BEST BMET
CBET STUDY GUIDE
MODULE VI

Medical Equipment Function and Operation

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CERTIFIED BIOMEDICAL EQUIPMENT TECHNICIAN (CBET)
STUDY GUIDE
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1. Continuous Doppler ultrasonic instruments are used to

   a. image body structure
   b. locate brain midline
   c. detect moving interface
   d. provide deep tissue heating
   e. all of the above

2. The primary function of soda lime crystals in an anesthesia machine is to

   a. remove microorganisms from the patient airway circuit
   b. absorb the carbon dioxide
   c. purify the nitrous oxide
   d. remove water vapor

3. The typical band pass for aortic blood-pressure monitor waveforms is about

   a. 0.05 to 100Hz
   b. DC to 30 Hz
   c. 1 to 20 Hz
   d. 25 to 1000 Hz

4. The output frequency of a therapeutic ultrasound unit is approximately

   a. 1000 Hz
   b. 10 kHz
   c. 100 kHz
   d. 1 MHz
   e. 10 MHz

5. If proper technique is used, the patient's impedance between the defibrillator's paddles during the discharge should be about

   a. 50 ohms
   b. 500 ohms
   c. 5000 ohms
   d. 50,000 ohms

6. A typical output pulse from an internal cardiac pacemaker would be about

a. 5 volts for 1 mS
b. 1 volt for 820 mS
c. 10 volts for 5.0 mS
d. 1 millivolt for 1 mS

7. The gamma or scintillation camera is primarily used to study body organ

a. function
b. location
c. density
d. motion

8. The velocity of ultrasonic waves through typical soft tissues is about

a. 100 meters/second
b. 500 meters/second
c. 1100 meters/second
d. 1500 meters/second

9. The function of the monochromator in a spectrophotometer is to

a. prevent simultaneous testing on more than one sample
b. select a narrow band of the light spectrum
c. prevent double-beam operation interference
d. adjust the width of the light exit slit

10. In pulmonary function testing, the purpose of the multiple breath nitrogen washout test is to obtain the

a. maximum flow rate
b. functional residual capacity
c. tidal volume
d. closing volume

11. On a respiratory ventilator, the 'PEEP' control would

a. adjust the sound of the 'alarm' circuit
b. prompt the operator to check all control settings
c. activate the personal effective effort prediction circuit
d. set the plethysmographic expiration error prevention range
e. be used to increase functional residual capacity

12. The crest factor for an electro surgical unit in the

a. ratio of the peak voltage to the RMS voltage
b. maximum output power available
c. optimal spark-gap spacing
d. relationship of load impedance to source impedance

13. In an electrocardiogram, the bipolar leads are

a. I, II, & III
b. aVR, aVL, & aVFV
c. 1 through V6
d. all of the above

14. The change in electrical impedance in the human chest due to respiration during quiet breathing is about

a. 5 milliohm
b. 500 milliohm
c. 5 ohms
d. 50 ohms

15. In fetal monitoring, the fetal heart rate information may be obtained by

a. a fetal scalp electrode
b. maternal abdominal electrodes
c. a phono-transducer
d. an ultrasound transducer
e. any of the above

16. For an infant radiant warmer, the radiated energy should have wavelengths between

a. 0.2 and 1.0 micron
b. 1.0 and 3.0 microns
c. 3.0 and 10 microns
d. 10 and 100 microns

17. During pulmonary function nitrogen washout test, the patient breathes

a. room air
b. pure nitrogen
c. air with increased carbon dioxide
d. pure oxygen

18. Electromyograph amplifiers require a frequency bandpass of about

a. DC to 100 Hz
b. DC to 20 Hz
c. 10 to 3000 Hz
d. 1 to 50 Hz

19. The resonant frequency of a blood pressure transducer and its plumbing system is determined by the

a. length and diameter of the catheter used
b. presence of small air bubbles
c. type and number of stopcocks used
d. all of the above

20. The AHA required frequency response for diagnostic ECG signals is

a. 0.5 to 50 Hz.
b. 0.05 to 100 Hz.
c. DC to 20 Hz.
d. DC to 500 Hz.

21. The primary reason for using 'bootstrapping' with biomedical amplifiers is for

a. improved defibrillation protection
b. greater hum shielding
c. increased output pressure
d. the elimination of DC offsets

22. The basic advantage of 'fluid column' ECG monitoring electrodes is the

a. reduction of electrode impedances
b. increase in ECG signal strengths
c. elimination of wandering base lines
d. reduction of artifacts due to patient movements

23. In electroencephalograms records from scalp electrodes, the P-P amplitudes and the frequency spectrum of the typical signals are

a. 2 mV and 0.05 Hz to 100 Hz
b. 10 uV and 2 Hz to 100 Hz
c. 50 uV and 0.5 Hz to 100 Hz
d. 100 mV and 1 Hz to 10 kHz

24. The current in an X-ray tube is controlled by the

a. applied KVP
b. exposure time
c. filament resistance
d. filament temperature

25. A normal adult male's vital capacity would be about

a. 600 mL2 liters
b. 5 liters
c. 10 liters

26. The resistance of a typical medical thermistor

a. decreased as temperature increases
b. increases as temperature increases
c. is not affected by temperature changes
d. changes linearly with large temperature changes

27. The characteristic of any X-ray tube that primarily determines the geometric sharpness of its roentgenographs is the

a. focal spot size
b. composition of the target
c. angle of the target
d. cooling capacity of the tube
e. KVP applied

28. The type of therapeutic energy that is normally used for heating the bone/muscle interface is

a. shortwave diathermy
b. microwave diathermy
c. induction-coil diathermy
d. ultrasound
e. condenser field diathermy

29. ECG-monitor interference caused by an electrosurgical unit can be minimized by

a. placing the return plate directly under the surgical site
b. placing the ECG electrodes equally distant and as far away as possible from the surgical site
c. placing all ECG electrodes on the frontal surface, or all on the posterior surface of the patient
d. using shielded ECG patient cables and lead wires
e. all of the above

30. The typical chart-speed for an EEG is

a. 15 mm/sec
b. 25 mm/sec
c. 30 mm/sec
d. 45 mm/sec
e. 60 mm/sec

31 An instrument used to measure the intensity of light by comparing light from two different light sources is called a(n)radiation monitor

a. oscilloscope
b. photometer
c. electromanometer

32. The three most commonly reported arterial blood gas measurements are Pa02, PaC02, and

a. pHPa
b. N2Pa
c. H20
d. HC03-

33. When the rate and depth of respiration are reduced, the PaCO2

a. goes up due to hypocapnia
b. goes up due to retention of C02
c. goes down due to hypercapnia
d. goes down due to increased excretion of C02

34. The normal range for blood pH in a healthy adult is

a. 6.95 to 7.05
b. 7.00 to 7.25
c. 7.35 to 7.45
d. 7.45 to 7.65

35. The normal range for Pa02 in a healthy adult is

a. 20 to 40 mmHg
b. 60 to 80 mmHg
c. 80 to 100 mmHg
d. 110 to 130 mmHg

36. Separating a mixture of substances by means of solvents flowing on a column of aluminum oxide or filter paper is called

a. dynography
b. cytoanalysis
c. densitometry
d. chromatography

37. To detect lead II, an electrocardiograph uses two electrodes usually placed on the

a. left arm and left leg
b. right arm and left arm
c. right arm and left leg
d. left arm and right leg

38. An instrument that records changes in the volume of an organ or vessel by measuring changes in the quantity of blood thereiî ió called

a. aplethysmograph
b. hemomanometer
c. cytoanalyzer
d. densitometer

39. Which one of the following diagnostic techniques involves the use of radioactive pharmaceuticals

a. nuclear medicine
b. radiology
c. nuclear magnetic resonance
d. sonography

40. A diagnostic device that includes a multichannel collimator, a sodium iodide crystal, and an array of photomultipliers is called a

a. photometer
b. scintillation projector
c. mass spectrometer
d. gamma camera

41. The diagnostic imaging procedure in which various anatomical data are digitally reconstructed from X-ray transmission data obtained by scanning an area from many directions is called

a. ultrasound imaging
b. computerized axial tomography
c. magnetic resonance imaging
d. digital radiology

42. The X-ray tube anode current is controlled by adjusting the

a. filament voltage and anode temperature.
b. anode reactance and collimator aperture.
c. filament reactance with anode current.
d. filament current with compensation for anode voltage variations.

43. A toxin removed from the body during hemodialysis is

a. creatinine
b. hemoglobin
c. iodine
d. cholinesterase

44. Every heart-lung machine includes a blood pump and a(n)

a. sterilizer
b. gas exchanger
c. electrosurgery device
d. anesthesia monitor

45. The purpose of induced hypothermia for a patient on a heart- lung machine in open-heart surgery is to reduce

a. blood cell hemolysis
b. metabolic 02 requirements
c. time under anesthesia
d. recurrent coagulation

46. For invasive blood pressure measurement, the transducer should be placed at the same level as the patient's heart in order to avoid

a. hydrostatic pressure interference
b. catheter whip
c. overdamping the pressure wave
d. transducer imbalance

47. The upper limit for a heart rate alarm on a patient monitor should be set to indicate alarm if which one of the following arrhythmias occurs

a. sinus bradycardia
b. missed beats
c. asystole
d. ventricular tachycardia

48. A fetal monitor usually records fetal heart rate and

a. maternal dilation
b. intracranial pressure
c. uterine activity
c. maternal arrhythmia

49. A pulmonary capillary wedge pressure is obtained with a Swan- Ganz catheter to approximate

a. right atrial mean pressure
b. left ventricular and diastolic pressure
c. pulmonary artery pressure
d. right ventricular mean pressure

50. An item commonly used to obtain a cardiac output measurement is a(n)

a. blood pressure transducer
b. electrocardiograph
c. external pacemaker
d. injectate

51. An automatic blood pressure cuff that is too narrow for the patient's arm may cause

a. artificially low blood pressure readings
b. artificially high blood pressure readings
c. difficulty in hearing Korotkoff sounds
d. difficulty in deflating the cuff

52. Coagulation, fulguration, and cutting are the three main functions of

a. electrosurgery
b. haemostatis
c. cryosurgery
d. cyanosis

53. A device used to convert a biological variable to an electrical variable is called a

a. transducer
b. transmitter
c. biosphere
d. bionic device

54. In a cathode ray tube, the motion of the electrodes is controlled by vertical and horizontal deflection plates where the amount of deflection is proportional to the

a. resistance
b. current
c. voltage
d. inductance

55. Ultrasound refers to sound waves with a frequency greater than 16,000 cycles per second that are generated by

a. piezoelectric crystals
b. pulse generators
c. Doppler effects
d. electrostatic discharges

56. Normal cardiac output for an average 70-kg adult is

a. 0.5 liter per minute
b. 1 liter per minute
c. 3 liters per minute
d. 5 liters per minute

57. For optimum performance, nickel-cadmium batteries should be charged in an environment where the ambient temperature is

a. 0-20 degrees Celsius
b. 10-40 degrees Celsius
c. 20-30 degrees Celsius
d. 30-40 degrees Celsius

58. Cell reversal may occur in a multi-cell nickel-cadmium battery pack when discharge continues after

a. one or more cells are depleted before the others
b. the battery pack has been overcharged
c. it develops voltage depression, referred to as 'memory'
d. an individual cell develops an internal 'short'

59. Magnetic resonance signals are often synchronized to the patient's ECG signal in order to

a. detect nuclear spins
b. prevent motion artifact
c. monitor patient vital signs
d. image cross-sectional heart tissue

60. Refer to the pages of drawings and schematics; see Drawing 14. Which one of the following ECG strips shows clipping of the waveform

a.
b.
c.
d.

61. What is the wavelength of a CO2 laser

a. 10,600nm
b. 450nm
c. 1,060nm
d. 632.8nm

62. Where should the tip of a Swan-Ganz catheter be positioned when measuring cardiac output

a. dicrotic notch
b. right atrium
c. left ventricle
d. pulmonary artery

63. What is the name of the technique used to destroy cellular components by placing an active ESU electrodå iî direcô contacô witè tissue¬ whilå □ sufficienô current is flowing

a. fulguration
b. hemostasis
c. desiccation
d. volatilization

64. Which type of diathermy uses piezoelectric material to transfer energy to the patient

a. microwave diathermy
b. shortwave diathermy
c. infrared diathermy
d. ultrasonic diathermy

65. The soda lime found in an anesthesia machine absorber is used to

a. remove water
b. remove bacteria
c. remove carbon dioxide
d. remove nitrous oxide

66. The defibrillator is not used in the synchronized mode to counteract

a. ventricular fibrillation
b. atrial fibrillation
c. junctional tachycardia
d. ventricular tachycardia

67. Hydrostatic pressure caused by the fluid in blood pressure tubing makes it necessary to have a blood pressure transducer positioned at

a. the head height of the patient
b. the same height as the catheter tip
c. the same height as the catheter entrance into the patient
d. the same height as the bed

68. Which of the following devices is used to noninvasively monitor oxygen saturation by monitoring the light absorbance changes caused by arterial blood flow pulsations

a. pulse Oximeter
b. transcutaneous Monitor
c. blood Gas Machine
d. oculoplethysmograph

69. An ECG lead configuration which measures the voltage between one electrode and the average of two other limb leads is

a. a bipolar lead configuration
b. an augmented lead configuration
c. a precordial lead configuration
d. an inferior complex lead configuration

70. Which of the following uses a rotating or phased array transducer to produce a fan-shaped, two-dimensional image on a diagnostic ultrasound machine

a. A-mode
b. B-mode
c. M-mode
d. delta-mode

71. What is the purpose of a Bucky grid on a X-ray machine

a. more accurately time patient exposures
b. increase tube anode current
c. sharpen an image by absorbing scattered rays
d. prolong the useful life of tubes by reducing filament current

72. In a laboratory colorimeter, if the path length or concentration increases, then the transmittance decreases, and the

a. pH increases
b. pH decreases
c. absorbance increases
d. optical density decreases

73. Which of the following accurately describes the voltage level range of EEG signals at the cranial surface

a. 1 to 100 microvolts
b. 1 to 100 minivolts
c. 1 to 1000 minivolts
d. 1 to 10 microvolts

74. Which of the following is used in the process of gas sterilization

a. cyclopropane
b. carbon Dioxide
c. ethylene Oxide
d. sulfur Dioxide

75. Plastics, rubbers, synthetics, and other substances which cannot tolerate high temperatures are candidates for which type of sterilization

a. gas
b. steam
c. dry Heat
d. these types of items cannot be safely sterilized

76. Which of the following statements regarding readings on a pH meter is correct

a. a pH of 7 is considered alkaline
b. a pH of 0 is considered neutral
c. a pH of 9 is considered acidic
d. a pH of 2 is considered acidic

77. The Clark type of oxygen electrode features which of the following in its construction

a. a platinum tip with a polyethylene membrane
b. zinc and copper rods in a glass tube
c. silver button with a conductive gel, surrounded by an adhesive coated paper or foam backing
d. calomel and pure mercury

78. Which of the following is true about an intra-aortic balloon pump

a. it is a device used for aorta angioplasty
b. it improves perfusion through the coronary arteries and reduces the coronary work load
c. it is a device introduced into the aorta during coronary bypass
d. it is a pump that inflates the angta-balloon

79. In ultrasound instruments used for imaging, the images are obtained from

a. acoustic waves reflected from different encountered structures
b. acoustic waves transmitted through tissue
c. Doppler frequency shifts
d. electromagnetic waves

80. The most common blood gas measurements are

a. N2 and O2
b. air and nitrous oxide
c. O2 and C0
d. PO2 and PCO2

81. Which of the following best describes the operating principle used by the mass spectrometer

a. the optical spectrum of reflected light
b. the effect of a strong magnetic field on an ionized gas mixture
c. the spectrum of transmitted light through a sample of a gas mixture
d. the effect of the electromagnetic spectrum on mass

82. In a X-ray machine which component shapes the X-ray beam

a. X-ray Tube
b. collimator
c. Bucky grid
d. pulse duration timer

83. For an electrocardiogram, lead II refers to the voltage between

a. left leg and right arm
b. left arm and right leg
c. left leg and right leg
d. right arm and right leg

84. An electronic device that creates a sustained myocardial depolarization of the heart to stop ventricular or atrial fibrillation, is known as

a. electrocardiograph
b. electroencephalograph
c. defibrillator
d. pacemaker

85. Which of the following is a device used to measure and analyze lung functions:

a. plethysmograph
b. pulmonary function analyzer
c. pheresis system
d. electromyograph

86. The EEG is used clinically in examination for suspected

a. brain tumor
b. arrhythmias
c. murmurder
d. matosis

87. Which of the following best describes a typical X-ray tube

a. diode
b. triode
c. thyratron
d. photomultiplier

88. If a thermistor has a negative temperature coefficient, which of the following is true

a. resistance increases when temperature increases
b. resistance remains constant when temperature decreases
c. resistance decreases when temperature decreases
d. resistance decreases when temperature increases

89. Some mechanical thermal strip chart recorders utilize a 'knife edge' over which the paper passes during the writing process. This type of writing edge is necessary because

a. it would otherwise be impossible to cut the paper after use
b. the stylus is too hot to contact the paper directly
c. the galvanometer itself has a poor frequency response
d. of the curvilinear path of the stylus

90. Which of the following is NOT correct regarding the construction of a simple resistor/ammeter test fixture for the inspection of electrosurgical units

a. load resistors must be inductive, high wattage type
b. thermocouple RF ammeter must be used
c. load resistors should have a value of 200 - 500 ohms
d. a meter range of 0 to about 1.5 A is desirable