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THE JOURNAL OF BONE & JOINT SURGERY

CONTINUING MEDICAL EDUCATION

CME

REVIEW QUESTIONS

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OCTOBER, NOVEMBER, DECEMBER  
2006

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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 APRIL 15, 2007.

## 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 October, November, and December issues of the American volume of *The Journal of Bone and Joint Surgery* (Volume 88-A, Numbers 10, 11, and 12). 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-I 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 \$30 per quarter, or \$110 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 April 15, 2007.**

1. **Among patients with a hip fracture, severe cognitive dysfunction as assessed with the SPMSQ (Short Portable Mental Status Questionnaire) at the time of admission to the hospital was associated with:**
  - A. a lower mortality rate
  - B. an increased infection rate
  - C. a shorter hospital stay
  - D. a worse functional outcome
  - E. an increased risk of revision surgery
2. **Patients with advanced bilateral knee osteoarthritis who have elected to have both knees replaced must choose between simultaneous bilateral total knee replacement (both knees replaced during the same hospitalization) and staged bilateral total knee replacements (the knees replaced during two separate admissions). How does the risk of pulmonary embolus compare between the two options?**
  - A. the risk of pulmonary embolus is much higher in patients undergoing simultaneous bilateral total knee replacement
  - B. the risk of pulmonary embolus is much lower in patients undergoing simultaneous bilateral total knee replacement
  - C. the risk of pulmonary embolus following simultaneous bilateral total knee replacement is comparable with the overall risk following two-stage total knee replacements
  - D. the risk of pulmonary embolus is less than one in 500 for both procedures
  - E. the risk of pulmonary embolus is about 10% for both procedures
3. **Regarding intoeing gait in ambulatory children with cerebral palsy, which of the following statements is true?**
  - A. the factors contributing to intoeing gait are the same for all patterns of involvement of cerebral palsy (diplegia, quadriplegia, and hemiplegia)
  - B. pes varus is the most common cause of intoeing in patients with bilateral involvement
  - C. internal hip rotation is the most common cause of intoeing in patients with hemiplegic cerebral palsy
  - D. the cause of intoeing is often multifactorial
  - E. internal tibial torsion rarely contributes to intoeing in patients with cerebral palsy
4. **In a series of patients who sustained a fracture of the anteromedial facet of the coronoid with varus elbow subluxation, but not dislocation, the most frequent associated injury was to the lateral collateral ligament. The next most frequent injury was to the:**
  - A. lateral epicondyle
  - B. medial epicondyle
  - C. medial collateral ligament
  - D. interosseous ligament of the forearm
  - E. olecranon (fracture)
5. **Stress injuries of the calcaneus can be seen in athletes and military recruits. Which of the fol-**

- lowing statements is most appropriate regarding proper management?**
- cast treatment should be used if the symptoms are prolonged
  - calcium supplements in the diet accelerate the healing of these stress injuries
  - imaging with computed tomography is indicated to detect possible displacement of the fracture fragments
  - the injury eventually heals well with reduced exercise, but this can take up to months
  - follow-up radiographs should routinely be made to verify the healing process
- 6. A fifty-six-year-old physically active right-hand-dominant woman with substantial osteoporosis falls and sustains a comminuted and displaced two-part surgical neck fracture of the proximal part of the humerus. Which of the following is true with regard to possible fixation strategies?**
- implant rigidity is the principal determinant of fixation stability
  - locking plate fixation offers little benefit with regard to fixation stability
  - proximal humeral nail fixation is less stable than locking proximal humeral plate fixation
  - the implant material is the principal determinant of fixation stability
  - hemiarthroplasty is the treatment of choice
- 7. Which of the following factors is correlated with the rates of success of nonoperative treatment of irreparable rotator cuff tears?**
- amount of pain at presentation
  - amount of weakness at presentation
  - ability to perform activities of daily living at presentation
  - duration of symptoms prior to presentation
  - male gender
- 8. In human cartilage:**
- a disintegrin and metalloprotease with thrombospondin-like repeat (ADAMTS)-4 is constitutively active while ADAMTS-5 is induced by inflammatory factors such as interleukin-1 (IL-1) or tumor necrosis factor (TNF)
  - ADAMTS-4 is induced by IL-1 and TNF while ADAMTS-5 is constitutively active
  - both ADAMTS-4 and ADAMTS-5 are induced by IL-1 and TNF
  - deletion of the ADAMTS-5 gene protects against arthritis
  - deletion of the ADAMTS-4 gene does not affect normal development
- 9. The parents of a three-year-old girl with unilateral below-the-elbow deficiency want to know if a prosthesis will improve her performance of daily tasks, which is currently age-appropriate. The most appropriate response to the parents' question is:**
- a prosthesis should be prescribed and the child should wear it full-time except when sleeping or she will not continue to function at an age-appropriate level
  - a prosthesis will not help function, but multiple toe-to-thumb transfers will improve her performance of daily tasks
  - the use of a prosthesis does not appear to have an impact on performance of daily tasks by children with unilateral below-the-elbow deficiency
  - a prosthesis will not help because the child will be severely impaired whether or not she wears a prosthesis
  - a prosthesis should be prescribed when the child is ready to learn to tie her shoes, as prostheses have proven to be helpful for the performance of that task
- 10. Detection of deep venous thrombosis with duplex Doppler compression ultrasound after lower-extremity total joint replacement is best utilized for which of the following patient scenarios?**
- as a screening test at two weeks after the operation
  - in symptomatic patients after the operation
  - preoperatively
  - as a screening test at one day after the operation
  - as a screening test at the time of hospital discharge
- 11. Which part of the axillary nerve is at high risk for injury during surgical procedures involving the deltoid muscle?**
- posterior trunk
  - anterior trunk
  - posterior cord
  - quadrilateral cord
  - main trunk
- 12. Which of the following factors is the least important in determining hand grip strength following open carpal tunnel decompression?**
- gender
  - age
  - preoperative grip strength
  - division of the ulnar bursa
  - use of a tourniquet
- 13. Which natural inhibitor of transforming growth factor- $\beta$  may have future clinical use in decreasing flexor tendon adhesions?**
- platelet-derived growth factor
  - mannose-6-phosphate
  - fibronectin
  - hyaluronic acid
  - trypsin
- 14. Autologous chondrocyte implantation performed for a patellar lesion has a higher failure rate than that done for a lesion in the medial or lateral femoral condyle. What concomitant procedure substantially increases the likelihood of a successful outcome:**
- anterior tibial tubercleplasty (Fulkerson osteotomy)
  - patellofemoral ligament reconstruction
  - high tibial osteotomy
  - lateral release
  - proximal vastus medialis obliquus advancement

- 15. Osteonecrosis of the femoral head in patients with sickle cell anemia:**
- is a rare orthopaedic condition
  - is common in patients younger than ten years old
  - usually begins in adolescence
  - is seen only in patients with a history of treatment with steroids
  - develops by the age of thirty-five years in 90% of patients
- 16. Response shift is a psychological construct whereby:**
- an individual changes priorities in his or her life following a bad outcome from treatment
  - an individual changes his or her internal standards, values, or conceptualizations of related quality of life over the course of time
  - quality-of-life outcome measurements are affected by unmet expectations
  - an adjusted treatment effect will always be greater than an unadjusted treatment effect
  - an individual forgets his or her preoperative level of disability
- 17. Continuous infusion of local anesthetic at bone-graft harvest sites in the iliac crest:**
- is the most effective method to control postoperative pain at the harvest site in patients undergoing bone-grafting procedures related to extremity trauma
  - is no more effective than systemic narcotics in controlling pain at the bone-graft harvest site
  - limits the need for systemic narcotics in patients undergoing iliac crest bone-graft harvest
  - is or is not effective depending on the weight of the patient
  - causes a substantial number of complications
- 18. In comparison with use of so-called off-the-shelf braces for treatment of varus gonarthrosis, a custom-fitting valgus brace:**
- was not associated with improved outcomes
  - was associated with increased stiffness of the knee
  - was associated with more pain
  - was associated with a reduction in the varus angle of knee alignment
  - was associated with reduced function
- 19. What is one purported benefit of utilizing a bio-degradable decellularized extracellular matrix scaffold rather than a nondegradable extracellular matrix or synthetic scaffold?**
- after the scaffold implant is surrounded by a fibrous capsule, the scaffold remains inert and virtually noncellular
  - the degradation products, such as growth factors and chemoattractant peptides, encourage angiogenesis and recruitment of progenitor cells
  - extracellular matrix scaffolds have relatively few known components compared with synthetic materials
  - the conventional pathway of the inflammatory response is typically seen with extracellular matrix scaffolds, in that mononuclear cells are present in chronic inflammation and do not participate in site-specific remodeling
- 20. Of the following factors, which has the most important effect on the fusion result following posterior lumbar interbody fusion in elderly patients?**
- degradable extracellular matrix implants elicit a foreign-body response more commonly than do nondegradable or synthetic scaffolds
  - preservation of vertebral end plates and use of large amounts of bone graft
  - segmental lordosis at the fusion segment
  - gender
  - age
  - preoperative clinical status
- 21. A twenty-seven-year-old man presents with an open tibial shaft fracture with an 8-cm open wound and substantial comminution. Which of the following statements is true with regard to this patient?**
- treatment with five days of antibiotics will not reduce the rate of infection
  - the infection rate following use of a reamed intramedullary nail will be significantly lower than that following use of an unreamed intramedullary nail
  - the rate of secondary procedures following treatment with an external fixator will be higher than that following use of an intramedullary nail
  - treatment with antibiotics is of uncertain benefit
  - fixation should not be performed until infection is ruled out
- 22. Which of the following types of scaphoid fractures is appropriately paired with the preferable method of treatment?**
- waist fracture with intrascaphoid angle of 35° and surgery
  - proximal pole fracture and short arm thumb-spica cast
  - waist fracture with 2-mm displacement and surgery
  - waist fracture with scapholunate angle of 80° and long arm thumb-spica cast
  - distal pole fracture and surgery
- 23. A large twin study confirmed the etiology of Scheuermann kyphosis to be at least partly genetic because:**
- heritability was calculated
  - prevalence was found to be significantly higher in males than in females
  - pairwise and probandwise concordance was significantly higher in monozygotic than in dizygotic twins
  - pairwise and probandwise concordance was significantly higher in dizygotic than in monozygotic twins
  - the findings fit a dominant major gene diallele model
- 24. The most important reason why Asian-American patients are less likely to receive a total knee**

- replacement appears to be:**
- on average, Asian patients have lower incomes
  - a lower prevalence of osteoarthritis among Asian patients
  - miscommunication between doctor and patient
  - Asian patients live in regions where overall rates of total knee arthroplasty are lower
  - racial differences in Medicare status
- 25. In an in vivo canine model, what was the critical time for adhesion formation after tendon graft surgery?**
- within twenty-four hours after surgery
  - within three days after surgery
  - within one week after surgery
  - within three weeks after surgery
  - within six weeks after surgery
- 26. What was the most common patellar complication of distal femoral replacement following bone tumor resection in one series?**
- patellar impingement on the tibial bearing
  - patellar subluxation
  - patellar (anterior knee) pain syndrome
  - patella alta
  - extensor mechanism weakness
- 27. A patient presents with limb shortening and mild genu valgum secondary to fibular hemimelia. The most helpful imaging modality for initial evaluation and follow-up of such patients was found to be:**
- computed tomography
  - slit scanogram
  - bone-scanning
  - standing full-length radiograph of the lower extremities
  - magnetic resonance imaging
- 28. Despite the short-term success of reverse shoulder arthroplasty in the treatment of rotator cuff arthropathy, the procedure has been associated with complications. The most common complications, in order of frequency, are:**
- hematoma formation, glenoid component dissociation, instability, acromial and/or scapular spine fracture, infection, scapular notching
  - scapular notching, hematoma formation, glenoid component dissociation, instability, acromial and/or scapular spine fracture, infection
  - instability, scapular notching, glenoid component dissociation, infection, acromial and/or scapular spine fracture, hematoma formation
  - acromial and/or scapular spine fracture, infection, stability, glenoid component dissociation, hematoma formation, scapular notching
  - scapular notching, infection, hematoma formation, glenoid component dissociation, instability, acromial and/or scapular spine fracture
- 29. Tendon that is exposed to excessive cyclic loading responds with which of the following structural or compositional alteration?**
- increased expression of collagenase
  - inflammatory cell accumulation
  - decreased expression of inflammatory mediators such as PGE2
  - increased collagen fibril diameter
  - increased expression of genes that are normally found in tendon
- 30. Which of the following is considered a contraindication to the use of shoulder hemiarthroplasty in patients with cuff tear arthropathy and an irreparable rotator cuff?**
- collapse of the humeral head
  - anterosuperior shoulder instability
  - severe glenohumeral degeneration
  - superior migration of the humeral head
  - humeral head retroversion of  $>40^\circ$
- 31. Patients' perception of ankle pain is influenced by:**
- the number of musculoskeletal and systemic comorbidities
  - the number of musculoskeletal but NOT systemic comorbidities
  - neither the number of musculoskeletal nor the number of systemic comorbidities
  - the number of systemic but NOT musculoskeletal comorbidities
  - the number of non-musculoskeletal comorbidities
- 32. On the basis of extrapolation of results from studies of rats, what nutritional strategy may improve fracture-healing in patients?**
- supplementation with calcium and zinc
  - supplementation with conditionally essential amino acids
  - low-carbohydrate, low-glycemic-index diet
  - low-volume, high-frequency feedings with calorie-rich foods
  - vitamins D, E, and A
- 33. Which of the following patient groups is not at increased risk for infection following primary total hip or knee replacement?**
- patients with prior infection of the involved joint
  - patients with diabetes mellitus
  - patients with rheumatoid arthritis
  - patients with Paget disease
  - patients with a body-mass index of  $>30$
- 34. An appropriate method of coping with a patient who displays racism is to:**
- engage in a verbal dispute with the patient
  - initiate a rational discussion with the patient regarding his or her reason for displaying racist views
  - withhold care until the patient changes his or her views
  - attempt to evaluate and treat the patient's medical condition while remaining as objective and professional as possible
  - dismiss the patient from the emergency department before initiating any evaluation or treatment protocols
- 35. In the Steinberg classification system, Stage-I osteonecrosis of the femoral head is defined as:**

- A. collapse of the femoral head seen on magnetic resonance imaging  
 B. narrowing of the joint space  
 C. lucencies of the femoral head seen on plain radiographs  
 D. lucencies of the femoral head seen on plain radiographs and an abnormal appearance on a magnetic resonance image  
 E. a normal appearance on a plain radiograph but findings consistent with osteonecrosis on magnetic resonance imaging
- 36. For patients with patellofemoral pain syndrome and clinical evidence of patellar malalignment, which of the following statements is least true?**
- A. the pattern of medial/lateral patellar translation during loaded knee flexion is similar to the pattern observed in individuals with no knee problems  
 B. the patella shifts medially from a lateral position and then shifts laterally again as the loaded knee is flexed to 60°  
 C. the patella tends to be positioned more laterally as it enters the trochlear groove as compared with its position in individuals with no knee problems  
 D. if the angle between the lateral facet of the patella and the trochlear groove increases over the initial 20° of knee flexion, it is abnormal  
 E. most patients do not have identifiable patellar tracking problems during the initial 60° of loaded knee flexion
- 37. Which of the following statements best describes the material properties of dermis and small intestine submucosa extracellular matrix materials used for rotator cuff tendon repairs?**
- A. they are approximately the same as those of tendon  
 B. they are isotropic  
 C. they remain the same after implantation  
 D. they require 10% to 30% stretch before they carry substantial load and 30% to 80% stretch to reach their maximum modulus  
 E. dermis and small intestine mucosa have essentially the same material properties
- 38. Which of the following structures is the most important for passive anterior/posterior stability of the ankle under weight-bearing conditions?**
- A. the tibial-talar articulation  
 B. the anterior and posterior talofibular ligaments  
 C. the medial (deltoid) ligament  
 D. the extensor retinaculum  
 E. the flexor retinaculum
- 39. A seventy-nine-year-old woman with a history of osteoporosis and vertebral compression fractures of T11-L1 has continued severe pain despite conservative treatment. Laboratory values including the results of serum protein electrophoresis and urine protein electrophoresis, the complete blood-cell count, the serum calcium level, and the 25-hydroxyvitamin-D level are normal. Magnetic resonance imaging shows edema in the fractured vertebral bodies but otherwise demonstrates normal findings. The patient is scheduled to undergo kyphoplasty of T11-L1. Which of the following statements is true regarding which concomitant procedure should be performed in addition to the kyphoplasty?**
- A. a bone-marrow aspiration specimen should be taken from the iliac crest  
 B. a biopsy is not indicated because laboratory values are normal  
 C. a biopsy should be performed in a single vertebral body  
 D. a biopsy should be performed in all three vertebral bodies  
 E. a bone-marrow aspiration specimen should be taken from the iliac crest and a biopsy should be performed in all three vertebral bodies
- 40. Which patients undergoing bilateral total knee replacement are more likely to have simultaneous procedures and which are more likely to have staged procedures?**
- A. low-volume surgeons are more likely to perform simultaneous procedures  
 B. high-volume hospitals are more likely to perform simultaneous procedures  
 C. simultaneous procedures are more likely to be performed in southern states  
 D. simultaneous procedures are more likely to be performed in women  
 E. simultaneous procedures are more likely to be performed in older patients
- 41. In an animal wound model, the bacterial clearance produced by 3 L of pulsed lavage irrigation was equivalent to what volume of irrigation with a bulb syringe?**
- A. 3 L  
 B. 6 L  
 C. 9 L  
 D. 12 L  
 E. 16 L
- 42. What preoperative factor is most predictive of the development of superior mesenteric artery syndrome following surgical correction of scoliosis?**
- A. Lenke curve type (1 through 6)  
 B. curve magnitude  
 C. preoperative height  
 D. lateralized lumbar curve (Lenke C modifier)  
 E. sagittal curve profile (hyperkyphosis or hypokyphosis)
- 43. Postoperative infections, although rare, remain a devastating complication following total shoulder arthroplasty. In the setting of a subacute infection (three months to one year following replacement) or a late infection (more than one year following replacement), which type of intervention results in optimal out-**

- comes regarding shoulder function, pain relief, and eradication of infection?**
- débridement, intravenous antibiotics, and retention of the prosthesis
  - débridement, intravenous antibiotics, and primary exchange of the prosthesis
  - resection arthroplasty, intravenous antibiotics
  - intravenous antibiotics alone
  - débridement, removal of the prosthesis, intravenous antibiotics, staged reimplantation of the prosthesis
- 44. Implantation of stem cells that are insufficiently differentiated may lead to production of unintended tissues at the graft site, including teratomas. Which of the following is the best way to ensure that grafted stem-cell populations are uniformly and sufficiently differentiated?**
- growth of the implanted stem cells on mouse embryo fibroblasts
  - culture of the implanted stem cells with Wnt-enriched conditioned media
  - use of CD73 (or another specific antigenic marker for differentiation) and fluorescence activated cell sorting to purify subpopulations of differentiated stem cells
  - treatment of stem cells with BMP-2
  - assessment of cell cultures for spindle morphology
- 45. Compared with functional bracing, operative treatment (plate and screw fixation) of a diaphyseal fracture of the distal third of the humerus results in better:**
- radial nerve function
  - elbow motion
  - shoulder motion
  - radiographic alignment of the humerus
  - union rate
- 46. Stability of a distal radial comminuted fracture can best be measured by:**
- force-displacement curves
  - relative gap motion at the fracture site
  - plate-screw loosening
  - plate bending at the fracture site
  - torsional stiffness at the fracture site
- 47. Osteonecrosis of the femoral head is one of the complications of sickle cell disease. Which of the following factors is associated with an increased risk of progression to collapse in asymptomatic osteonecrosis?**
- sex of the patient
  - level of anemia
  - occurrence of pain
  - number of sickle cell crises
  - genotype
- 48. Total hip arthroplasty was found to be superior to hemiarthroplasty in mobile, independent patients with a displaced intracapsular femoral neck fracture because it was associated with:**
- reduced mortality
  - lower dislocation rate
  - improved walking distance
  - shorter hospital stay
  - shorter operative time
- 49. When an extramedullary alignment guide is used to prepare the tibia in total knee arthroplasty, which alignment will occur if one ignores the rotational mismatch between the proximal part of the tibia and the ankle joint?**
- normal alignment in the coronal plane
  - varus alignment in the coronal plane
  - valgus alignment in the coronal plane
  - more anterior slope in the sagittal plane
  - more posterior slope in the sagittal plane
- 50. Which of the following statements best describes the material properties of dermis and small intestine submucosa extracellular matrix materials as compared with those of tendon?**
- they are a little less than those of tendon
  - they are at least an order of magnitude less than those of tendon
  - they are the same as those of tendon
  - if they are prestretched at implantation, they are almost the same as those of tendon
  - if they are chemically cross-linked, they are almost the same as those of tendon
- 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 January 2007 CME Review Questions meet these educational objectives\*:

1. Provide a broad-based review and update specifically in the areas of orthopaedic research and trauma?  Yes  No
2. Strengthen your problem-solving abilities related to patient care particularly in the area of orthopaedic trauma?  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 April 15, 2007.

**QUESTIONS?**

For payment questions, contact the Subscription Department at 781-449-9780, x140. For questions regarding submitted tests, contact Melissa Viola at 781-449-9780, x124. E-mail all other questions to 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 | <b>CME Credits Claimed*</b> _____ |

\*Required. Please enter the number of CME credit hours you are claiming for this exam. You must complete this field to receive CME credit.

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