Attachment 80

To: Federal Communications Commission
Personal Radio Branch
2025 M Street, N.W., Room 5328
Washington, DC 20554
Attn: Tom Fitz-Gibbon, Attorney

From: Dave Morse WW7K
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Date: September 29, 1991

Dear Tom,

As per the tape enclosed you will find the following. Sandra Crane was acting as a member of the VE team administering the exams. This is clearly a conflict of interest in that the two owners of the school made and supplied the code tests and administered the written and code exams.

Sandra: The VE's are not paid but we comp. them to lunch or dinner.

Charlie talking to Mike Bryant: You or Ray or **SANDY** can interpret questions during the test.

This clearly shows that Sandra had planned to stay in the testing session and act as an examiner. Sandra did stay in the session most of the time. There were times where no Ve was present during testing. Jim Mc Kinley was rarely in the room during any testing session. The Ve's frequently deferred to Sandra and Charlie for instructions on using and locating test materials. It is obvious the Ve's had no control over the material to be administered, written and code.

On the tape you will find Sandra giving instructions on the code and written tests. This clearly shows she is acting as an examiner.

Dialogue between Mike, Charlie and Sandy indicates Charlie and Sandy knew the content of the test tape and the VE's did not

The VE (Mike) was looking at a test copy and insisted that the tape started with 6V's and Charlie and Sandra are adamant that the test starts with the word novice and there are no 6 V's. A copy of the code test shows there are no series of v's at the start.

Mike Bryant asks Charlie for the code test tape. Charlie replies that Sandy has the tape and calls out to Sandy to get the tape.

The following is a transcription of the code. Please notice that the random letters at the beginning are not random. They appear to follow a widely accepted format of teaching the code, such as sending all dits first, then the dahs, followed by letter patterns consisting of dits and dahs. Even the numerals follow the standard teaching patterns.

NOVICE 5 0 1 9 2 8 3 7 4 6

H	S	I	E	O	M	T	N	A	D	U	K	R
....	...	..	.	---	--	-	-.	.-	-..	..-	-.-	.-.

G W B V F L Y Q C J P X Z . / BK SK AR BT

THE NAME IS DON AND I AM IN TENNESSEE.
THE TRAIN IS NOT AT THE STATION.

The examining Ve team consisted of: Michael Bryant, N6UBW, Raymond A. Navarro, N6RXX, James E. Mc Kinley, N6RPC. A Danny ? acted as a Ve in that he corrected the written tests with Ray Navarro.

Dave Morse
OOC, Los Angeles Section

Chris McElwain

ATTACHMENT 405

W5YI, P.O. Box #565101, Dallas, Texas, 75356 - Tel. (817)461-6443 Published February, 1991

The Radio Amateur's

ELEMENT 3(A)

Technician Class Test Manual

Contains all questions & answers in the Technician Class VEC Question Pool

Updated for the new Codeless Technician rules

All accredited Volunteer Examiners (VE's) and Volunteer Examiner Coordinator (VEC) organizations are required to use these Technician Class questions verbatim in preparing their Element 3(A) examinations. These test questions were released into the public domain by the VEC organizations' Question Pool Committee on July 1, 1990. The purpose of this test manual is to alert the public to the content of the Element 3(A) question pool. It is not a study guide since no explanations of the answers are included.

Contents:

SUBELEMENT 3AA - Commission's Rules (5 Questions)

1. What is the control point of an amateur station? [3AA-1.1]
   A. The location at which the control operator function is performed
   B. The operating position of any Amateur Radio station operating as a repeater user station
   C. The physical location of any Amateur Radio transmitter, even if it is operated by radio link from some other location
   D. The variable frequency oscillator (VFO) of the transmitter

2. What is the term for the location at which the control operator function is performed? [3AA-1.2]
   A. The operating desk
   B. The control point
   C. The station location
   D. The manual control location

3. Which operator licenses authorize privileges on 52.525 MHz? [3AA-2.2]
   A. Extra, Advanced only
   B. Extra, Advanced, General only
   C. Extra, Advanced, General, Technician only
   D. Extra, Advanced, General, Technician, Novice

4. Which operator licenses authorize privileges on 146.52 MHz? [3AA-2.3]
   A. Extra, Advanced, General, Technician, Novice
   B. Extra, Advanced, General, Technician only
   C. Extra, Advanced, General only
   D. Extra, Advanced only

5. Which operator licenses authorize privileges on 223.50 MHz? [3AA-2.4]
   A. Extra, Advanced, General, Technician, Novice
   B. Extra, Advanced, General, Technician only
   C. Extra, Advanced, General only
   D. Extra, Advanced only

6. Which operator licenses authorize privileges on 446.0 MHz? [3AA-2.5]
   A. Extra, Advanced, General, Technician, Novice
   B. Extra, Advanced, General, Technician only
   C. Extra, Advanced, General only
   D. Extra, Advanced only

7. How often do amateur service licenses generally need to be renewed? [3AA-3.1]
   A. Every 10 years
   B. Every 5 years
   C. Every 2 years
   D. They are lifetime licenses

8. The FCC currently issues amateur licenses carrying 10-year terms. What is the "grace period" during which the FCC will renew an expired 10-year license? [3AA-3.2]
   A. 2 years
   B. 5 years
   C. 10 years
   D. There is no grace period

9. What action would you take to modify your operator/primary station license? [3AA-3.3]
   A. Properly fill out FCC Form 610 and send it to the FCC in Gettysburg, PA
   B. Properly fill out FCC Form 610 and send it to the nearest FCC field office
   C. Write the FCC at their nearest field office
   D. There is no need to modify an amateur license between renewals

10. On what frequencies within the 6-meter wavelength band may FM phone emissions be transmitted? [3AA-4.1]
   A. 50.0-54.0 MHz only
   B. 50.1-54.0 MHz only
   C. 51.0-54.0 MHz only
   D. 52.0-54.0 MHz only

11. On what frequencies within the 2-meter wavelength band may FM image emissions be transmitted? [3AA-4.2]
   A. 144.1-148.0 MHz only
   B. 146.0-148.0 MHz only
   C. 144.0-148.0 MHz only
   D. 146.0-147.0 MHz only

12. What emission type may always be used for station identification, regardless of the transmitting frequency? [3AA-4.3]
   A. CW
   B. RTTY
   C. MCW
   D. Phone

13. If you are using a frequency within a band designated to the amateur service on a secondary basis and another station assigned to a primary service on that band causes interference, what action should you take? [3AA-5.1]
   A. Notify the FCC's regional Engineer in Charge of the interference
   B. Increase your transmitter's power to overcome the interference
   C. Attempt to contact the station and request that it stop the interference
   D. Change frequencies; you may also be causing interference to the other station and that would be a violation of FCC rules

14. What is the basic principle of frequency sharing between two stations allocated to a primary service within a frequency band, but each in a different ITU Region or Subregion? [3AA-5.2]
A. The station with a control operator holding a lesser class of license must yield the frequency to the station with a control operator holding a higher class license
B. The station with a lower power output must yield the frequency to the station with a higher power output
C. Both stations have an equal right to operate on the frequency
D. Stations in ITU Regions 1 and 3 must yield the frequency to stations in ITU Region 2

15. FCC Rules specify the maximum transmitter power that you may use with your Amateur Radio station. At what point in your station is the transmitter power measured? [3AA-6-1.1]
A. By measuring the final amplifier supply voltage inside the transmitter or amplifier
B. By measuring the final amplifier supply current inside the transmitter or amplifier
C. At the antenna terminals of the transmitter or amplifier
D. On the antenna itself, after the feed line

16. What is the term used to define the average power supplied to the antenna transmission line during one RF cycle at the crest of the modulation envelope? [3AA-6-1.2]
A. Peak transmitter power
B. Peak output power
C. Average radio-frequency power
D. Peak envelope power

17. Notwithstanding the numerical limitations in the FCC Rules, how much transmitting power shall be used by an amateur station? [3AA-6-2.1]
A. There is no regulation other than the numerical limits
B. The minimum power level required to achieve S9 signal reports
C. The minimum power necessary to carry out the desired communication
D. The maximum power available, as long as it is under the allowable limit

18. What is the maximum transmitting power permitted an amateur station on 146.52 MHz? [3AA-6-3.1]
A. 200 watts PEP output
B. 500 watts ERP
C. 1000 watts DC input
D. 1500 watts PEP output

19. What is the maximum transmitting power permitted an amateur station in beacon operation? [3AA-6-4.1]
A. 10 watts PEP output
B. 100 watts PEP output
C. 500 watts PEP output
D. 1500 watts PEP output

20. What is the maximum sending speed permitted for a RTTY transmission between 28 and 50 MHz? [3AA-7-1.1]
A. 56 kilobauds
B. 19.6 kilobauds
C. 1200 bauds
D. 300 bauds

21. What is the maximum sending speed permitted for a RTTY transmission between 50 and 220 MHz? [3AA-7-1.2]
A. 56 kilobauds
B. 19.6 kilobauds
C. 1200 bauds
D. 300 bauds

22. What is the maximum sending speed permitted for a RTTY transmission above 220 MHz? [3AA-7-1.3]
A. 300 bauds
B. 1200 bauds
C. 19.6 kilobauds
D. 56 kilobauds

23. What is the maximum frequency shift permitted for RTTY when transmitted below 50 MHz? [3AA-7-2.1]
A. 100 Hz
B. 500 Hz
C. 1000 Hz
D. 5000 Hz

24. What is the maximum frequency shift permitted for RTTY when transmitted above 50 MHz? [3AA-7-2.2]
A. 100 Hz or the sending speed, in bauds, whichever is greater
B. 500 Hz or the sending speed, in bauds, whichever is greater
C. The FCC rules do not specify a maximum frequency shift above 50 MHz
D. 5000 Hz or the sending speed, in bauds, whichever is greater

25. What is the maximum authorized bandwidth of an RTTY, data or multiplexed emission using a specified digital code within the frequency range of 50 to 225 MHz? [3AA-7-3.1]
A. 20 kHz
B. 50 kHz
C. The total bandwidth shall not exceed that of a single-sideband emission
D. The total bandwidth shall not exceed 10 times that of a CW emission

26. What is the maximum authorized bandwidth of a RTTY, data or multiplexed emission using an unspecified digital code within the frequency range of 220 to 450 MHz? [3AA-7-3.2]
A. 50 kHz
B. 150 kHz
C. 200 kHz
D. 100 kHz

27. What is the maximum authorized bandwidth of an RTTY, data or multiplexed emission using an unspecified digital code within the 420 to 450 MHz amateur band? [3AA-7-3.3]
A. 50 kHz
B. 200 kHz
C. 300 kHz
D. 100 kHz

28. How must a control operator who has a Novice license and a Certificate of Successful Completion of Examination for Technician privileges identify the station when transmitting on 146.34 MHz? [3AA-8-1.1]
A. The new Technician may not operate on 146.34 until his or her new license arrives
B. The licensee gives his or her call sign, followed by any suitable word that denotes the slant mark and the identifier "KT"
C. No special form of identification is needed
D. The licensee gives his or her call sign and states the location of the VE examination where he or she obtained the certificate of successful completion

29. Which language(s) must be used when making the station identification by telephony? [3AA-8-2.1]
A. The language being used for the contact may be used if it is not English, providing the US has a third-party traffic agreement with that country
B. English must be used for identification
C. Any language may be used, if the country which uses that language is a member of the International Telecommunication Union
D. The language being used for the contact must be used for identification purposes

30. What does the FCC recommend to aid correct station identification when using phone? [3AA-8-3.1]
A. A speech compressor
B. Q signals
C. A recognized phonetic alphabet
D. Unique words of the operator's choice

31. What is the term used to describe an amateur station transmitting communications for the purpose of observation of propagation and reception or other related experimental activities? [3AA-9-1.1]
A. Beacon operation
B. Repeater operation
C. Auxiliary operation
D. Radio control operation

32. What class of amateur operator license must you hold to operate a beacon station? [3AA-9-2.1]
A. Technician, General, Advanced or Amateur Extra class
B. General, Advanced or Amateur Extra class
C. Amateur Extra class only
D. Any license class

33. What is the maximum transmitter power an amateur station is permitted when transmitting signals to control a model craft? [3AA-10.1]
A. One watt
B. One milliwatt
C. Two watts
D. Three watts

34. What minimum information must be indicated on the label affixed to a transmitter transmitting signals to control a model craft? [3AA-10.2]
A. Station call sign
B. Station call sign and operating times
C. Station call sign and the station licensee's name and address
D. Station call sign, class of license, and operating times

35. What are the station identification requirements for an amateur station transmitting signals to control a model craft? [3AA-10.3]
A. Once every ten minutes, and at the beginning and end of each transmission
B. Once every ten minutes
C. At the beginning and end of each transmission
D. Station identification is not required provided that a label indicating the station call sign and the station licensee's name and address is affixed to the station transmitter

36. Where must the writing indicating the station call sign and the licensee's name and address be affixed in order to operate under the special rules for radio control of remote model craft and vehicles? [3AA-10.4]
A. It must be in the operator's possession
B. It must be affixed to the transmitter
C. It must be affixed to the craft or vehicle
D. It must be filed with the nearest FCC Field Office

37. If an amateur repeater is causing harmful interference to another amateur repeater and a frequency coordinator has coordinated (recommends) the operation of one station and not the other, who is primarily responsible for resolving the interference? [3AA-11-1.1]
A. The licensee of the non-coordinated (unrecommended) repeater
B. Both repeater licensees
C. The licensee of the coordinated (recommended) repeater
D. The frequency coordinator

38. If an amateur repeater is causing harmful interference to another amateur repeater and a frequency coordinator has coordinated (recommends) the operation of both stations, who is primarily responsible for resolving the interference? [3AA-11-1.2]
A. The licensee of the repeater which has been coordinated for the longest period of time
B. Both repeater licensees
C. The licensee of the repeater which has been coordinated the most recently
D. The frequency coordinator

39. If an amateur repeater is causing harmful interference to another amateur repeater and a frequency coordinator has not coordinated the operation of either station, who is primarily responsible for resolving the interference? [3AA-11-1.3]
A. Both repeater licensees
B. The licensee of the repeater which has been in operation for the longest period of time
C. The licensee of the repeater which has been in operation for the shortest period of time
D. The frequency coordinator

40. Under what circumstances does the FCC declare a temporary state of communication emergency? [3AA-11-2.1]
A. When a declaration of war is received from Congress
B. When the maximum usable frequency goes above 28 MHz
C. When communications facilities in Washington, DC, are disrupted
D. When a disaster disrupts normal communications systems in a particular area

41. By what means should a request for a declaration of a temporary state of communication emergency be initiated? [3AA-11-2.2]
A. Communication with the FCC Engineer-In-Charge of the affected area
B. Communication with the US senator or congressman for the area affected
C. Communication with the local Emergency Coordinator
D. Communication with the Chief of the FCC Private Radio Bureau

42. What information is included in an FCC declaration of a temporary state of communication emergency? [3AA-11-2.3]
A. Designation of the areas affected and of organizations authorized to use radio communications in the affected area
B. Designation of amateur frequency bands for use only by amateurs participating in emergency communications in the affected area, and complete suspension of Novice operating privileges for the duration of the emergency
C. Any special conditions and special rules to be observed during the communication emergency
D. Suspension of amateur rules regarding station identification and business communication

43. If a disaster disrupts normal communication systems in an area where the amateur service is regulated by the FCC, what kinds of transmissions are authorized to amateur stations in such an area? [3AA-11-2.4]
A. Communications which are necessary to meet essential communication needs and facilitate relief actions
B. Communications which allow a commercial business to continue to operate in the affected area
C. Communications for which material compensation has been paid to the amateur operator for delivery into the affected area
D. Communications which are to be used for program production or newsgathering for broadcasting purposes

44. What is meant by the term broadcasting? [3AA-12.1]
A. Transmissions intended for reception by the general public, either direct or relayed
B. Retransmission by automatic means of programs or signals emanating from any class of station other than amateur
C. The transmission of any one-way radio communication, regardless of purpose or content
D. Any one-way or two-way radio communication involving more than two stations

45. Which of the following is an amateur station that cannot automatically retransmit signals of other amateur stations? [3AA-12.2]
A. Auxiliary station
B. Repeater station
C. Beacon station
D. Space station

46. Which of the following is an amateur station that is permitted to automatically retransmit signals of other amateur stations? [3AA-12.3]
A. Beacon station
B. Space station
C. Official bulletin station
D. RACES station

47. Signals from what type of radio station may be directly retransmitted by an amateur station? [3AA-12.4]
A. AM radio station
B. Police or fire department radio station
C. NOAA weather station
D. US Government communications between the space shuttle and associated Earth stations with prior approval from the National Aeronautics and Space Administration (NASA)

48. When may US Government communications between the space shuttle and associated Earth stations be directly retransmitted by an amateur station? [3AA-12.5]
A. After prior approval has been obtained from the FCC in Washington, DC
B. No radio stations other than amateur may be retransmitted in the amateur service
C. After prior approval has been obtained from the National Aeronautics and Space Administration (NASA)
D. After prior approval has been obtained from the nearest FCC Engineer-In-Charge

49. What kinds of one-way communications by amateur stations are not considered broadcasting? [3AA-13.1]
A. All types of one-way communications by amateurs are considered by the FCC as broadcasting
B. Beacon operation, remote control of a device, emergency communications, information bulletins consisting solely of subject matter of direct interest to the amateur service, and telegraphy practice
C. Only code-practice transmissions conducted simultaneously on all available amateur bands below 30 MHz and conducted for more than 40 hours per week are not considered broadcasting
D. Only actual emergency communications during a declared communications emergency are exempt

50. Which of the following one-way communications may not be transmitted in the amateur service? [3AA-13.2]
A. Transmissions to remotely control a device at a distant location
B. Transmissions to assist persons learning or improving their proficiency in Morse code
C. Brief transmissions to make adjustments to the station
D. Transmission of music

51. What kinds of one-way information bulletins may be transmitted by amateur stations? [3AA-13.3]
A. NOAA weather bulletins
B. Commuter traffic reports from local radio stations
C. Regularly scheduled announcements concerning Amateur Radio equipment for sale or trade
D. Messages directed only to amateur operators consisting solely of subject matter of direct interest to the amateur service

52. What types of one-way amateur communications may be transmitted by an amateur station? [3AA-13.4]
A. Beacon operation, radio control, code practice, retransmission of other services
B. Beacon operation, radio control, transmitting an unmodulated carrier, NOAA weather bulletins
C. Beacon operation, remote control of a device, information bulletins consisting solely of subject matter of direct interest to the amateur service, telegraphy practice and emergency communications
D. Beacon operation, emergency-drill-practice transmissions, automatic retransmission of NOAA weather transmissions, code practice

53. What types of material compensation, if any, may be involved in third-party traffic transmitted by an amateur station? [3AA-14.1]
A. Payment of an amount agreed upon by the amateur operator and the parties involved
B. Assistance in maintenance of auxiliary station equipment
C. Donation of amateur equipment to the control operator
D. No compensation may be accepted

54. What types of business communications, if any, may be transmitted by an amateur station on behalf of a third party? [3AA-14.2]
A. The FCC rules specifically prohibit communications with a business for any reason
B. Business communications involving the sale of Amateur Radio equipment
C. Communications to a business may be provided during an emergency as provided by the FCC rules
D. Business communications aiding a broadcast station

55. Does the FCC allow third-party messages when communicating with Amateur Radio operators in a foreign country? [3AA-14.3]
A. Third-party messages with a foreign country are only allowed on behalf of other amateurs.
B. Yes, provided the third-party message involves the immediate family of one of the communicating amateurs
C. Under no circumstances may US amateurs exchange third-party messages with an amateur in a foreign country
D. Yes, when communicating with a person in a country with which the US shares a third-party agreement

56. Under what circumstances, if any, may a third party participate in radio communications from an amateur station if the third party is ineligible to be a control operator of one of the stations? [3AA-15.1]
A. A control operator must be present at the control point and continuously monitor and supervise the third party participation. Also, contacts may only be made with amateurs in the US and countries with which the US has a third-party communications agreement
B. A control operator must be present and continuously monitor and supervise the radio communication to ensure compliance with the rules only if contacts are made with amateurs in countries with which the US has no third-party traffic agreement
C. A control operator must be present and continuously monitor and supervise the radio communication to ensure compliance with the rules. In addition, the control operator must key the transmitter and make the station identification.
D. A control operator must be present and continuously monitor and supervise the radio communication to ensure compliance with the rules. In addition, if contacts are made on frequencies below 30 MHz, the control operator must transmit the call signs of both stations involved in the contact at 10-minute intervals

57. Where must the control operator be situated when a third party is participating in radio communications from an amateur station? [3AA-15.2]
A. If a radio remote control is used, the control operator may be physically separated from the control point, when provisions are incorporated to shut off the transmitter by remote control
B. If the control operator supervises the third party until he or she is satisfied of the competence of the third party, the control operator may leave the control point
C. The control operator must be present at the control point
D. If the third party holds a valid radiotelegraph license issued by the FCC, no supervision is necessary

58. What must the control operator do while a third party is participating in radio communications? [3AA-15.3]
A. If the third party holds a valid commercial radiotelegraph license, no supervision is necessary
B. The control operator must tune up and down 5 kHz from the transmitting frequency on another receiver, to ensure that no interference is taking place
C. If a radio control link is available, the control operator may leave the room
D. The control operator must continuously monitor and supervise the third party's participation

59. In an exchange of international third-party communications, when is the station identification procedure required? [3AA-15.4]
A. Only at the beginning of the communications
B. At the end of each exchange of communications
C. The station identification procedure is not required during international third-party communications
D. Only at the end of multiple exchanges of communications

60. Under what circumstances, if any, may an amateur station transmit radio communications containing obscene words? [3AA-16.1]
A. Obscene words are permitted when they do not cause interference to any other radio communication or signal
B. Obscene words are prohibited in Amateur Radio transmissions
C. Obscene words are permitted when they are not retransmitted through repeater or auxiliary stations
D. Obscene words are permitted, but there is an unwritten rule among amateurs that they should not be used on the air

61. Under what circumstances, if any, may an amateur station transmit radio communications containing indecent words? [3AA-16.2]
A. Indecent words are permitted when they do not cause interference to any other radio communication or signal
B. Indecent words are permitted when they are not retransmitted through repeater or auxiliary stations
C. Indecent words are permitted, but there is an unwritten rule among amateurs that they should not be used on the air
D. Indecent words are prohibited in Amateur Radio transmissions

62. Under what circumstances, if any, may an amateur station transmit radio communications containing profane words? [3AA-16.3]
A. Profane words are permitted when they are not retransmitted through repeater or auxiliary stations
B. Profane words are permitted, but there is an unwritten rule among amateurs that they should not be used on the air
C. Profane words are prohibited in Amateur Radio transmissions
D. Profane words are permitted when they do not cause interference to any other radio communication or signal

63. Which of the following VHF/UHF bands may not be used by Earth stations for satellite communications? [3AA-17.1]
A. 6 meters
B. 2 meters
C. 1.25 meters
D. 70 centimeters

SUBELEMENT 3AB - Operating Procedures (3 Questions)

64. What is the meaning of: "Your report is five seven..."? [3AB-1.1]
A. Your signal is perfectly readable and moderately strong
B. Your signal is perfectly readable, but weak
C. Your signal is readable with considerable difficulty
D. Your signal is perfectly readable with near pure tone

65. What is the meaning of: "Your report is three three..."? [3AB-1.2]
A. The contact is serial number thirty-three
B. The station is located at latitude 33 degrees
C. Your signal is readable with considerable difficulty and weak in strength
D. Your signal is unreadable, very weak in strength

66. What is the meaning of: "Your report is five nine plus 20 dB..."? [3AB-1.3]
A. Your signal strength has increased by a factor of 100
B. Repeat your transmission on a frequency 20 kHz higher
C. The bandwidth of your signal is 20 decibels above linearity
D. A relative signal-strength meter reading is 20 decibels greater than strength 9

67. How should a QSO be initiated through a station in repeater operation? [3AB-2-1.1]
A. Say "breaker, breaker 79"
B. Call the desired station and then identify your own station
C. Call "CQ" three times and identify three times
D. Wait for a "CQ" to be called and then answer it

68. Why should users of a station in repeater operation pause briefly between transmissions? [3AB-2-1.2]
A. To check the SWR of the repeater
B. To reach for pencil and paper for third party traffic
C. To listen for any hams wanting to break in
D. To dial up the repeater's autopatch

69. Why should users of a station in repeater operation keep their transmissions short and thoughtful? [3AB-2-1.3]
A. A long transmission may prevent someone with an emergency from using the repeater
B. To see if the receiving station operator is still awake
C. To give any non-hams that are listening a chance to respond
D. To keep long-distance charges down

70. What is the proper procedure to break into an on-going QSO through a station in repeater operation? [3AB-2-1.4]
A. Wait for the end of a transmission and start calling
B. Shout, "break, break!" to show that you're eager to join the conversation
C. Turn on your 100-watt amplifier and override whoever is talking
D. Send your call sign during a break between transmissions

71. What is the purpose of repeater operation? [3AB-2-1.5]
A. To cut your power bill by using someone's higher power system
B. To enable mobile and low-power stations to extend their usable range
C. To reduce your telephone bill
D. To call the ham radio distributor 50 miles away

72. What is meant by "making the repeater time out"? [3AB-2-1.6]
A. The repeater's battery supply has run out
B. The repeater's transmission time limit has expired during a single transmission
C. The warranty on the repeater duplexer has expired
D. The repeater is in need of repairs

73. During commuting rush hours, which types of operation should relinquish the use of the repeater? [3AB-2-1.7]
A. Mobile operators
B. Low-power stations
C. Highway traffic information nets
D. Third-party communications nets

74. Why should simplex be used where possible instead of using a station in repeater operation? [3AB-2-2.1]
A. Farther distances can be reached
B. To avoid long distance toll charges
C. To avoid tying up the repeater unnecessarily
D. To permit the testing of the effectiveness of your antenna

75. When a frequency conflict arises between a simplex operation and a repeater operation, why does good amateur practice call for the simplex operation to move to another frequency? [3AB-2-2.2]
A. The repeater's output power can be turned up to ruin the front end of the station in simplex operation
B. There are more repeaters than simplex operators
C. Changing the repeater's frequency is not practical
D. Changing a repeater frequency requires the authorization of the Federal Communications Commission

76. What is the usual input/output frequency separation for stations in repeater operation in the 2-meter wavelength band? [3AB-2-3.1]
A. 1 MHz
B. 1.6 MHz
C. 170 Hz
D. 0.6 MHz

77. What is the usual input/output frequency separation for stations in repeater operation in the 70-centimeter band? [3AB-2-3.2]
A. 1.6 MHz
B. 5 MHz
C. 600 kHz
D. 5 kHz

78. What is the usual input/output frequency separation for a 6-meter station in repeater operation? [3AB-2-3.3]
A. 1 MHz
B. 600 kHz
C. 1.6 MHz
D. 20 kHz

79. What is the usual input/output frequency separation for a 1.25-meter station in repeater operation? [3AB-2-3.4]
A. 1000 kHz
B. 600 kHz
C. 1600 kHz
D. 1.6 GHz

80. What is a repeater frequency coordinator? [3AB-2-4.1]
A. Someone who coordinates the assembly of a repeater station
B. Someone who provides advice on what kind of system to buy
C. The club's repeater trustee
D. A person or group that recommends frequency pairs for repeater usage

81. Why should local amateur communications be conducted on VHF and UHF frequencies? [3AB-3.1]
A. To minimize interference on HF bands capable of long-distance sky-wave communication
B. Because greater output power is permitted on VHF and UHF
C. Because HF transmissions are not propagated locally
D. Because absorption is greater at VHF and UHF frequencies

82. How can on-the-air transmissions be minimized during a lengthy transmitter testing or loading up procedure? [3AB-3.2]
A. Choose an unoccupied frequency
B. Use a dummy antenna
C. Use a non-resonant antenna
D. Use a resonant antenna that requires no loading up procedure

83. What is the proper Q signal to use to determine whether a frequency is in use before making a transmission? [3AB-3.3]
A. QRV?
B. QRU?
C. QRL?
D. QRZ?

84. What is the proper distress calling procedure when using telephony? [3AB-4.1]
A. Transmit MAYDAY
B. Transmit QRRR
C. Transmit QRZ
D. Transmit SOS

85. What is the proper distress calling procedure when using telegraphy? [3AB-4.2]
A. Transmit MAYDAY
B. Transmit QRRR
C. Transmit QRZ
D. Transmit SOS

86. What is one requirement you must meet before you can participate in RACES drills? [3AB-5-1.1]
A. You must be registered with ARRL
B. You must be registered with a local racing organization
C. You must be registered with the responsible civil defense organization
D. You need not register with anyone to operate RACES

87. What is the maximum amount of time allowed per week for RACES drills? [3AB-5-1.2]
A. Eight hours
B. One hour
C. As many hours as you want
D. Six hours, but not more than one hour per day

88. How must you identify messages sent during a RACES drill? [3AB-5-2.1]
A. As emergency messages
B. As amateur traffic
C. As official government messages
D. As drill or test messages

89. What is the term used to describe first-response communications in an emergency situation? [3AB-6-1.1]
A. Tactical communications
B. Emergency communications
C. Formal message traffic
D. National Traffic System messages

90. What is one reason for using tactical call signs such as "command post" or "weather center" during an emergency? [3AB-6-1.2]
A. They keep the general public informed about what is going on
B. They promote efficiency and coordination in public-service communications activities
C. They are required by the FCC
D. They promote goodwill among amateurs

91. What is the term used to describe messages sent into or out of a disaster area that pertain to a person's well being? [3AB-6-2.1]
A. Emergency traffic
B. Tactical traffic
C. Formal message traffic
D. Health and welfare traffic

92. Why is it important to provide a means of operating your amateur station separate from the commercial AC power lines? [3AB-6-3.1]
A. So that you can take your station mobile
B. So that you can provide communications in an emergency
C. So that you can operate field day
D. So that you will comply with Subpart 97.169 of the FCC Rules

93. Which type of antenna would be a good choice as part of a portable HF amateur station that could be set up in case of a communications emergency? [3AB-6-3.2]
A. A three-element quad
B. A three-element Yagi
C. A dipole
D. A parabolic dish

SUBELEMENT 3AC - Radio-Wave Propagation (3 Questions)

94. What is the ionosphere? [3AC-1-1.1]
A. That part of the upper atmosphere where enough ions and free electrons exist to affect radio-wave propagation
B. The boundary between two air masses of different temperature and humidity, along which radio waves can travel
C. The ball that goes on the top of a mobile whip antenna
D. That part of the atmosphere where weather takes place

95. What is the region of the outer atmosphere that makes long-distance radio communications possible as a result of bending of radio waves? [3AC-1-1.2]
A. Troposphere
B. Stratosphere
C. Magnetosphere
D. Ionosphere

96. What type of solar radiation is most responsible for ionization in the outer atmosphere? [3AC-1-1.3]
A. Thermal
B. Ionized particle
C. Ultraviolet
D. Microwave

97. Which ionospheric layer limits daytime radio communications in the 80-meter wavelength band to short distances? [3AC-1-2.1]
A. D layer
B. F1 layer
C. E layer
D. F2 layer

98. What is the lowest ionospheric layer? [3AC-1-2.2]
A. The A layer
B. The D layer
C. The E layer
D. The F layer

99. What is the lowest region of the ionosphere that is useful for long-distance radio wave propagation? [3AC-1-3.1]
A. The D layer
B. The E layer
C. The F1 layer
D. The F2 layer

100. Which layer of the ionosphere is mainly responsible for long-distance sky-wave radio communications? [3AC-1-4.1]
A. D layer
B. E layer
C. F1 layer
D. F2 layer

101. What are the two distinct sub-layers of the F layer of the ionosphere during the daytime? [3AC-1-4.2]
A. Troposphere and stratosphere
B. F1 and F2
C. Electrostatic and electromagnetic
D. D and E

102. Which two daytime ionospheric layers combine into one layer at night? [3AC-1-4.3]
A. E and F1
B. D and E
C. F1 and F2
D. E1 and E2

103. Which layer of the ionosphere is most responsible for absorption of radio signals during daylight hours? [3AC-2.1]
A. The E layer
B. The F1 layer
C. The F2 layer
D. The D layer

104. When is ionospheric absorption most pronounced? [3AC-2.2]
A. When tropospheric ducting occurs
B. When radio waves enter the D layer at low angles
C. When radio waves travel to the F layer
D. When a temperature inversion occurs

105. During daylight hours, what effect does the D layer of the ionosphere have on 80-meter radio waves? [3AC-2.3]
A. The D layer absorbs the signals
B. The D layer bends the radio waves out into space
C. The D layer refracts the radio waves back to earth
D. The D layer has little or no effect on 80-meter radio wave propagation

106. What causes ionospheric absorption of radio waves? [3AC-2.4]
A. A lack of D layer ionization
B. D layer ionization
C. The presence of ionized clouds in the E layer
D. Splitting of the F layer

107. What is usually the condition of the ionosphere just before sunrise? [3AC-3.1]
A. Atmospheric attenuation is at a maximum
B. Ionization is at a maximum
C. The E layer is above the F layer
D. Ionization is at a minimum

108. At what time of day does maximum ionization of the ionosphere occur? [3AC-3.2]
A. Dusk
B. Midnight
C. Midday
D. Dawn

109. Minimum ionization of the ionosphere occurs daily at what time? [3AC-3.3]
A. Shortly before dawn
B. Just after noon
C. Just after dusk
D. Shortly before midnight

110. When is E layer ionization at a maximum? [3AC-3.4]
A. Dawn
B. Midday
C. Dusk
D. Midnight

111. What is the name for the highest radio frequency that will be refracted back to earth? [3AC-4.1]
A. Lowest usable frequency
B. Optimum working frequency
C. Ultra high frequency
D. Critical frequency

112. What causes the maximum usable frequency to vary? [3AC-4.2]
A. Variations in the temperature of the air at ionospheric levels
B. Upper-atmospheric wind patterns
C. The amount of ultraviolet and other types of radiation received from the sun
D. Presence of ducting

113. What does the term maximum usable frequency refer to? [3AC-4.3]
A. The maximum frequency that allows a radio signal to reach its destination in a single hop
B. The minimum frequency that allows a radio signal to reach its destination in a single hop
C. The maximum frequency that allows a radio signal to be absorbed in the lowest ionospheric layer
D. The minimum frequency that allows a radio signal to be absorbed in the lowest ionospheric layer

114. When two stations are within each other's skip zone on the frequency being used, what mode of propagation would it be desirable to use? [3AC-5.1]
A. Ground wave propagation
B. Sky wave propagation
C. Scatter-mode propagation
D. Ionospheric ducting propagation

115. You are in contact with a distant station and are operating at a frequency close to the maximum usable frequency. If the received signals are weak and somewhat distorted, what type of propagation are you probably experiencing? [3AC-5.2]
A. Tropospheric ducting
B. Line-of-sight propagation
C. Backscatter propagation
D. Waveguide propagation

116. What is the transmission path of a wave that travels directly from the transmitting antenna to the receiving antenna called? [3AC-6.1]
A. Line of sight
B. The sky wave
C. The linear wave
D. The plane wave

117. How are VHF signals within the range of the visible horizon propagated? [3AC-6.2]
A. By sky wave
B. By direct wave
C. By plane wave
D. By geometric wave

118. Ducting occurs in which region of the atmosphere? [3AC-7.1]
A. F2
B. Ionosphere
C. Troposphere
D. Stratosphere

119. What effect does tropospheric bending have on 2-meter radio waves? [3AC-7.2]
A. It increases the distance over which they can be transmitted
B. It decreases the distance over which they can be transmitted
C. It tends to garble 2-meter phone transmissions
D. It reverses the sideband of 2-meter phone transmissions

120. What atmospheric phenomenon causes tropospheric ducting of radio waves? [3AC-7.3]
A. A very low pressure area
B. An aurora to the north
C. Lightning between the transmitting and receiving station
D. A temperature inversion

121. Tropospheric ducting occurs as a result of what phenomenon? [3AC-7.4]
A. A temperature inversion
B. Sun spots
C. An aurora to the north
D. Lightning between the transmitting and receiving station

122. What atmospheric phenomenon causes VHF radio waves to be propagated several hundred miles through stable air masses over oceans? [3AC-7.5]
A. Presence of a maritime polar air mass
B. A widespread temperature inversion
C. An overcast of cirriform clouds
D. Atmospheric pressure of roughly 29 inches of mercury or higher

123. In what frequency range does tropospheric ducting occur most often? [3AC-7.6]
A. LF
B. MF
C. HF
D. VHF

SUBELEMENT 3AD - Amateur Radio Practice (4 Questions)

124. Where should the green wire in an AC line cord be attached in a power supply? [3AD-1-1.1]
A. To the fuse
B. To the "hot" side of the power switch
C. To the chassis
D. To the meter

125. Where should the black (or red) wire in a three-wire line cord be attached in a power supply? [3AD-1-1.2]
A. To the filter capacitor
B. To the DC ground
C. To the chassis
D. To the fuse

126. Where should the white wire in a three-wire line cord be attached in a power supply? [3AD-1-1.3]
A. To the side of the transformer's primary winding that has a fuse
B. To the side of the transformer's primary winding without a fuse
C. To the black wire
D. To the rectifier junction

127. Why is the retaining screw in one terminal of a light socket made of brass while the other one is silver colored? [3AD-1-1.4]
A. To prevent galvanic action
B. To indicate correct wiring polarity
C. To better conduct current
D. To reduce skin effect

128. How much electrical current flowing through the human body is usually fatal? [3AD-1-2.1]
A. As little as 100 milliamperes may be fatal
B. Approximately 10 amperes is required to be fatal
C. More than 20 amperes is needed to kill a human being
D. No amount of current will harm you. Voltages of over 2000 volts are always fatal, however

129. What is the minimum voltage considered to be dangerous to humans? [3AD-1-2.2]
A. 30 volts
B. 100 volts
C. 1000 volts
D. 2000 volts

130. How much electrical current flowing through the human body is usually painful? [3AD-1-2.3]
A. As little as 50 milliamperes may be painful
B. Approximately 10 amperes is required to be painful
C. More than 20 amperes is needed to be painful to a human being
D. No amount of current will be painful. Voltages of over 2000 volts are always painful, however

131. Where should the main power-line switch for a high voltage power supply be situated? [3AD-1-3.1]
A. Inside the cabinet, to interrupt power when the cabinet is opened
B. On the rear panel of the high-voltage supply
C. Where it can be seen and reached easily
D. This supply should not be switch-operated

132. How is a voltmeter typically connected to a circuit under test? [3AD-2-1.1]
A. In series with the circuit
B. In parallel with the circuit
C. In quadrature with the circuit
D. In phase with the circuit

133. How can the range of a voltmeter be extended? [3AD-2-2.1]
A. By adding resistance in series with the circuit under test
B. By adding resistance in parallel with the circuit under test
C. By adding resistance in series with the meter
D. By adding resistance in parallel with the meter

134. How is an ammeter typically connected to a circuit under test? [3AD-3-1.1]
A. In series with the circuit
B. In parallel with the circuit
C. In quadrature with the circuit
D. In phase with the circuit

135. How can the range of an ammeter be extended? [3AD-3-2.1]
A. By adding resistance in series with the circuit under test
B. By adding resistance in parallel with the circuit under test
C. By adding resistance in series with the meter
D. By adding resistance in parallel with the meter

136. What is a multimeter? [3AD-4.1]
A. An instrument capable of reading SWR and power
B. An instrument capable of reading resistance, capacitance and inductance
C. An instrument capable of reading resistance and reactance
D. An instrument capable of reading voltage, current and resistance

137. Where in the antenna transmission line should a peak-reading wattmeter be attached to determine the transmitter output power? [3AD-5-1.1]
A. At the transmitter output
B. At the antenna feed point
C. One-half wavelength from the antenna feed point
D. One-quarter wavelength from the transmitter output

138. For the most accurate readings of transmitter output power, where should the RF wattmeter be inserted? [3AD-5-1.2]
A. The wattmeter should be inserted and the output measured one-quarter wavelength from the antenna feed point
B. The wattmeter should be inserted and the output measured one-half wavelength from the antenna feed point
C. The wattmeter should be inserted and the output power measured at the transmitter antenna jack
D. The wattmeter should be inserted and the output power measured at the Transmatch output

139. At what line impedance are RF wattmeters usually designed to operate? [3AD-5-1.3]
A. 25 ohms
B. 50 ohms
C. 100 ohms
D. 300 ohms

140. What is a directional wattmeter? [3AD-5-1.4]
A. An instrument that measures forward or reflected power
B. An instrument that measures the directional pattern of an antenna
C. An instrument that measures the energy consumed by the transmitter
D. An instrument that measures thermal heating in a load resistor

141. If a directional RF wattmeter indicates 90 watts forward power and 10 watts reflected power, what is the actual transmitter output power? [3AD-5-2.1]
A. 10 watts
B. 80 watts
C. 90 watts
D. 100 watts

142. If a directional RF wattmeter indicates 96 watts forward power and 4 watts reflected power, what is the actual transmitter output power? [3AD-5-2.2]
A. 80 watts
B. 88 watts
C. 92 watts
D. 100 watts

143. What is a marker generator? [3AD-6.1]
A. A high-stability oscillator that generates a series of reference signals at known frequency intervals
B. A low-stability oscillator that "sweeps" through a band of frequencies
C. An oscillator often used in aircraft to determine the craft's location relative to the inner and outer markers at airports
D. A high-stability oscillator whose output frequency and amplitude can be varied over a wide range

144. What type of circuit is used to inject a frequency calibration signal into a communications receiver? [3AD-6.2]
A. A product detector
B. A receiver incremental tuning circuit
C. A balanced modulator
D. A crystal calibrator

145. How is a marker generator used? [3AD-6.3]
A. To calibrate the tuning dial on a receiver
B. To calibrate the volume control on a receiver
C. To test the amplitude linearity of an SSB transmitter
D. To test the frequency deviation of an FM transmitter

146. What piece of test equipment produces a stable, low-level signal that can be set to a specific frequency? [3AD-7.1]
A. A wavemeter
B. A reflectometer
C. A signal generator
D. A balanced modulator

147. What is an RF signal generator commonly used for? [3AD-7.2]
A. Measuring RF signal amplitude
B. Aligning receiver tuned circuits
C. Adjusting the transmitter impedance-matching network
D. Measuring transmission line impedance

148. What is a reflectometer? [3AD-8-1.1]
A. An instrument used to measure signals reflected from the ionosphere
B. An instrument used to measure radiation resistance
C. An instrument used to measure transmission-line impedance
D. An instrument used to measure standing wave ratio

149. What is the device that can indicate an impedance mismatch in an antenna system? [3AD-8-1.2]
A. A field-strength meter
B. A set of lecher wires
C. A wavemeter
D. A reflectometer

150. For best accuracy when adjusting the impedance match between an antenna and feed line, where should the match-indicating device be inserted? [3AD-8-2.1]
A. At the antenna feed point
B. At the transmitter
C. At the midpoint of the feed line
D. Anywhere along the feed line

151. Where should a reflectometer be inserted into a long antenna transmission line in order to obtain the most valid standing wave ratio indication? [3AD-8-2.2]
A. At any quarter-wavelength interval along the transmission line
B. At the receiver end
C. At the antenna end
D. At any even half-wavelength interval along the transmission line

152. When adjusting a transmitter filter circuit, what device is connected to the transmitter output? [3AD-9.1]
A. A multimeter
B. A set of Litz wires
C. A receiver
D. A dummy antenna

153. What is a dummy antenna? [3AD-9.2]
A. An isotropic radiator
B. A nonradiating load for a transmitter
C. An antenna used as a reference for gain measurements
D. The image of an antenna, located below ground

154. Of what materials may a dummy antenna be made? [3AD-9-3]
A. A wire-wound resistor
B. A diode and resistor combination
C. A noninductive resistor
D. A coil and capacitor combination

155. What station accessory is used in place of an antenna during transmitter tests so that no signal is radiated? [3AD-9.4]
A. A Transmatch
B. A dummy antenna
C. A low-pass filter
D. A decoupling resistor

156. What is the purpose of a dummy load? [3AD-9.5]
A. To allow off-the-air transmitter testing
B. To reduce output power for QRP operation
C. To give comparative signal reports
D. To allow Transmatch tuning without causing interference

157. How many watts should a dummy load for use with a 100-watt single-sideband phone transmitter be able to dissipate? [3AD-9.6]
A. A minimum of 100 watts continuous
B. A minimum of 141 watts continuous
C. A minimum of 175 watts continuous
D. A minimum of 200 watts continuous

158. What is an S-meter? [3AD-10.1]
A. A meter used to measure sideband suppression
B. A meter used to measure spurious emissions from a transmitter
C. A meter used to measure relative signal strength in a receiver
D. A meter used to measure solar flux

159. A meter that is used to measure relative signal strength in a receiver is known as what? [3AD-10.2]
A. An S-meter
B. An RST-meter
C. A signal deviation meter
D. An SSB meter

160. Large amounts of RF energy may cause damage to body tissue, depending on the wavelength of the signal, the energy density of the RF field, and other factors. How does RF energy effect body tissue? [3AD-11-1.1]
A. It causes radiation poisoning
B. It heats the tissue
C. It cools the tissue
D. It produces genetic changes in the tissue

161. Which body organ is most susceptible to damage from the heating effects of radio frequency radiation? [3AD-11-1.2]
A. Eyes
B. Hands
C. Heart
D. Liver

162. Scientists have devoted a great deal of effort to determine safe RF exposure limits. What organization has established an RF protection guide? [3AD-11-2.1]
A. The Institute of Electrical and Electronics Engineers
B. The American Radio Relay League
C. The Environmental Protection Agency
D. The American National Standards Institute

163. What is the purpose of the ANSI RF protection guide? [3AD-11-2.2]
A. It protects you from unscrupulous radio dealers
B. It sets RF exposure limits under certain circumstances
C. It sets transmitter power limits
D. It sets antenna height requirements

164. The American National Standards Institute RF protection guide sets RF exposure limits under certain circumstances. In what frequency range is the maximum exposure level the most stringent (lowest)? [3AD-11-2.3]
A. 3 to 30 MHz
B. 30 to 300 MHz
C. 300 to 3000 MHz
D. Above 1.5 GHz

165. The American National Standards Institute RF protection guide sets RF exposure limits under certain circumstances. Why is the maximum exposure level the most stringent (lowest) in the ranges between 30 MHz and 300 MHz? [3AD-11-2.4]
A. There are more transmitters operating in this frequency range
B. There are fewer transmitters operating in this frequency range
C. Most transmissions in this frequency range are for an extended time
D. Human body lengths are close to whole-body resonance in that range

166. The American National Standards Institute RF protection guide sets RF exposure limits under certain circumstances. What is the maximum safe power output to the antenna terminal of a hand-held VHF or UHF radio, as set by this RF protection guide? [3AD-11-2.5]
A. 125 milliwatts
B. 7 watts
C. 10 watts
D. 25 watts

167. After you make internal tuning adjustments to your VHF power amplifier, what should you do before you turn the amplifier on? [3AD-11-3.1]
A. Remove all amplifier shielding to ensure maximum cooling
B. Connect a noise bridge to eliminate any interference
C. Be certain all amplifier shielding is fastened in place
D. Be certain no antenna is attached so that you will not cause any interference

SUBELEMENT 3AE - Electrical Principles (2 Questions)

168. What is meant by the term resistance? [3AE-1-1.1]
A. The opposition to the flow of current in an electric circuit containing inductance
B. The opposition to the flow of current in an electric circuit containing capacitance
C. The opposition to the flow of current in an electric circuit containing reactance
D. The opposition to the flow of current in an electric circuit that does not contain reactance

169. What is an ohm? [3AE-1-2.1]
A. The basic unit of resistance
B. The basic unit of capacitance
C. The basic unit of inductance
D. The basic unit of admittance

170. What is the unit measurement of resistance? [3AE-1-2.2]
A. Volt
B. Ampere
C. Joule
D. Ohm

171. Two equal-value resistors are connected in series. How does the total resistance of this combination compare with the value of either resistor by itself? [3AE-1-3.1]
A. The total resistance is half the value of either resistor
B. The total resistance is twice the value of either resistor
C. The total resistance is the same as the value of either resistor
D. The total resistance is the square of the value of either resistor

172. How does the total resistance of a string of series-connected resistors compare to the values of the individual resistors? [3AE-1-3.2]
A. The total resistance is the square of the sum of all the individual resistor values
B. The total resistance is the square root of the sum of the individual resistor values
C. The total resistance is the sum of the squares of the individual resistor values
D. The total resistance is the sum of all the individual resistance values

173. Two equal-value resistors are connected in parallel. How does the total resistance of this combination compare with the value of either resistor by itself? [3AE-1-4.1]
A. The total resistance is twice the value of either resistor
B. The total resistance is half the value of either resistor
C. The total resistance is the square of the value of either resistor
D. The total resistance is the same as the value of either resistor

174. How does the total resistance of a string of parallel-connected resistors compare to the values of the individual resistors? [3AE-1-4.2]
A. The total resistance is the square of the sum of the resistor values
B. The total resistance is more than the highest-value resistor in the combination
C. The total resistance is less than the smallest-value resistor in the combination
D. The total resistance is same as the highest-value resistor in the combination

175. What is Ohm's Law? [3AE-2.1]
A. A mathematical relationship between resistance, voltage and power in a circuit
B. A mathematical relationship between current, resistance and power in a circuit
C. A mathematical relationship between current, voltage and power in a circuit
D. A mathematical relationship between resistance, current and applied voltage in a circuit

176. How is the current in a DC circuit calculated when the voltage and resistance are known? [3AE-2.2]
A. I = E / R
B. P = I x E
C. I = R x E
D. I = E x R

177. What is the input resistance of a load when a 12-volt battery supplies 0.25 amperes to it? [3AE-2.3]
A. 0.02 ohms
B. 3 ohms
C. 48 ohms
D. 480 ohms

178. The product of the current and what force gives the electrical power in a circuit? [3AE-2.4]
A. Magnetomotive force
B. Centripetal force
C. Electrochemical force
D. Electromotive force

179. What is the input resistance of a load when a 12-volt battery supplies 0.15 amperes to it? [3AE-2.5]
A. 8 ohms
B. 80 ohms
C. 100 ohms
D. 800 ohms

180. When 120 volts is measured across a 4700-ohm resistor, approximately how much current is flowing through it? [3AE-2.6]
A. 39 amperes
B. 3.9 amperes
C. 0.26 ampere
D. 0.026 ampere

181. When 120 volts is measured across a 47000-ohm resistor, approximately how much current is flowing through it? [3AE-2.7]
A. 392 A
B. 39.2 A
C. 26 mA
D. 2.6 mA

182. When 12 volts is measured across a 4700-ohm resistor, approximately how much current is flowing through it? [3AE-2.8]
A. 2.6 mA
B. 26 mA
C. 39.2 A
D. 392 A

183. When 12 volts is measured across a 47000-ohm resistor, approximately how much current is flowing through it? [3AE-2.9]
A. 255 uA
B. 255 mA
C. 3917 mA
D. 3917 A

184. What is the term used to describe the ability of a component to store energy in a magnetic field? [3AE-3-1.1]
A. Admittance
B. Capacitance
C. Inductance
D. Resistance

185. What is the basic unit of inductance? [3AE-3-2.1]
A. Coulomb
B. Farad
C. Henry
D. Ohm

186. What is a henry? [3AE-3-2.2]
A. The basic unit of admittance
B. The basic unit of capacitance
C. The basic unit of inductance
D. The basic unit of resistance

187. What is a microhenry? [3AE-3-2.3]
A. A basic unit of inductance equal to 10\-12/ henrys
B. A basic unit of inductance equal to 10\-6/ henrys
C. A basic unit of inductance equal to 10\-3/ henrys
D. A basic unit of inductance equal to 10\6/ henrys

188. What is a millihenry? [3AE-3-2.4]
A. A basic unit of inductance equal to 10\-12/ henrys
B. A basic unit of inductance equal to 10\-6/ henrys
C. A basic unit of inductance equal to 10\-3/ henrys
D. A basic unit of inductance equal to 10\6/ henrys

189. Two equal-value inductors are connected in series. How does the total inductance of this combination compare with the value of either inductor by itself? [3AE-3-3.1]
A. The total inductance is half the value of either inductor
B. The total inductance is twice the value of either inductor
C. The total inductance is equal to the value of either inductor
D. No comparison can be made without knowing the exact inductances

190. How does the total inductance of a string of series-connected inductors compare to the values of the individual inductors? [3AE-3-3.2]
A. The total inductance is equal to the average of all the individual inductances
B. The total inductance is equal to less than the value of the smallest inductance
C. The total inductance is equal to the sum of all the individual inductances
D. No comparison can be made without knowing the exact inductances

191. Two equal-value inductors are connected in parallel. How does the total inductance of this combination compare with the value of either inductor by itself? [3AE-3-4.1]
A. The total inductance is half the value of either inductor
B. The total inductance is twice the value of either inductor
C. The total inductance is equal to the square of either inductance
D. No comparison can be made without knowing the exact inductances

192. How does the total inductance of a string of parallel-connected inductors compare to the values of the individual inductors? [3AE-3-4.2]
A. The total inductance is equal to the sum of the inductances in the combination
B. The total inductance is less than the smallest inductance value in the combination
C. The total inductance is equal to the average of the inductances in the combination
D. No comparison can be made without knowing the exact inductances

193. What is the term used to describe the ability of a component to store energy in an electric field? [3AE-4-1.1]
A. Capacitance
B. Inductance
C. Resistance
D. Tolerance

194. What is the basic unit of capacitance? [3AE-4-2.1]
A. Farad
B. Ohm
C. Volt
D. Ampere

195. What is a microfarad? [3AE-4-2.2]
A. A basic unit of capacitance equal to 10\-12/ farads
B. A basic unit of capacitance equal to 10\-6/ farads
C. A basic unit of capacitance equal to 10\-2/ farads
D. A basic unit of capacitance equal to 10\6/ farads

196. What is a picofarad? [3AE-4-2.3]
A. A basic unit of capacitance equal to 10\-12/ farads
B. A basic unit of capacitance equal to 10\-6/ farads
C. A basic unit of capacitance equal to 10\-2/ farads
D. A basic unit of capacitance equal to 10\6/ farads

197. What is a farad? [3AE-4-2.4]
A. The basic unit of resistance
B. The basic unit of capacitance
C. The basic unit of inductance
D. The basic unit of admittance

198. Two equal-value capacitors are connected in series. How does the total capacitance of this combination compare with the value of either capacitor by itself? [3AE-4-3.1]
A. The total capacitance is twice the value of either capacitor
B. The total capacitance is equal to the value of either capacitor
C. The total capacitance is half the value of either capacitor
D. No comparison can be made without knowing the exact capacitances

199. How does the total capacitance of a string of series-connected capacitors compare to the values of the individual capacitors? [3AE-4-3.2]
A. The total capacitance is equal to the sum of the capacitances in the combination
B. The total capacitance is less than the smallest value of capacitance in the combination
C. The total capacitance is equal to the average of the capacitances in the combination
D. No comparison can be made without knowing the exact capacitances

200. Two equal-value capacitors are connected in parallel. How does the total capacitance of this combination compare with the value of either capacitor by itself? [3AE-4-4.1]
A. The total capacitance is twice the value of either capacitor
B. The total capacitance is half the value of either capacitor
C. The total capacitance is equal to the value of either capacitor
D. No comparison can be made without knowing the exact capacitances

201. How does the total capacitance of a string of parallel-connected capacitors compare to the values of the individual capacitors? [3AE-4-4.2]
A. The total capacitance is equal to the sum of the capacitances in the combination
B. The total capacitance is less than the smallest value of capacitance in the combination
C. The total capacitance is equal to the average of the capacitances in the combination
D. No comparison can be made without knowing the exact capacitances

SUBELEMENT 3AF - Circuit Components (2 Questions)

202. What are the four common types of resistor construction? [3AF-1-1.1]
A. Carbon-film, metal-film, micro-film and wire-film
B. Carbon-composition, carbon-film, metal-film and wire-wound
C. Carbon-composition, carbon-film, electrolytic and metal-film
D. Carbon-film, ferrite, carbon-composition and metal-film

203. What is the primary function of a resistor? [3AF-1-2.1]
A. To store an electric charge
B. To store a magnetic field
C. To match a high-impedance source to a low-impedance load
D. To limit the current in an electric circuit

204. What is a variable resistor? [3AF-1-2.2]
A. A resistor that changes value when an AC voltage is applied to it
B. A device that can transform a variable voltage into a constant voltage
C. A resistor with a slide or contact that makes the resistance adjustable
D. A resistor that changes value when it is heated

205. What do the first three color bands on a resistor indicate? [3AF-1-3.1]
A. The value of the resistor in ohms
B. The resistance tolerance in percent
C. The power rating in watts
D. The value of the resistor in henrys

206. How can a carbon resistor's electrical tolerance rating be found? [3AF-1-3.2]
A. By using a wavemeter
B. By using the resistor's color code
C. By using Thevenin's theorem for resistors
D. By using the Baudot code

207. What does the fourth color band on a resistor indicate? [3AF-1-3.3]
A. The value of the resistor in ohms
B. The resistance tolerance in percent
C. The power rating in watts
D. The resistor composition

208. When the color bands on a group of resistors indicate that they all have the same resistance, what further information about each resistor is needed in order to select those that have nearly equal value? [3AF-1-3.4]
A. The working voltage rating of each resistor
B. The composition of each resistor
C. The tolerance of each resistor
D. The current rating of each resistor

209. Why do resistors generate heat? [3AF-1-4.1]
A. They convert electrical energy to heat energy
B. They exhibit reactance
C. Because of skin effect
D. To produce thermionic emission

210. Why would a large size resistor be substituted for a smaller one of the same resistance? [3AF-1-4.2]
A. To obtain better response
B. To obtain a higher current gain
C. To increase power dissipation capability
D. To produce a greater parallel impedance

211. What is the symbol used to represent a fixed resistor on schematic diagrams? (Please refer to Diagram 3AF-1-5.1) [3AF-1-5.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

212. What is the symbol used to represent a variable resistor on schematic diagrams. (Please refer to Diagram 3AF-1-5.2) [3AF-1-5.2]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

213. What is an inductor core? [3AF-2-1.1]
A. The point at which an inductor is tapped to produce resonance
B. A tight coil of wire used in a transformer
C. An insulating material placed between the plates of an inductor
D. The central portion of a coil; may be made from air, iron, brass or other material

214. What are the component parts of a coil? [3AF-2-1.2]
A. The wire in the winding and the core material
B. Two conductive plates and an insulating material
C. Two or more layers of silicon material
D. A donut-shaped iron core and a layer of insulating tape

215. Describe an inductor. [3AF-2-1.3]
A. A semiconductor in a conducting shield
B. Two parallel conducting plates
C. A straight wire conductor mounted inside a Faraday shield
D. A coil of conducting wire

216. For radio frequency power applications, which type of inductor has the least amount of loss? [3AF-2-1.4]
A. Magnetic wire
B. Iron core
C. Air core
D. Slug tuned

217. What is an inductor? [3AF-2-2.1]
A. An electronic component that stores energy in an electric field
B. An electronic component that converts a high voltage to a lower voltage
C. An electronic component that opposes DC while allowing AC to pass
D. An electronic component that stores energy in a magnetic field

218. What are the electrical properties of an inductor? [3AF-2-2.2]
A. An inductor stores a charge electrostatically and opposes a change in voltage
B. An inductor stores a charge electrochemically and opposes a change in current
C. An inductor stores a charge electromagnetically and opposes a change in current
D. An inductor stores a charge electromechanically and opposes a change in voltage

219. What factors determine the amount of inductance in a coil? [3AF-2-3.1]
A. The type of material used in the core, the diameter of the core and whether the coil is mounted horizontally or vertically
B. The diameter of the core, the number of turns of wire used to wind the coil and the type of metal used in the wire
C. The type of material used in the core, the number of turns used to wind the core and the frequency of the current through the coil
D. The type of material used in the core, the diameter of the core, the length of the coil and the number of turns of wire used to wind the coil

220. What can be done to raise the inductance of a 5-microhenry air-core coil to a 5-millihenry coil with the same physical dimensions? [3AF-2-3.2]
A. The coil can be wound on a non-conducting tube
B. The coil can be wound on an iron core
C. Both ends of the coil can be brought around to form the shape of a donut, or toroid
D. The coil can be made of a heavier-gauge wire

221. As an iron core is inserted in a coil, what happens to the inductance? [3AF-2-3.3]
A. It increases
B. It decreases
C. It stays the same
D. It becomes voltage-dependent

222. As a brass core is inserted in a coil, what happens to the inductance? [3AF-2-3.4]
A. It increases
B. It decreases
C. It stays the same
D. It becomes voltage-dependent

223. What is the symbol used to represent an adjustable inductor on schematic diagrams? (Please refer to Diagram 3AF-2-4.1) [3AF-2-4.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

224. What is the symbol used to represent an iron-core inductor on schematic diagrams? (Please refer to Diagram 3AF-2-4.2) [3AF-2-4.2]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

225. What is the symbol used to represent an inductor wound over a toroidal core on schematic diagrams? (Please refer to Diagram 3AF-2-4.3) [3AF-2-4.3]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

226. What is a capacitor dielectric? [3AF-3-1.1]
A. The insulating material used for the plates
B. The conducting material used between the plates
C. The ferrite material that the plates are mounted on
D. The insulating material between the plates

227. What are the component parts of a capacitor? [3AF-3-1.2]
A. Two or more conductive plates with an insulating material between them
B. The wire used in the winding and the core material
C. Two or more layers of silicon material
D. Two insulating plates with a conductive material between them

228. What is an electrolytic capacitor? [3AF-3-1.3]
A. A capacitor whose plates are formed on a thin ceramic layer
B. A capacitor whose plates are separated by a thin strip of mica insulation
C. A capacitor whose dielectric is formed on one set of plates through electrochemical action
D. A capacitor whose value varies with applied voltage

229. What is a paper capacitor? [3AF-3-1.4]
A. A capacitor whose plates are formed on a thin ceramic layer
B. A capacitor whose plates are separated by a thin strip of mica insulation
C. A capacitor whose plates are separated by a layer of paper
D. A capacitor whose dielectric is formed on one set of plates through electrochemical action

230. What is a capacitor? [3AF-3-2.1]
A. An electronic component that stores energy in a magnetic field
B. An electronic component that stores energy in an electric field
C. An electronic component that converts a high voltage to a lower voltage
D. An electronic component that converts power into heat

231. What are the electrical properties of a capacitor? [3AF-3-2.2]
A. A capacitor stores a charge electrochemically and opposes a change in current
B. A capacitor stores a charge electromagnetically and opposes a change in current
C. A capacitor stores a charge electromechanically and opposes a change in voltage
D. A capacitor stores a charge electrostatically and opposes a change in voltage

232. What factors must be considered when selecting a capacitor for a circuit? [3AF-3-2.3]
A. Type of capacitor, capacitance and voltage rating
B. Type of capacitor, capacitance and the kilowatt-hour rating
C. The amount of capacitance, the temperature coefficient and the KVA rating
D. The type of capacitor, the microscopy coefficient and the temperature coefficient

233. How are the characteristics of a capacitor usually specified? [3AF-3-2.4]
A. In volts and amperes
B. In microfarads and volts
C. In ohms and watts
D. In millihenrys and amperes

234. What factors determine the amount of capacitance in a capacitor? [3AF-3-3.1]
A. The dielectric constant of the material between the plates, the area of one side of one plate, the separation between the plates and the number of plates
B. The dielectric constant of the material between the plates, the number of plates and the diameter of the leads connected to the plates
C. The number of plates, the spacing between the plates and whether the dielectric material is N type or P type
D. The dielectric constant of the material between the plates, the surface area of one side of one plate, the number of plates and the type of material used for the protective coating

235. As the plate area of a capacitor is increased, what happens to its capacitance? [3AF-3-3.2]
A. Decreases
B. Increases
C. Stays the same
D. Becomes voltage dependent

236. As the plate spacing of a capacitor is increased, what happens to its capacitance? [3AF-3-3.3]
A. Increases
B. Stays the same
C. Becomes voltage dependent
D. Decreases

237. What is the symbol used to represent an electrolytic capacitor on schematic diagrams? (Please refer to Diagram 3AF-3-4.1) [3AF-3-4.1]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

238. What is the symbol used to represent a variable capacitor on schematic diagrams? (Please refer to Diagram 3AF-3-4.2) [3AF-3-4.2]
A. Symbol A
B. Symbol B
C. Symbol C
D. Symbol D

SUBELEMENT 3AG - Practical Circuits (1 Question)

239. Which frequencies are attenuated by a low-pass filter? [3AG-1-1.1]
A. Those above its cut-off frequency
B. Those within its cut-off frequency
C. Those within 50 kHz on either side of its cut-off frequency
D. Those below its cut-off frequency

240. What circuit passes electrical energy below a certain frequency and blocks electrical energy above that frequency? [3AG-1-1.2]
A. A band-pass filter
B. A high-pass filter
C. An input filter
D. A low-pass filter

241. Why does virtually every modern transmitter have a built-in low-pass filter connected to its output? [3AG-1-2.1]
A. To attenuate frequencies below its cutoff point
B. To attenuate low frequency interference to other amateurs
C. To attenuate excess harmonic radiation
D. To attenuate excess fundamental radiation

242. You believe that excess harmonic radiation from your transmitter is causing interference to your television receiver. What is one possible solution for this problem? [3AG-1-2.2]
A. Install a low-pass filter on the television receiver
B. Install a low-pass filter at the transmitter output
C. Install a high-pass filter on the transmitter output
D. Install a band-pass filter on the television receiver

243. What circuit passes electrical energy above a certain frequency and attenuates electrical energy below that frequency? [3AG-2-1.1]
A. A band-pass filter
B. A high-pass filter
C. An input filter
D. A low-pass filter

244. Where is the proper place to install a high-pass filter? [3AG-2-2.1]
A. At the antenna terminals of a television receiver
B. Between a transmitter and a Transmatch
C. Between a Transmatch and the transmission line
D. On a transmitting antenna

245. Your Amateur Radio transmissions cause interference to your television receiver even though you have installed a low-pass filter at the transmitter output. What is one possible solution for this problem? [3AG-2-2.2]
A. Install a high-pass filter at the transmitter terminals
B. Install a high-pass filter at the television antenna terminals
C. Install a low-pass filter at the television antenna terminals also
D. Install a band-pass filter at the television antenna terminals

246. What circuit attenuates electrical energy above a certain frequency and below a lower frequency? [3AG-3-1.1]
A. A band-pass filter
B. A high-pass filter
C. An input filter
D. A low-pass filter

247. What general range of RF energy does a band-pass filter reject? [3AG-3-1.2]
A. All frequencies above a specified frequency
B. All frequencies below a specified frequency
C. All frequencies above the upper limit of the band in question
D. All frequencies above a specified frequency and below a lower specified frequency

248. The IF stage of a communications receiver uses a filter with a peak response at the intermediate frequency. What term describes this filter response? [3AG-3-2.1]
A. A band-pass filter
B. A high-pass filter
C. An input filter
D. A low-pass filter

249. What circuit is likely to be found in all types of receivers? [3AG-4-1.1]
A. An audio filter
B. A beat frequency oscillator
C. A detector
D. An RF amplifier

250. What type of transmitter does this block diagram represent? (Please refer to Diagram 3AG-4-1.2) [3AG-4-1.2]
A. A simple packet-radio transmitter
B. A simple crystal-controlled transmitter
C. A single-sideband transmitter
D. A VFO-controlled transmitter

251. What type of transmitter does this block diagram represent? (Please refer to Diagram 3AG-4-1.3) [3AG-4-1.3]
A. A simple packet-radio transmitter
B. A simple crystal-controlled transmitter
C. A single-sideband transmitter
D. A VFO-controlled transmitter

252. What is the unlabeled block (?) in this diagram? (Please refer to Diagram 3AG-4-1.4) [3AG-4-1.4]
A. An AGC circuit
B. A detector
C. A power supply
D. A VFO circuit

253. What type of device does this block diagram represent? (Please refer to Diagram 3AG-4-1.5) [3AG-4-1.5]
A. A double-conversion receiver
B. A variable-frequency oscillator
C. A simple superheterodyne receiver
D. A simple CW transmitter

254. What type of device does this block diagram represent? (Please refer to Diagram 3AG-4-2.1) [3AG-4-2.1]
A. A double-conversion receiver
B. A variable-frequency oscillator
C. A simple superheterodyne receiver
D. A simple FM receiver