With this issue, the AANA Journal’s 22nd course has been completed.

The course consisted of a 6-part series, beginning with the April 2002 issue and concluding in the February 2003 issue. The series was published as follows:

- **Part 1 (April 2002)** – Perioperative considerations in major orthopedic trauma: Pelvic and long bone fractures
- **Part 2 (June 2002)** – A common sense approach to hypothermia
- **Part 3 (August 2002)** – Etiology, mechanisms, and anesthesia implications of autoimmune myasthenia gravis
- **Part 4 (October 2002)** – Functional residual capacity: The human windbag
- **Part 5 (December 2002)** – Gender and pain
- **Part 6 (February 2003)** – Cancer: New therapies and new approaches to recurring problems

Each article included objectives for the reader and sources for reference and study.

The examination printed in this issue incorporates material from all 6 articles. The examination consists of 60 multiple choice questions, 10 questions from each article. The examination is clearly marked as to which questions refer to which article. Remember, as you are taking the examination, you are free to refer to the original articles. Note also that there is but 1 correct answer to be marked for each question.

**About your continuing education credit**

To ensure that a certain level of knowledge has been attained, a minimum of 80% correct answers (48 out of 60) must be achieved. A total of 6 hours of continuing education (CE) credit will be awarded for the successful completion of the examination; partial CE credit will not be awarded.

Only those passing the examination will be notified by mail of the successful completion of the course. (The time of this mailing will be dependent on the volume of response; however, notification will be effected prior to the close of the CE year—July 31, 2003.) AANA members will automatically have their 6 CE credits recorded for them. Individuals with record-keeping contracts through the AANA also will have the credits recorded for them.

The correct answers to the examination will appear in the August 2003 issue of the AANA Journal. By keeping a copy of your answers, you will automatically be able to see how you scored.

**How to fill out the answer sheet and evaluation form**

It is recommended that you first mark your answers on the examination itself (so that you have your own record). Then, transfer your answers in pencil to the answer sheet, which appears on the adjacent page. Be sure to include your name, address, and AANA identification number. You are required to fill out an evaluation of the course, which includes the time required for reading and comprehension of each part. The evaluation is printed on the reverse side of the answer sheet. (Non-AANA members should include a $30 processing fee—payable to the AANA Journal Course—along with their examination answer sheet and evaluation form.)

**Important deadline**

The examination answers must be postmarked by July 31, 2003. Adequate time must be allowed for the examination to be processed to ensure that all CE credits are recorded prior to the end of the CE year. Mail your answer sheet to:

American Association of Nurse Anesthetists
222 S. Prospect Ave.
Park Ridge, IL 60068-4001
Attn: AANA Journal Course

**Much success**

We hope that you have found this 22nd AANA Journal course to be of value. We wish you well in its successful completion.
### AANA Journal Course No. 22 Examination Update for Nurse Anesthetists

*(Issued April 2003)*

**Please PRINT.**

**Name:**

**Address:**

**AANA Membership ID Number:**

To ensure that your examination will be processed, you must complete every section of the evaluation and mail it with this examination answer sheet to: American Association of Nurse Anesthetists, 222 S. Prospect Ave., Park Ridge, IL 60068-4001. Attn: AANA Journal Course

If you are not an AANA member, check here. Be sure to enclose your $30 processing fee payable to AANA.

Please circle one response for each question.

For example, 36. 1 2 3 4 would indicate that the third alternative was chosen in response to question 36.

Please erase completely any changed responses.

<table>
<thead>
<tr>
<th>Circle one response (1-4) for each question</th>
<th>Chapter objective reference</th>
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*AANA Code No.: 24623; Expiration date: July 31, 2003*

Time required to complete this answer sheet: _____________________________ minutes
AANA Journal Course—No. 22–2003 Evaluation Form

Please evaluate the AANA Journal Course in each of the categories listed below. Circle the number that corresponds with the rating scale for the overall course evaluation, as well as for each part.

1 = Poor  2 = Fair  3 = Average  4 = Very Good  5 = Excellent

Overall Course Evaluation

A. Content (Parts 1-6)
   1. Relates to objectives and overall purpose/goals ................................................................. 1 2 3 4 5
   2. Based on current professional information ......................................................................... 1 2 3 4 5
   3. Level appropriate for identified intended audience............................................................. 1 2 3 4 5
   4. Corresponds with learner objectives identified at beginning of each part .......................... 1 2 3 4 5

B. Teaching Methods (Parts 1-6)
   1. Self-test questions facilitated the learning process ............................................................ 1 2 3 4 5

C. Relevancy to Practice (Parts 1-6)
   1. Information presented can be applied to my practice ........................................................ 1 2 3 4 5
   2. Information provided is helpful in achieving my professional goals .................................. 1 2 3 4 5

D. Faculty/Objectives for each part of this course

Part 1: Perioperative considerations in major orthopedic trauma: Pelvic and long bone fractures
DAVID D. ROSE, CRNA, MAEd
DAVID W. ROWEN, CRNA, MSNA

1. Content related to objectives ............................................................................................... 1 2 3 4 5
   2. Content organized and easy to follow ................................................................................ 1 2 3 4 5
   3. Content relevant and current ............................................................................................ 1 2 3 4 5

Objectives

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<tr>
<td>1.1 Describe how the mechanism of injury aids in the diagnosis of pelvic fractures.</td>
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<td>1.2 Detect the potential for hemorrhage and other associated life-threatening injuries in the patient with a pelvic fracture.</td>
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<tr>
<td>1.3 Identify the preoperative treatment of the patient with pelvic and long bone fractures in the emergency department and how it relates to anesthetic care.</td>
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<tr>
<td>1.4 Describe the perioperative management of a patient with a pelvic or a long bone fracture.</td>
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<tr>
<td>1.5 Describe the significance of adequate volume resuscitation and the ongoing evaluation of that resuscitation in the patient with pelvic and long bone fracture.</td>
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Time required for reading and comprehension of Part 1 of Journal course text:_________ minutes

continued next page
Part 2: A common sense approach to hypothermia

TONY C. WELCH, CRNA, MSNA

1. Content related to objectives ..................................................... 1  2  3  4  5
2. Content organized and easy to follow ........................................ 1  2  3  4  5
3. Content relevant and current ..................................................... 1  2  3  4  5

Objectives

2.1 Define hypothermia in relation to normothermia and heat production. ........................................ 1  2  3  4  5
2.2 Describe a heat-preservation method that is simple and effective ........................................ 1  2  3  4  5
2.3 Enumerate at least 4 mechanisms that contribute to hypothermia. ........................................ 1  2  3  4  5
2.4 Discuss the relative economics of hypothermia prevention compared with hypothermia-related adversities. ........................................ 1  2  3  4  5
2.5 Describe possible sequelae of hypothermia ........................................ 1  2  3  4  5

Time required for reading and comprehension of Part 2 of Journal course text:________ minutes

Part 3: Etiology, mechanisms, and anesthesia implications of autoimmune myasthenia gravis

MAJ THOMAS E. CEREMUGA, CRNA, MSN, AN, USA
XIANG-LAN YAO, MD, PhD
JOSEPH T. MCCABE, PhD

1. Content related to objectives ..................................................... 1  2  3  4  5
2. Content organized and easy to follow ........................................ 1  2  3  4  5
3. Content relevant and current ..................................................... 1  2  3  4  5

Objectives

3.1 Discuss the pathologic processes related to the neuromuscular junction in autoimmune myasthenia gravis. ........................................ 1  2  3  4  5
3.2 Identify the cellular autoimmune events occurring in myasthenia gravis. ........................................ 1  2  3  4  5
3.3 Describe the various modalities used in the treatment of myasthenia gravis. ........................................ 1  2  3  4  5
3.4 Identify the pharmacologic agents that reduce neuromuscular transmission in patients with myasthenia gravis and should be avoided in the perioperative period ........................................ 1  2  3  4  5
3.5 Discuss the prudent delivery of anesthesia and anesthetic plan for the patient with myasthenia gravis. ........................................ 1  2  3  4  5

Time required for reading and comprehension of Part 3 of Journal course text:________ minutes

Part 4: Functional residual capacity: The human windbag

PENELOPE S. VILLARS, CRNA, RRT, MSN
JOSEPH T. KANUSKY, CRNA, MS
MICHAEL G. LEVITZKY, PhD

1. Content related to objectives ..................................................... 1  2  3  4  5
2. Content organized and easy to follow ........................................ 1  2  3  4  5
3. Content relevant and current ..................................................... 1  2  3  4  5
### Objectives

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<td>Examine the effects of anesthesia on pulmonary mechanics.</td>
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<td>4.2</td>
<td>Discuss the determinants of functional residual capacity.</td>
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<td>Examine the effects of anesthesia on functional residual capacity.</td>
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<tr>
<td>4.4</td>
<td>Describe the effects of anesthetic agents on pulmonary mechanics.</td>
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<td>4.5</td>
<td>Analyze the occurrence, causes, and effects of intraoperative atelectasis.</td>
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Time required for reading and comprehension of Part 4 of Journal course text: ______ minutes

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### Part 5: Gender and pain

**AMY CRISTE, RN, BSN, CCRN**

1. Content related to objectives……………………………………………………………………………………………………………………………1 2 3 4 5
2. Content organized and easy to follow……………………………………………………………………………………………………………………1 2 3 4 5
3. Content relevant and current…………………………………………………………………………………………………………………………1 2 3 4 5

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<tr>
<td>5.1</td>
<td>Describe the adverse physical effects of pain.</td>
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<td>5.2</td>
<td>Identify the differences between males and females in their reports of pain.</td>
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<td>5.3</td>
<td>Identify the differences in response to opioids between males and females.</td>
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<td>5.4</td>
<td>Discuss the differences in pain perception between males and females.</td>
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<td>5.5</td>
<td>Recognize variables that may interfere with the accurate assessment of pain.</td>
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Time required for reading and comprehension of Part 5 of Journal course text: ______ minutes

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### Part 6: Cancer: New therapies and new approaches to recurring problems

**KENNETH M. KIRSNER, CRNA, MS, JD**

1. Content related to objectives……………………………………………………………………………………………………………………………1 2 3 4 5
2. Content organized and easy to follow……………………………………………………………………………………………………………………1 2 3 4 5
3. Content relevant and current…………………………………………………………………………………………………………………………1 2 3 4 5

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<tr>
<td>6.1</td>
<td>Discuss the impact of chemotherapeutic agents on the patient undergoing anesthesia.</td>
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<tr>
<td>6.2</td>
<td>Discuss surgical and interventional radiological procedures for spinal stabilization in patients with cancerous lesions of the spine.</td>
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<tr>
<td>6.3</td>
<td>Discuss the types of cancer that sentinel node biopsy is used for and the implications of isosulfan blue injection.</td>
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<td>6.4</td>
<td>Discuss the implications of tumors of the upper and lower airway and anesthetic approaches to tumors of the airway.</td>
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<td>6.5</td>
<td>Discuss the anesthetic management of patients with cancer who have cardiac tamponade.</td>
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Time required for reading and comprehension of Part 6 of Journal course text: ______ minutes
1. In addition to pelvic fractures, the mechanism of injury described as a “lateral impact collision” accounts for nearly half of all:
   1. pneumothorax
   2. closed head injury
   3. cervical spine injury
   4. traumatic aortic rupture

2. A fall from a 4-story building results in death in what percentage of individuals?
   1. 25
   2. 50
   3. 75
   4. 100

3. Hemorrhage secondary to a pelvic fracture can lead to exsanguination because of:
   1. the significant volume sequestered in the retroperitoneum
   2. venous bleeding
   3. arterial bleeding
   4. all of the above

4. An unstable pelvic fracture that is contributing to hemodynamic instability can be stabilized preoperatively by:
   1. an external fixator
   2. angiographic embolization
   3. peritoneal lavage
   4. answers 1 and 2

5. Eighty percent of hemorrhage in the pelvic fracture is caused by:
   1. venous bleeding
   2. arterial bleeding
   3. both venous and arterial bleeding
   4. associated injuries such as long bone fractures

6. The need for early surgical fixation (within the first 24 hours) of the patient with a pelvic fracture can improve functional outcome based on:
   1. lower incidence of developing adult respiratory distress syndrome
   2. lower incidence of developing multiple organ failure
   3. lower incidence of fat emboli syndrome
   4. all of the above

7. Mean arterial pressure should be maintained above _____ to prevent cerebral ischemia.
   1. 60 mm Hg
   2. 70 mm Hg
   3. 80 mm Hg
   4. 90 mm Hg

8. The following laboratory study can be helpful in intraoperatively assessing the patient for disseminated intravascular coagulation:
   1. thromboelastogram
   2. base excess
   3. lactate
   4. hemoglobin

9. Coagulopathies can develop intraoperatively secondary to:
   1. choice of fluid, lactated Ringer’s solution vs normal saline, used for resuscitation
   2. base excess less than or equal to 5
   3. hypothermia
   4. cerebral perfusion pressure less than 70 mm Hg

10. Pelvic fracture may result in:
    1. bladder/urethral trauma
    2. rectal trauma
    3. obturator nerve damage
    4. all of the above

A common sense approach to hypothermia

11. The onset of hypothermia is defined as a patient temperature of less than:
    1. 79°F/26°C
    2. 93.2°F/34°C
    3. 96.8°F/36°C
    4. 98.6°F/37°C
12. Hypothermia occurs in what percentage of perioperative patients?
   1. 10
   2. 50
   3. 70
   4. 90

13. The major contributor to body heat loss is:
   1. cold rooms
   2. room temperature fluids
   3. exposure
   4. indifference

14. Which heat loss mechanism contributes most to hypothermia?
   1. radiant
   2. convective
   3. evaporative
   4. conduction

15. During an anesthetic, the average 70-kg adult's heat production can drop to what kcal per hour?
   1. 21
   2. 42
   3. 60
   4. 70

16. Which of the following are possible hypothermia-related sequelae?
   1. morbid cardiac events
   2. higher infection rates
   3. larger perioperative blood losses
   4. all of the above

17. Adverse outcomes associated with hypothermia can increase perioperative costs by:
   1. $2,500 to $7,000 overall
   2. $100 per hour of recovery room time
   3. $465 per day for hospital care
   4. all of the above

18. Using a convection warmer and an intravenous fluid warmer, thereby addressing as much as 70% of the anticipated perioperative heat loss, costs:
   1. $10 or less
   2. $50 or less
   3. $125 or more
   4. $200 or more

19. The most effective simple patient warming intervention is:
   1. keeping the patient covered
   2. placing hot water bottles in the axilla
   3. microwaving the blankets
   4. warm water baths for fluids

20. Perhaps the most beneficial warming device is:
   1. genitourinary fluid warmers
   2. artificial noses
   3. convection warming devices
   4. irrigation fluid warmers

21. The hallmark features of autoimmune myasthenia gravis (MG) are:
   1. increasing weakness with repetitive motion
   2. fatigue
   3. higher incidence in women
   4. all of the above

22. The main mechanism that metabolizes acetylcholine (ACh) at the neuromuscular junction is through:
   1. acetylcholinesterase (AChE) hydrolysis
   2. ACh dehydrogenase
   3. dopamine decarboxylase
   4. none of the above

23. What is the primary pathologic mechanism of autoimmune MG?
   1. overproduction of ACh
   2. decreased AChE synthesis
   3. a result of acetylcholine receptor (AChR) antibodies
   4. cholinergic nerve destruction

24. Anticholinesterases (eg, pyridostigmine) are used to treat MG patients. Which of the following medications are affected by this treatment?
   1. succinylcholine
   2. nondepolarizing muscle relaxants (eg, curare)
   3. ester-type local anesthetics
   4. all of the above

25. Which of the following medications have been reported to reduce neuromuscular transmission in MG patients and should be avoided in the perioperative period?
   1. aminoglycosides (eg, kanamycin, gentamycin, amikacin)
   2. beta blockers
   3. phenytoin
   4. all of the above

26. In general, the treatment for autoimmune MG consists of the following modalities EXCEPT:
   1. anticholinesterase drugs
   2. aminoglycosides
   3. immunosuppressants
   4. thymectomy

27. Which of the following preoperative criteria correlate with the need for postoperative ventilatory support in the MG patient undergoing thymectomy?
1. disease duration greater than 6 years
2. presence of chronic obstructive pulmonary disease
3. pyridostigmine dose greater than 750 mg per day during 48 hours before surgery
4. all of the above

28. Which of the following is false relating to an anesthetic plan regarding the MG patient?
1. a long-acting nondepolarizing neuromuscular relaxant is needed, as the patient is resistant to its effects
2. muscle relaxing properties associated with volatile anesthetic gases are beneficial in the maintenance of anesthetic depth for surgery
3. opioids are used with caution due to their ventilatory depressant effects
4. intravenous general anesthesia with propofol has been used successfully with easy control of depth, quick recovery, and without consequences at the neuromuscular junction

29. Which of the following are prudent criteria for extubation of the MG patient?
1. maintenance of head lift for more than 5 seconds
2. generate a sustained negative inspiratory force of more than –25 cm H₂O
3. the patient's respiratory rate is less than 30 per minute
4. all of the above

30. Select the true statement about prudent postoperative pain management in the MG patient:
1. postoperative analgesia can be achieved by use of heavy parental opioids
2. epidural narcotics provide excellent postoperative analgesia for the MG patient with much less incidence of respiratory depression
3. respiratory depression is not a major concern with opioid administration
4. all of the above

31. The apneic patient's source of O₂ during induction of anesthesia is the:
1. total lung capacity
2. functional residual capacity
3. tidal volume
4. inspiratory reserve volume

32. The explanation for hysteresis demonstrated on pressure-volume loops is:
1. surface tension is lower on lung inflation than lung deflation
2. surface tension is the same on both lung inflation and lung deflation
3. surface tension is higher on lung inflation than lung deflation
4. surface tension acts to “recruit” alveolar surface area

33. At constant lung volumes there is a(n):
1. increase in surface tension
2. narrowing of the alveolar ducts
3. increase in functional residual volume
4. decreased area of lung collapse

34. Which of the following factors does NOT augment surfactant production?
1. hypoinflation
2. adenosine triphosphate
3. beta-adrenergic agonists
4. stretching of alveolar surface

35. Propofol depresses diaphragmatic contractility because of:
1. enhanced excitation-contraction coupling
2. increased cardiac output
3. depression of membrane excitability
4. decreased diaphragmatic blood flow

36. The expected decrease in functional residual capacity when placing a patient in the supine position from the erect position is:
1. 100 to 200 mL
2. 250 to 400 mL
3. 500 to 1,000 mL
4. 1,500 to 2,000 mL

37. Which of the following factors does NOT contribute to the decrease in functional residual capacity under anesthesia?
1. relative distribution of blood from the periphery into the central blood compartment
2. chest wall configuration
3. relative distribution of blood volume between the thorax and abdomen
4. diaphragmatic position

38. What percentage of anesthetized patients develop atelectasis?
1. 45 to 50
2. 65 to 75
3. 85 to 90
4. 95 to 99

39. A normal vital capacity is approximately:
1. 10 to 12 mL/kg
2. 15 to 20 mL/kg
3. 65 to 69 mL/kg
4. 150 mL/kg

40. What governs the micromechanics of the pulmonary acinus at a constant low lung volume?
1. tissue resistance
2. surface forces  
3. airway resistance  
4. vascular forces

**Gender and pain**

41. The adverse physical effects of pain can affect nearly every body system. These effects may include:  
1. sympathetic nervous system stimulation  
2. decreased lung volume  
3. hyperglycemia  
4. all of the above

42. Nociceptors function primarily to:  
1. regulate breathing  
2. release endogenous endorphins  
3. respond to noxious stimuli  
4. depress the central nervous system

43. In 1994, the National Institutes of Health changed its funding rules to mandate:  
1. women and minorities be included in all clinical studies  
2. only females not of childbearing age be included in all clinical studies  
3. all females included in clinical studies must reveal hormonal levels when reporting findings  
4. no changes were made in funding rules

44. Painful disorders demonstrating a higher prevalence among females include all the following EXCEPT:  
1. fibromyalgia  
2. Raynaud disease  
3. pancreatic disease  
4. postdural puncture headache

45. Several theories exist to explain the higher occurrence of autoimmune disorders in females. Which of the following is a currently accepted theory?  
1. the presence of cell lines from one person that are present in another person  
2. the role of testosterone and estrogen  
3. chemical and environmental factors  
4. all the above

46. Regarding pain perception between males and females, select the correct statement.  
1. females have a lower pain threshold and a lower pain tolerance than males  
2. females have a higher pain threshold and a higher pain tolerance than males  
3. females have a lower pain threshold and a higher pain tolerance than males  
4. females have a higher pain threshold and a lower pain tolerance than males

47. Which of the following variables have not been identified as influencing reports of pain?  
1. level of anxiety of patient, time of pain report, and environment in which pain is reported  
2. hormonal status of patient, season and weather, and previous experiences with pain  
3. hemoglobin concentration, time of last meal ingestion, and music preference  
4. method of pain reporting, gender of pain interpreter, location of pain, and social and cultural beliefs

48. The definition of pain threshold is the:  
1. minimum amount of stimulation that reliably evokes a report of pain  
2. maximum amount of stimulation that reliably evokes a report of pain  
3. maximum time that a continuous painful stimulus is endured  
4. amount of time that a continuous painful stimulus is endured

49. The recent trend in research to analyze data between male and female patients has revealed:  
1. there is no difference between males and females in their response to certain drugs  
2. there are distinct gender distributions for certain pathophysiologic conditions  
3. gender bias never contributes to suboptimal analgesic intervention  
4. gender of the provider never influences clinical decisions regarding the treatment of reported pain

50. Some of the recently recognized differences between males and females in regard to response to medications has been identified in:  
1. opioids  
2. anesthetic agents  
3. antidepressants  
4. all of the above

**Cancer: New therapies and new approaches to recurring problems**

51. Adriamycin most frequently is toxic to which organ?  
1. heart  
2. lungs  
3. liver  
4. kidneys

52. Although controversial, caution with what agent is needed in patients who have received bleomycin?  
1. propofol  
2. succinylcholine  
3. oxygen  
4. sevoflurane
53. Which of the following are true for vertebrectomies?
   1. their aim is palliative
   2. vertebrae are removed
   3. positioning may be supine, lateral, or prone
   4. all of the above

54. In vertebroplasty and kyphoplasty what is injected into the vertebrae?
   1. lidocaine
   2. alcohol
   3. phenol
   4. polymethylmethacrylate

55. Reactions during sentinel node biopsy are most likely due to:
   1. manipulation of the melanoma lesions
   2. injection of radioactive dye
   3. injection of isosulfan blue
   4. concurrent use of etomidate

56. Allergic reactions during sentinel node biopsy should be treated:
   1. with epinephrine, steroids, H₂ blockers, and fluids
   2. with ephedrine first
   3. by lowering the anesthetic level
   4. not at all because it is self-limiting

57. Radiation therapy to the head and neck:
   1. has no effect on the ability to intubate
   2. can stiffen the tissue, making direct laryngoscopy impossible
   3. shrinks tumors, making fiberoptic intubation unnecessary
   4. causes pulse oximeters to read falsely low

58. Narrowing of the trachea or bronchi by tumor reduces airflow:
   1. and can be worsened by positive pressure ventilation
   2. that can be overcome by use of muscle relaxant
   3. that should be treated with administration of epinephrine
   4. is unimportant when the trachea is intubated

59. Cancer patients with cardiac tamponade:
   1. do not need to be treated
   2. will need cardiopulmonary bypass surgery
   3. have similar symptoms to patients with acute tamponade
   4. should always have general anesthesia

60. Cardiac effusion and tamponade are best treated by:
   1. beta blockers
   2. opioids
   3. pericardiocentesis or pericardial window
   4. very deep general anesthesia