciate ligament does it delineate?**
- media
  - proximal
  - lateral
  - distal
  - posterior
- 41. In a long-term follow-up study of total hip arthroplasty with cement, use of a matte-finish collared femoral component with a metal-backed polyethylene acetabular component was compared with use of a polished Charnley femoral component with an all-polyethylene acetabular component. The results were:**
- comparable between the two hip constructs
  - superior with the polished Charnley femoral component
  - superior with the all-polyethylene acetabular component
  - superior with the matte-finish collared femoral component
  - superior with the metal-backed acetabular component
- 42. Atlantoaxial instability is a common clinical problem associated with congenital osseous anomalies of the upper cervical spine. The most common associated anomaly is:**
- a hypoplastic dens
  - congenital fusion of C2-C3
  - basilar invagination
  - os odontoidemum
  - Chiari type-I malformation

- 43. In a cadaver study, ankle joints with a step-off incongruity that were nevertheless stable were compared with ankles with a similar incongruity but that were unstable. Which of the following statements best reflects the findings of this comparison?**
- there was greater than a 100% increase in peak contact stresses in the stable ankles
  - there was a decrease in tibiotalar sagittal translation in the unstable ankles
  - there was a greater percentage increase in contact stress rates compared with the corresponding increase in contact stress magnitudes in the unstable ankles
  - there was a loss of plantar flexion and dorsiflexion during testing in both groups
  - there were smaller increases in 95th percentile contact stress rates compared with 95th percentile contact stress magnitudes in both groups
- 44. For successful decompression of the radial nerve in the forearm, the surgeon may need to release multiple structures. All of the following have been implicated as a potential source of compression in radial tunnel syndrome except the:**
- distal edge of the supinator
  - extensor carpi radialis brevis
  - arcade of Struthers
  - arcade of Frohse
  - radial recurrent vessels
- 45. In a study of the fate of untreated asymptomatic osteonecrosis of the femoral head, which of the following factors was found to be the most important in predicting the prognosis of this lesion:**
- age of the patient
  - extent of a necrotic lesion
  - location of a necrotic lesion
  - initial radiographic stage
  - risk factors associated with osteonecrosis
- 46. Nonunion of the site of a Ludloff osteotomy was most often seen in which group of patients?**
- patients with previous foot procedures
  - patients fifty-four years of age or less
  - patients sixty-three years of age or more
  - male patients
  - female patients
- 47. Which of the following biomarkers, when elevated in the wound effluent, was found to be associated with dehiscence of extremity wounds?**
- interleukin-6
  - interleukin-13
  - the protein regulated on activation, normal T-cell expressed and secreted (RANTES)
  - amino-procalcitonin
  - tumor necrosis factor- $\alpha$
- 48. On the basis of biomechanical findings, which of the following locking modes provides the most stability at the site of a tibiotalar calcaneal arthrodesis with retrograde intramedullary nails?**
- unlocked nailing
  - statically locked nailing
  - conventional transverse locking screws
  - angle-stable locking
  - compression locking
- 49. The most likely reason for continued pain six months after a glenohumeral arthrodesis performed in a patient with a failed total shoulder arthroplasty was found to be:**
- subclinical infection
  - scapular winging
  - delayed union or nonunion of the fusion site
  - symptomatic hardware
  - malposition of the fused shoulder
- 50. What was the most common complication of spinal stenosis surgery in patients with achondroplasia?**
- infection
  - neurologic deficit
  - dural tear
  - nonunion
  - pulmonary embolus
- Conflict of Interest**  
The author of these CME questions does not have any financial conflict of interest with regard to the subject matter discussed in these review questions.

**RESPONSE FORM**

**EXAMINATION EVALUATION**

Did the April 2008 CME Review Questions meet these educational objectives\*:

1. Provide a broad-based review and update specifically in the areas of sports medicine and the upper extremity?  Yes  No
2. Strengthen your problem-solving abilities related to patient care particularly in the areas of sports medicine and the upper extremity?  Yes  No
3. Make you aware of new advances in orthopaedic surgical techniques and technology?  Yes  No

Comments (please comment on the quality of the questions and their relationship to your practice): \_\_\_\_\_

\*Note: These objectives will change every quarter.

**SURVEY (optional)**

1. Which of the following best describes your practice type?
  - General orthopaedics
  - General orthopaedics with subspecialty interest
  - Exclusively subspecialty
  - Resident or student
  - Researcher
  - Other: \_\_\_\_\_
2. What are your specialty interests? Please rank in order of importance (1 = highest importance).
 

____ Adult	____ Spine
____ Geriatric	____ Hand
____ Pediatric	____ Rheumatology
____ Rehabilitation	____ Foot and Ankle
____ Sports	____ Other: _____
____ Trauma	
3. Which is your number-one priority to read when you receive *The Journal* (American volume only) each month?
  - Commercial advertising
  - Current Concepts
  - Classified advertising
  - Letters to The Editor
  - Clinical scientific articles
  - Basic scientific articles
  - Orthopaedic Forum
  - Instructional Course Lectures

**ACCREDITATION STATEMENT**

This activity has been planned and implemented in accordance with the Essential Areas and policies of the Accreditation Council for Continuing Medical Education (ACCME) through the joint sponsorship of the American Academy of Orthopaedic Surgeons (AAOS) and *The Journal of Bone and Joint Surgery* (JBJS). The AAOS is accredited by the ACCME to provide continuing medical education for physicians. The AAOS designates this educational activity for up to 10 hours of category-1 credit toward the AMA Physicians' Recognition Award. Each physician should claim only those hours of credit that he/she actually spent in the educational activity.

The deadline to submit your answers for grading this set of questions is July 15, 2008.

**QUESTIONS?**

For payment questions, contact the Subscription Department at 781-449-9780, x1240. For questions regarding submitted tests, contact Melissa Viola at 781-449-9780, x1224. E-mail all other questions to [cme@jbjs.org](mailto:cme@jbjs.org).

**ANSWER KEY**

**Black out the correct answers**

- |               |               |               |
|---------------|---------------|---------------|
| 1. A B C D E  | 18. A B C D E | 35. A B C D E |
| 2. A B C D E  | 19. A B C D E | 36. A B C D E |
| 3. A B C D E  | 20. A B C D E | 37. A B C D E |
| 4. A B C D E  | 21. A B C D E | 38. A B C D E |
| 5. A B C D E  | 22. A B C D E | 39. A B C D E |
| 6. A B C D E  | 23. A B C D E | 40. A B C D E |
| 7. A B C D E  | 24. A B C D E | 41. A B C D E |
| 8. A B C D E  | 25. A B C D E | 42. A B C D E |
| 9. A B C D E  | 26. A B C D E | 43. A B C D E |
| 10. A B C D E | 27. A B C D E | 44. A B C D E |
| 11. A B C D E | 28. A B C D E | 45. A B C D E |
| 12. A B C D E | 29. A B C D E | 46. A B C D E |
| 13. A B C D E | 30. A B C D E | 47. A B C D E |
| 14. A B C D E | 31. A B C D E | 48. A B C D E |
| 15. A B C D E | 32. A B C D E | 49. A B C D E |
| 16. A B C D E | 33. A B C D E | 50. A B C D E |
| 17. A B C D E | 34. A B C D E |               |

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