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Po Box 997, Grove City, OH 43123

800-435-3131, 305-851-8081 FL Office, 614-883-1739 OH Office, 305-946-0232 Fax, Info@LaserTraining.org

Surgical Lasers Principles and Safety
Accredited Post Test

Provider approved by the California Board of Registered Nursing
Provider #CEP 12386 for up to 4.0 Contact Hours

Note: Most State Boards of Nursing accept another State Board’s approval for granting credits. Check with the Board of Nursing in your state for clarification. Certificates of Completion will be provided.

INSTRUCTIONS: Home Study / Online Course

Attached are post tests for each chapter of the Laser Medicine & Surgery Book. You may complete these enclosed tests and upon successful completion (70% correct answers) we will return to you a Certificate of Laser Training accredited for 4.0 Contact Hours.

Return the completed answer sheet (not the actual tests) to us via fax at 305-946-0232, or scan and email to info@lasertraining.org.

You can have additional staff view the program and take these tests for an additional \$85 per person.

The Tests include:

- 1. Laser & Energy Concepts; 2. Laser-Tissue Interactions; 3. Laser Safety (2 parts); and 4. Clinical Applications.

You may mail or fax the test answer sheets back to us for grading. You’ll have a separate answer sheet for each test. Tests and blank answer sheets are available at www.LaserTraining.org, on the “Home Study” pages, and then select “Tests”. Include on this application all of your information exactly as you would like it to appear on the certificate. If a fee is due the certificates will be mailed upon receipt of payment. Please also list the original purchasers name in the spaces provided.

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**Surgical Laser Principles & Safety
V100310**

Name _____ Date _____

(use the blank answer sheet for your answers)

1. **What is the difference between Spontaneous and Stimulated Emission of Light?**
 - a. Stimulated emission gives rise to an organized coherent output, while spontaneous does not.
 - b. Spontaneous emission produces more powerful beams of light than Stimulated
 - c. Stimulated emissions must always use electricity, but spontaneous uses another light source
 - d. The individual photons emitted through Stimulation are much brighter than spontaneous

2. **What are three unique characteristics of laser light?**
 - a. Monochromatic, Powerful and Collimated
 - b. Collimated, Coherent and Monochromatic
 - c. Coherent, Collimated and Powerful
 - d. Laser light always burns, always blinds, and is very bright

3. **Pick one individual who contributed toward development of laser medicine**
 - a. Leo Geovanni
 - b. Leon Goldman
 - c. Arthur Anderson
 - d. Joseph Marconi

4. **Why are lasers called "monochromatic" even though they may emit multiple lines of colors.**
 - a. The statement is false; they do only emit one color of light
 - b. They do emit different colors, but each color is a pure, narrow bandwidth
 - c. Monochromatic only means it emits one beam of light, even if it's multi-colored
 - d. The statement is false; it is monochromatic but lasers are infrared so colors don't apply

5. **Pick one area of medical application where the pure color of light is most important to its use.**
 - a. General Surgery
 - b. Urology – bladder tumors
 - c. Ophthalmology
 - d. Photodynamic Therapy

6. **What is the difference between a collimated beam of light and a divergent one.**
 - a. there is no difference, both divergent and collimated beams spread out
 - b. the beam spread from collimated beams is minimized compared to divergent ones
 - c. the beam spread from divergent beams is minimized compared to collimated ones
 - d. Collimated beams of light are always from laser, and divergent ones always from other light sources.

7. **What is the wavelength & color of the Nd:Yag Laser:**
 - a. 488 & 515nm Blue Green
 - b. 10,600 nm Far Infrared
 - c. 1064 nm near infrared
 - d. 532 nm Green

8. **Why can laser beams be more highly focused (small spots) than regular light sources.**
 - a. The lenses used by lasers are more powerful than other lenses
 - b. The laser is a very fine beam anyway so may be focused to smaller spots
 - c. Collimated beams from lasers have parallel rays of light so focus to smaller spots
 - d. The high power outputs allow more light to be focused into a smaller area.

9. **What does L-A-S-E-R stand for?**
 - a. Laser And Stimulated Emission of Radiation
 - b. Light And Sound Emittors of Radiation
 - c. Laser Amplification by Solid-State Electronic Remissions
 - d. Light Amplification by Stimulated Emission of Radiation

10. **Pick the laser which is customarily delivered through an articulated arm**
 - a. Nd:Yag
 - b. CO₂
 - c. Alexandrite
 - d. Argon

11. **What is the primary difference between the control of the spot size with bare fiber delivery (free beam applications) compared to the focusing lens of a CO₂ laser.**
 - a. Both use focusing lenses to achieve the small spots for surgical cutting & ablation
 - b. The CO₂ laser uses a handpiece lens while the fiber uses a microlens on its tip
 - c. Both are focused to small spots at the focal points of the lens
 - d. The CO₂ laser has a focal point, the bare fiber's spot keeps getting bigger with distance

12. **Depth of field of a focused (CO₂) laser beam is defined as:**
 - a. the distance from the laser lens to the smallest spot
 - b. the distance around the focal point, where the spot size remains essentially unchanged.
 - c. the distance the laser beam will travel through tissue
 - d. the focal point of the laser lens

13. **What are factors that determine power density of any laser beam**
 - a. TEM structure of the beam and peak power delivered
 - b. Spot size & Power
 - c. Power and Pulse duration
 - d. Wavelength and Power

14. **Where is the smallest spot of laser beam from a transmitting fiber.**
- 1 cm from the tip
 - just at the tip of the fiber itself, since it diverges and does not focus
 - the spot stays pretty much the same small spot since the beam is collimated
 - At the focal point of that particular transmitting fiber.
15. **Which best defines a true laser pulse?**
- an automatic timer or shutter which emits light consistently in controlled intervals, like 0.1 second pulses.
 - a compression of laser energy which momentarily emits power at a higher rate than the laser otherwise could in the continuous wave mode.
 - a burst of laser energy which creates shock waves
 - high power outputs of any type
16. **Which factor changes power density more rapidly?**
- spot size changes
 - laser power changes
 - Pulse width changes
 - wavelength changes
17. **Through which instrument(s) (device or attachment) may the CO₂ laser be delivered to tissue?**
- Flexible bronchoscope
 - Micromanipulator
 - Laparoscope
 - Both B & C
18. **The depth of field of a focused CO₂ laser beam is greatest with the use of:**
- a 125 mm focusing handpiece
 - a 280 mm laser laparoscope coupler
 - a 400 mm laser lens used on an operating microscope
 - a 50mm handpiece lens
19. **The laser wavelength which is most highly absorbed by water is:**
- The Ho:Yag (Holmium Yag)
 - The Nd:Yag (Neodymium Yag)
 - The CO₂ (Carbon Dioxide)
 - The He:Ne (Helium Neon)
20. **The laser wavelength which scatters most through tissue and causes the most diffuse coagulation injury is the:**
- The Ho:Yag (Holmium Yag)
 - The continuous wave Nd:Yag (Neodymium Yag)
 - The continuous wave CO₂ (Carbon Dioxide)
 - The HeNe (Helium Neon)
21. **Which laser is a non-thermal instrument:**
- 308nm Excimer laser for cardiology
 - 193nm Excimer laser for ophthalmology
 - 2.9u Er:Yag laser for dermatology
 - CO₂ laser for skin resurfacing

22. **How does light from a free beam laser heat tissue?**
- light creates a "photo-effect" within cells to vaporize them
 - light is absorbed by the tissues, which generates heat
 - the laser beam is hot and heats tissues when it shines on them
 - lasers all use cold-cutting capabilities with no heat generation
23. **The primary advantage of using pulsed laser energy on tissue is:**
- The procedure takes less time
 - The procedure is better tolerated by the patient
 - Thermal damage from the laser impact is more highly limited
 - Reimbursement rates are better for higher pulse powers
24. **Sapphire or contact tips, when added to the Nd:Yag laser, change the otherwise widespread coagulation created by that laser to very precise effects, by:**
- Acting as fine focusing lenses to increase power density
 - Acting as a thermal knife to convert laser energy absorbed by the tip, to conduction heat of the sapphire tip - a hot knife.
 - slowing down the procedure so that very low powers may be used
 - changing the wavelength so that laser now cuts
25. **The primary way to surgically change the tissue effect of any fiberoptically delivered laser (free beam) is:**
- to move the handpiece faster or slower
 - to repeatedly have the laser nurse alter the power output of the unit
 - to keep changing the wavelengths of light emitted
 - to alter the distance of the fiber tip from tissue, thereby changing power density
26. **Identify the laser below which relies on acoustical shock wave formation to create its tissue effects:**
- yellow light pulsed dye laser for dermatology, vascular lesions
 - Q-switch pulsed Nd:Yag laser for ophthalmology, "secondary" cataracts
 - CW Nd:Yag laser for urology,
 - Argon laser for ophthalmology, retinal photocoagulation
27. **Which laser application involves photochemical reactions, but does not involve either heat or shock wave generation from the laser:**
- laser assisted prostate resection in urology
 - photodynamic therapy to treat cancer
 - yellow light pulsed dye laser use in dermatology
 - fragmentation of kidney stones by pulsed dye laser, green light
28. **Which of the following laser pulses exhibit the highest fluence? (assume same spot sizes)**
- 1.5 joules delivered in 400 microseconds - 0.0004 seconds
 - 1.5 joules delivered in 1/20 of a second - 0.05 seconds
 - 1.5 joules delivered in 1/10 of a second - 0.2 seconds
 - 1.5 joules delivered in 1 second - 1.0 second

29. **With surgical lasers, the use of low laser power, when combined with larger spot sizes, can create unseen excessive burning of adjacent tissues, especially if char is allowed to form.**
- True
 - False
 - irrelevant question, power & spot size do not contribute to burning
 - True for infrared lasers only
30. **Surgical laser systems which can vaporize or photocoagulate tissues are classified by ANSI as:**
- Class I systems
 - Class II systems
 - Class III systems
 - Class IV systems
31. **The laser which presents a burn hazard only to the surface of the eye and not to the retina is:**
- CO₂ laser
 - Nd:Yag laser
 - Argon laser
 - Pulsed dye laser, yellow
32. **Which wavelength labeling of safety glasses offers protection for a KTP laser?**
- 10.6 micron
 - 1.06 micron (1064nm)
 - 488 to 515 nm
 - 532 nm
33. **For which type of laser does the glass optics in microscopes offer protection to the user, in lieu of safety glasses:**
- CO₂ laser
 - Nd:Yag laser
 - Argon laser
 - Pulsed dye laser, yellow
34. **Which one type of endotracheal tube is to be avoided when using the laser (most likely the CO₂ laser) directly in the airway:**
- Red rubber, wrapped with metal foil
 - PVC, polyvinylchloride
 - Silicone rubber
 - all metal Norton tubes
35. **Which laser presents the highest risk of igniting dry materials, like dry 4x4 sponges, in the surgical field:**
- CO₂ laser
 - Nd:Yag laser
 - Argon laser
 - Pulsed dye laser, yellow
36. **Select the laser below which does NOT present a retinal burn hazard:**
- CO₂ laser

- b. Nd:Yag laser
 - c. Argon laser
 - d. Pulsed dye laser, yellow
37. **What should be done to preclude damage to a flexible endoscope?**
- a. Fire the laser as it is advanced through the channel to clear it
 - b. If the fiber gets stuck push hard to ensure it clears the channel
 - c. Mark the fiber, or view directly on video to ensure it's outside the channel before firing.
 - d. Flush the channel with saline while firing to absorb the heat of the laser.
38. **What should be done when using the Ho:Yag laser, through rigid arthroscopes to preclude damage to the optics in the rigid scope:**
- a. Flush continuously with saline to absorb the heat
 - b. ensure that the fiber tip doesn't come too close to the telescope optic
 - c. Use only the laser resistant scopes
 - d. Have the telescope black anodized to reduce reflections
39. **Fiberoptic lasers such as the Nd:Yag present a fire or burn hazard to dry materials in which one of the following scenarios:**
- a. When the laser fiber is fired at a dry towel in the surgical field, but 9-12 inches away from the tip.
 - b. When the laser fiber is fired at a dry towel across the room from the laser fiber.
 - c. When the laser fiber is fired into a dry towel while the fiber tip is resting in the towel.
 - d. When the laser fiber is fired at a dry towel several inches away from the tip, while a contact fiber or tip is being used.
40. **For which laser does the glass in the windows of the operating room offer protection to viewers outside the room, so that NO additional window coverings are required:**
- a. CO2 laser
 - b. Nd:Yag laser
 - c. Argon laser
 - d. Pulsed dye laser, yellow
41. **When moistening sponges in the surgical field as a precaution for laser use, which materials are both safe and adequate to prevent the sponges from igniting:**
- a. Saline
 - b. Sterile distilled water
 - c. blood
 - d. All of the above
42. **For which laser can pools of irrigating solution serve as a backstop to the laser beam:**
- a. CO2 laser
 - b. Nd:Yag laser
 - c. Argon laser
 - d. Pulsed dye laser, yellow
43. **What characteristic of anodizing instruments causes its reflectivity of CO2 laser beams to be significantly reduced:**
- a. the dulled surface of the instrument it creates

- b. the black coloration on the instruments surface
 - c. a special process which changes the nature of the metal causing it to absorb all of the incident laser energy.
44. **Which one of the following statements regarding the radiation risks of the laser "environment" to pregnant women is most true:**
- a. Pregnant women should avoid working around lasers during the first trimester.
 - b. Pregnant women should avoid working around lasers during their entire term of pregnancy.
 - c. Laser "radiation" presents no risks to women in any stage of pregnancy.
 - d. Pregnant women should simply wear the radiation dosage tags to monitor
45. **Which item below is NOT a responsibility of the laser nurse/technician, functioning under the authority of the laser safety officer, during a laser procedure:**
- a. Post appropriate Laser Danger signs on the door(s) to the room
 - b. Ensure that the correct laser safety glasses are available and worn
 - c. Inform the operating physician of the correct laser power and other laser settings to use for the procedure.
 - d. Ensure compliance with the institutions safety policies and procedures
46. **Which wavelength labeling of safety glasses offers protection for a Pulsed Dye Yellow Light laser?**
- a. 10.6 micron
 - b. 1.06 micron (1064nm)
 - c. 585 nm
 - d. 2.1 micron
47. **Which wavelength labeling of safety glasses offers protection for a Ho:Yag laser?**
- a. 10.6 micron
 - b. 1.06 micron (1064nm)
 - c. 585 nm
 - d. 2.1 micron
48. **Which Optical Density of safety glasses offers the highest degree of protection from a Nd:Yag laser?**
- a. 7.0
 - b. 1064 nm
 - c. 10.6 microns
 - d. 4.0

49. **Which organizations provide guidelines or enforcement of laser safety/training:**
- A. American Hospital Association (AHA)
 - B. American National Standards Institute (ANSI)
 - C. American Society for Laser Medicine & Surgery (ASLMS)
 - D. Both B & C
50. **Who provides voluntary laser certification for nurses, operators & technicians?**
- A. The FDA
 - B. ANSI (American National Standards Institute)
 - C. The Laser Training Institute
 - D. National Council on Laser Excellence (NCLE)
51. **What best describes the ANSI safety regulations?**
- A. They are federally required safety regulations with the force of law
 - B. They are only suggestions from a volunteer agency and have no regulatory impact.
 - C. They are voluntary standards by themselves, but are used as a reference by other agencies such as OSHA and JCAHO for enforcement.
 - D. They apply only to higher powered industrial lasers and do not apply to medical nor aesthetic lasers.
52. **Most Surgical lasers are classified as which Hazard Class of Laser (ANSI)?**
- A. Class 1
 - B. Class 2
 - C. Class 3
 - D. Class 4
53. **All of the following are responsibilities of the LSO, EXCEPT:**
- A. Ensure that warning signs are posted
 - B. Ensure that physicians use appropriate power and exposure settings
 - C. Ensure that the entire O.R. staff has been properly trained in Laser Safety
 - D. Ensure that the lasers are properly maintained and serviced.

54. **How often are formal Laser Safety Audits required to be conducted within a facility to be in compliance with ANSI recommendations?**
- A. Every 6 months
 - B. Every year
 - C. No requirements
 - D. Each time the Laser Safety Officer position changes
55. **All Service Technicians should have:**
- A. An authorized service technician certificate from the manufacturer
 - B. A degree from a laser technical school
 - C. Documented laser safety training and education
 - D. Laser Repair Certification
56. **Which is a non-beam laser hazard?**
- A. Laser Plume
 - B. Skin burns
 - C. Retinal eye injury
 - D. Corneal burn
57. **Which hazard is probably greater with surgical laser use?**
- A. Direct hazards of the laser beam
 - B. Improper surgical procedures & use of the laser
 - C. Non-beam laser hazards such as electrical, etc.
 - D. Long term, unknown complications from laser use.
58. **The NHZ (Nominal Hazard Zone) requires that:**
- A. All personnel wear safety eyewear upon entering the room
 - B. All personnel wear safety eyewear only when inside the NHZ boundary
 - C. All personnel must follow all control measures within the NHZ
 - D. Both B & C
59. **How often must the alignment of the surgical laser beam be checked against its aiming beam?**
- A. Every Six months
 - B. Every Year
 - C. Every Case
 - D. Only during Periodic Maintenance (PM)
60. **Who determines the boundaries of the Nominal Hazard Zone**
- A. The operating physician
 - B. The Laser Safety Officer
 - C. The Laser Nurse/Operator in the room
 - D. No one, it is already set as the entire room for medical use

61. **Which organization can levy large fines against an institution/office for violation of laser safety standards?**
- A. ASLMS ,
 - B. OSHA
 - C. JCAHO
 - D. FDA-CDRH
62. **What are the requirements for the Laser Treatment Controlled Area (LTCA, or the Laser Room)**
- A. Safety Eyewear must be made available upon entry to this room
 - B. Safety Eyewear must be worn when entering this room
 - C. Only authorized personnel are to enter this room
 - D. Both A & C
63. **All Health Care Facilities, including hospitals, clinics, offices, etc. MUST appoint a Laser Safety Officer if lasers are used in the facility.**
- A. True
 - B. False
 - C. True for Hospitals and Surgical Facilities only
 - D. True for industrial laser settings only