

# Study Guide for Exam Questions



This version of the Question Pool has been rearranged to follow the topics as presented in the ARRL General Class License Manual, 6th Edition. See the printed book for a version of the Question Pool arranged by Subelement, as released by the NCVEC Question Pool Committee.

As you study, cover the answer key provided at the margin to test your knowledge. (Please note: Answer selections may be presented in a different order on the actual FCC exam.)

## Chapter 2, Section 2.1

### BASIC OPERATING

What is the recommended way to break into a conversation when using phone?

- A. Say "QRZ" several times followed by your call sign
- B. Say your call sign during a break between transmissions from the other stations
- C. Say "Break" "Break" "Break" and wait for a response
- D. Say "CQ" followed by the call sign of either station

G2A12  
(B)  
Page 2-2

What does the expression "CQ DX" usually indicate?

- A. A general call for any station
- B. The caller is listening for a station in Germany
- C. The caller is looking for any station outside their own country
- D. This is a form of distress call

G2A13  
(C)  
Page 2-2

### GOOD PRACTICES

What action should be taken if the frequency on which a net normally meets is in use just before the net begins?

- A. Reduce your output power and start the net as usual
- B. Increase your power output so that net participants will be able to hear you
- C. Ask the stations if the net may use the frequency, or move the net to a nearby clear frequency if necessary
- D. Cancel the net for that day

G2B01  
(C)  
Page 2-3

G2B02 (A) Page 2-3	<p>What should be done if a net is about to begin on a frequency you and another station are using?</p> <ul style="list-style-type: none"> <li>A. Move to a different frequency as a courtesy to the net</li> <li>B. Tell the net that they must to move to another frequency</li> <li>C. Reduce power to avoid interfering with the net</li> <li>D. Pause between transmissions to give the net a chance to change frequency</li> </ul>
G2B04 (B) Page 2-3	<p>What minimum frequency separation between CW signals should be allowed to minimize interference?</p> <ul style="list-style-type: none"> <li>A. 5 to 50 Hz</li> <li>B. 150 to 500 Hz</li> <li>C. 1 to 3 kHz</li> <li>D. 3 to 6 kHz</li> </ul>
G2B05 (B) Page 2-3	<p>What minimum frequency separation between SSB signals should be allowed to minimize interference?</p> <ul style="list-style-type: none"> <li>A. Between 150 and 500 Hz</li> <li>B. Approximately 3 kHz</li> <li>C. Approximately 6 kHz</li> <li>D. Approximately 10 kHz</li> </ul>
G2B06 (B) Page 2-3	<p>What minimum frequency separation between 170 Hz shift RTTY signals should be allowed to minimize interference?</p> <ul style="list-style-type: none"> <li>A. 60 Hz</li> <li>B. 250 to 500 Hz</li> <li>C. Approximately 3 kHz</li> <li>D. 170 Hz</li> </ul>
G2B07 (A) Page 2-4	<p>What is a band plan?</p> <ul style="list-style-type: none"> <li>A. A voluntary guideline for band use beyond the divisions established by the FCC</li> <li>B. A guideline from the FCC for making amateur frequency band allocations</li> <li>C. A guideline from the ITU for making amateur frequency band allocations</li> <li>D. A plan devised by a club to best use a frequency band during a contest</li> </ul>
G2B08 (A) Page 2-4	<p>What is the “DX window” in a voluntary band plan?</p> <ul style="list-style-type: none"> <li>A. A portion of the band that should not be used for contacts between stations within the 48 contiguous United States</li> <li>B. An FCC rule that prohibits contacts between stations within the United States and possessions on that band segment</li> <li>C. An FCC rule that allows only digital contacts in that portion of the band</li> <li>D. A portion of the band that has been set aside for digital contacts only</li> </ul>
G2B09 (D) Page 2-4	<p>What should you do to comply with good amateur practice when choosing a frequency for Slow-Scan TV (SSTV) operation?</p> <ul style="list-style-type: none"> <li>A. Transmit only on lower sideband</li> <li>B. Transmit your callsign as an SSTV image for 1 minute to ensure a clear frequency</li> <li>C. Select a frequency in the portion of the band set aside for digital operation</li> <li>D. Follow generally accepted band plans for SSTV operation</li> </ul>
G2B10 (D) Page 2-4	<p>What should you do to comply with good amateur practice when choosing a frequency for radio-teletype (RTTY) operation?</p> <ul style="list-style-type: none"> <li>A. Call CQ in Morse code before attempting to establish a contact in RTTY</li> <li>B. Select a frequency in the upper end of the phone band</li> <li>C. Select a frequency in the lower end of the phone band</li> <li>D. Follow generally accepted band plans for RTTY operation</li> </ul>

<p>What should you do to comply with good amateur practice when choosing a frequency for HF PSK operation?</p> <p>A. Call CQ in Morse code before attempting to establish a contact in PSK</p> <p>B. Select a frequency in the upper end of the phone band</p> <p>C. Select a frequency in the lower end of the phone band</p> <p>D. Follow generally accepted band plans for PSK operation</p>	<p>G2B11 (D) Page 2-4</p>
<p>What is a practical way to avoid harmful interference when selecting a frequency to call CQ using phone?</p> <p>A. Ask if the frequency is in use, say your callsign, and listen for a response</p> <p>B. Keep your CQ to less than 2 minutes in length to avoid interference to contacts that may be in progress</p> <p>C. Listen for 2 minutes before calling CQ to avoid interference to contacts that may be in progress</p> <p>D. Call CQ at low power first and if there is no indication of interference, increase power as necessary</p>	<p>G2B12 (A) Page 2-3</p>
<p>What is a practical way to avoid harmful interference when calling CQ using Morse code or CW?</p> <p>A. Send the letter "V" 12 times and then listen for a response</p> <p>B. Keep your CQ to less than 2 minutes in length to avoid interference with contacts already in progress</p> <p>C. Send "QRL? de" followed by your callsign and listen for a response</p> <p>D. Call CQ at low power first; if there is no indication of interference then increase power as necessary</p>	<p>G2B13 (C) Page 2-3</p>
<p>Why do many amateurs keep a log even though the FCC doesn't require it?</p> <p>A. The ITU requires a log of all international contacts</p> <p>B. The ITU requires a log of all international third party traffic</p> <p>C. The log provides evidence of operation needed to renew a license without retest</p> <p>D. To help with a reply if the FCC requests information on who was control operator of your station at a given date and time</p>	<p>G2D08 (D) Page 2-4, 3-16</p>
<p>What information is traditionally contained in a station log?</p> <p>A. Date and time of contact</p> <p>B. Band and/or frequency of the contact</p> <p>C. Call sign of station contacted and the signal report given</p> <p>D. All of these choices are correct</p>	<p>G2D09 (D) Page 2-4, 3-16</p>
<b>MANAGING INTERFERENCE</b>	
<p>What should you do if you notice increasing interference from other activity on a frequency you are using?</p> <p>A. Tell the interfering stations to change frequency since you were there first</p> <p>B. Report the interference to your local Amateur Auxiliary Coordinator</p> <p>C. Move your contact to another frequency</p> <p>D. Turn on your amplifier</p>	<p>G2B03 (C) Page 2-6</p>
<b>MODES</b>	
<p>Which sideband is most commonly used for phone communications on the bands above 20 meters?</p> <p>A. Upper Sideband</p> <p>B. Lower Sideband</p> <p>C. Vestigial Sideband</p> <p>D. Double Sideband</p>	<p>G2A01 (A) Page 2-8</p>

G2A02 (B) Page 2-8	Which sideband is commonly used on the 160, 75, and 40 meter bands? A. Upper Sideband B. Lower Sideband C. Vestigial Sideband D. Double Sideband
G2A03 (A) Page 2-8	Which sideband is commonly used in the VHF and UHF bands? A. Upper Sideband B. Lower Sideband C. Vestigial Sideband D. Double Sideband
G2A04 (A) Page 2-8	Which mode is most commonly used for voice communications on the 17 and 12 meter bands? A. Upper Sideband B. Lower Sideband C. Vestigial Sideband D. Double Sideband
G2A05 (C) Page 2-7	Which mode of voice communication is most commonly used on the High Frequency Amateur bands? A. FM B. AM C. SSB D. PM
G2A06 (B) Page 2-7	Which of the following is an advantage when using single sideband as compared to other voice modes on the HF amateur bands? A. Very high fidelity voice modulation B. Less bandwidth used and high power efficiency C. Ease of tuning on receive D. Less subject to static crashes (atmospherics)
G2A07 (B) Page 2-7	Which of the following statements is true of the single sideband (SSB) voice mode? A. Only one sideband and the carrier are transmitted; the other sideband is suppressed B. Only one sideband is transmitted; the other sideband and carrier are suppressed C. SSB voice transmissions have higher average power than any other mode D. SSB is the only mode that is authorized on the 160, 75 and 40 meter amateur bands
G2A08 (A) Page 2-7	Which of the following statements is true of single sideband (SSB) voice mode? A. It is a form of amplitude modulation in which one sideband and the carrier are suppressed B. It is a form of frequency modulation in which higher frequencies are emphasized C. It reproduces upper frequencies more efficiently than lower frequencies D. It is the only voice mode authorized on the HF bands between 14 and 30 MHz
G2A09 (D) Page 2-8	Why do most amateur stations use lower sideband on the 160, 75 and 40 meter bands? A. The lower sideband is more efficient at these frequency bands B. The lower sideband is the only sideband legal on these frequency bands C. Because it is fully compatible with an AM detector D. Current amateur practice is to use lower sideband on these frequency bands

## HF TRANSMITTING

Which of the following statements is true of VOX operation?

- A. The received signal is more natural sounding
- B. VOX allows “hands free” operation
- C. Frequency spectrum is conserved
- D. The duty cycle of the transmitter is reduced

G2A10

(B)

Page 2-11

Which of the following user adjustable controls are usually associated with VOX circuitry?

- A. Anti-VOX
- B. VOX Delay
- C. VOX Sensitivity
- D. All of these choices are correct

G2A11

(D)

Page 2-11

Which of the following describes full break-in telegraphy (QSK)?

- A. Breaking stations send the Morse code prosign BK
- B. Automatic keyers are used to send Morse code instead of hand keys
- C. An operator must activate a manual send/receive switch before and after every transmission
- D. Incoming signals are received between transmitted code character elements

G2F01

(D)

Page 2-13

What should you do if a CW station sends “QRS” when using Morse code?

- A. Send slower
- B. Change frequency
- C. Increase your power
- D. Repeat everything twice.

G2F02

(A)

Page 2-13

What does it mean when a CW operator sends “KN” at the end of a transmission?

- A. Listening for novice stations
- B. Operating full break-in
- C. Listening only for a specific station or stations
- D. Closing station now

G2F03

(C)

Page 2-13

What does it mean when a CW operator sends “CL” at the end of a transmission?

- A. Keep frequency clear
- B. Operating full break-in
- C. Listening only for a specific station or stations
- D. Closing station

G2F04

(D)

Page 2-13

What is the best speed to use answering a CQ in Morse Code?

- A. The speed at which you are most comfortable copying
- B. The speed at which the CQ was sent
- C. A slow speed until contact is established
- D. 5 wpm, as all operators licensed to operate CW can copy this speed

G2F05

(B)

Page 2-13

What does the term “zero beat” mean in CW operation?

- A. Matching the speed of the transmitting station
- B. Operating split to avoid interference on frequency
- C. Sending without error
- D. Matching the frequency of the transmitting station

G2F06

(D)

Page 2-13

When sending CW, what does a “C” mean when added to the RST report?

- A. Chirpy or unstable signal
- B. Report was read from S meter reading rather than estimated
- C. 100 percent copy
- D. Key clicks

G2F07

(A)

Page 2-12

G2F08 (C) Page 2-13	<p>What prosign is sent using CW to indicate the end of a formal message?</p> <ul style="list-style-type: none"> <li>A. SK</li> <li>B. BK</li> <li>C. AR</li> <li>D. KN</li> </ul>
G2F09 (C) Page 2-13	<p>What does the Q signal “QSL” mean when operating CW?</p> <ul style="list-style-type: none"> <li>A. Send slower</li> <li>B. We have already confirmed by card</li> <li>C. I acknowledge receipt</li> <li>D. We have worked before</li> </ul>
G2F10 (B) Page 2-13	<p>What does the Q signal “QRQ” mean when operating CW?</p> <ul style="list-style-type: none"> <li>A. Slow down</li> <li>B. Send faster</li> <li>C. Zero beat my signal</li> <li>D. Quitting operation</li> </ul>
G2F11 (D) Page 2-13	<p>What does the Q signal “QRV” mean when operating CW?</p> <ul style="list-style-type: none"> <li>A. You are sending too fast</li> <li>B. There is interference on the frequency</li> <li>C. I am quitting for the day</li> <li>D. I am ready to receive messages</li> </ul>

## Section 2.2

### DEFINITIONS

G2E04 (B) Page 2-14	<p>Which of the following 20 meter band segments is most often used for most data transmissions?</p> <ul style="list-style-type: none"> <li>A. 14.000 - 14.050 MHz</li> <li>B. 14.070 - 14.100 MHz</li> <li>C. 14.150 - 14.225 MHz</li> <li>D. 14.275 - 14.350 MHz</li> </ul>
G2E08 (A) Page 2-14	<p>What segment of the 80 meter band is most commonly used for data transmissions?</p> <ul style="list-style-type: none"> <li>A. 3570 – 3600 kHz</li> <li>B. 3500 – 3525 kHz</li> <li>C. 3700 – 3750 kHz</li> <li>D. 3775 – 3825 kHz</li> </ul>
G2E09 (D) Page 2-14	<p>Where are PSK signals generally found on the 20 meter band?</p> <ul style="list-style-type: none"> <li>A. In the low end of the phone band</li> <li>B. In the high end of the phone band</li> <li>C. In the weak signal portion of the band</li> <li>D. Around 14.070 MHz</li> </ul>
G8B11 (D) Page 2-14	<p>What part of the 20 meter band is most commonly used for PSK31 operation?</p> <ul style="list-style-type: none"> <li>A. At the bottom of the slow-scan TV segment, near 14.230 MHz</li> <li>B. At the top of the SSB phone segment, near 14.325 MHz</li> <li>C. In the middle of the CW segment, near 14.100 MHz</li> <li>D. Below the RTTY segment, near 14.070 MHz</li> </ul>

## DIGITAL MODE OVERVIEWS

How many data bits are sent in a single PSK31 character?

- A. The number varies
- B. 5
- C. 7
- D. 8

G2E02

(A)

Page 2-16, 5-5

What part of a data packet contains the routing and handling information?

- A. Directory
- B. Preamble
- C. Header
- D. Footer

G2E03

(C)

Page 2-16, 5-6

Which of the following describes Baudot RTTY?

- A. 7-bit code, with start, stop and parity bits
- B. Utilizes error detection and correction
- C. 5-bit code, with additional start and stop bits
- D. Two major operating modes are SELCAL and LISTEN

G2E05

(C)

Page 2-15, 5-4

What is the most common frequency shift for RTTY emissions in the amateur HF bands?

- A. 85 Hz
- B. 170 Hz
- C. 425 Hz
- D. 850 Hz

G2E06

(B)

Page 2-15, 5-5

What does the abbreviation "RTTY" stand for?

- A. "Returning To You", meaning "your turn to transmit"
- B. Radio-Teletype
- C. A general call to all digital stations
- D. Repeater Transmission Type

G2E07

(B)

Page 2-15

What is a major advantage of MFSK16 compared to other digital modes?

- A. It is much higher speed than RTTY
- B. It is much narrower bandwidth than most digital modes
- C. It has built-in error correction
- D. It offers good performance in weak signal environment without error correction

G2E10

(D)

Page 2-16

What does the abbreviation "MFSK" stand for?

- A. Manual Frequency Shift Keying
- B. Multi (or Multiple) Frequency Shift Keying
- C. Manual Frequency Sideband Keying
- D. Multi (or Multiple) Frequency Sideband Keying

G2E11

(B)

Page 2-16

## Section 2.3

### EMERGENCY OPERATION

G1B04 (A) [97.113(b)] Page 2-21	<p>Which of the following must be true before an amateur station may provide news information to the media during a disaster?</p> <ul style="list-style-type: none"><li>A. The information must directly relate to the immediate safety of human life or protection of property and there is no other means of communication available</li><li>B. The exchange of such information must be approved by a local emergency preparedness official and transmitted on officially designated frequencies</li><li>C. The FCC must have declared a state of emergency</li><li>D. Both amateur stations must be RACES stations</li></ul>
G2C01 (C) [97.403] Page 2-19	<p>When normal communications systems are not available, what means may an amateur station use to provide essential communications when there is an immediate threat to the safety of human life or the protection of property?</p> <ul style="list-style-type: none"><li>A. Only transmissions sent on internationally recognized emergency channels</li><li>B. Any means, but only to RACES recognized emergency stations</li><li>C. Any means of radiocommunication at its disposal</li><li>D. Only those means of radiocommunication for which the station is licensed</li></ul>
G2C02 (A) [97.407(a)] Page 2-22	<p>Who may be the control operator of an amateur station transmitting in RACES to assist relief operations during a disaster?</p> <ul style="list-style-type: none"><li>A. Only a person holding an FCC issued amateur operator license</li><li>B. Only a RACES net control operator</li><li>C. Only official emergency stations may transmit during a disaster</li><li>D. Any control operator when normal communication systems are operational</li></ul>
G2C03 (D) [97.407(b)] Page 2-22	<p>When may the FCC restrict normal frequency operations of amateur stations participating in RACES?</p> <ul style="list-style-type: none"><li>A. When they declare a temporary state of communication emergency</li><li>B. When they seize your equipment for use in disaster communications</li><li>C. Only when all amateur stations are instructed to stop transmitting</li><li>D. When the President's War Emergency Powers have been invoked</li></ul>
G2C04 (C) [97.405(b)] Page 2-21	<p>When is an amateur station prevented from using any means at its disposal to assist another station in distress?</p> <ul style="list-style-type: none"><li>A. Only when transmitting in RACES</li><li>B. Only when authorized by the FCC rule</li><li>C. Never</li><li>D. Only on authorized HF frequencies</li></ul>
G2C05 (B) [97.403] Page 2-22	<p>What type of transmission would a control operator be making when transmitting out of the amateur band without station identification during a life threatening emergency?</p> <ul style="list-style-type: none"><li>A. A prohibited transmission</li><li>B. An unidentified transmission</li><li>C. A third party communication</li><li>D. An auxiliary transmission</li></ul>
G2C07 (B) Page 2-22	<p>What is the first thing you should do if you are communicating with another amateur station and hear a station in distress break in?</p> <ul style="list-style-type: none"><li>A. Continue your communication because you were on frequency first</li><li>B. Acknowledge the station in distress and determine what assistance may be needed</li><li>C. Change to a different frequency</li><li>D. Immediately cease all transmissions</li></ul>



When are you prohibited from helping a station in distress?	G2C08
A. When that station is not transmitting on amateur frequencies	(C)
B. When the station in distress offers no call sign	[97.405(b)]
C. You are never prohibited from helping any station in distress	Page 2-21
D. When the station is not another amateur station	
What type of transmissions may an amateur station make during a disaster?	G2C09
A. Only transmissions when RACES net is activated	(B)
B. Transmissions necessary to meet essential communications needs and to facilitate relief actions	[97.111(a)(2)]
C. Only transmissions from an official emergency station	Page 2-19
D. Only one-way communications	
Which emission mode must be used to obtain assistance during a disaster?	G2C10
A. Only SSB	(C)
B. Only SSB and CW	Page 2-20
C. Any mode	
D. Only CW	
What information should be given to a station answering a distress transmission?	G2C11
A. The ITU region and grid square locator of the emergency	(B)
B. The location and nature of the emergency	Page 2-22
C. The time that the emergency occurred and the local weather	
D. The name of the local emergency coordinator	
What frequency should be used to send a distress call?	G2C12
A. Whatever frequency has the best chance of communicating the distress message	(A)
B. 3873 kHz at night or 7285 kHz during the day	Page 2-22
C. Only frequencies that are within your operating privileges	
D. Only frequencies used by police, fire or emergency medical services	

# Chapter 3

## Section 3.1

### FCC STRUCTURE AND AUTHORITY

G2D01  
(A)  
Page 3-2

What is the Amateur Auxiliary to the FCC?

- A. Amateur volunteers who are formally enlisted to monitor the airwaves for rules violations
- B. Amateur volunteers who conduct amateur licensing examinations
- C. Amateur volunteers who conduct frequency coordination for amateur VHF repeaters
- D. Amateur volunteers who use their station equipment to help civil defense organizations in times of emergency

G2D02  
(B)  
Page 3-2

What are the objectives of the Amateur Auxiliary?

- A. To conduct efficient and orderly amateur licensing examinations
- B. To encourage amateur self-regulation and compliance with the rules
- C. To coordinate repeaters for efficient and orderly spectrum usage
- D. To provide emergency and public safety communications

G2D03  
(B)  
Page 3-2

What skills learned during “Fox Hunts” are of help to the Amateur Auxiliary?

- A. Identification of out of band operation
- B. Direction-finding skills used to locate stations violating FCC Rules
- C. Identification of different call signs
- D. Hunters have an opportunity to transmit on non-amateur frequencies

### FAA RULES

G1B01  
(C)  
[97.15(a)]  
Page 3-2

What is the maximum height above ground to which an antenna structure may be erected without requiring notification to the FAA and registration with the FCC, provided it is not at or near a public-use airport?

- A. 50 feet
- B. 100 feet
- C. 200 feet
- D. 300 feet

## Section 3.2

### EXAMINER RULES

G1D02  
(C)  
[97.509(b)(3)(i)]  
Page 3-3

What license examinations may you administer when you are an accredited VE holding a General Class operator license?

- A. Novice
- B. General
- C. Technician
- D. All elements

G1D05  
(D)  
[97.509(b)(3)(i)]  
Page 3-3

Which of the following is sufficient for you to be an administering VE for a Technician Class operator license examination?

- A. Notification to the FCC that you want to give an examination
- B. Receipt of a CSCE for General class
- C. Possession of properly obtained telegraphy and written examinations
- D. A FCC General class or higher license and VEC accreditation

What is the minimum age that one must be to qualify as an accredited Volunteer Examiner?	G1D10
A. 12 years	(B)
B. 18 years	[97.509(b)(2)]
C. 21 years	Page 3-3
D. There is no age limit	
What criteria must be met for a non U.S. citizen to be an accredited Volunteer Examiner?	G1D11
A. The person must be a resident of the U.S. for a minimum of 5 years	(B)
B. The person must hold a U.S. amateur radio license of General class or above	[97.509(b)(3)]
C. The person's home citizenship must be in the ITU 2 region	Page 3-3
D. None of these answers is correct; non U.S. citizens cannot be volunteer examiners	
Volunteer Examiners are accredited by what organization?	G1D12
A. The Federal Communications Commission	(C)
B. The Universal Licensing System	[97.509(b)(1)]
C. A Volunteer Examiner Coordinator	Page 3-3
D. The Wireless Telecommunications Bureau	
When may you participate as a VE in administering an amateur radio license examination?	G1D13
A. Once you have notified the FCC that you want to give an examination	(D)
B. Once you have a Certificate of Successful Completion of Examination (CSCE) for General class	[97.509]
C. Once your General class license appears in the FCC's ULS database	Page 3-3
D. Once you have been granted your General class license and received your VEC accreditation	
<b>EXAMINATION RULES</b>	
Which of the following are requirements for administering a Technician Class operator examination?	G1D04
A. At Least three VEC-accredited General Class or higher VEs must be present	(A)
B. At least two VEC-accredited General Class or higher VEs must be present	[97.509(a),
C. At least two General Class or higher VEs must be present, but only one need be VEC accredited	97.509(b)]
D. At least three VEs of Technician Class or higher must be present	Page 3-4
Who is responsible at a Volunteer Exam Session for determining the correctness of the answers on the exam?	G1D07
A. The FCC	(B)
B. The administering VEs	[97.509(h)]
C. The VEC	Page 3-4
D. The local VE team liaison	
What document must be issued to a person that passes an exam element?	G1D08
A. FCC form 605	(B)
B. CSCE	[97.509(i)]
C. CCSA	Page 3-4
D. NCVEC form 605	
How long is a Certificate of Successful Completion of Examination(CSCE)valid for exam element credit?	G1D09
A. 30 days	(C)
B. 180 days	[97.3(a)(15)]
C. 365 days	Page 3-4
D. For as long as your current license is valid	

## IDENTIFICATION REQUIREMENTS

G1D01 (C) [97.119(f)(2)] Page 3-5	<p>What is the proper way to identify when transmitting on General class frequencies if you have a CSCE for the required elements but your upgrade from Technician has not appeared in the ULS database?</p> <p>A. Give your call sign followed by the words “General class” B. No special identification is needed, since your license upgrade would already be shown in the FCC’s database C. Give your call sign followed by the words “temporary AG” D. Give your call sign followed the abbreviation “CSCE”</p>
G1D03 (C) [97.9(b)] Page 3-5	<p>Which of the following band segments may you operate on if you are a Technician Class operator and have a CSCE for General Class privileges?</p> <p>A. Only the Technician band segments until your upgrade is posted on the FCC database B. Only on the Technician band segments until your license arrives in the mail C. On any General Class band segment D. On any General Class Band segment except 30 and 60 meters</p>
G1D06 (A) [97.119(f)(2)] Page 3-5	<p>When must you add the special identifier “AG” after your call sign if you are a Technician Class licensee and have a CSCE for General Class operator privileges?</p> <p>A. Whenever you operate using General class frequency privileges B. Whenever you operate on any amateur frequency C. Whenever you operate using Technician frequency privileges D. A special identifier is not required as long as your General class license application has been filed with the FCC</p>
G1E09 (C) [97.119(b)(2)] Page 3-5	<p>What language must you use when identifying your station if you are using a language other than English in making a contact?</p> <p>A. The language being used for the contact B. Any language if the US has a third party agreement with that country C. English D. Any language of a country that is a member of the ITU</p>

## Section 3.3

### FREQUENCY PRIVILEGES

G1A01 (C) [97.301(d)] Page 3-9	<p>On which of the following bands is a General Class license holder granted all amateur frequency privileges?</p> <p>A. 20, 17, and 12 meters B. 160, 80, 40, and 10 meters C. 160, 30, 17, 12, and 10 meters D. 160, 30, 17, 15, 12, and 10 meters</p>
G1A02 (B) [97.305] Page 3-9	<p>On which of the following bands is phone operation prohibited?</p> <p>A. 160 meters B. 30 meters C. 17 meters D. 12 meters</p>
G1A03 (B) [97.305] Page 3-9	<p>On which of the following bands is image transmission prohibited?</p> <p>A. 160 meters B. 30 meters C. 20 meters D. 12 meters</p>

Which amateur band restricts communication to specific channels, using only USB voice, and prohibits all other modes, including CW and data?

- A. 11 meters
- B. 12 meters
- C. 30 meters
- D. 60 meters

G1A04  
(D)  
[97.303(s)]  
Page 3-9

Which of the following frequencies is in the General Class portion of the 40 meter band?

- A. 7.250 MHz
- B. 7.500 MHz
- C. 40.200 MHz
- D. 40.500 MHz

G1A05  
(A)  
[97.301(d)]  
Page 3-5

Which of the following frequencies is in the 12 meter band?

- A. 3.940 MHz
- B. 12.940 MHz
- C. 17.940 MHz
- D. 24.940 MHz

G1A06  
(D)  
[97.301(d)]  
Page 3-5

Which of the following frequencies is within the General class portion of the 75 meter phone band?

- A. 1875 kHz
- B. 3750 kHz
- C. 3900 kHz
- D. 4005 kHz

G1A07  
(C)  
[97.301(d)]  
Page 3-5

Which of the following frequencies is within the General Class portion of the 20 meter phone band?

- A. 14005 kHz
- B. 14105 kHz
- C. 14305 kHz
- D. 14405 kHz

G1A08  
(C)  
[97.301(d)]  
Page 3-5

Which of the following frequencies is within the General Class portion of the 80 meter band?

- A. 1855 kHz
- B. 2560 kHz
- C. 3560 kHz
- D. 3650 kHz

G1A09  
(C)  
[97.301(d)]  
Page 3-5

Which of the following frequencies is within the General Class portion of the 15 meter band?

- A. 14250 kHz
- B. 18155 kHz
- C. 21300 kHz
- D. 24900 kHz

G1A10  
(C)  
[97.301(d)]  
Page 3-5

Which of the following frequencies is available to a control operator holding a General Class license?

- A. 28.020 MHz
- B. 28.350 MHz
- C. 28.550 MHz
- D. All of these answers are correct

G1A11  
(D)  
[97.301(d)]  
Page 3-5

G1A12  
(B)  
[97.301]  
Page 3-9

When a General Class licensee is not permitted to use the entire voice portion of a particular band, which portion of the voice segment is generally available to them?

- A. The lower end
- B. The upper end
- C. The lower end on frequencies below 7.3 MHz and the upper end on frequencies above 14.150 MHz
- D. The upper end on frequencies below 7.3 MHz and the lower end on frequencies above 14.150 MHz

G1A13  
(D)  
[97.303]  
Page 3-9

Which amateur band is shared with the Citizens Radio Service?

- A. 10 meters
- B. 11 meters
- C. 12 meters
- D. None

### TRANSMISSION DEFINITIONS

G1B02  
(D)  
[97.203(b)]  
Page 3-10

With which of the following conditions must beacon stations comply?

- A. Identification must be in Morse Code
- B. The frequency must be coordinated with the National Beacon Organization
- C. The frequency must be posted on the Internet or published in a national periodical
- D. There must be no more than one beacon signal in the same band from a single location

G1B03  
(A)  
[97.1(a)(9)]  
Page 3-10

Which of the following is a purpose of a beacon station as identified in the FCC Rules?

- A. Observation of propagation and reception, or other related activities
- B. Automatic Identification of Repeaters
- C. Transmission of bulletins of General interest to amateur radio licensees
- D. Identifying Net Frequencies

G1B10  
(C)  
[97.203(c)]  
Page 3-10

What is the power limit for beacon stations?

- A. 10 watts PEP output
- B. 20 watts PEP output
- C. 100 watts PEP output
- D. 200 watts PEP output

### INTERFERENCE DEFINITIONS

G1A14  
(C)  
[97.303]  
Page 3-13

Which of the following applies when the FCC rules designate the amateur service as a secondary user and another service as a primary user on a band?

- A. Amateur stations must obtain permission from a primary service station before operating on a frequency assigned to that station
- B. Amateur stations are allowed to use the frequency band only during emergencies
- C. Amateur stations are allowed to use the frequency band only if they do not cause harmful interference to primary users
- D. Amateur stations may only operate during specific hours of the day, while primary users are permitted 24 hour use of the band

G1A15  
(D)  
[97.303]  
Page 3-13

What must you do if, when operating on either the 30 or 60 meter bands, a station in the primary service interferes with your contact?

- 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. Stop transmitting at once and/or move to a clear frequency

Which of the following operating restrictions applies to amateur radio stations as a secondary service in the 60 meter band?

- A. They must not cause harmful interference to stations operating in other radio services
- B. They must transmit no more than 30 minutes during each hour to minimize harmful interference to other radio services
- C. They must use lower sideband, suppressed-carrier, only
- D. They must not exceed 2.0 kHz of bandwidth

G1A16  
(A)  
[97.303(s)]  
Page 3-13

What restrictions may the FCC place on an amateur station that is causing interference to a broadcast receiver of good engineering design?

- A. Restrict the amateur station operation to times other than 8 pm to 10:30 pm local time every day, as well as on Sundays from 10:30 am to 1 pm local time
- B. Restrict the amateur station from operating at times requested by the owner of the receiver
- C. Restrict the amateur station to operation only during RACES drills
- D. Restrict the amateur station from operating at any time

G1B13  
(A)  
[97.121(a)]  
Page 3-12

Which of the following conditions require an amateur radio station to take specific steps to avoid harmful interference to other users or facilities?

- A. When operating within one mile of an FCC Monitoring Station
- B. When using a band where the amateur service is secondary
- C. When a station is transmitting spread spectrum emissions
- D. All of these answers are correct

G1E04  
(D)  
[97.13(b), 97.311(b),  
97.303]  
Page 3-11

Which of the following applies in the event of interference between a coordinated repeater and an uncoordinated repeater?

- A. The licensee of the non-coordinated repeater has primary responsibility to resolve the interference
- B. The licensee of the coordinated repeater has primary responsibility to resolve the interference
- C. Both repeater licensees share equal responsibility to resolve the interference
- D. The frequency coordinator bears primary responsibility to resolve the interference

G1E06  
(A)  
[97.205(c)]  
Page 3-12

### THIRD-PARTY TRAFFIC

Which of the following would disqualify a third party from participating in stating a message over an amateur station?

- A. The third party is a person previously licensed in the amateur service whose license had been revoked
- B. The third party is not a U.S. citizen
- C. The third party is a licensed amateur
- D. The third party is speaking in a language other than English, French, or Spanish

G1E01  
(A)  
[97.115(b)(2)]  
Page 3-13

What types of messages for a third party in another country may be transmitted by an amateur station?

- A. Any message, as long as the amateur operator is not paid
- B. Only messages for other licensed amateurs
- C. Only messages relating to amateur radio or remarks of a personal character, or messages relating to emergencies or disaster relief
- D. No messages may be transmitted to foreign countries for third parties

G1E05  
(C)  
[97.115(a)(2), 97.117]  
Page 3-13

G1E07 (C) [97.115(a)(2)] Page 3-14	<p>With which of the following is third-party traffic prohibited, except for messages directly involving emergencies or disaster relief communications?</p> <ul style="list-style-type: none"> <li>A. Countries in ITU Region 2</li> <li>B. Countries in ITU Region 1</li> <li>C. Any country other than the United States, unless there is a third-party agreement in effect with that country</li> <li>D. Any country which is not a member of the Internal Amateur Radio Union (IARU)</li> </ul>
G1E08 (B) [97.115(a)(b)] Page 3-14	<p>Which of the following is a requirement for a non-licensed person to communicate with a foreign amateur radio station from a US amateur station at which a licensed control operator is present?</p> <ul style="list-style-type: none"> <li>A. Information must be exchanged in English</li> <li>B. The foreign amateur station must be in a country with which the United States has a third party agreement</li> <li>C. The control operator must have at least a General class license</li> <li>D. All of these answers are correct</li> </ul>
G1E10 (D) [97.115(a)(2)] Page 3-13	<p>Which of the following is a permissible third party communication during routine amateur radio operations?</p> <ul style="list-style-type: none"> <li>A. Permitting an unlicensed person to speak to a licensed amateur anywhere in the world</li> <li>B. Sending a business message for another person, as long it is for a non-profit organization</li> <li>C. Sending a business message for another person, as long as the control operator has no pecuniary interest in the message</li> <li>D. Sending a message to a third party through a foreign station, as long as that person is a licensed amateur radio operator</li> </ul>
<b>PROHIBITED AND RESTRICTED COMMUNICATIONS</b>	
G1B05 (D) [97.113(a)(4), 97.113(e)] Page 3-15	<p>When may music be transmitted by an amateur station?</p> <ul style="list-style-type: none"> <li>A. At any time, as long as it produces no spurious emissions</li> <li>B. When it is unintentionally transmitted from the background at the transmitter</li> <li>C. When it is transmitted on frequencies above 1215 MHz</li> <li>D. When it is an incidental part of a space shuttle or ISS retransmission</li> </ul>
G1B06 (B) [97.113(a)(4), 97.207(f)] Page 3-15	<p>When is an amateur station permitted to transmit secret codes?</p> <ul style="list-style-type: none"> <li>A. During a declared communications emergency</li> <li>B. To control a space station</li> <li>C. Only when the information is of a routine, personal nature</li> <li>D. Only with Special Temporary Authorization from the FCC</li> </ul>
G1B07 (B) [97.113(a)(4)] Page 3-15	<p>What are the restrictions on the use of abbreviations or procedural signals in the amateur service?</p> <ul style="list-style-type: none"> <li>A. Only "Q" codes are permitted</li> <li>B. They may be used if they do not obscure the meaning of a message</li> <li>C. They are not permitted because they obscure the meaning of a message to FCC monitoring stations</li> <li>D. Only "10-codes" are permitted</li> </ul>
G1B08 (D) [97.113(a)(4), 97.113(e)] Page 3-15	<p>Which of the following is prohibited by the FCC Rules for amateur radio stations?</p> <ul style="list-style-type: none"> <li>A. Transmission of music as the primary program material during a contact</li> <li>B. The use of obscene or indecent words</li> <li>C. Transmission of false or deceptive messages or signals</li> <li>D. All of these answers are correct</li> </ul>



When may an amateur station transmit communications in which the licensee or control operator has a pecuniary (monetary) interest?	G1B09 (A) [97.113(a)(3)] Page 3-15
A. Only when other amateurs are being notified of the sale of apparatus normally used in an amateur station and such activity is not done on a regular basis	
B. Only when there is no other means of communications readily available	
C. At any time as long as the communication does not involve a third party	
D. Never	
When may a 10 meter repeater retransmit the 2 meter signal from a station having a Technician Class control operator?	G1E02 (D) [97.205(a)] Page 3-15
A. Under no circumstances	
B. Only if the station on 10 meters is operating under a Special Temporary Authorization allowing such retransmission	
C. Only during an FCC-declared General state of communications emergency	
D. Only if the 10 meter control operator holds at least a General class license	
What kind of amateur station simultaneously retransmits the signals of other stations on another channel?	G1E03 (A) [97.3(a)(39)] Page 3-15
A. Repeater Station	
B. Beacon Station	
C. Telecommand Station	
D. Relay Station	
<b>WRITTEN RECORDS</b>	
Which of the following information must a licensee retain as part of their station records?	G2D07 (B) [97.103(b)] Page 3-16
A. The call sign of other amateurs operating your station	
B. Antenna gain calculations or manufacturer's data for antennas used on 60 meters	
C. A record of all contacts made with stations in foreign countries	
D. A copy of all third party messages sent through your station	
Why do many amateurs keep a log even though the FCC doesn't require it?	G2D08 (D) Page 2-4, 3-16
A. The ITU requires a log of all international contacts	
B. The ITU requires a log of all international third party traffic	
C. The log provides evidence of operation needed to renew a license without retest	
D. To help with a reply if the FCC requests information on who was control operator of your station at a given date and time	
What information is traditionally contained in a station log?	G2D09 (D) Page 2-4, 3-16
A. Date and time of contact	
B. Band and/or frequency of the contact	
C. Call sign of station contacted and the signal report given	
D. All of these choices are correct	
Which of the following is required by the FCC rules when operating in the 60 meter band?	G2D12 (A) [97.303(s)] Page 3-15
A. If you are using other than a dipole antenna, you must keep a record of the gain of your antenna	
B. You must keep a log of the date, time, frequency, power level and stations worked	
C. You must keep a log of all third party traffic	
D. You must keep a log of the manufacturer of your equipment and the antenna used	

## Section 3.4

### GOOD AMATEUR PRACTICES

- G1B11  
(C)  
[97.101(a)]  
Page 3-16
- How does the FCC require an amateur station to be operated in all respects not covered by the Part 97 rules?
- A. In conformance with the rules of the IARU
  - B. In conformance with amateur radio custom
  - C. In conformance with good engineering and good amateur practice
  - D. All of these answers are correct
- G1B12  
(A)  
[97.101(a)]  
Page 3-16
- Who or what determines “good engineering and good amateur practice” that apply to operation of an amateur station in all respects not covered by the Part 97 rules?
- A. The FCC
  - B. The Control Operator
  - C. The IEEE
  - D. The ITU

### TRANSMITTERS AND AMPLIFIER POWER

- G1C01  
(A)  
[97.313(c)(1)]  
Page 3-17
- What is the maximum transmitting power an amateur station may use on 10.140 MHz?
- A. 200 watts PEP output
  - B. 1000 watts PEP output
  - C. 1500 watts PEP output
  - D. 2000 watts PEP output
- G1C02  
(C)  
[97.313(a),  
97.313(b)]  
Page 3-17
- What is the maximum transmitting power an amateur station may use on the 12 meter band?
- A. 1500 PEP output, except for 200 watts PEP output in the novice portion
  - B. 200 watts PEP output
  - C. 1500 watts PEP output
  - D. Effective radiated power equivalent to 50 watts from a half wave dipole
- G1C03  
(B)  
[97.313]  
Page 3-17
- What is the maximum transmitting power a General class licensee may use when operating between 7025 and 7125 kHz?
- A. 200 watts PEP output
  - B. 1500 watts PEP output
  - C. 1000 watts PEP output
  - D. 2000 watts PEP output
- G1C04  
(A)  
[97.313]  
Page 3-17
- What limitations, other than the 1500 watt PEP limit, are placed on transmitter power in the 14 MHz band?
- A. Only the minimum power necessary to carry out the desired communications should be used
  - B. Power must be limited to 200 watts when transmitting between 14.100 MHz and 14.150 MHz
  - C. Power should be limited as necessary to avoid interference to another radio service on the frequency
  - D. Effective radiated power cannot exceed 3000 watts
- G1C05  
(C)  
[97.313]  
Page 3-17
- What is the maximum transmitting power a station with a General Class control operator may use on the 28 MHz band?
- A. 100 watts PEP output
  - B. 1000 watts PEP output
  - C. 1500 watts PEP output
  - D. 2000 watts PEP output

What is the maximum transmitting power an amateur station may use on 1825 kHz?	G1C06 (D) [97.313(b)] Page 3-17
A. 200 watts PEP output	
B. 1000 watts PEP output	
C. 1200 watts PEP output	
D. 1500 watts PEP output	
Which of the following is a requirement when a station is transmitting on the 60 meter band?	G1C07 (C) [97.303(s)] Page 3-17
A. Transmissions may only use Lower Sideband (LSB)	
B. Transmissions must use only CW or Data modes	
C. Transmissions must not exceed an effective radiated power of 50 Watts PEP referred to a dipole antenna	
D. Transmissions must not exceed an effective radiated power of 200 Watts PEP referred to a dipole antenna	
What is the maximum bandwidth permitted by FCC rules for amateur radio stations when operating on USB frequencies in the 60-meter band?	G1C13 (A) [97.303s] Page 3-17
A. 2.8 kHz	
B. 5.6 kHz	
C. +/-2.8 kHz	
D. 3 kHz	
What is QRP operation?	G2D10 (B) Page 3-17
A. Remote Piloted Model control	
B. Low power transmit operation, typically about 5 watts	
C. Transmission using Quick Response Protocol	
D. Traffic Relay Procedure net operation	
<b>DIGITAL TRANSMISSIONS</b>	
What is the maximum symbol rate permitted for RTTY emissions transmitted on frequency bands below 28 MHz?	G1C08 (D) [97.305(c), 97.307(f)(3)] Page 3-18
A. 56 kilobaud	
B. 19.6 kilobaud	
C. 1200 baud	
D. 300 baud	
What is the maximum symbol rate permitted for packet emission transmissions on the 2 meter band?	G1C09 (C) [97.305(c), 97.307(f)(5)] Page 3-18
A. 300 baud	
B. 1200 baud	
C. 19.6 kilobaud	
D. 56 kilobaud	
What is the maximum symbol rate permitted for RTTY or data emission transmissions on the 10 meter band?	G1C10 (C) [97.305(c), 97.307(f)(4)] Page 3-18
A. 56 kilobaud	
B. 19.6 kilobaud	
C. 1200 baud	
D. 300 baud	
What is the maximum symbol rate permitted for RTTY or data emission transmissions on the 6 and 2 meter bands?	G1C11 (B) [97.305(c), 97.307(f)(5)] Page 3-18
A. 56 kilobaud	
B. 19.6 kilobaud	
C. 1200 baud	
D. 300 baud	

G1C12  
(A)  
[97.305(c),  
97.307(f)(5)]  
Page 3-18

What is the maximum authorized bandwidth for RTTY, data or multiplexed emissions using an unspecified digital code transmitted on the 6 and 2 meter bands?

- A. 20 kHz
- B. 50 kHz
- C. The total bandwidth shall not exceed that of a single-sideband phone emission
- D. The total bandwidth shall not exceed 10 times that of a CW emission

# Chapter 4

## Section 4.1

### RESISTANCE AND OHM'S LAW

How many watts of electrical power are used if 400 VDC is supplied to an 800-ohm load?

- A. 0.5 watts
- B. 200 watts
- C. 400 watts
- D. 3200 watts

G5B03  
(B)  
Page 4-2

How many watts of electrical power are used by a 12-VDC light bulb that draws 0.2 amperes?

- A. 2.4 watts
- B. 24 watts
- C. 6 watts
- D. 60 watts

G5B04  
(A)  
Page 4-2

How many watts are being dissipated when a current of 7.0 milliamperes flows through 1.25 kilohms?

- A. Approximately 61 milliwatts
- B. Approximately 39 milliwatts
- C. Approximately 11 milliwatts
- D. Approximately 9 milliwatts

G5B05  
(A)  
Page 4-2

## Section 4.2

### DECIBELS

A two-times increase or decrease in power results in a change of how many dB?

- A. 2 dB
- B. 3 dB
- C. 6 dB
- D. 12 dB

G5B01  
(B)  
Page 4-4

What percentage of power loss would result from a transmission line loss of 1 dB?

- A. 10.9 %
- B. 12.2 %
- C. 20.5 %
- D. 25.9 %

G5B13  
(C)  
Page 4-5

### RMS: DEFINITION AND MEASUREMENT

Which measurement of an AC signal is equivalent to a DC voltage of the same value?

- A. The peak-to-peak value
- B. The peak value
- C. The RMS value
- D. The reciprocal of the RMS value

G5B07  
(C)  
Page 4-5

G5B08  
(D)  
Page 4-6

What is the peak-to-peak voltage of a sine wave that has an RMS voltage of 120 volts?

- A. 84.8 volts
- B. 169.7 volts
- C. 240.0 volts
- D. 339.4 volts

G5B09  
(B)  
Page 4-6

What is the RMS voltage of sine wave with a value of 17 volts peak?

- A. 8.5 volts
- B. 12 volts
- C. 24 volts
- D. 34 volts

### **PEP: DEFINITION AND MEASUREMENT**

G5B06  
(B)  
Page 4-7

What is the output PEP from a transmitter if an oscilloscope measures 200 volts peak-to-peak across a 50-ohm dummy load connected to the transmitter output?

- A. 1.4 watts
- B. 100 watts
- C. 353.5 watts
- D. 400 watts

G5B11  
(B)  
Page 4-7

What is the ratio of peak envelope power to average power for an unmodulated carrier?

- A. .707
- B. 1.00
- C. 1.414
- D. 2.00

G5B12  
(B)  
Page 4-7

What would be the voltage across a 50-ohm dummy load dissipating 1200 watts?

- A. 173 volts
- B. 245 volts
- C. 346 volts
- D. 692 volts

G5B14  
(B)  
Page 4-7

What is the output PEP from a transmitter if an oscilloscope measures 500 volts peak-to-peak across a 50-ohm resistor connected to the transmitter output?

- A. 8.75 watts
- B. 625 watts
- C. 2500 watts
- D. 5000 watts

G5B15  
(B)  
Page 4-7

What is the output PEP of an unmodulated carrier if an average reading wattmeter connected to the transmitter output indicates 1060 watts?

- A. 530 watts
- B. 1060 watts
- C. 1500 watts
- D. 2120 watts

## Section 4.3

### RESISTORS AND RESISTANCE

What will happen to the resistance if the temperature of a carbon resistor is increased?

- A. It will increase by 20% for every 10 degrees centigrade
- B. It will stay the same
- C. It will change depending on the resistor's temperature coefficient rating
- D. It will become time dependent

G6A01  
(C)  
Page 4-9

What is the main disadvantage of using a conventional wire-wound resistor in a resonant circuit?

- A. The resistor's tolerance value would not be adequate for such a circuit
- B. The resistor's inductance could detune the circuit
- C. The resistor could overheat
- D. The resistor's internal capacitance would detune the circuit

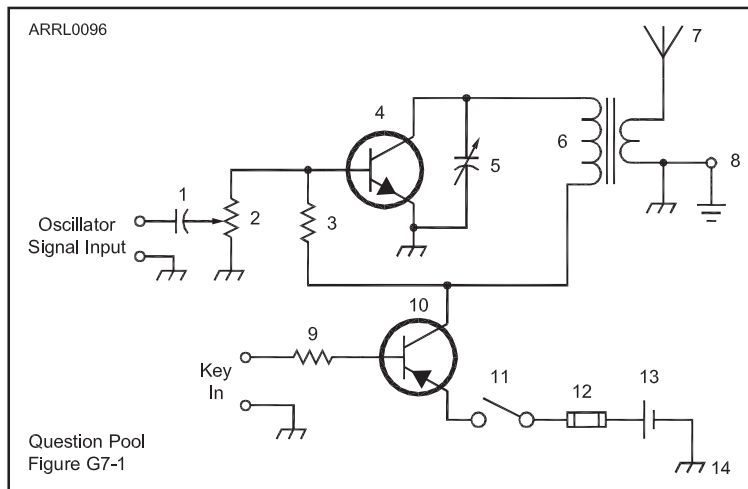
G6A06  
(B)  
Page 4-9

What type of component is a thermistor?

- A. A resistor that is resistant to changes in value with temperature variations
- B. A device having a controlled change in resistance with temperature variations
- C. A special type of transistor for use at very cold temperatures
- D. A capacitor that changes value with temperature

G6A13  
(B)  
Page 4-9

**Figure G7-1 — Refer to this figure for questions G7A19 through G7A24.**



Which symbol in figure G7-1 represents a fixed resistor?

- A. Symbol 2
- B. Symbol 6
- C. Symbol 3
- D. Symbol 12

G7A19  
(C)  
Page 4-10

## INDUCTORS AND INDUCTANCE

- G6A07  
(D)  
Page 4-12
- What is an advantage of using a ferrite core with a toroidal inductor?
- A. Large values of inductance may be obtained
  - B. The magnetic properties of the core may be optimized for a specific range of frequencies
  - C. Most of the magnetic field is contained in the core
  - D. All of these choices are correct
- G6A08  
(C)  
Page 4-11
- How should two solenoid inductors be placed so as to minimize their mutual inductance?
- A. In line with their winding axis
  - B. With their winding axes parallel to each other
  - C. With their winding axes at right angles to each another
  - D. Within the same shielded enclosure
- G6A09  
(B)  
Page 4-11
- Why might it be important to minimize the mutual inductance between two inductors?
- A. To increase the energy transfer between both circuits
  - B. To reduce or eliminate unwanted coupling
  - C. To reduce conducted emissions
  - D. To increase the self-resonant frequency of both inductors
- G6A10  
(B)  
Page 4-11
- What is an effect of inter-turn capacitance in an inductor?
- A. The magnetic field may become inverted
  - B. The inductor may become self resonant at some frequencies
  - C. The permeability will increase
  - D. The voltage rating may be exceeded
- G6A12  
(D)  
Page 4-11
- What is the common name for an inductor used to help smooth the DC output from the rectifier in a conventional power supply?
- A. Back EMF choke
  - B. Repulsion coil
  - C. Charging inductor
  - D. Filter choke

## CAPACITORS AND CAPACITANCE

- G6A02  
(D)  
Page 4-13
- What type of capacitor is often used in power-supply circuits to filter the rectified AC?
- A. Disc ceramic
  - B. Vacuum variable
  - C. Mica
  - D. Electrolytic
- G6A03  
(D)  
Page 4-13
- Which of the following is the primary advantage of ceramic capacitors?
- A. Tight tolerance
  - B. High stability
  - C. High capacitance for given volume
  - D. Comparatively low cost
- G6A04  
(C)  
Page 4-13
- Which of the following is an advantage of an electrolytic capacitor?
- A. Tight tolerance
  - B. Non-polarized
  - C. High capacitance for given volume
  - D. Inexpensive RF capacitor



Which of the following is one effect of lead inductance in a capacitor used at VHF and above?

- A. Effective capacitance may be reduced
- B. Voltage rating may be reduced
- C. ESR may be reduced
- D. The polarity of the capacitor might become reversed

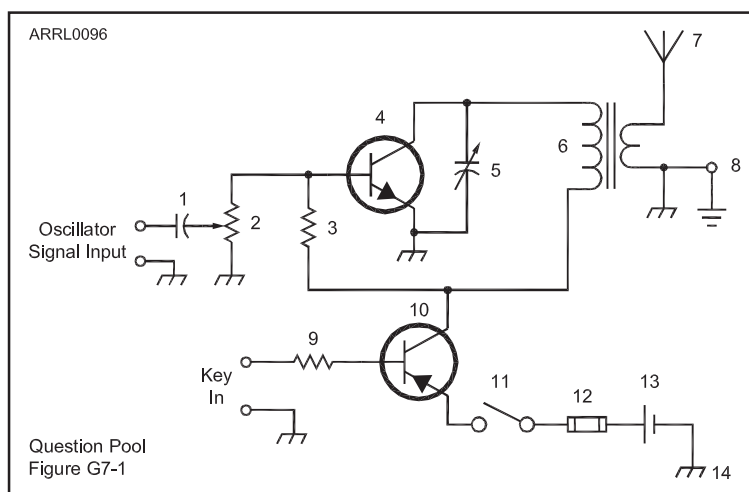
G6A05  
(A)  
Page 4-13

What is the common name for a capacitor connected across a transformer secondary that is used to absorb transient voltage spikes?

- A. Clipper capacitor
- B. Trimmer capacitor
- C. Feedback capacitor
- D. Suppressor capacitor

G6A11  
(D)  
Page 4-13

**Figure G7-1 — Refer to this figure for questions G7A19 through G7A24.**



Which symbol in figure G7-1 represents a variable capacitor?

- A. Symbol 2
- B. Symbol 11
- C. Symbol 5
- D. Symbol 12

G7A22  
(C)  
Page 4-12

## SERIES AND PARALLEL CIRCUITS AND COMPONENTS

How does the total current relate to the individual currents in each branch of a parallel circuit?

- A. It equals the average of each branch current
- B. It decreases as more parallel branches are added to the circuit
- C. It equals the sum of the currents through each branch
- D. It is the sum of the reciprocal of each individual voltage drop

G5B02  
(C)  
Page 4-14

What is the total resistance of three 100-ohm resistors in parallel?

- A. .30 ohms
- B. .33 ohms
- C. 33.3 ohms
- D. 300 ohms

G5C04  
(C)  
Page 4-15

G5C05 (C) Page 4-15	<p>What is the value of each resistor if three equal value resistors in parallel produce 50 ohms of resistance, and the same three resistors in series produce 450 ohms?</p> <p>A. 1500 ohms B. 90 ohms C. 150 ohms D. 175 ohms</p>
G5C08 (D) Page 4-15	<p>What is the equivalent capacitance of two 5000 picofarad capacitors and one 750 picofarad capacitor connected in parallel?</p> <p>A. 576.9 picofarads B. 1733 picofarads C. 3583 picofarads D. 10750 picofarads</p>
G5C09 (C) Page 4-15	<p>What is the capacitance of three 100 microfarad capacitors connected in series?</p> <p>A. .30 microfarads B. .33 microfarads C. 33.3 microfarads D. 300 microfarads</p>
G5C10 (C) Page 4-15	<p>What is the inductance of three 10 millihenry inductors connected in parallel?</p> <p>A. .30 Henrys B. 3.3 Henrys C. 3.3 millihenrys D. 30 millihenrys</p>
G5C11 (C) Page 4-15	<p>What is the inductance of a 20 millihenry inductor in series with a 50 millihenry inductor?</p> <p>A. .07 millihenrys B. 14.3 millihenrys C. 70 millihenrys D. 1000 millihenrys</p>
G5C12 (B) Page 4-15	<p>What is the capacitance of a 20 microfarad capacitor in series with a 50 microfarad capacitor?</p> <p>A. .07 microfarads B. 14.3 microfarads C. 70 microfarads D. 1000 microfarads</p>
G5C13 (C) Page 4-14	<p>What component should be added to a capacitor in a circuit to increase the circuit capacitance?</p> <p>A. An inductor in series B. A resistor in series C. A capacitor in parallel D. A capacitor in series</p>
G5C14 (D) Page 4-14	<p>What component should be added to an inductor in a circuit to increase the circuit inductance?</p> <p>A. A capacitor in series B. A resistor in parallel C. An inductor in parallel D. An inductor in series</p>

What is the total resistance of a 10 ohm, a 20 ohm, and a 50 ohm resistor in parallel?

- A. 5.9 ohms
- B. 0.17 ohms
- C. 10000 ohms
- D. 80 ohms

G5C15

(A)

Page 4-15

What component should be added to an existing resistor in a circuit to increase circuit resistance?

- A. A resistor in parallel
- B. A resistor in series
- C. A capacitor in series
- D. A capacitor in parallel

G5C16

(B)

Page 4-14

### TRANSFORMERS

What causes a voltage to appear across the secondary winding of a transformer when an AC voltage source is connected across its primary winding?

- A. Capacitive coupling
- B. Displacement current coupling
- C. Mutual inductance
- D. Mutual capacitance

G5C01

(C)

Page 4-16

Where is the source of energy normally connected in a transformer?

- A. To the secondary winding
- B. To the primary winding
- C. To the core
- D. To the plates

G5C02

(B)

Page 4-16

What is current in the primary winding of a transformer called if no load is attached to the secondary?

- A. Magnetizing current
- B. Direct current
- C. Excitation current
- D. Stabilizing current

G5C03

(A)

Page 4-17

What is the voltage across a 500-turn secondary winding in a transformer if the 2250-turn primary is connected to 120 VAC?

- A. 2370 volts
- B. 540 volts
- C. 26.7 volts
- D. 5.9 volts

G5C06

(C)

Page 4-16

What is the turns ratio of a transformer used to match an audio amplifier having a 600-ohm output impedance to a speaker having a 4-ohm impedance?

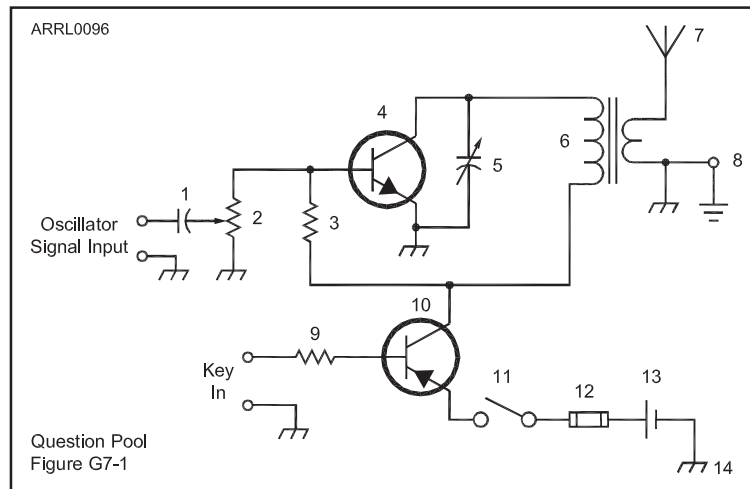
- A. 12.2 to 1
- B. 24.4 to 1
- C. 150 to 1
- D. 300 to 1

G5C07

(A)

Page 4-16

**Figure G7-1 — Refer to this figure for questions G7A19 through G7A24.**



G7A23  
(A)  
Page 4-16

Which symbol in figure G7-1 represents a transformer?

- A. Symbol 6
- B. Symbol 4
- C. Symbol 10
- D. Symbol 2

### VACUUM TUBES

G6B10  
(A)  
Page 4-17

Which element of a triode vacuum tube is used to regulate the flow of electrons between cathode and plate?

- A. Control grid
- B. Heater
- C. Screen Grid
- D. Suppressor grid

G6B11  
(B)  
Page 4-18

Which of the following solid state devices is most like a vacuum tube in its general characteristics?

- A. A bipolar transistor
- B. An FET
- C. A tunnel diode
- D. A varistor

G6B12  
(A)  
Page 4-17

What is the primary purpose of a screen grid in a vacuum tube?

- A. To reduce grid-to-plate capacitance
- B. To increase efficiency
- C. To increase the high frequency response
- D. To decrease plate resistance

## Section 4.4

### REACTANCE

What is reactance?

- A. Opposition to the flow of direct current caused by resistance
- B. Opposition to the flow of alternating current caused by capacitance or inductance
- C. A property of ideal resistors in AC circuits
- D. A large spark produced at switch contacts when an inductor is deenergized

G5A02  
(B)  
Page 4-18

Which of the following causes opposition to the flow of alternating current in an inductor?

- A. Conductance
- B. Reluctance
- C. Admittance
- D. Reactance

G5A03  
(D)  
Page 4-20

Which of the following causes opposition to the flow of alternating current in a capacitor?

- A. Conductance
- B. Reluctance
- C. Reactance
- D. Admittance

G5A04  
(C)  
Page 4-19

How does a coil react to AC?

- A. As the frequency of the applied AC increases, the reactance decreases
- B. As the amplitude of the applied AC increases, the reactance increases
- C. As the amplitude of the applied AC increases, the reactance decreases
- D. As the frequency of the applied AC increases, the reactance increases

G5A05  
(D)  
Page 4-20

How does a capacitor react to AC?

- A. As the frequency of the applied AC increases, the reactance decreases
- B. As the frequency of the applied AC increases, the reactance increases
- C. As the amplitude of the applied AC increases, the reactance increases
- D. As the amplitude of the applied AC increases, the reactance decreases

G5A06  
(A)  
Page 4-19

What unit is used to measure reactance?

- A. Farad
- B. Ohm
- C. Ampere
- D. Siemens

G5A09  
(B)  
Page 4-18

### IMPEDANCE

What is impedance?

- A. The electric charge stored by a capacitor
- B. The inverse of resistance
- C. The opposition to the flow of current in an AC circuit
- D. The force of repulsion between two similar electric fields

G5A01  
(C)  
Page 4-20

What unit is used to measure impedance?

- A. Volt
- B. Ohm
- C. Ampere
- D. Watt

G5A10  
(B)  
Page 4-20

## RESONANCE, SOURCE AND LOAD IMPEDANCE MATCHING

- G5A07  
(D)  
Page 4-21
- What happens when the impedance of an electrical load is equal to the internal impedance of the power source?
- A. The source delivers minimum power to the load
  - B. The electrical load is shorted
  - C. No current can flow through the circuit
  - D. The source can deliver maximum power to the load
- G5A08  
(A)  
Page 4-21
- Why is impedance matching important?
- A. So the source can deliver maximum power to the load
  - B. So the load will draw minimum power from the source
  - C. To ensure that there is less resistance than reactance in the circuit
  - D. To ensure that the resistance and reactance in the circuit are equal
- G5A11  
(A)  
Page 4-22
- Why should core saturation of a conventional impedance matching transformer be avoided?
- A. Harmonics and distortion could result
  - B. Magnetic flux would increase with frequency
  - C. RF susceptance would increase
  - D. Temporary changes of the core permeability could result
- G5A12  
(B)  
Page 4-21
- What is one reason to use an impedance matching transformer?
- A. To reduce power dissipation in the transmitter
  - B. To maximize the transfer of power
  - C. To minimize SWR at the antenna
  - D. To minimize SWR in the transmission line
- G5A13  
(D)  
Page 4-21
- Which of the following devices can be used for impedance matching at radio frequencies?
- A. A transformer
  - B. A Pi-network
  - C. A length of transmission line
  - D. All of these choices are correct
- G5A14  
(A)  
Page 4-21
- Which of the following describes one method of impedance matching between two AC circuits?
- A. Insert an LC network between the two circuits
  - B. Reduce the power output of the first circuit
  - C. Increase the power output of the first circuit
  - D. Insert a circulator between the two circuits

## Section 4.5

### DIODES AND RECTIFIERS

- G6B01  
(C)  
Page 4-22
- What is the peak-inverse-voltage rating of a rectifier?
- A. The maximum voltage the rectifier will handle in the conducting direction
  - B. 1.4 times the AC frequency
  - C. The maximum voltage the rectifier will handle in the non-conducting direction
  - D. 2.8 times the AC frequency
- G6B02  
(A)  
Page 4-22
- What are the two major ratings that must not be exceeded for silicon-diode rectifiers?
- A. Peak inverse voltage; average forward current
  - B. Average power; average voltage
  - C. Capacitive reactance; avalanche voltage
  - D. Peak load impedance; peak voltage

What is the approximate junction threshold voltage of a germanium diode?

- A. 0.1 volt
- B. 0.3 volts
- C. 0.7 volts
- D. 1.0 volts

G6B03

(B)

Page 4-22

What is the approximate junction threshold voltage of a silicon diode?

- A. 0.1 volt
- B. 0.3 volts
- C. 0.7 volts
- D. 1.0 volts

G6B05

(C)

Page 4-22

Which of the following is an advantage of using a Schottky diode in an RF switching circuit as compared to a standard silicon diode?

- A. Lower capacitance
- B. Lower inductance
- C. Longer switching times
- D. Higher breakdown voltage

G6B06

(A)

Page 4-23

### **BIPOLAR AND FET TRANSISTORS**

What are the stable operating points for a bipolar transistor that is used as a switch in a logic circuit?

- A. Its saturation and cut-off regions
- B. Its active region (between the cut-off and saturation regions)
- C. Between its peak and valley current points
- D. Between its enhancement and depletion modes

G6B07

(A)

Page 4-24

Why is it often necessary to insulate the case of a large power transistor?

- A. To increase the beta of the transistor
- B. To improve the power dissipation capability
- C. To reduce stray capacitance
- D. To avoid shorting the collector or drain voltage to ground

G6B08

(D)

Page 4-25

Which of the following describes the construction of a MOSFET?

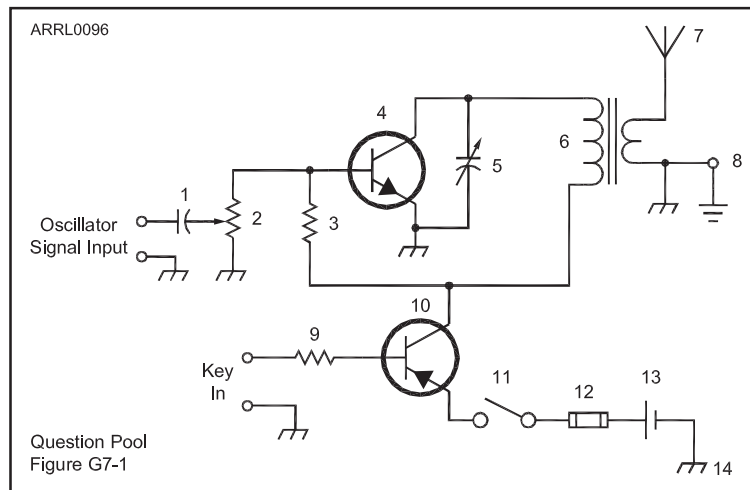
- A. The gate is formed by a back-biased junction
- B. The gate is separated from the channel with a thin insulating layer
- C. The source is separated from the drain by a thin insulating layer
- D. The source is formed by depositing metal on silicon

G6B09

(B)

Page 4-24

**Figure G7-1 — Refer to this figure for questions G7A19 through G7A24.**



G7A21  
(B)  
Page 4-23

Which symbol in figure G7-1 represents a single a NPN transistor?

- A. Symbol 2
- B. Symbol 4
- C. Symbol 10
- D. Symbol 12

G6C01  
(D)  
Page 4-25

Which of the following is most often provided as an analog integrated circuit?

- A. NAND Gate
- B. Gallium Arsenide UHF Receiver “front end” Amplifier
- C. Frequency Counter
- D. Linear voltage regulator

G6C02  
(C)  
Page 4-27

Which of the following is the most commonly used digital logic family of integrated circuits?

- A. RTL
- B. TTL
- C. CMOS
- D. PMOS

G6C03  
(A)  
Page 4-27

Which of the following is an advantage of CMOS Logic integrated circuits compared to TTL logic circuits?

- A. Low power consumption
- B. High power handling capability
- C. Better suited for RF amplification
- D. Better suited for power supply regulation

G6C06  
(D)  
Page 4-25

Which type of integrated circuit is an operational amplifier?

- A. Digital
- B. MMIC
- C. Programmable
- D. Analog



Which of the following describes a “flip-flop” circuit?

- A. A transmit-receive circuit
- B. A digital circuit with two stable states
- C. An RF limiter
- D. A voice-operated switch

G7B01  
(B)  
Page 4-25

Why do digital circuits use the binary number system?

- A. Binary “ones” and “zeros” are easy to represent with an “on” or “off” state
- B. The binary number system is most accurate
- C. Binary numbers are more compatible with analog circuitry
- D. All of these answers are correct

G7B02  
(A)  
Page 4-25

What is the output of a two-input NAND gate, given both inputs are “one”?

- A. Two
- B. One
- C. Zero
- D. Minus One

G7B03  
(C)  
Page 4-25

What is the output of a NOR gate given that both inputs are “zero”?

- A. Zero
- B. One
- C. Minus one
- D. The opposite from the previous state

G7B04  
(B)  
Page 4-25

How many states are there in a 3-bit binary counter?

- A. 3
- B. 6
- C. 8
- D. 16

G7B05  
(C)  
Page 4-27

What is a shift register?

- A. A clocked array of circuits that passes data in steps along the array
- B. An array of operational amplifiers used for tri-state arithmetic operations
- C. A digital mixer
- D. An analog mixer

G7B06  
(A)  
Page 4-27

## **RF INTEGRATED CIRCUITS**

What is meant by the term MMIC?

- A. Multi Megabyte Integrated Circuit
- B. Monolithic Microwave Integrated Circuit
- C. Military-specification Manufactured Integrated Circuit
- D. Mode Modulated Integrated Circuit

G6C10  
(B)  
Page 4-27

## **MICROPROCESSORS AND RELATED COMPONENTS**

What is meant by the term ROM?

- A. Resistor Operated Memory
- B. Read Only Memory
- C. Random Operational Memory
- D. Resistant to Overload Memory

G6C04  
(B)  
Page 4-28

G6C05  
(C)  
Page 4-28

- What is meant when memory is characterized as “non-volatile”?
- A. It is resistant to radiation damage
  - B. It is resistant to high temperatures
  - C. The stored information is maintained even if power is removed
  - D. The stored information cannot be changed once written

G6C11  
(B)  
Page 4-28

- What is a microprocessor?
- A. A low powered analog signal processor used as a microwave detector
  - B. A miniature computer on a single integrated circuit chip
  - C. A microwave detector, amplifier, and local oscillator on a chip
  - D. A low voltage amplifier used in a microwave transmitter modulator stage

G6C12  
(A)  
Page 4-29

- What two devices in an amateur radio station might be connected using a USB interface?
- A. Computer and transceiver
  - B. Microphone and transceiver
  - C. Amplifier and antenna
  - D. Power supply and amplifier

### **VISUAL INTERFACES**

G6C07  
(D)  
Page 4-29

- What is one disadvantage of an incandescent indicator compared to a LED?
- A. Low power consumption
  - B. High speed
  - C. Long life
  - D. High power consumption

G6C08  
(D)  
Page 4-29

- How is an LED biased when emitting light?
- A. Beyond cutoff
  - B. At the Zener voltage
  - C. Reverse Biased
  - D. Forward Biased

G6C09  
(A)  
Page 4-29

- Which of the following is a characteristic of a liquid crystal display?
- A. It requires ambient or back lighting
  - B. It offers a wide dynamic range
  - C. It has a wide viewing angle
  - D. All of these choices are correct

## **Section 4.6**

### **RECTIFIERS AND POWER SUPPLIES**

G6B04  
(C)  
Page 4-32

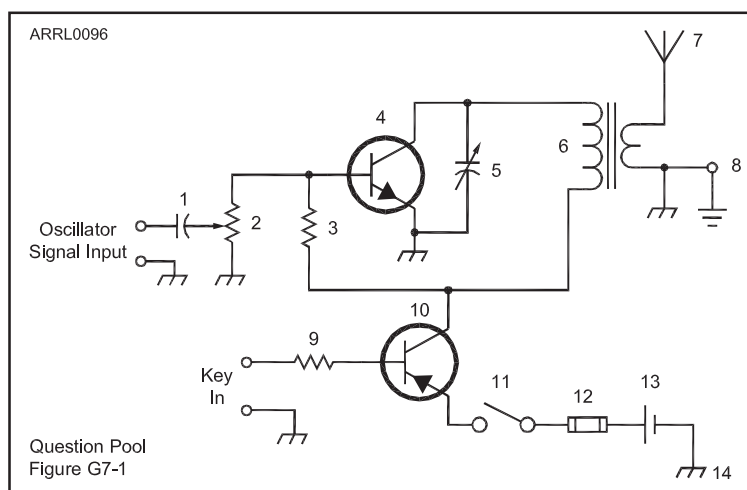
- When two or more diodes are connected in parallel to increase current handling capacity, what is the purpose of the resistor connected in series with each diode?
- A. The resistors ensure the thermal stability of the power supply
  - B. The resistors regulate the power supply output voltage
  - C. The resistors ensure that one diode doesn't carry most of the current
  - D. The resistors act as swamping resistors in the circuit

G7A01  
(B)  
Page 4-33

- What safety feature does a power-supply bleeder resistor provide?
- A. It acts as a fuse for excess voltage
  - B. It discharges the filter capacitors
  - C. It removes shock hazards from the induction coils
  - D. It eliminates ground-loop current

What components are used in a power-supply filter network?	G7A02
A. Diodes	(D)
B. Transformers and transistors	Page 4-32
C. Quartz crystals	
D. Capacitors and inductors	
What should be the minimum peak-inverse-voltage rating of the rectifier in a full-wave power supply?	G7A03
A. One-quarter the normal output voltage of the power supply	(C)
B. Half the normal output voltage of the power supply	Page 4-31
C. Double the normal peak output voltage of the power supply	
D. Equal to the normal output voltage of the power supply	
What should be the approximate minimum peak-inverse-voltage rating of the rectifier in a half-wave power supply?	G7A04
A. One-half the normal peak output voltage of the power supply	(D)
B. Half the normal output voltage of the power supply	Page 4-31
C. Equal to the normal output voltage of the power supply	
D. Two times the normal peak output voltage of the power supply	
Which of the following is a desirable characteristic for capacitors used to filter the DC output of a switching power supply?	G7A14
A. Low equivalent series resistance	(A)
B. High equivalent series resistance	Page 4-34
C. Low Temperature coefficient	
D. High Temperature coefficient	
Which of the following is an advantage of a switched-mode power supply as compared to a linear power supply?	G7A15
A. Faster switching time makes higher output voltage possible	(C)
B. Fewer circuit components are required	Page 4-34
C. High frequency operation allows the use of smaller components	
D. All of these choices are correct	
What portion of the AC cycle is converted to DC by a half-wave rectifier?	G7A16
A. 90 degrees	(B)
B. 180 degrees	Page 4-30
C. 270 degrees	
D. 360 degrees	
What portion of the AC cycle is converted to DC by a full-wave rectifier?	G7A17
A. 90 degrees	(D)
B. 180 degrees	Page 4-30
C. 270 degrees	
D. 360 degrees	
What is the output waveform of an unfiltered full-wave rectifier connected to a resistive load?	G7A18
A. A series of DC pulses at twice the frequency of the AC input	(A)
B. A series of DC pulses at the same frequency as the AC input	Page 4-30
C. A sine wave at half the frequency of the AC input	
D. A steady DC voltage	

**Figure G7-1 — Refer to this figure for questions G7A19 through G7A24.**



G7A24  
(C)  
Page 4-30

Which symbol in figure G7-1 represents a single pole switch?

- A. Symbol 2
- B. Symbol 3
- C. Symbol 11
- D. Symbol 12

### BATTERIES AND CHARGERS

G4E07  
(C)  
Page 4-36

When might a lead-acid storage battery give off explosive hydrogen gas?

- A. When stored for long periods of time
- B. When being discharged
- C. When being charged
- D. When not placed on a level surface

G6B13  
(B)  
Page 4-35

What is an advantage of the low internal resistance of Nickel Cadmium batteries?

- A. Long life
- B. High discharge current
- C. High voltage
- D. Rapid recharge

G6B14  
(C)  
Page 4-35

What is the minimum allowable discharge voltage for maximum life of a standard 12 volt lead acid battery?

- A. 6 volts
- B. 8.5 volts
- C. 10.5 volts
- D. 12 volts

G6B15  
(D)  
Page 4-36

When is it acceptable to recharge a carbon-zinc primary cell?

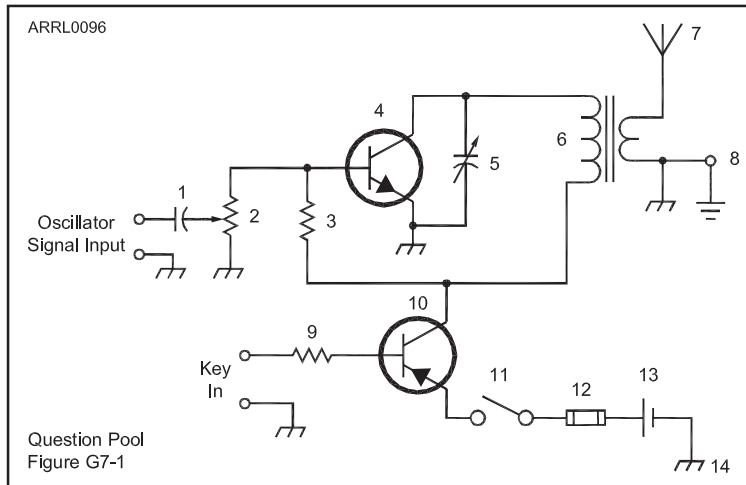
- A. As long as the voltage has not been allowed to drop below 1.0 volt
- B. When the cell is kept warm during the recharging period
- C. When a constant current charger is used
- D. Never

Which of the following is a rechargeable battery?

- A. Carbon-zinc
- B. Silver oxide
- C. Nickel Metal Hydride
- D. Mercury

G6B16  
(C)  
Page 4-35

**Figure G7-1 — Refer to this figure for questions G7A19 through G7A24.**



Which symbol in figure G7-1 represents a single cell battery?

- A. Symbol 5
- B. Symbol 12
- C. Symbol 8
- D. Symbol 13

G7A20  
(D)  
Page 4-35

### ALTERNATIVE POWER

What is the name of the process by which sunlight is changed directly into electricity?

- A. Photovoltaic conversion
- B. Photon emission
- C. Photosynthesis
- D. Photon decomposition

G4E08  
(A)  
Page 4-36

What is the approximate open-circuit voltage from a modern, well illuminated photovoltaic cell?

- A. 0.02 VDC
- B. 0.5 VDC
- C. 0.2 VDC
- D. 1.38 VDC

G4E09  
(B)  
Page 4-36

Which of these materials is used as the active element of a solar cell?

- A. Doped Silicon
- B. Nickel Hydride
- C. Doped Platinum
- D. Aluminum nitride

G4E10  
(A)  
Page 4-36

G4E11  
(C)  
Page 4-36

- Which of the following is a disadvantage to using wind power as the primary source of power for an emergency station?
- A. The conversion efficiency from mechanical energy to electrical energy is less than 2 percent
  - B. The voltage and current ratings of such systems are not compatible with amateur equipment
  - C. A large energy storage system is needed to supply power when the wind is not blowing
  - D. All of these choices are correct

## CONNECTORS

G4D07  
(A)  
Page 4-39

- Which of the following describes a Type-N connector?
- A. A moisture resistant RF connector useful to 10 GHz
  - B. A small bayonet connector used for data circuits
  - C. A threaded connector used for hydraulic systems
  - D. An audio connector used in surround sound installations

G4D08  
(D)  
Page 4-39

- Which of the following connectors would be a good choice for a serial data port?
- A. PL-259
  - B. Type N
  - C. Type SMA
  - D. DB

G4D09  
(C)  
Page 4-39

- Which of these connector types is commonly used for RF service at frequencies up to 150 MHz?
- A. Octal
  - B. RJ
  - C. UHF
  - D. DB

G4D10  
(C)  
Page 4-38

- Which of these connector types is commonly used for audio signals in amateur radio stations?
- A. PL-259
  - B. BNC
  - C. RCA Phono
  - D. Type N

G4D11  
(B)  
Page 4-37

- What is the main reason to use keyed connectors over non-keyed types?
- A. Prevention of use by unauthorized persons
  - B. Reduced chance of damage due to incorrect mating
  - C. Higher current carrying capacity
  - D. All of these choices are correct

## Section 4.7

### ANALOG AND DIGITAL METERS

G4B07  
(C)  
Page 4-40

- What is an advantage of a digital voltmeter as compared to an analog voltmeter?
- A. Better for measuring computer circuits
  - B. Better for RF measurements
  - C. Significantly better precision for most uses
  - D. Faster response

Why is high input impedance desirable for a voltmeter?	G4B16
A. It improves the frequency response	(D)
B. It decreases battery consumption in the meter	Page 4-41
C. It improves the resolution of the readings	
D. It decreases the loading on circuits being measured	

### OSCILLOSCOPE

What item of test equipment contains horizontal and vertical channel amplifiers?	G4B01
A. An ohmmeter	(D)
B. A signal generator	Page 4-41
C. An ammeter	
D. An oscilloscope	

Which of the following is an advantage of an oscilloscope versus a digital voltmeter?	G4B02
A. An oscilloscope uses less power	(D)
B. Complex impedances can be easily measured	Page 4-41
C. Input impedance is much lower	
D. Complex waveforms can be measured	

Which of the following is the best instrument to use to check the keying waveform of a CW transmitter?	G4B05
A. A monitoring oscilloscope	(A)
B. A field-strength meter	Page 4-41
C. A sidetone monitor	
D. A wavemeter	

What signal source is connected to the vertical input of a monitoring oscilloscope when checking the quality of a transmitted signal?	G4B06
A. The local oscillator of the transmitter	(D)
B. The audio input of the transmitter	Page 4-41
C. The transmitter balanced mixer output	
D. The attenuated RF output of the transmitter	

### SIGNAL GENERATORS AND TRACERS

How would a signal tracer normally be used?	G4B03
A. To identify the source of radio transmissions	(D)
B. To make exact drawings of signal waveforms	Page 4-42
C. To show standing wave patterns on open-wire feed-lines	
D. To identify an inoperative stage in a receiver	

### IMPEDANCE AND RESONANCE MEASUREMENTS

How is a noise bridge normally used?	G4B04
A. It is connected at an antenna's feed point and reads the antenna's noise figure	(C)
B. It is connected between a transmitter and an antenna and tuned for minimum SWR	Page 4-43
C. It is connected between a receiver and an antenna of unknown impedance and is adjusted for minimum noise	

D. It is connected between an antenna and ground and tuned for minimum SWR	G4B12
What is one way a noise bridge might be used?	(B)
A. Determining an antenna's gain in dBi	Page 4-43
B. Pre-tuning an antenna tuner	
C. Pre-tuning a linear amplifier	
D. Determining the line loss of the antenna system	

G4B13  
(A)  
Page 4-43

What is one measurement that can be made with a dip meter?

- A. The resonant frequency of a circuit
- B. The tilt of the ionosphere
- C. The gain of an antenna
- D. The notch depth of a filter

G4B14  
(C)  
Page 4-43

Which of the following must be connected to an antenna analyzer when it is being used for SWR measurements?

- A. Receiver
- B. Transmitter
- C. Antenna and feedline
- D. All of these answers are correct

### **FIELD STRENGTH AND RF POWER METERS**

G4B08  
(A)  
Page 4-44

What instrument may be used to monitor relative RF output when making antenna and transmitter adjustments?

- A. A field-strength meter
- B. An antenna noise bridge
- C. A multimeter
- D. A Q meter

G4B10  
(B)  
Page 4-44

Which of the following can be determined with a field strength meter?

- A. The radiation resistance of an antenna
- B. The radiation pattern of an antenna
- C. The presence and amount of phase distortion of a transmitter
- D. The presence and amount of amplitude distortion of a transmitter

G4B11  
(A)  
Page 4-44

Which of the following might be a use for a field strength meter?

- A. Close-in radio direction-finding
- B. A modulation monitor for a frequency or phase modulation transmitter
- C. An overmodulation indicator for a SSB transmitter
- D. A keying indicator for a RTTY or packet transmitter

G4B15  
(A)  
Page 4-44

Which of the following can be measured with a directional wattmeter?

- A. Standing Wave Ratio
- B. Antenna front-to-back ratio
- C. RF interference
- D. Radio wave propagation



# Section 5.1

## AMPLITUDE MODULATED MODES

What is the name of the process that changes the envelope of an RF wave to convey information?

- A. Phase modulation
- B. Frequency modulation
- C. Spread Spectrum modulation
- D. Amplitude modulation

G8A01  
(D)  
Page 5-1

What type of transmission varies the instantaneous power level of the RF signal to convey information?

- A. Frequency shift keying
- B. Pulse modulation
- C. Frequency modulation
- D. Amplitude modulation

G8A05  
(D)  
Page 5-1

What is one advantage of carrier suppression in a single-sideband phone transmission?

- A. Audio fidelity is improved
- B. Greater modulation percentage is obtainable with lower distortion
- C. More transmitter power can be put into the remaining sideband
- D. Simpler receiving equipment can be used

G8A06  
(C)  
Page 5-2

Which of the following phone emissions uses the narrowest frequency bandwidth?

- A. Single sideband
- B. Double sideband
- C. Phase modulation
- D. Frequency modulation

G8A07  
(A)  
Page 5-2

## ANGLE MODULATED MODES

What is the name of the process that changes the phase angle of an RF wave to convey information?

- A. Phase convolution
- B. Phase modulation
- C. Angle convolution
- D. Radian Inversion

G8A02  
(B)  
Page 5-2

What is the name of the process which changes the frequency of an RF wave to convey information?

- A. Frequency convolution
- B. Frequency transformation
- C. Frequency conversion
- D. Frequency modulation

G8A03  
(D)  
Page 5-2

G8A11  
(A)  
Page 5-2

What happens to the RF carrier signal when a modulating audio signal is applied to an FM transmitter?

- A. The carrier frequency changes proportionally to the instantaneous amplitude of the modulating signal
- B. The carrier frequency changes proportionally to the amplitude and frequency of the modulating signal
- C. The carrier amplitude changes proportionally to the instantaneous frequency of the modulating signal
- D. The carrier phase changes proportionally to the instantaneous amplitude of the modulating signal

## Section 5.2

G8B09  
(B)  
Page 5-3

What do RTTY, Morse code, PSK31 and packet communications have in common?

- A. They require the same bandwidth
- B. They are digital modes
- C. They use on/off keying
- D. They use phase shift modulation

G8B10  
(B)  
Page 5-3

When transmitting a data mode signal, why is it important to know the duty cycle of the mode you are using?

- A. To aid in tuning your transmitter
- B. To prevent damage to your transmitter's final output stage
- C. To allow time for the other station to break in during a transmission
- D. All of these choices are correct

### FREQUENCY SHIFT KEYING (FSK) MODES

G2E01  
(D)  
Page 5-5

Which mode should be selected when using a SSB transmitter with an Audio Frequency Shift Keying (AFSK) RTTY signal?

- A. USB
- B. DSB
- C. CW
- D. LSB

G2E05  
(C)  
Page 2-15, 5-4

Which of the following describes Baudot RTTY?

- A. 7-bit code, with start, stop and parity bits
- B. Utilizes error detection and correction
- C. 5-bit code, with additional start and stop bits
- D. Two major operating modes are SELCAL and LISTEN

G2E06  
(B)  
Page 2-15, 5-5

What is the most common frequency shift for RTTY emissions in the amateur HF bands?

- A. 85 Hz
- B. 170 Hz
- C. 425 Hz
- D. 850 Hz

G8B08  
(C)  
Page 5-4

How is frequency shift related to keying speed in an FSK signal?

- A. The frequency shift in hertz must be at least four times the keying speed in WPM
- B. The frequency shift must not exceed 15 Hz per WPM of keying speed
- C. Greater keying speeds require greater frequency shifts
- D. Greater keying speeds require smaller frequency shifts

## PHASE-SHIFT KEYING (PSK) MODES

How many data bits are sent in a single PSK31 character?

- A. The number varies
- B. 5
- C. 7
- D. 8

G2E02

(A)

Page 2-16, 5-5

## PACKET MODES

What part of a data packet contains the routing and handling information?

- A. Directory
- B. Preamble
- C. Header
- D. Footer

G2E03

(C)

Page 2-16, 5-6

# Section 5.3

## OSCILLATORS

What are the basic components of virtually all oscillators?

- A. An amplifier and a divider
- B. A frequency multiplier and a mixer
- C. A circulator and a filter operating in a feed-forward loop
- D. A filter and an amplifier operating in a feedback loop

G7B07

(D)

Page 5-7

What determines the frequency of an RC oscillator?

- A. The ratio of the capacitors in the feedback loop
- B. The value of the inductor in the tank circuit
- C. The phase shift of the RC feedback circuit
- D. The gain of the amplifier

G7B08

(C)

Page 5-7

What determines the frequency of an LC oscillator?

- A. The number of stages in the counter
- B. The number of stages in the divider
- C. The inductance and capacitance in the tank circuit
- D. The time delay of the lag circuit

G7B09

(C)

Page 5-8

## MIXERS

What stage in a transmitter would change a 5.3 MHz input signal to 14.3 MHz?

- A. A mixer
- B. A beat frequency oscillator
- C. A frequency multiplier
- D. A linear translator

G8B03

(A)

Page 5-8

What is another term for the mixing of two RF signals?

- A. Heterodyning
- B. Synthesizing
- C. Cancellation
- D. Multiplying

G8B12

(A)

Page 5-8

## MODULATORS

- G8A04  
(B)  
Page 5-10
- What emission is produced by a reactance modulator connected to an RF power amplifier?
- A. Multiplex modulation
  - B. Phase modulation
  - C. Amplitude modulation
  - D. Pulse modulation
- G8A12  
(A)  
Page 5-9
- What signal(s) would be found at the output of a properly adjusted balanced modulator?
- A. Both upper and lower sidebands
  - B. Either upper or lower sideband, but not both
  - C. Both upper and lower sidebands and the carrier
  - D. The modulating signal and the unmodulated carrier

## Section 5.4

### AM MODES

- G7A06  
(B)  
Page 5-12
- Which of the following might be used to process signals from the balanced modulator and send them to the mixer in a single-sideband phone transmitter?
- A. Carrier oscillator
  - B. Filter
  - C. IF amplifier
  - D. RF amplifier
- G7A07  
(D)  
Page 5-12
- Which circuit is used to combine signals from the carrier oscillator and speech amplifier and send the result to the filter in a typical single-sideband phone transmitter?
- A. Mixer
  - B. Detector
  - C. IF amplifier
  - D. Balanced modulator
- G7A10  
(A)  
Page 5-11
- What is an advantage of a crystal controlled transmitter?
- A. Stable output frequency
  - B. Excellent modulation clarity
  - C. Ease of switching between bands
  - D. Ease of changing frequency

### FM TRANSMITTERS

- G8B04  
(D)  
Page 5-12
- What is the name of the stage in a VHF FM transmitter that selects a harmonic of an HF signal to reach the desired operating frequency?
- A. Mixer
  - B. Reactance modulator
  - C. Pre-emphasis network
  - D. Multiplier
- G8B05  
(C)  
Page 5-13
- Why isn't frequency modulated (FM) phone used below 29.5 MHz?
- A. The transmitter efficiency for this mode is low
  - B. Harmonics could not be attenuated to practical levels
  - C. The bandwidth would exceed FCC limits
  - D. The frequency stability would not be adequate

What is the total bandwidth of an FM-phone transmission having a 5 kHz deviation and a 3 kHz modulating frequency?

- A. 3 kHz
- B. 5 kHz
- C. 8 kHz
- D. 16 kHz

G8B06  
(D)  
Page 5-13

What is the frequency deviation for a 12.21-MHz reactance-modulated oscillator in a 5-kHz deviation, 146.52-MHz FM-phone transmitter?

- A. 101.75 Hz
- B. 416.7 Hz
- C. 5 kHz
- D. 60 kHz

G8B07  
(B)  
Page 5-13

### SIGNAL QUALITY

Which of the following instruments may be used to measure the output of a single-sideband transmitter when performing a two-tone test of amplitude linearity?

- A. An audio distortion analyzer
- B. An oscilloscope
- C. A directional wattmeter
- D. A high impedance audio voltmeter

G4A02  
(B)  
Page 5-14

What type of transmitter performance does a two-tone test analyze?

- A. Linearity
- B. Carrier and undesired sideband suppression
- C. Percentage of frequency modulation
- D. Percentage of carrier phase shift

G4A11  
(A)  
Page 5-14

What type of signals are used to conduct a two-tone test?

- A. Two audio signals of the same frequency shifted 90-degrees
- B. Two non-harmonically related audio signals
- C. Two swept frequency tones
- D. Two audio frequency range square wave signals of equal amplitude

G4A12  
(B)  
Page 5-14

What is the reason for using a properly adjusted speech processor with a single sideband phone transmitter?

- A. It reduces average transmitter power requirements
- B. It reduces unwanted noise pickup from the microphone
- C. It improves voice-frequency fidelity
- D. It improves signal intelligibility at the receiver

G4D01  
(D)  
Page 5-15

Which of the following describes how a speech processor affects a transmitted single sideband signal?

- A. It increases the peak power
- B. It increases the average power
- C. It reduces harmonic distortion
- D. It reduces intermodulation distortion

G4D02  
(B)  
Page 5-15

Which of the following can be the result of an incorrectly adjusted speech processor?

- A. Distorted speech
- B. Splatter
- C. Excessive background pickup
- D. All of these answers are correct

G4D03  
(D)  
Page 5-15

G8A08 (D) Page 5-13	<p>What happens to the signal of an over-modulated single-sideband phone transmitter?</p> <ul style="list-style-type: none"> <li>A. It becomes louder with no other effects</li> <li>B. It occupies less bandwidth with poor high frequency response</li> <li>C. It has higher fidelity and improved signal to noise ratio</li> <li>D. It becomes distorted and occupies more bandwidth</li> </ul>
G8A09 (B) Page 5-14	<p>What control is typically adjusted for proper ALC setting on an amateur single sideband transceiver?</p> <ul style="list-style-type: none"> <li>A. The RF Clipping Level</li> <li>B. Audio or microphone gain</li> <li>C. Antenna inductance or capacitance</li> <li>D. Attenuator Level</li> </ul>
G8A10 (C) Page 5-14	<p>What is meant by flat-topping of a single-sideband phone transmission?</p> <ul style="list-style-type: none"> <li>A. Signal distortion caused by insufficient collector current</li> <li>B. The transmitter's automatic level control is properly adjusted</li> <li>C. Signal distortion caused by excessive drive</li> <li>D. The transmitter's carrier is properly suppressed</li> </ul>

### AMPLIFIERS

G4A06 (B) Page 5-17	<p>What reading on the plate current meter of a vacuum tube RF power amplifier indicates correct adjustment of the plate tuning control?</p> <ul style="list-style-type: none"> <li>A. A pronounced peak</li> <li>B. A pronounced dip</li> <li>C. No change will be observed</li> <li>D. A slow, rhythmic oscillation</li> </ul>
G4A07 (D) Page 5-17	<p>What is the correct adjustment for the "Load" or "Coupling" control of a vacuum tube RF power amplifier?</p> <ul style="list-style-type: none"> <li>A. Minimum SWR on the antenna</li> <li>B. Minimum plate current without exceeding maximum allowable grid current</li> <li>C. Highest plate voltage while minimizing grid current</li> <li>D. Maximum power output without exceeding maximum allowable plate current</li> </ul>
G4A08 (C) Page 5-17	<p>Which of the following techniques is used to neutralize an RF amplifier?</p> <ul style="list-style-type: none"> <li>A. Feed-forward compensation</li> <li>B. Feed-forward cancellation</li> <li>C. Negative feedback</li> <li>D. Positive feedback</li> </ul>
G4A09 (B) Page 5-17	<p>What does a neutralizing circuit do in an RF amplifier?</p> <ul style="list-style-type: none"> <li>A. It controls differential gain</li> <li>B. It cancels the effects of positive feedback</li> <li>C. It eliminates AC hum from the power supply</li> <li>D. It reduces incidental grid modulation</li> </ul>
G4A10 (B) Page 5-17	<p>What is the reason for neutralizing the final amplifier stage of a transmitter?</p> <ul style="list-style-type: none"> <li>A. To limit the modulation index</li> <li>B. To eliminate self oscillations</li> <li>C. To cut off the final amplifier during standby periods</li> <li>D. To keep the carrier on frequency</li> </ul>

Which of the following is a characteristic of a Class A amplifier?

- A. Low standby power
- B. High Efficiency
- C. No need for bias
- D. Low distortion

G7B10  
(D)  
Page 5-16

For which of the following modes is a Class C power stage appropriate for amplifying a modulated signal?

- A. SSB
- B. CW
- C. AM
- D. All of these answers are correct

G7B11  
(B)  
Page 5-16

Which of the following is an advantage of a Class C amplifier?

- A. High efficiency
- B. Linear operation
- C. No need for tuned circuits
- D. All of these answers are correct

G7B12  
(A)  
Page 5-16

How is the efficiency of an RF power amplifier determined?

- A. Divide the DC input power by the DC output power
- B. Divide the RF output power by the DC input power
- C. Multiply the RF input power by the reciprocal of the RF output power
- D. Add the RF input power to the DC output power

G7B13  
(B)  
Page 5-16

Which of the following describes a linear amplifier?

- A. Any RF power amplifier used in conjunction with an amateur transceiver
- B. An amplifier whose output preserves the input waveform
- C. A Class C high efficiency amplifier
- D. An amplifier used as a frequency multiplier

G7B14  
(B)  
Page 5-16

## Chapter 5, Section 5.6

### BASIC SUPERHETERODYNE RECEIVERS

What circuit is used to process signals from the RF amplifier and local oscillator and send the result to the IF filter in a superheterodyne receiver?

- A. Balanced modulator
- B. IF amplifier
- C. Mixer
- D. Detector

G7A08  
(C)  
Page 5-18

What circuit is used to process signals from the IF amplifier and BFO and send the result to the AF amplifier in a single-sideband phone superheterodyne receiver?

- A. RF oscillator
- B. IF filter
- C. Balanced modulator
- D. Product detector

G7A09  
(D)  
Page 5-19

G7A11 (C) Page 5-18	<p>What is the simplest combination of stages that can be combined to implement a superheterodyne receiver?</p> <p>A. RF amplifier, detector, audio amplifier  B. RF amplifier, mixer, if amplifier  C. HF oscillator, mixer, detector  D. HF oscillator, product detector, audio amplifier</p>
G7A12 (D) Page 5-19	<p>What type of receiver is suitable for CW and SSB reception but does not require a mixer stage or an IF amplifier?</p> <p>A. A super-regenerative receiver  B. A TRF receiver  C. A super-heterodyne receiver  D. A direct conversion receiver</p>
G7A13 (D) Page 5-19	<p>What type of circuit is used in many FM receivers to convert signals coming from the IF amplifier to audio?</p> <p>A. Product detector  B. Phase inverter  C. Mixer  D. Discriminator</p>
G8B01 (A) Page 5-18	<p>What receiver stage combines a 14.250 MHz input signal with a 13.795 MHz oscillator signal to produce a 455 kHz intermediate frequency (IF) signal?</p> <p>A. Mixer  B. BFO  C. VFO  D. Multiplier</p>
G8B02 (B) Page 5-19	<p>If a receiver mixes a 13.800 MHz VFO with a 14.255 MHz received signal to produce a 455 kHz intermediate frequency (IF) signal, what type of interference will a 13.345 MHz signal produce in the receiver?</p> <p>A. Local oscillator  B. Image response  C. Mixer interference  D. Intermediate interference</p>
<b>DIGITAL SIGNAL PROCESSING</b>	
G4A01 (B) Page 5-20	<p>Which of the following is one use for a DSP in an amateur station?</p> <p>A. To provide adequate grounding  B. To remove noise from received signals  C. To increase antenna gain  D. To increase antenna bandwidth</p>
G4A03 (D) Page 5-20	<p>Which of the following is needed for a DSP IF filter?</p> <p>A. An Analog to Digital Converter  B. Digital to Analog Converter  C. A Digital Processor Chip  D. All of the these answers are correct</p>
G4A04 (A) Page 5-20	<p>Which of the following is an advantage of a receiver IF filter created with a DSP as compared to an analog filter?</p> <p>A. A wide range of filter bandwidths and shapes can be created  B. Fewer digital components are required  C. Mixing products are greatly reduced  D. The DSP filter is much more effective at VHF frequencies</p>



How is DSP filtering accomplished?

- A. By using direct signal phasing
- B. By converting the signal from analog to digital and using digital processing
- C. By up-converting the signal to VHF
- D. By converting the signal from digital to analog and taking the difference of mixing products

G4A05  
(B)  
Page 5-20

Which of the following performs automatic notching of interfering carriers?

- A. Band pass tuning
- B. A DSP filter
- C. Balanced mixing
- D. A noise limiter

G4A13  
(B)  
Page 5-20

## MANAGING RECEIVER GAIN

How much must the power output of a transmitter be raised to change the “S” meter reading on a distant receiver from S8 to S9?

- A. Approximately 2 times
- B. Approximately 3 times
- C. Approximately 4 times
- D. Approximately 5 times

G4B09  
(C)  
Page 5-21

What does an S-meter measure?

- A. Conductance
- B. Impedance
- C. Received signal strength
- D. Transmitter power output

G4D04  
(C)  
Page 5-21

How does an S-meter reading of 20 db over S-9 compare to an S-9 signal, assuming a properly calibrated S meter?

- A. It is 10 times weaker
- B. It is 20 times weaker
- C. It is 20 times stronger
- D. It is 100 times stronger

G4D05  
(D)  
Page 5-21

Where is an S-meter generally found?

- A. In a receiver
- B. In a SWR bridge
- C. In a transmitter
- D. In a conductance bridge

G4D06  
(A)  
Page 5-21

## Chapter 5, Section 5.7

### MOBILE INSTALLATIONS

Which of the following emission types are permissible while operating HF mobile?

- A. CW
- B. SSB
- C. FM
- D. All of these choices are correct

G4E01  
(D)  
Page 5-22

G4E02 (C) Page 5-22	<p>What is alternator whine?</p> <p>A. A DC emission from the alternator</p> <p>B. A constant pitched tone or buzz in transmitted or received audio that occurs whenever the ignition key is in the on position</p> <p>C. A tone or buzz in transmitted or received audio that varies with engine speed</p> <p>D. A mechanical sound from the alternator indicating current overload</p>
G4E03 (A) Page 5-22	<p>Which of the following power connections would be the best for a 100-watt HF mobile installation?</p> <p>A. A direct, fused connection to the battery using heavy gauge wire</p> <p>B. A direct, fused connection to the alternator or generator using heavy gauge wire</p> <p>C. A direct, fused connection to the battery using resistor wire</p> <p>D. A direct, fused connection to the alternator or generator using resistor wire</p>
G4E04 (B) Page 5-22	<p>Why is it best NOT to draw the DC power for a 100-watt HF transceiver from an automobile's cigarette lighter socket?</p> <p>A. The socket is not wired with an RF-shielded power cable</p> <p>B. The socket's wiring may be inadequate for the current being drawn by the transceiver</p> <p>C. The DC polarity of the socket is reversed from the polarity of modern HF transceivers</p> <p>D. The power from the socket is never adequately filtered for HF transceiver operation</p>
G4E05 (C) Page 5-22	<p>Which of the following most limits the effectiveness of an HF mobile transceiver operating in the 75 meter band?</p> <p>A. "Picket Fencing" signal variation</p> <p>B. The wire gauge of the DC power line to the transceiver</p> <p>C. The HF mobile antenna system</p> <p>D. FCC rules limiting mobile output power on the 75 meter band</p>

### RF GROUNDING

G4C05 (D) Page 5-23	<p>What might be the problem if you receive an RF burn when touching your equipment while transmitting on a HF band, assuming the equipment is connected to a ground rod?</p> <p>A. Flat braid rather than round wire has been used for the ground wire</p> <p>B. Insulated wire has been used for the ground wire</p> <p>C. The ground rod is resonant</p> <p>D. The ground wire is resonant</p>
G4C06 (D) Page 5-23	<p>Which of the following is an important reason to have a good station ground?</p> <p>A. To reduce the likelihood of RF burns</p> <p>B. To reduce the likelihood of electrical shock</p> <p>C. To reduce interference</p> <p>D. All of these answers are correct</p>
G4C07 (A) Page 5-23	<p>What is one good way to avoid stray RF energy in an amateur station?</p> <p>A. Keep the station's ground wire as short as possible</p> <p>B. Install an RF filter in series with the ground wire</p> <p>C. Use a ground loop for best conductivity</p> <p>D. Install a few ferrite beads on the ground wire where it connects to your station</p>

- Which of the following statements about station grounding is true?
- A. The chassis of each piece of station equipment should be tied together with high-impedance conductors
  - B. If the chassis of all station equipment is connected with a good conductor, there is no need to tie them to an earth ground
  - C. RF hot spots can occur in a station located above the ground floor if the equipment is grounded by a long ground wire
  - D. A ground loop is an effective way to ground station equipment

G4C09  
(C)  
Page 5-23

How can a ground loop be avoided?

- A. Series connect all ground conductors
- B. Connect the AC neutral conductor to the ground wire
- C. Avoid using lock washers and star washers in making ground connections
- D. Connect all ground conductors to a single point

G4C13  
(D)  
Page 5-23

### RF INTERFERENCE

Which of the following should be installed if a properly operating amateur station is interfering with a nearby telephone?

- A. An RFI filter on the transmitter
- B. An RFI filter at the affected telephone
- C. A high pass filter on the transmitter
- D. A high pass filter at the affected telephone

G4C02  
(B)  
Page 5-24

What sound is heard from a public-address system if there is interference from a nearby single-sideband phone transmitter?

- A. A steady hum whenever the transmitter is on the air
- B. On-and-off humming or clicking
- C. Distorted speech
- D. Clearly audible speech

G4C03  
(C)  
Page 5-24

What is the effect on a public-address system if there is interference from nearby CW transmitter?

- A. On-and-off humming or clicking
- B. A CW signal at a nearly pure audio frequency
- C. A chirpy CW signal
- D. Severely distorted audio

G4C04  
(A)  
Page 5-24

Which of the following can cause unintended rectification of RF signal energy and can result in interference to your station as well as nearby radio and TV receivers?

- A. Induced currents in conductors that are in poor electrical contact
- B. Induced voltages in conductors that are in good electrical contact
- C. Capacitive coupling of the RF signal to ground
- D. Excessive standing wave ratio (SWR) of the transmission line system

G4C11  
(A)  
Page 5-24

What is one cause of broadband radio frequency interference at an amateur radio station?

- A. Not using a balun or line isolator to feed balanced antennas
- B. Lack of rectification of the transmitter's signal in power conductors
- C. Arcing at a poor electrical connection
- D. The use of horizontal, rather than vertical antennas

G4C12  
(C)  
Page 5-24

G7A05  
(B)  
Page 5-24

What should be the impedance of a low-pass filter as compared to the impedance of the transmission line into which it is inserted?

- A. Substantially higher
- B. About the same
- C. Substantially lower
- D. Twice the transmission line impedance

### **RF INTERFERENCE SUPPRESSION**

G4C01  
(B)  
Page 5-25

Which of the following might be useful in reducing RF interference to audio-frequency devices?

- A. Bypass inductor
- B. Bypass capacitor
- C. Forward-biased diode
- D. Reverse-biased diode

G4C08  
(A)  
Page 5-25

Which of the following is a reason to place ferrite beads around audio cables to reduce common mode RF interference?

- A. They act as a series inductor
- B. They act as a shunt capacitor
- C. They lower the impedance of the cable
- D. They increase the admittance of the cable

## Chapter 6, Section 6.2

### DIPOLES

What is the low angle azimuthal radiation pattern of an ideal half-wavelength dipole antenna installed 1/2 wavelength high and parallel to the earth?

- A. It is a figure-eight at right angles to the antenna
- B. It is a figure-eight off both ends of the antenna
- C. It is a circle (equal radiation in all directions)
- D. It has a pair of lobes on one side of the antenna and a single lobe on the other side

G9B04  
(A)  
Page 6-2

How does the feed-point impedance of a 1/2 wave dipole change as the feed-point location is moved from the center toward the ends?

- A. It steadily increases
- B. It steadily decreases
- C. It peaks at about 1/8 wavelength from the end
- D. It is unaffected by the location of the feed-point

G9B08  
(A)  
Page 6-2

What is the approximate length for a 1/2-wave dipole antenna cut for 14.250 MHz?

- A. 8.2 feet
- B. 16.4 feet
- C. 24.6 feet
- D. 32.8 feet

G9B10  
(D)  
Page 6-3

What is the approximate length for a 1/2-wave dipole antenna cut for 3.550 MHz?

- A. 42.2 feet
- B. 84.5 feet
- C. 131.8 feet
- D. 263.6 feet

G9B11  
(C)  
Page 6-3

### GROUND PLANES (VERTICALS)

What is an advantage of downward sloping radials on a ground-plane antenna?

- A. They lower the radiation angle
- B. They bring the feed-point impedance closer to 300 ohms
- C. They increase the radiation angle
- D. They can be adjusted to bring the feed-point impedance closer to 50 ohms

G9B02  
(D)  
Page 6-4

What happens to the feed-point impedance of a ground-plane antenna when its radials are changed from horizontal to downward-sloping?

- A. It decreases
- B. It increases
- C. It stays the same
- D. It reaches a maximum at an angle of 45 degrees

G9B03  
(B)  
Page 6-4

Where should the radial wires of a ground-mounted vertical antenna system be placed?

- A. As high as possible above the ground
- B. Parallel to the antenna element
- C. On the surface or buried a few inches below the ground
- D. At the top of the antenna

G9B06  
(C)  
Page 6-4

G9B12  
(A)  
Page 6-4

- What is the approximate length for a 1/4-wave vertical antenna cut for 28.5 MHz?
- A. 8.2 feet
  - B. 10.5 feet
  - C. 16.4 feet
  - D. 21.0 feet

### **RANDOM WIRES**

G9B01  
(B)  
Page 6-6

- What is one disadvantage of a directly fed random-wire antenna?
- A. It must be longer than 1 wavelength
  - B. You may experience RF burns when touching metal objects in your station
  - C. It produces only vertically polarized radiation
  - D. It is not effective on the higher HF bands

### **EFFECTS OF HEIGHT ABOVE GROUND AND POLARIZATION**

G9B05  
(C)  
Page 6-7

- How does antenna height affect the horizontal (azimuthal) radiation pattern of a horizontal dipole HF antenna?
- A. If the antenna is too high, the pattern becomes unpredictable
  - B. Antenna height has no effect on the pattern
  - C. If the antenna is less than 1/2 wavelength high, the azimuthal pattern is almost omnidirectional
  - D. If the antenna is less than 1/2 wavelength high, radiation off the ends of the wire is eliminated

G9B07  
(B)  
Page 6-6

- How does the feed-point impedance of a 1/2 wave dipole antenna change as the antenna is lowered from 1/4 wave above ground?
- A. It steadily increases
  - B. It steadily decreases
  - C. It peaks at about 1/8 wavelength above ground
  - D. It is unaffected by the height above ground

G9B09  
(A)  
Page 6-7

- Which of the following is an advantage of a horizontally polarized as compared to vertically polarized HF antenna?
- A. Lower ground reflection losses
  - B. Lower feed-point impedance
  - C. Shorter Radials
  - D. Lower radiation resistance

## **Chapter 6, Section 6.3**

### **HOW THEY WORK**

G2D04  
(B)  
Page 6-8

- What is an azimuthal projection map?
- A. A world map projection centered on the North Pole
  - B. A world map projection centered on a particular location
  - C. A world map that shows the angle at which an amateur satellite crosses the equator
  - D. A world map that shows the number of degrees longitude that an amateur satellite appears to move westward at the equator with each orbit

What is the most useful type of map to use when orienting a directional HF antenna toward a distant station?	G2D05 (A) Page 6-8
A. Azimuthal projection B. Mercator projection C. Polar projection D. Stereographic projection	
Which HF antenna would be the best to use for minimizing interference?	G2D11 (C) Page 6-7
A. A bi-directional antenna B. An isotropic antenna C. A unidirectional antenna D. An omnidirectional antenna	
Which of the following is a reason why a Yagi antenna is often used for radio communications on the 20 meter band?	G9C06 (C) Page 6-7
A. It provides excellent omnidirectional coverage in the horizontal plane B. It is smaller, less expensive and easier to erect than a dipole or vertical antenna C. It helps reduce interference from other stations to the side or behind the antenna D. It provides the highest possible angle of radiation for the HF bands	
What is meant by the “main lobe” of a directive antenna?	G9C08 (D) Page 6-7
A. The magnitude of the maximum vertical angle of radiation B. The point of maximum current in a radiating antenna element C. The maximum voltage standing wave point on a radiating element D. The direction of maximum radiated field strength from the antenna	
<b>YAGI STRUCTURE AND FUNCTION</b>	
What is the approximate length of the driven element of a Yagi antenna?	G9C02 (B) Page 6-9
A. 1/4 wavelength B. 1/2 wavelength C. 3/4 wavelength D. 1 wavelength	
Which statement about a three-element single-band Yagi antenna is true?	G9C03 (B) Page 6-10
A. The reflector is normally the shortest parasitic element B. The director is normally the shortest parasitic element C. The driven element is the longest parasitic element D. Low feed-point impedance increases bandwidth	
Which statement about a Yagi antenna is true?	G9C04 (A) Page 6-9
A. The reflector is normally the longest parasitic element B. The director is normally the longest parasitic element C. The reflector is normally the shortest parasitic element D. All of the elements must be the same length	
What does “front-to-back ratio” mean in reference to a Yagi antenna?	G9C07 (C) Page 6-10
A. The number of directors versus the number of reflectors B. The relative position of the driven element with respect to the reflectors and directors C. The power radiated in the major radiation lobe compared to the power radiated in exactly the opposite direction D. The ratio of forward gain to dipole gain	

G9C09  
(A)  
Page 6-10

What is the approximate maximum theoretical forward gain of a 3 Element Yagi antenna?

- A. 9.7 dBi
- B. 7.3 dBd
- C. 5.4 times the gain of a dipole
- D. All of these choices are correct

G9C18  
(D)  
Page 6-8

Which of the following antenna types consists of a driven element and some combination of parasitically excited reflector and/or director elements?

- A. A collinear array
- B. A rhombic antenna
- C. A double-extended Zepp antenna
- D. A Yagi antenna

### DESIGN TRADEOFFS

G9C01  
(A)  
Page 6-10

How can the SWR bandwidth of a Yagi antenna be increased?

- A. Use larger diameter elements
- B. Use closer element spacing
- C. Use traps on the elements
- D. Use tapered-diameter elements

G9C05  
(A)  
Page 6-10

What is one effect of increasing the boom length and adding directors to a Yagi antenna?

- A. Gain increases
- B. SWR increases
- C. Weight decreases
- D. Wind load decreases

G9C10  
(D)  
Page 6-10

Which of the following is a Yagi antenna design variable that could be adjusted to optimize forward gain, front-to-back ratio, or SWR bandwidth?

- A. The physical length of the boom
- B. The number of elements on the boom
- C. The spacing of each element along the boom
- D. All of these choices are correct

### IMPEDANCE MATCHING

G9C11  
(A)  
Page 6-11

What is the purpose of a “gamma match” used with Yagi antennas?

- A. To match the relatively low feed-point impedance to 50 ohms
- B. To match the relatively high feed-point impedance to 50 ohms
- C. To increase the front to back ratio
- D. To increase the main lobe gain

G9C12  
(D)  
Page 6-11

Which of the following describes a common method for insulating the driven element of a Yagi antenna from the metal boom when using a gamma match?

- A. Support the driven element with ceramic standoff insulators
- B. Insert a high impedance transformer at the driven element
- C. Insert a high voltage balun at the driven element
- D. None of these answers are correct. No insulation is needed



## Chapter 6, Section 6.4

Approximately how long is each side of a cubical-quad antenna driven element?

- A. 1/4 wavelength
- B. 1/2 wavelength
- C. 3/4 wavelength
- D. 1 wavelength

G9C13

(A)

Page 6-12

How does the forward gain of a 2-element cubical-quad antenna compare to the forward gain of a 3 element Yagi antenna?

- A. 2/3
- B. About the same
- C. 3/2
- D. Twice

G9C14

(B)

Page 6-13

Approximately how long is each side of a cubical-quad antenna reflector element?

- A. Slightly less than 1/4 wavelength
- B. Slightly more than 1/4 wavelength
- C. Slightly less than 1/2 wavelength
- D. Slightly more than 1/2 wavelength

G9C15

(B)

Page 6-13

How does the gain of a two element delta-loop beam compare to the gain of a two element cubical quad antenna?

- A. 3 dB higher
- B. 3 dB lower
- C. 2.54 dB higher
- D. About the same

G9C16

(D)

Page 6-13

Approximately how long is each leg of a symmetrical delta-loop antenna Driven element?

- A. 1/4 wavelengths
- B. 1/3 wavelengths
- C. 1/2 wavelengths
- D. 2/3 wavelengths

G9C17

(B)

Page 6-12

What type of directional antenna is typically constructed from 2 square loops of wire each having a circumference of approximately one wavelength at the operating frequency and separated by approximately 0.2 wavelength?

- A. A stacked dipole array
- B. A collinear array
- C. A cubical quad antenna
- D. An Adcock array

G9C19

(C)

Page 6-13

What happens when the feed-point of a cubical quad antenna is changed from the center of the lowest horizontal wire to the center of one of the vertical wires?

- A. The polarization of the radiated signal changes from horizontal to vertical
- B. The polarization of the radiated signal changes from vertical to horizontal
- C. The direction of the main lobe is reversed
- D. The radiated signal changes to an omnidirectional pattern

G9C20

(A)

Page 6-13

What configuration of the loops of a cubical-quad antenna must be used for the antenna to operate as a beam antenna, assuming one of the elements is used as a reflector?

- A. The driven element must be fed with a balun transformer
- B. The driven element must be open-circuited on the side opposite the feed-point
- C. The reflector element must be approximately 5% shorter than the driven element
- D. The reflector element must be approximately 5% longer than the driven element

G9C21

(D)

Page 6-13

## Chapter 6, Section 6.5

### NVIS

G9D01  
(D)  
Page 6-14

- What does the term “NVIS” mean as related to antennas?
- A. Nearly Vertical Inductance System
  - B. Non-Visible Installation Specification
  - C. Non-Varying Impedance Smoothing
  - D. Near Vertical Incidence Skywave

G9D02  
(B)  
Page 6-14

- Which of the following is an advantage of an NVIS antenna?
- A. Low vertical angle radiation for DX work
  - B. High vertical angle radiation for short skip during the day
  - C. High forward gain
  - D. All of these choices are correct

G9D03  
(D)  
Page 6-14

- At what height above ground is an NVIS antenna typically installed?
- A. As close to one-half wave as possible
  - B. As close to one wavelength as possible
  - C. Height is not critical as long as significantly more than 1/2 wavelength
  - D. Between 1/10 and 1/4 wavelength

### STACKED ANTENNAS

G9D04  
(B)  
Page 6-15

- How does the gain of two 3-element horizontally polarized Yagi antennas spaced vertically 1/2 wave apart from each other typically compare to the gain of a single 3-element Yagi?
- A. Approximately 1.5 dB higher
  - B. Approximately 3 dB higher
  - C. Approximately 6 dB higher
  - D. Approximately 9 dB higher

G9D05  
(D)  
Page 6-14

- What is the advantage of vertical stacking of horizontally polarized Yagi antennas?
- A. Allows quick selection of vertical or horizontal polarization
  - B. Allows simultaneous vertical and horizontal polarization
  - C. Narrows the main lobe in azimuth
  - D. Narrows the main lobe in elevation

### LOG PERIODICS

G9D06  
(A)  
Page 6-15

- Which of the following is an advantage of a log periodic antenna?
- A. Wide bandwidth
  - B. Higher gain per element than a Yagi antenna
  - C. Harmonic suppression
  - D. Polarization diversity

G9D07  
(A)  
Page 6-15

- Which of the following describes a log periodic antenna?
- A. Length and spacing of the elements increases logarithmically from one end of the boom to the other
  - B. Impedance varies periodically as a function of frequency
  - C. Gain varies logarithmically as a function of frequency
  - D. SWR varies periodically as a function of boom length

### BEVERAGE ANTENNAS

Why is a Beverage antenna generally not used for transmitting?

- A. Its impedance is too low for effective matching
- B. It has high losses compared to other types of antennas
- C. It has poor directivity
- D. All of these choices are correct

G9D08  
(B)  
Page 6-16

Which of the following is an application for a Beverage antenna?

- A. Directional transmitting for low HF bands
- B. Directional receiving for low HF bands
- C. Portable Direction finding at higher HF frequencies
- D. Portable Direction finding at lower HF frequencies

G9D09  
(B)  
Page 6-16

Which of the following describes a Beverage antenna?

- A. A vertical antenna constructed from beverage cans
- B. A broad-band mobile antenna
- C. A helical antenna for space reception
- D. A very long and low receiving antenna that is highly directional

G9D10  
(D)  
Page 6-16

### MULTIBAND ANTENNAS

Which of the following is a disadvantage of multiband antennas?

- A. They present low impedance on all design frequencies
- B. They must be used with an antenna tuner
- C. They must be fed with open wire line
- D. They have poor harmonic rejection

G9D11  
(D)  
Page 6-17

What is the primary purpose of traps installed in antennas?

- A. To permit multiband operation
- B. To notch spurious frequencies
- C. To provide balanced feed-point impedance
- D. To prevent out of band operation

G9D12  
(A)  
Page 6-17

## Chapter 6, Section 6.6

### CHARACTERISTIC IMPEDANCE

Which of the following factors help determine the characteristic impedance of a parallel conductor antenna feedline?

- A. The distance between the centers of the conductors and the radius of the conductors
- B. The distance between the centers of the conductors and the length of the line
- C. The radius of the conductors and the frequency of the signal
- D. The frequency of the signal and the length of the line

G9A01  
(A)  
Page 6-18

What is the typical characteristic impedance of coaxial cables used for antenna feedlines at amateur stations?

- A. 25 and 30 ohms
- B. 50 and 75 ohms
- C. 80 and 100 ohms
- D. 500 and 750 ohms

G9A02  
(B)  
Page 6-18

G9A03  
(D)  
Page 6-18

What is the characteristic impedance of flat ribbon TV type twin lead?

- A. 50 ohms
- B. 75 ohms
- C. 100 ohms
- D. 300 ohms

### **FORWARD AND REFLECTED POWER AND SWR**

G9A04  
(C)  
Page 6-19

What is a common reason for the occurrence of reflected power at the point where a feedline connects to an antenna?

- A. Operating an antenna at its resonant frequency
- B. Using more transmitter power than the antenna can handle
- C. A difference between feedline impedance and antenna feed point impedance
- D. Feeding the antenna with unbalanced feedline

G9A05  
(D)  
Page 6-19

What must be done to prevent standing waves on an antenna feedline?

- A. The antenna feed point must be at DC ground potential
- B. The feedline must be cut to an odd number of electrical quarter wavelengths long
- C. The feedline must be cut to an even number of physical half wavelengths long
- D. The antenna feed point impedance must be matched to the characteristic impedance of the feedline

G9A09  
(A)  
Page 6-19

What standing-wave-ratio will result from the connection of a 50-ohm feed line to a non-reactive load having a 200-ohm impedance?

- A. 4:1
- B. 1:4
- C. 2:1
- D. 1:2

G9A10  
(D)  
Page 6-19

What standing-wave-ratio will result from the connection of a 50-ohm feed line to a non-reactive load having a 10-ohm impedance?

- A. 2:1
- B. 50:1
- C. 1:5
- D. 5:1

G9A11  
(B)  
Page 6-19

What standing-wave-ratio will result from the connection of a 50-ohm feed line to a non-reactive load having a 50-ohm impedance?

- A. 2:1
- B. 1:1
- C. 50:50
- D. 0:0

G9A12  
(A)  
Page 6-19

What would be the SWR if you feed a vertical antenna that has a 25-ohm feed-point impedance with 50-ohm coaxial cable?

- A. 2:1
- B. 2.5:1
- C. 1.25:1
- D. You cannot determine SWR from impedance values

G9A13  
(C)  
Page 6-19

What would be the SWR if you feed a folded dipole antenna that has a 300-ohm feed-point impedance with 50-ohm coaxial cable?

- A. 1.5:1
- B. 3:1
- C. 6:1
- D. You cannot determine SWR from impedance values

## IMPEDANCE MATCHING AND TUNERS

Which of the following is a reason for using an inductively coupled matching network between the transmitter and parallel conductor feed line feeding an antenna?

- A. To increase the radiation resistance
- B. To reduce spurious emissions
- C. To match the unbalanced transmitter output to the balanced parallel conductor feedline
- D. To reduce the feed-point impedance of the antenna

G9A06

(C)

Page 6-20

If the SWR on an antenna feedline is 5 to 1, and a matching network at the transmitter end of the feedline is adjusted to 1 to 1 SWR, what is the resulting SWR on the feedline?

- A. 1 to 1
- B. 5 to 1
- C. Between 1 to 1 and 5 to 1 depending on the characteristic impedance of the line
- D. Between 1 to 1 and 5 to 1 depending on the reflected power at the transmitter

G9A14

(B)

Page 6-20

## LOSSES

How does the attenuation of coaxial cable change as the frequency of the signal it is carrying increases?

- A. It is independent of frequency
- B. It increases
- C. It decreases
- D. It reaches a maximum at approximately 18 MHz

G9A07

(B)

Page 6-21

In what values are RF feed line losses usually expressed?

- A. ohms per 1000 ft
- B. dB per 1000 ft
- C. ohms per 100 ft
- D. dB per 100 ft

G9A08

(D)

Page 6-21

# Chapter 7, Section 7.1

## REGIONS

- G3C01  
(A)  
Page 7-1
- Which of the following ionospheric layers is closest to the surface of the Earth?
- A. The D layer
  - B. The E layer
  - C. The F1 layer
  - D. The F2 layer
- G3C02  
(A)  
Page 7-3
- When can the F2 region be expected to reach its maximum height at your location?
- A. At noon during the summer
  - B. At midnight during the summer
  - C. At dusk in the spring and fall
  - D. At noon during the winter

## REFLECTION AND ABSORPTION

- G3C04  
(D)  
Page 7-3
- What does the term “critical angle” mean as used in radio wave propagation?
- A. The long path azimuth of a distant station
  - B. The short path azimuth of a distant station
  - C. The lowest takeoff angle that will return a radio wave to the Earth under specific ionospheric conditions
  - D. The highest takeoff angle that will return a radio wave to the Earth under specific ionospheric conditions
- G3C05  
(C)  
Page 7-4
- Why is long distance communication on the 40, 60, 80 and 160 meter bands more difficult during the day?
- A. The F layer absorbs these frequencies during daylight hours
  - B. The F layer is unstable during daylight hours
  - C. The D layer absorbs these frequencies during daylight hours
  - D. The E layer is unstable during daylight hours
- G3C12  
(D)  
Page 7-4
- Which ionospheric layer is the most absorbent of long skip signals during daylight hours on frequencies below 10 MHz?
- A. The F2 layer
  - B. The F1 layer
  - C. The E layer
  - D. The D layer

## SKY-WAVE AND GROUND-WAVE PROPAGATION

- G3B09  
(C)  
Page 7-4
- What is the maximum distance along the Earth’s surface that is normally covered in one hop using the F2 region?
- A. 180 miles
  - B. 1,200 miles
  - C. 2,500 miles
  - D. 12,000 miles
- G3B10  
(B)  
Page 7-4
- What is the maximum distance along the Earth’s surface that is normally covered in one hop using the E region?
- A. 180 miles
  - B. 1,200 miles
  - C. 2,500 miles
  - D. 12,000 miles

Which of the following is a good indicator of the possibility of sky-wave propagation on the 6 meter band?

- A. Short hop sky-wave propagation on the 10 meter band
- B. Long hop sky-wave propagation on the 10 meter band
- C. Severe attenuation of signals on the 10 meter band
- D. Long delayed echoes on the 10 meter band

G3B14  
(A)  
Page 7-5

Why is the F2 region mainly responsible for the longest distance radio wave propagation?

- A. Because it is the densest ionospheric layer
- B. Because it does not absorb radio waves as much as other ionospheric regions
- C. Because it is the highest ionospheric region
- D. All of these choices are correct

G3C03  
(C)  
Page 7-4

### LONG PATH AND SHORT PATH

How is a directional antenna pointed when making a “long-path” contact with another station?

- A. Toward the rising sun
- B. Along the Gray Line
- C. 180 degrees from its short-path heading
- D. Toward the North

G2D06  
(C)  
Page 7-5

How might a sky-wave signal sound if it arrives at your receiver by both short path and long path propagation?

- A. Periodic fading approximately every 10 seconds
- B. Signal strength increased by 3 dB
- C. The signal will be cancelled causing severe attenuation
- D. A well-defined echo can be heard

G3B13  
(D)  
Page 7-5

## Chapter 7, Section 7.2

### SUNSPOTS AND CYCLES

What is the effect on radio communications when sunspot numbers are high?

- A. High-frequency radio signals become weak and distorted
- B. Frequencies above 300 MHz become usable for long-distance communication
- C. Long-distance communication in the upper HF and lower VHF range is enhanced
- D. Long-distance communication in the upper HF and lower VHF range is diminished

G3A09  
(C)  
Page 7-6

What is the sunspot number?

- A. A measure of solar activity based on counting sunspots and sunspot groups
- B. A 3 digit identifier which is used to track individual sunspots
- C. A measure of the radio flux from the sun measured at 10.7 cm
- D. A measure of the sunspot count based on radio flux measurements

G3A10  
(A)  
Page 7-6

How long is the typical sunspot cycle?

- A. Approximately 8 minutes
- B. Between 20 and 40 hours
- C. Approximately 28 days
- D. Approximately 11 years

G3A11  
(D)  
Page 7-6

- G3A17  
(D)  
Page 7-7
- At what point in the solar cycle does the 20 meter band usually support worldwide propagation during daylight hours?
- At the summer solstice
  - Only at the maximum point of the solar cycle
  - Only at the minimum point of the solar cycle
  - At any point in the solar cycle
- G3A18  
(C)  
Page 7-7
- If the HF radio-wave propagation (skip) is generally good on the 24-MHz and 28-MHz bands for several days, when might you expect a similar condition to occur?
- 7 days later
  - 14 days later
  - 28 days later
  - 90 days later
- G3A19  
(D)  
Page 7-7
- Which frequencies are least reliable for long distance communications during periods of low solar activity?
- Frequencies below 3.5 MHz
  - Frequencies near 3.5 MHz
  - Frequencies at or above 10 MHz
  - Frequencies above 20 MHz

### MEASURING SOLAR ACTIVITY

- G3A04  
(B)  
Page 7-7
- What is measured by the solar flux index?
- The density of the sun's magnetic field
  - The radio energy emitted by the sun
  - The number of sunspots on the side of the sun facing the Earth
  - A measure of the tilt of the Earth's ionosphere on the side toward the sun
- G3A05  
(D)  
Page 7-7
- What is the solar-flux index?
- A measure of the highest frequency that is useful for ionospheric propagation between two points on the Earth
  - A count of sunspots which is adjusted for solar emissions
  - Another name for the American sunspot number
  - A measure of solar activity at 10.7 cm
- G3A12  
(B)  
Page 7-7
- What is the K-index?
- An index of the relative position of sunspots on the surface of the sun
  - A measure of the short term stability of the Earth's magnetic field
  - A measure of the stability of the sun's magnetic field
  - An index of solar radio flux measured at Boulder, Colorado
- G3A13  
(C)  
Page 7-8
- What is the A-index?
- An index of the relative position of sunspots on the surface of the sun
  - The amount of polarization of the sun's electric field
  - An indicator of the long term stability of the Earth's geomagnetic field
  - An index of solar radio flux measured at Boulder, Colorado

### ASSESSING PROPAGATION

- G3B01  
(B)  
Page 7-8
- Which band should offer the best chance for a successful contact if the maximum usable frequency (MUF) between the two stations is 22 MHz?
- 10 meters
  - 15 meters
  - 20 meters
  - 40 meters



Which band should offer the best chance for a successful contact if the maximum usable frequency (MUF) between the two stations is 16 MHz?	G3B02 (C) Page 7-8
<ul style="list-style-type: none"> <li>A. 80 meters</li> <li>B. 40 meters</li> <li>C. 20 meters</li> <li>D. 2 meters</li> </ul>	
Which of the following guidelines should be selected for lowest attenuation when transmitting on HF?	G3B03 (A) Page 7-8
<ul style="list-style-type: none"> <li>A. Select a frequency just below the MUF</li> <li>B. Select a frequency just above the LUF</li> <li>C. Select a frequency just below the critical frequency</li> <li>D. Select a frequency just above the critical frequency</li> </ul>	
What is a reliable way to determine if the maximum usable frequency (MUF) is high enough to support 28-MHz propagation between your station and Western Europe?	G3B04 (A) Page 7-8
<ul style="list-style-type: none"> <li>A. Listen for signals on a 28 MHz international beacon</li> <li>B. Send a series of dots on the 28 MHz band and listen for echoes from your signal</li> <li>C. Check the strength of TV signals from Western Europe</li> <li>D. Listen to WWV propagation signals on the 28 MHz band</li> </ul>	
What usually happens to radio waves with frequencies below the maximum usable frequency (MUF) when they are sent into the ionosphere?	G3B05 (A) Page 7-8
<ul style="list-style-type: none"> <li>A. They are bent back to the Earth</li> <li>B. They pass through the ionosphere</li> <li>C. They are completely absorbed by the ionosphere</li> <li>D. They are bent and trapped in the ionosphere to circle the Earth</li> </ul>	
What usually happens to radio waves with frequencies below the lowest usable frequency (LUF)?	G3B06 (C) Page 7-8
<ul style="list-style-type: none"> <li>A. They are bent back to the Earth</li> <li>B. They pass through the ionosphere</li> <li>C. They are completely absorbed by the ionosphere</li> <li>D. They are bent and trapped in the ionosphere to circle the Earth</li> </ul>	
What does LUF stand for?	G3B07 (A) Page 7-8
<ul style="list-style-type: none"> <li>A. The Lowest Usable Frequency for communications between two points</li> <li>B. The Longest Universal Function for communications between two points</li> <li>C. The Lowest Usable Frequency during a 24 hour period</li> <li>D. The Longest Universal Function during a 24 hour period</li> </ul>	
What does MUF stand for?	G3B08 (B) Page 7-8
<ul style="list-style-type: none"> <li>A. The Minimum Usable Frequency for communications between two points</li> <li>B. The Maximum Usable Frequency for communications between two points</li> <li>C. The Minimum Usable Frequency during a 24 hour period</li> <li>D. The Maximum Usable Frequency during a 24 hour period</li> </ul>	
What happens to HF propagation when the lowest usable frequency (LUF) exceeds the maximum usable frequency (MUF)?	G3B11 (A) Page 7-8
<ul style="list-style-type: none"> <li>A. No HF radio frequency will support communications over the path</li> <li>B. HF communications over the path are enhanced at the frequency where the LUF and MUF are the same</li> <li>C. Double hop propagation along the path is more common</li> <li>D. Propagation over the path on all HF frequencies is enhanced</li> </ul>	

G3B12  
(D)  
Page 7-8

What factors affect the maximum usable frequency (MUF)?  
A. Path distance and location  
B. Time of day and season  
C. Solar radiation and ionospheric disturbance  
D. All of these choices are correct

G3C11  
(A)  
Page 7-8

Which of the following is true about ionospheric absorption near the maximum usable frequency (MUF)?  
A. Absorption will be minimum  
B. Absorption is greater for vertically polarized waves  
C. Absorption approaches maximum  
D. Absorption is greater for horizontally polarized waves

### **SOLAR DISTURBANCES**

G3A01  
(A)  
Page 7-10

What can be done at an amateur station to continue communications during a sudden ionospheric disturbance?  
A. Try a higher frequency  
B. Try the other sideband  
C. Try a different antenna polarization  
D. Try a different frequency shift

G3A02  
(B)  
Page 7-10

What effect does a Sudden Ionospheric Disturbance (SID) have on the daytime ionospheric propagation of HF radio waves?  
A. It disrupts higher-latitude paths more than lower-latitude paths  
B. It disrupts signals on lower frequencies more than those on higher frequencies  
C. It disrupts communications via satellite more than direct communications  
D. None, because only areas on the night side of the Earth are affected

G3A03  
(C)  
Page 7-9

How long does it take the increased ultraviolet and X-ray radiation from solar flares to affect radio-wave propagation on the Earth?  
A. 28 days  
B. Several hours depending on the position of the Earth in its orbit  
C. Approximately 8 minutes  
D. 20 to 40 hours after the radiation reaches the Earth

G3A06  
(D)  
Page 7-10

What is a geomagnetic disturbance?  
A. A sudden drop in the solar-flux index  
B. A shifting of the Earth's magnetic pole  
C. Ripples in the ionosphere  
D. A significant change in the Earth's magnetic field over a short period of time

G3A07  
(A)  
Page 7-10

Which latitudes have propagation paths that are more sensitive to geomagnetic disturbances?  
A. Those greater than 45 degrees North or South latitude  
B. Those between 5 and 45 degrees North or South latitude  
C. Those at or very near to the equator  
D. All paths are affected equally

G3A08  
(B)  
Page 7-10

What can be an effect of a geomagnetic storm on radio-wave propagation?  
A. Improved high-latitude HF propagation  
B. Degraded high-latitude HF propagation  
C. Improved ground-wave propagation  
D. Improved chances of UHF ducting

How are radio communications usually affected by the charged particles that reach the Earth from solar coronal holes?

- A. HF communications are improved
- B. HF communications are disturbed
- C. VHF/UHF ducting is improved
- D. VHF/UHF ducting is disturbed

G3A14  
(B)  
Page 7-10

How long does it take charged particles from Coronal Mass Ejections to affect radio-wave propagation on the Earth?

- A. 28 days
- B. 14 days
- C. The effect is instantaneous
- D. 20 to 40 hours

G3A15  
(D)  
Page 7-10

What is a possible benefit to radio communications resulting from periods of high geomagnetic activity?

- A. Aurora that can reflect VHF signals
- B. Higher signal strength for HF signals passing through the polar regions
- C. Improved HF long path propagation
- D. Reduced long delayed echoes

G3A16  
(A)  
Page 7-10

## Chapter 7, Section 7.3

### SCATTER SIGNAL CHARACTERISTICS

What is a characteristic of HF scatter signals?

- A. They have high intelligibility
- B. They have a wavering sound
- C. They have very large swings in signal strength
- D. All of these choices are correct

G3C06  
(B)  
Page 7-10

What makes HF scatter signals often sound distorted?

- A. The ionospheric layer involved is unstable
- B. Ground waves are absorbing much of the signal
- C. The E-region is not present
- D. Energy is scattered into the skip zone through several radio wave paths

G3C07  
(D)  
Page 7-10

Why are HF scatter signals in the skip zone usually weak?

- A. Only a small part of the signal energy is scattered into the skip zone
- B. Signals are scattered from the troposphere which is not a good reflector
- C. Propagation is through ground waves which absorb most of the signal energy
- D. Propagation is through ducts in F region which absorb most of the energy

G3C08  
(A)  
Page 7-10

What type of radio wave propagation allows a signal to be detected at a distance too far for ground wave propagation but too near for normal sky wave propagation?

- A. Ground wave
- B. Scatter
- C. Sporadic-E skip
- D. Short-path skip

G3C09  
(B)  
Page 7-10

G3C10  
(D)  
Page 7-10

Which of the following might be an indication that signals heard on the HF bands are being received via scatter propagation?

- A. The communication is during a sunspot maximum
- B. The communication is during a sudden ionospheric disturbance
- C. The signal is heard on a frequency below the maximum usable frequency
- D. The signal is heard on a frequency above the maximum usable frequency

### **NVIS**

G3C13  
(B)  
Page 7-12

What is Near Vertical Incidence Sky-wave (NVIS) propagation?

- A. Propagation near the MUF
- B. Short distance HF propagation using high elevation angles
- C. Long path HF propagation at sunrise and sunset
- D. Double hop propagation near the LUF

G3C14  
(B)  
Page 7-12

Which of the following antennas will be most effective for skip communications on 40 meters during the day?

- A. A vertical antenna
- B. A horizontal dipole placed between 1/8 and 1/4 wavelength above the ground
- C. A left-hand circularly polarized antenna
- D. A right-hand circularly polarized antenna

# Chapter 8, Section 8.1

## BASIC SAFETY

Which of the following is a danger from lead-tin solder?

- A. Lead can contaminate food if hands are not washed carefully after handling
- B. High voltages can cause lead-tin solder to disintegrate suddenly
- C. Tin in the solder can “cold flow” causing shorts in the circuit
- D. RF energy can convert the lead into a poisonous gas

G0B10  
(A)  
Page 8-2

## ELECTRICAL SHOCK

What is the mechanism by which electrical shock can be lethal?

- A. Current through the heart can cause the heart to stop pumping
- B. A large voltage field can induce currents in the brain
- C. Heating effects in major organs can cause organ failure
- D. All of these choices are correct

G0B04  
(A)  
Page 8-2

Which of the following is the most hazardous type of electrical energy?

- A. Direct Current
- B. 60 cycle Alternating current
- C. Radio Frequency
- D. All of these choices are correct

G0B13  
(B)  
Page 8-2

What is the maximum amount of electrical current flow through the human body that can be tolerated safely?

- A. 5 microamperes
- B. 50 microamperes
- C. 500 milliamperes
- D. 5 amperes

G0B14  
(B)  
Page 8-2

## WIRING AND SAFETY GROUNDING

Which of the following is covered in the National Electrical Code?

- A. Acceptable bandwidth limits
- B. Acceptable modulation limits
- C. Electrical safety inside the ham shack
- D. RF exposure limits of the human body

G4C10  
(C)  
Page 8-3

What is the minimum wire size that may be safely used for a circuit that draws up to 20 amperes of continuous current?

- A. AWG number 20
- B. AWG number 16
- C. AWG number 12
- D. AWG number 8

G0B02  
(C)  
Page 8-4

Which size of fuse or circuit breaker would be appropriate to use with a circuit that uses AWG number 14 wiring?

- A. 100 amperes
- B. 60 amperes
- C. 30 amperes
- D. 15 amperes

G0B03  
(D)  
Page 8-4

G0B06  
(D)  
Page 8-4

- Why must the metal chassis of every item of station equipment be grounded (assuming the item has such a chassis)?
- A. It prevents blowing of fuses in case of an internal short circuit
  - B. It provides a ground reference for the internal circuitry
  - C. It ensures that the neutral wire is grounded
  - D. It ensures that hazardous voltages cannot appear on the chassis

### **PROTECTIVE COMPONENTS**

G0B01  
(A)  
Page 8-5

- Which wire(s) in a four-conductor line cord should be attached to fuses or circuit breakers in a device operated from a 240-VAC single-phase source?
- A. Only the “hot” (black and red) wires
  - B. Only the “neutral” (white) wire
  - C. Only the ground (bare) wire
  - D. All wires

G0B05  
(B)  
Page 8-5

- Which of the following conditions will cause a Ground Fault Circuit Interrupter (GFCI) to disconnect the 120 or 240 Volt AC line power to a device?
- A. Current flowing from the hot wire to the neutral wire
  - B. Current flowing from the hot wire to ground
  - C. Over-voltage on the hot wire
  - D. All of these choices are correct

G0B12  
(C)  
Page 8-5

- What is the purpose of a transmitter power supply interlock?
- A. To prevent unauthorized access to a transmitter
  - B. To guarantee that you cannot accidentally transmit out of band
  - C. To ensure that dangerous voltages are removed if the cabinet is opened
  - D. To shut off the transmitter if too much current is drawn

### **GENERATOR SAFETY**

G4E06  
(A)  
Page 8-5

- Which of the following is true of an emergency generator installation?
- A. The generator should be located in a well ventilated area
  - B. The generator should be insulated from ground
  - C. Fuel should be stored near the generator for rapid refueling in case of an emergency
  - D. All of these choices are correct

G4E12  
(A)  
Page 8-6

- Which of the following is a primary reason for not placing a gasoline-fueled generator inside an occupied area?
- A. Danger of carbon monoxide poisoning
  - B. Danger of engine over torque
  - C. Lack of oxygen for adequate combustion
  - D. Lack of nitrogen for adequate combustion

G4E13  
(A)  
Page 8-6

- Why would it be unwise to power your station by back feeding the output of a gasoline generator into your house wiring by connecting the generator through an AC wall outlet?
- A. It might present a hazard for electric company workers
  - B. It is prone to RF interference
  - C. It may disconnect your RF ground
  - D. None of the above; this is an excellent expedient

## LIGHTNING

Why is it not safe to use soldered joints with the wires that connect the base of a tower to a system of ground rods?

- A. The resistance of solder is too high
- B. Solder flux will prevent a low conductivity connection
- C. Solder has too high a dielectric constant to provide adequate lightning protection
- D. A soldered joint will likely be destroyed by the heat of a lightning strike

G0B09  
(D)  
Page 8-7

Which of the following is good engineering practice for lightning protection grounds?

- A. They must be bonded to all buried water and gas lines
- B. Bends in ground wires must be made as close as possible to a right angle
- C. Lightning grounds must be connected to all ungrounded wiring
- D. They must be bonded together with all other grounds

G0B11  
(D)  
Page 8-7

## Chapter 8, Section 8.2

### POWER DENSITY, ABSORPTION AND LIMITS

What is one way that RF energy can affect human body tissue?

- A. It heats body tissue
- B. It causes radiation poisoning
- C. It causes the blood count to reach a dangerously low level
- D. It cools body tissue

G0A01  
(A)  
Page 8-7

Which property is NOT important in estimating if an RF signal exceeds the maximum permissible exposure (MPE)?

- A. Its duty cycle
- B. Its critical angle
- C. Its power density
- D. Its frequency

G0A02  
(B)  
Page 8-7

Which of the following has the most direct effect on the permitted exposure level of RF radiation?

- A. The age of the person exposed
- B. The power level and frequency of the energy
- C. The environment near the transmitter
- D. The type of transmission line used

G0A03  
(B)  
Page 8-7

### AVERAGING AND DUTY CYCLE

What does "time averaging" mean in reference to RF radiation exposure?

- A. The average time of day when the exposure occurs
- B. The average time it takes RF radiation to have any long-term effect on the body
- C. The total time of the exposure
- D. The total RF exposure averaged over a certain time

G0A04  
(D)  
Page 8-9

What effect does transmitter duty cycle have when evaluating RF exposure?

- A. A lower transmitter duty cycle permits greater short-term exposure levels
- B. A higher transmitter duty cycle permits greater short-term exposure levels
- C. Low duty cycle transmitters are exempt from RF exposure evaluation requirements
- D. Only those transmitters that operate at a 100% duty cycle must be evaluated

G0A07  
(A)  
Page 8-9

## ESTIMATING EXPOSURE AND STATION EVALUATION

- G0A06  
(C)  
Page 8-11
- Which transmitter(s) at a multiple user site is/are responsible for RF safety compliance?
- A. Only the most powerful transmitter on site
  - B. All transmitters on site, regardless of their power level or duty cycle
  - C. Any transmitter that contributes 5% or more of the MPE
  - D. Only those that operate at more than 50% duty cycle
- G0A08  
(C)  
Page 8-10
- Which of the following steps must an amateur operator take to ensure compliance with RF safety regulations?
- A. Post a copy of FCC Part 97 in the station
  - B. Post a copy of OET Bulletin 65 in the station
  - C. Perform a routine RF exposure evaluation
  - D. All of these choices are correct
- G0A09  
(B)  
Page 8-10
- What type of instrument can be used to accurately measure an RF field?
- A. A receiver with an S meter
  - B. A calibrated field-strength meter with a calibrated antenna
  - C. A betascope with a dummy antenna calibrated at 50 ohms
  - D. An oscilloscope with a high-stability crystal marker generator
- G0A10  
(D)  
Page 8-11
- What do the RF safety rules require when the maximum power output capability of an otherwise compliant station is reduced?
- A. Filing of the changes with the FCC
  - B. Recording of the power level changes in the log or station records
  - C. Performance of a routine RF exposure evaluation
  - D. No further action is required
- G0A15  
(D)  
[97.13 (c) (1)]  
Page 8-10
- How can you determine that your station complies with FCC RF exposure regulations?
- A. By calculation based on FCC OET Bulletin 65
  - B. By calculation based on computer modeling
  - C. By measurement of field strength using calibrated equipment
  - D. All of these choices are correct

## EXPOSURE SAFETY MEASURES

- G0A05  
(A)  
Page 8-11
- What must you do if an evaluation of your station shows RF energy radiated from your station exceeds permissible limits?
- A. Take action to prevent human exposure to the excessive RF fields
  - B. File an Environmental Impact Statement (EIS-97) with the FCC
  - C. Secure written permission from your neighbors to operate above the controlled MPE limits
  - D. All of these answers are correct
- G0A11  
(C)  
Page 8-12
- What precaution should you take if you install an indoor transmitting antenna?
- A. Locate the antenna close to your operating position to minimize feed line radiation
  - B. Position the antenna along the edge of a wall to reduce parasitic radiation
  - C. Make sure that MPE limits are not exceeded in occupied areas
  - D. No special precautions are necessary if SSB and CW are the only modes used
- G0A13  
(D)  
Page 8-11
- What precaution should be taken when installing a ground-mounted antenna?
- A. It should not be installed higher than you can reach
  - B. It should not be installed in a wet area
  - C. It should be painted so people or animals do not accidentally run into it
  - D. It should be installed so no one can be exposed to RF radiation in excess of maximum permissible limits



What is one thing that can be done if evaluation shows that a neighbor might receive more than the allowable limit of RF exposure from the main lobe of a directional antenna?

- A. Change from horizontal polarization to vertical polarization
- B. Change from horizontal polarization to circular polarization
- C. Use an antenna with a higher front-to-back ratio
- D. Take precautions to ensure that the antenna cannot be pointed at their house

G0A14  
(D)  
Page 8-11

## Chapter 8, Section 8.3

### PERFORMING ANTENNA AND TOWER MAINTENANCE

What precaution should you take whenever you make adjustments or repairs to an antenna?

- A. Ensure that you and the antenna structure are grounded
- B. Turn off the transmitter and disconnect the feedline
- C. Wear a radiation badge
- D. All of these answers are correct

G0A12  
(B)  
Page 8-14

Which of the following should be observed for safety when climbing on a tower using a safety belt or harness?

- A. Never lean back and rely on the belt alone to support your weight
- B. Always attach the belt safety hook to the belt "D" ring with the hook opening away from the tower
- C. Ensure that all heavy tools are securely fastened to the belt D ring
- D. Make sure that your belt is grounded at all times

G0B07  
(B)  
Page 8-14

What should be done by any person preparing to climb a tower that supports electrically powered devices?

- A. Notify the electric company that a person will be working on the tower
- B. Make sure all circuits that supply power to the tower are locked out and tagged
- C. Ground the base of the tower
- D. Disconnect the feed-line for every antenna at the station

G0B08  
(B)  
Page 8-14