AMATURE RADIO CLASS 'B' LICENCE QUESTION POOL

June 2021

SUBELEMENT G1 - GOVERNMENT RULES AND REGULATIONS

(G1-01) Under what circumstances, if any, may an amateur station transmit radio communications containing obscene words?

- ❑ (A) Obscene words are permitted when they do not cause interference to any other radio communication or signal.
- ❑ (B) Obscene words are prohibited in Amateur Radio transmissions.
- ❑ (C) Obscene words are permitted when they are not retransmitted through repeater or auxiliary stations.
- ❑ (D) Obscene words are permitted, but there is an unwritten rule among amateurs that they should not be used on the air.

(G1-02) What types of messages may be transmitted by an amateur station to a foreign country for a third party?

- ❑ (A) Third party traffic involving materials compensation, either tangible or intangible, direct or indirect, to a third party, a station licensee, a control operator, or any other person.
- ❑ (B) Third party traffic consisting of business communications on behalf of any party.
- ❑ (C) Only third party traffic, duly authorized, during peacetime civil emergencies or periods of disaster for the purpose of disaster relief where no other means of communication is available.
- ❑ (D) No messages may be transmitted to foreign countries for third parties.

(G1-03) Under what circumstances, if any. May third party traffic be transmitted to a foreign country by an Amateur station?

- ❑ (A) Under no circumstances.
- ❑ (B) Only if the country has a third-party traffic agreement with Jamaica.
- ❑ (C) Only if the control operator is a class “A” licensee.
- ❑ (D) Only if the country has formed diplomatic relations with Jamaica.

(G1-04) What types of material compensation, if any, may be involved in third party traffic transmitted by an Amateur station?

- ❑ (A) Payment of an amount agreed upon by the amateur operator and the parties involved.
- ❑ (B) Assistance in maintenance of auxiliary station equipment.
- ❑ (C) Donation of amateur equipment to the control operator.
- ❑ (D) No compensation may be accepted.

(G1-05) What additional limitations apply to third party messages transmitted to foreign countries?

- ❑ (A) Third party messages may only be transmitted to an amateur in countries with which Jamaica has a third-party traffic agreement.
- ❑ (B) Third party messages may only be sent to amateurs in ITU Region 1.
- ❑ (C) Third party messages may only be sent to amateurs in ITU Region 3.
- ❑ (D) Third party messages must always be transmitted in English.

(G1-06) How often should an amateur radio station identify itself in a lengthy conversation?

- ❑ (A) At the beginning and end of each transmission.
- ❑ (B) Every ten minutes as well as at the beginning and end of a transmission.
- ❑ (C) Once every 15 minutes.
- ❑ (A) Station identification is not required.

(S1-07) What is the time period that an amateur station can be operated at a temporary location without having to notify the Postmaster General?

- ❑ (A) 24 hours.
- ❑ (B) 48 hours.
- ❑ (C) 36 hours.
- ❑ (D) 72 hours.

(G1-08) The Radio and Telegraph Control Act states a time period that an amateur radio operator must keep each log book after it has been completed. What is the period stated?

- ❑ (A) A log book must be preserved for at least 4 months following the last date of entry so it can be inspected by the Postmaster General if requested.
- ❑ (B) A log book must be preserved for at least 1 year following the last date of entry so it can be inspected by the Postmaster General if requested.
- ❑ (C) A log book must be preserved for at least 8 months following the last date of entry so it can be inspected by the Postmaster General if requested.
- ❑ (D) A log book must be preserved for at least 5 years following the last date of entry so it can be inspected by the Postmaster General if requested.

(G1-09) What are the classifications for stations in Amateur radio service in Jamaica?

- ❑ (A) Technicians Class, Advanced Class and Extra Class.
- ❑ (B) Class “A”, “B” and “C”.
- ❑ (C) Class “AR 1, “AR 2 and “AR 3”.
- ❑ (D) Class 1, 2, and 3.

(G1-10) Under what circumstances, if any, may an amateur radio station transmit music?

- ❑ (A) When it is used to jam an illegal transmission.
- ❑ (B) Only above 1215 MHz.
- ❑ (C) Transmitting music is not permitted in the amateur radio service.
- ❑ (D) When the music played produces no dissonances or spurious emissions.

(G1-11) What is the maximum transmitting power permitted a class "B" amateur station on frequency 21.150 MHz.?

- ❑ (A) 1,000 watts RMS at antenna feed point.
- ❑ (B) 250 watts RMS at antenna feed point.
- ❑ (C) 250 watts DC.
- ❑ (D) 21.150 MHz. is out the band plan for the amateur radio service.

(G1-12) What is the maximum RF Power output allowed a Class "B" amateur station when operating between 3.5 MHz. and 29.700 MHz?

- ❑ (A) 250 watts RMS at the antenna feed point.
- ❑ (B) 100 watts RMS at the antenna feed point.
- ❑ (C) 250 watts DC.
- ❑ (D) 100 watts DC.

(G1-13) What is the maximum RF Power output allowed a Class "B" amateur station when operating on Frequencies above 50 MHz?

- ❑ (A) 150 watts RMS at the antenna feed point.
- ❑ (B) 250 watts RMS at the antenna feed point.
- ❑ (C) 200 watts DC.
- ❑ (D) 300 ,watts DC.

(G1-14) What do you understand by the term "Modulation"?

- ❑ (A) The process of increasing the average power of a single side-band transmission.
- ❑ (B) Modulation means the process or the result of the process, whereby some characteristic of one wave is varied in accordance with another.
- ❑ (C) The process of recovering audio information from a received signal.
- ❑ (D) The process of suppressing the carrier in a single-side-band transmitter.

(G1-15) What do you understand by the term "Telephony"?

- ❑ (A) Telephony means a system of telecommunications set up for the transmission of RTTY.
- ❑ (B) Telephony means a system of telecommunications set up for the transmission of speech or in some cases, other sounds.
- ❑ (C) Telephony means a system of telecommunications set up for the transmission of Morse Code.
- ❑ (D) Telephony means a system of telecommunications set up for the transmission of A2 type transmissions.

(G1-16) What do you understand by the term frequency modulation?

- ❑ (A) Frequency modulation means modulation in which the frequency of the carrier is the characteristic varied.
- ❑ (B) Frequency modulation means modulation in which the amplitude of the carrier is the characteristic varied.
- ❑ (C) Frequency modulation means the process or the result of the process, whereby some characteristic of one wave is varied in accordance with another wave.
- ❑ (D) Frequency means modulation means a system of telecommunications set up for the transmission of F5 type emissions.

(G1-17) What do you understand by the term Amplitude modulation?

- ❑ (A) Amplitude modulation means modulation in which the frequency of the carrier is the character varied.
- ❑ (B) Amplitude modulation means modulation in which the amplitude of the carrier is the characteristic varied.
- ❑ (C) Amplitude means modulation the process or the result of the process, whereby some characteristic of one wave is varied in accordance with another wave.
- ❑ (D) Amplitude means modulation means a system of telecommunications set up for the transmission of F5 type emissions.

(G1-18) What type of radio wave emission does A3J represent?

- ❑ (A) Telegraphy by frequency modulation using the keying of a modulating audio tone.
- ❑ (B) Telegraphy by single sideband suppressed carrier.
- ❑ (C) Telephony by frequency or phase modulation.
- ❑ (D) Telegraphy by amplitude modulation.

(G1-19) What type of radio wave emission does A2 represent?

- ❑ (A) Telegraphy by frequency modulation using the keying of a modulating audio tone.
- ❑ (B) An emission unkeyed or unmodulated.
- ❑ (C) Telegraphy by amplitude modulation using the keying of a modulated audio frequency or the keying of the modulated emission, including in special cases, an unkeyed modulated emission.
- ❑ (D) Television by frequency modulation.

(G1-20) What type of radio wave emission dose F3 represent?

- ❑ (A) Telephony by frequency modulation.
- ❑ (B) Telephony by amplitude modulation.
- ❑ (C) Telegraphy by amplitude modulation using the keying of a modulated audio frequency or the keying of the modulated emission, including in special cases, an unkeyed modulated emission.
- ❑ (D) Television by frequency modulation.

(G1-21) What is the frequency range of operation for an amateur station operating on 2 meters?

- ❑ (A) 134.00 MHz. to 138.00 MHz..
- ❑ (B) 144.00 MHz. to 148.00 MHz...
- ❑ (C) 154.00 MHz. to 158.00 MHz..
- ❑ (D) 140 MHz. to 144.00 MHz...

(G1-22) What is the frequency range of operation for an amateur station operating on 6 meters?

- ❑ (A) 50.000 MHz. to 50.350 MHz..
- ❑ (B) 50.000 MHz. to 54.000 MHz...
- ❑ (C) 50.000 MHz. to 54.300 MHz..
- ❑ (D) 50.000 MHz. to 52.000 MHz..

(G1-23) What is the frequency range of operation designated for amateur radio stations using the 20 and 40 meter bands?

- ❑ (A) For 20 meters - 14.000 MHz. to 14.350 MHz & for 40 meters 7.000 MHz. to 7.300 MHz.
- ❑ (B) For 20 meters - 14.550 MHz. to 14.350 MHz and for 40 meters 7.000 MHz. To 7.350 MHz.
- ❑ (C) For 20 meters - 14.000 MHz. to 14.360 MHz and for 40 meters 7.000 MHz. To 7.550 MHz.
- ❑ (D) For 20 meters - 14.200 MHz. to 14.450 MHz and for 40 meters 7.100 MHz. To 7.400 MHz.

(G1-24) What is the frequency range of operation designated for amateur radio stations using the 15 and 10 meter bands?

- ❑ (A) For 15 meters - 21.000 MHz. to 21.450 MHz & for 10 meters 28.000 MHz. to 29.700 MHz.
- ❑ (B) For 15 meters - 21.000 MHz. to 21.350 MHz & for 10 meters 28.000 MHz. to 29.900 MHz.
- ❑ (C) For 15 meters - 21.100 MHz. to 21.500 MHz & for 10 meters 28.100 MHz. to 28.550 MHz.
- ❑ (D) For 15 meters - 21.200 MHz. to 21.450 MHz & for 10 meters 28.200 MHz. to 28.700 MHz.

(G1-25) What is the frequency range of operation designated for amateur radio stations using the 12 and 17 meter bands?

- ❑ (A) For 12 meters – 24.000 MHz. to 24.990 MHz & for 17 meters 18.000 MHz. to 18.500 MHz.
- ❑ (B) For 12 meters – 24.000 MHz. to 24.350 MHz & for 17 meters 18.000 MHz. to 18.900 MHz.
- ❑ (C) For 12 meters – 24.890 MHz. to 24.990 MHz & for 17 meters 18.068 MHz. to 18.168 MHz.
- ❑ (D) For 12 meters – 24.100 MHz. to 24.450 MHz & for 17 meters 18.100 MHz. to 18.700 MHz.

(G1-26) What is the frequency range of operation designated for amateur radio stations using the 30 and 80 meter bands?

- ❑ (A) For 30 meters – 10.000 MHz. to 10.990 MHz & for 80 meters 3.000 MHz. to 3.500 MHz.
- ❑ (B) For 30 meters – 21.000 MHz. to 21.450 MHz & for 80 meters 18.000 MHz. to 18.900 MHz.
- ❑ (C) For 30 meters – 10.100 MHz. to 10.150 MHz & for 80 meters 3.500 MHz. to 4.000 MHz.
- ❑ (D) For 30 meters – 21.100 MHz. to 21.150 MHz & for 80 meters 3.500 MHz. to 4.000 MHz.

G1-27) What is the frequency range of operation designated for amateur radio stations using the 80 and 40 meter bands?

- ❑ (A) For 80 meters - 3.500 MHz. to 4.000 MHz & for 40 meters 7.000 MHz. to 7.300 MHz.
- ❑ (B) For 80 meters - 3.000 MHz. to 4.350 MHz & for 40 meters 7.000 MHz. to 7.500 MHz.
- ❑ (C) For 80 meters - 3.100 MHz. to 3.900 MHz & for 40 meters 7.100 MHz. to 7.300 MHz.
- ❑ (D) For 80 meters - 3.100 MHz. to 3.450 MHz & for 40 meters 7.100 MHz. to 7.700 MHz.

(G1-28) State the types of emissions which may not be used by a class "B" amateur station?

- ❑ (A) A1, F1,
- ❑ (B) A5, F5
- ❑ (C) F3, A3J
- ❑ (D) AO, A3,

(G1-29) Which International Telecommunication Union Region is Jamaica located?

- ❑ (A) Region 1
- ❑ (B) Region 2
- ❑ (C) Region 3
- ❑ (D) Region 4

(G1-30) At what point in your station is the transmitter power to be measured?

- ❑ (A) By measuring the final amplifier supply voltage inside the transmitter or amplifier.
- ❑ (B) By measuring the final amplifier supply current inside the transmitter or amplifier.
- ❑ (C) At the transmitter or amplifier antenna terminals.
- ❑ (D) On the antenna itself, after the feed line.

(G1-31) What is the maximum transmitter power permitted a class 'B' Amateur station on frequency 14.400 MHz?

- ❑ (A) 250 watts.
- ❑ (B) 500 watts.
- ❑ (C) 14.400 MHz. is out the band plan for the amateur radio service.
- ❑ (D) 1,000 watts.

(G1-32) What do the initials ITU stand for?

- ❑ (A) International Transmission Unit.
- ❑ (B) International Telephony Union.
- ❑ (C) International Telecommunications Union.
- ❑ (D) Interparish Telecommunications Unit.

(G1-33) Which side-band is commonly used for 15 meters phone operations?

- ❑ (A) Lower sideband.
- ❑ (B) Double sideband.
- ❑ (C) Upper sideband.
- ❑ (D) Single side band.

(G1-34) If the ITU allocates a frequency band to the Amateur Service on a Secondary basis, what does this mean?

- ❑ (A) The Amateur service can claim protection from other Primary services using the same band.
- ❑ (B) The Amateur service cannot claim protection from other Primary services using the same band.
- ❑ (C) The Amateur service must operate at very low transmit power
- ❑ (D) The Amateur service is prohibited from operating in certain areas.

(G1-35) What portion of the 10-meter band is available for repeater use?

- ❑ (A) The entire band
- ❑ (B) The portion between 28.1 MHz - 28.2 MHz
- ❑ (C) The portion between 28.3 MHz - 28.5 MHz
- ❑ (D) The portion between 29.5 MHz – 29.7 Mhz

(G1-36) What language must be used when identifying your station if you are using a language other than English in making a contact using phone emission?

- ❑ (A) The language being used for the contact
- ❑ (B) Any language recognized by the United Nations
- ❑ (C) English only
- ❑ (D) English, Spanish, French, or German

(G1-37) With which foreign countries is third party traffic prohibited, except for messages directly involving emergencies or disaster relief communications?

- ❑ (A) Countries in ITU Region 2
- ❑ (B) Countries in ITU Region 1
- ❑ (C) Every foreign country, unless there is a third party agreement in effect with that country
- ❑ (D) Any country which is not a member of the International Amateur Radio Union (IARU)

SUBELEMENT G2 - OPERATING PROCEDURES

G2A - Phone operating procedures; USB/LSB conventions; procedural signals; breaking into a contact; VOX operation

(G2A-01) Which sideband is most commonly used for voice communications on frequencies of 14 MHz or higher?

- ❑ (A) Upper side-band
- ❑ (B) Lower side-band
- ❑ (C) Vestigial side-band
- ❑ (D) Double side-band

(G2A-02) Which of the following modes is most commonly used for voice communications on the 160-meter, 75-meter, and 40-meter bands?

- ❑ (A) Upper side band
- ❑ (B) Lower side band
- ❑ (C) Vestigial side band
- ❑ (D) Double side band

(G2A-03) Which of the following is most commonly used for SSB voice communications in the VHF and UHF bands?

- ❑ (A) Upper side-band
- ❑ (B) Lower side-band
- ❑ (C) Vestigial side-band
- ❑ (D) Double sideband

(G2A-04) Which mode is most commonly used for voice communications on the 17-meter and 12 -meter bands?

- ❑ (A) Upper sideband
- ❑ (B) Lower sideband
- ❑ (C) Vestigial sideband
- ❑ (D) Double sideband

(G2A-05) Which mode of voice communication is most commonly used on the HF amateur bands?

- ❑ (A) Frequency modulation
- ❑ (B) Double sideband
- ❑ (C) Single sideband
- ❑ (D) Phase modulation

(G2A-06) Which of the following is an advantage when using single sideband as compared to other analog voice modes on the HF amateur bands?

- ❑ (A) Very high fidelity voice modulation
- ❑ (B) Less bandwidth used and greater power efficiency
- ❑ (C) Ease of tuning on receive and immunity to impulse noise
- ❑ (D) Less subject to interference from atmospheric static crashes

(G2A-07) Which of the following statements is true of the single sideband voice mode?

- ❑ (A) Only one sideband and the carrier are transmitted; the other side-band is suppressed
- ❑ (B) Only one sideband is transmitted; the other side-band and carrier are suppressed
- ❑ (C) SSB is the only voice mode that is authorized on the 20-meter, 15 meter, and 10 meter amateur bands
- ❑ (D) SSB is the only voice mode that is authorized on the 160-meter, 75 meter and 40 meter amateur bands

(G2A-08) Which of the following is a recommended way to break into a contact when using phone?

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

(G2A-09) Why do most amateur stations use lower sideband on the 160-meter, 75-meter and 40 -meter bands?

- ❑ (A) Lower sideband is more efficient than upper sideband at these frequencies
- ❑ (B) 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

(G2A-10) Which of the following statements is true of voice VOX operation versus PTT operation?

- ❑ (A) The received signal is more natural sounding
- ❑ (B) It allows "hands free" operation
- ❑ (C) It occupies less bandwidth
- ❑ (D) It provides more power output

(G2A-11) What does the expression "CQ DX" usually indicate?

- ❑ (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) A distress call

G2B - Operating courtesy; band plans; emergencies, including drills and emergency communications

(G2B-01) Which of the following is true concerning access to frequencies?

- ❑ (A) Nets always have priority
- ❑ (B) QSOs in process always have priority
- ❑ (C) No one has priority access to frequencies, common courtesy should be a guide
- ❑ (D) Contest operations must always yield to non-contest use of frequencies

(G2B-02) What is the first thing you should do if you are communicating with another amateur station and hear a station in distress break in?

- ❑ (A) Continue your communication because you were on the frequency first
- ❑ (B) Acknowledge the station in distress and determine what assistance may be needed
- ❑ (C) Change to a different frequency
- ❑ (D) Immediately cease all transmissions

(G2B-03) If propagation changes during your contact and you notice increasing interference from other activity on the same frequency, what should you do?

- ❑ (A) Tell the interfering stations to change frequency
- ❑ (B) Report the interference to your local Amateur Auxiliary Coordinator
- ❑ (C) As a common courtesy, move your contact to another frequency
- ❑ (D) Increase power to overcome interference

(G2B-04) When selecting a CW transmitting frequency, what minimum separation should be used to minimize interference to stations on adjacent frequencies?

- ❑ (A) 5 to 50 Hz
- ❑ (B) 150 to 500 Hz
- ❑ (C) 1 to 3 kHz
- ❑ (D) 3 to 6 kHz

(G2B-05) What is the customary minimum frequency separation between SSB signals under normal conditions?

- ❑ (A) Between 150 and 500 Hz
- ❑ (B) Approximately 3 kHz
- ❑ (C) Approximately 6 kHz
- ❑ (D) Approximately 10 kHz

(G2B-06) What is a practical way to avoid harmful interference on an apparently clear frequency before calling CQ on CW or phone?

- ❑ (A) Send "QRL?" on CW, followed by your call sign; or, if using phone, ask if the frequency is in use, followed by your call sign
- ❑ (B) Listen for 2 minutes before calling CQ
- ❑ (C) Send the letter "V" in Morse code several times and listen for a response or say "test" several times and listen for a response
- ❑ (D) Send "QSY" on CW or if using phone, announce "the frequency is in use", then give your call and listen for a response

(G2B-07) Which of the following complies with good amateur practice when choosing a frequency on which to initiate a call?

- ❑ (A) Check to see if the channel is assigned to another station
- ❑ (B) Identify your station by transmitting your call sign at least 3 times 6
- ❑ (C) Follow the voluntary band plan for the operating mode you intend to use
- ❑ (D) All of these choices are correct

(G2B-10) When is an amateur station allowed to use any means at its disposal to assist another station in distress?

- ❑ (A) Only when transmitting in RACES
- ❑ (B) At any time when transmitting in an organized net
- ❑ (C) At any time during an actual emergency
- ❑ (D) Only on authorized HF frequencies

(G2B-11) What frequency should be used to send a distress call?

- ❑ (A) Whatever frequency has the best chance of communicating the distress message
- ❑ (B) Only frequencies authorized for RACES or ARES stations
- ❑ (C) Only frequencies that are within your operating privileges
- ❑ (D) Only frequencies used by police, fire or emergency medical services

G2C - CW operating procedures and procedural signals; Q signals and common abbreviations: full break in

NOTE: *Since proficiency in morse code is no longer a requirement for obtaining an amateur radio licence the questions in this section have been omitted from the exam pool of questions.*

(G2C-01) 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) Transmitting stations can receive between code characters and elements

(G2C-02) What should you do if a CW station sends "QRS"?

- ☐ (A) Send slower
- ☐ (B) Change frequency
- ☐ (C) Increase your power
- ☐ (D) Repeat everything twice

(G2C-03) 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

(G2C-04) 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

(G2C-05) What is the best speed to use when answering a CQ in Morse code?

- ☐ (A) The fastest speed at which you are 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

(G2C-06) 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 your transmit frequency to the frequency of a received signal

(G2C-07) 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

(G2C-08) What prosign is sent to indicate the end of a formal message when using CW?

- ❑ (A) SK
- ❑ (B) BK
- ❑ (C) AR
- ❑ (D) KN

(G2C-09) What does the Q signal "QSL" mean?

- ❑ (A) Send slower
- ❑ (B) We have already confirmed by card
- ❑ (C) I acknowledge receipt
- ❑ (D) We have worked before

(G2C-10) What does the Q signal "QRQ" mean?

- ❑ (A) Slow down
- ❑ (B) Send faster
- ❑ (C) Zero beat my signal
- ❑ (D) Quitting op

(G2C-11) What does the Q signal "QRV" mean?

- ❑ (A) You are sending too fast
- ❑ (B) There is interference on the frequency
- ❑ (C) I am quitting for the day
- ❑ (D) I am ready to receive messages

G2D - Amateur Auxiliary; minimizing interference; HF operations

(G2D-04) Which of the following describes an azimuthal projection map?

- ❑ (A) A world map that shows accurate land masses
- ❑ (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

(G2D-05) Which of the following is a good way to indicate on a clear frequency in the HF phone bands that you are looking for a contact with any station?

- ❑ (A) Sign your call sign once, followed by the words "listening for a call" -- if no answer, change frequency and repeat
- ❑ (B) Say "QTC" followed by "this is" and your call sign -- if no answer, change frequency and repeat
- ❑ (C) Repeat "CQ" a few times, followed by "this is," then your call sign a few times, then pause to listen, repeat as necessary
- ❑ (D) Transmit an unmodulated carried for approximately 10 seconds, followed by "this is" and your call sign, and pause to listen -- repeat as necessary

(G2D-06) 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) T oward the north

(G2D-07) Which of the following are examples of the NATO Phonetic Alphabet?

- ❑ (A) Able, Baker, Charlie, Dog
- ❑ (B) Adam, Boy, Charles, David
- ❑ (C) America, Boston, Canada, Denmark
- ❑ (D) Alpha, Bravo, Charlie, Delta

(G2D-09 What information is traditionally contained in a station log?

- ❑ (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

(G2D-10) What is QRP operation?

- ❑ (A. Remote piloted model control
- ❑ (B. Low power transmit operation
- ❑ (C. Transmission using Quick Response Protocol
- ❑ (D. Traffic relay procedure net operation

(G2D-11) Which of the following is typical of the lower HF frequencies during the summer?

- ❑ (A) Poor propagation at any time of day
- ❑ (B) World-wide propagation during the daylight hours
- ❑ (C) Heavy distortion on signals due to photon absorption
- ❑ (D) High levels of atmospheric noise or "static"

G2E - Digital operating: procedures, procedural signals and common abbreviations

(G2E-01) Which mode is normally used when sending an RTTY signal via AFSK with an SSB transmitter?

- ❑ (A) USB
- ❑ (B) DSB
- ❑ (C) CW
- ❑ (D) LSB

(G2E-02) How can a PACTOR modem or controller be used to determine if the channel is in use by other PACTOR stations?

- ❑ (A) Unplug the data connector temporarily and see if the channel-busy indication is turned off
- ❑ (B) Put the modem or controller in a mode which allows monitoring communications without a connection
- ❑ (C) Transmit UI packets several times and wait to see if there is a response from another PACTOR station
- ❑ (D) Send the message: "Is this frequency in use?"

(G2E-03) What symptoms may result from other signals interfering with a PACTOR or WINMOR transmission?

- ❑ (A) Frequent retries or timeouts
- ❑ (B) Long pauses in message transmission
- ❑ (C) Failure to establish a connection between stations
- ❑ (D) All of these choices are correct

(G2E-04) What segment of the 20-meter band is most often used for digital transmissions?

- ❑ (A) 14.000 - 14.050 MHz
- ❑ (B) 14.070 - 14.100 MHz
- ❑ (C) 14.150 - 14.225 MHz
- ❑ (D) 14.275 - 14.350 MHz

(G2E-05) What is the standard sideband used to generate a JT65 or JT9 digital signal when using AFSK in any amateur band?

- ❑ (A) LSB
- ❑ (B) USB
- ❑ (C) DSB
- ❑ (D) SSB

(G2E-06) 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

(G2E-07) What segment of the 80-meter band is most commonly used for digital transmissions?

- ❑ (A) 3570 – 3600 kHz
- ❑ (B) 3500 – 3525 kHz
- ❑ (C) 3700 – 3750 kHz
- ❑ (D) 3775 – 3825 kHz

(G2E-08) In what segment of the 20-meter band are most PSK31 operations commonly found?

- ❑ (A) At the bottom of the slow-scan TV segment, near 14.230 MHz
- ❑ (B). At the top of the SSB phone segment, near 14.325 MHz
- ❑ (C). In the middle of the CW segment, near 14.100 MHz
- ❑ (D). Below the RTTY segment, near 14.070 MHz

(G2E-09) How do you join a contact between two stations using the PACTOR protocol?

- ❑ (A) Send broadcast packets containing your call sign while in MONITOR mode
- ❑ (B) Transmit a steady carrier until the PACTOR protocol times out and disconnects
- ❑ (C) Joining an existing contact is not possible, PACTOR connections are limited to two stations
- ❑ (D) Send a NAK response continuously so that the sending station has to pause

(G2E-10) Which of the following is a way to establish contact with a digital messaging system gateway station?

- ❑ (A) Send an email to the system control operator
- ❑ (B) Send QRL in Morse code
- ❑ (C) Respond when the station broadcasts its SSID
- ❑ (D) Transmit a connect message on the station's published frequency

(G2E-11) What is indicated on a waterfall display by one or more vertical lines adjacent to a PSK31 signal?

- ❑ (A). Long Path propagation
- ❑ (B). Backscatter propagation
- ❑ (C). Insufficient modulation
- ❑ (D) Overmodulation

(G2E-12) 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) DE-9

(G2E-13) Which communication system sometimes uses the Internet to transfer messages?

- ❑ (A) Winlink
- ❑ (B) RTTY
- ❑ (C) ARES
- ❑ (D) Skywarn

(G2E-14) What could be wrong if you cannot decode an RTTY or other FSK signal even though it is apparently tuned in properly?

- ❑ (A) The mark and space frequencies may be reversed
- ❑ (B) You may have selected the wrong baud rate
- ❑ (C) You may be listening on the wrong sideband
- ❑ (D) All of these choices are correct

SUBELEMENT G3 - RADIO WAVE PROPAGATION

G3A - Sunspots and solar radiation; ionospheric disturbances; propagation forecasting and indices

(G3A-01) What is the significance of the sunspot number with regard to HF propagation?

- ❑ (A) Higher sunspot numbers generally indicate a greater probability of good propagation at higher\frequencies
- ❑ (B) Lower sunspot numbers generally indicate greater probability of sporadic E propagation
- ❑ (C) A zero sunspot number indicate radio propagation is not possible on any band
- ❑ (D) All of these choices are correct.

(G3A-02) What effect does a Sudden Ionospheric Disturbance have on the daytime ionospheric propagation of HF radio waves?

- ❑ (A) It enhances propagation on all HF frequencies
- ❑ (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

(G3A-03) Approximately how long does it take the increased ultraviolet and X-ray radiation from solar flares to affect radio propagation on the Earth?

- ❑ (A) 28 days
- ❑ (B) 1 to 2 hours
- ❑ (C) 8 minutes
- ❑ (D) 20 to 40 hours

(G3A-04) Which of the following are least reliable for long distance communications during periods of low solar activity?

- ❑ (A) 80 meters and 160 meters
- ❑ (B) 60 meters and 40 meters
- ❑ (C) 30 meters and 20 meters
- ❑ (D) 1 5 meters, 12 meters and 10 meters

(G3A-05) What is the solar flux index?

- ❑ (A) A measure of the highest frequency that is useful for ionospheric propagation between two points on the Earth
- ❑ (B) A count of sunspots which is adjusted for solar emissions
- ❑ (C) Another name for the American sunspot number
- ❑ (D) A measure of solar radiation at 10.7 centimeters wavelength

(G3A-06) What is a geomagnetic storm?

- ❑ (A) A sudden drop in the solar flux index
- ❑ (B) A thunderstorm which affects radio propagation
- ❑ (C) Ripples in the ionosphere
- ❑ (D) A temporary disturbance in the Earth's magnetosphere

(G3A-07) At what point in the solar cycle does the 20-meter band usually support worldwide propagation during daylight hours?

- ❑ (A) At the summer solstice
- ❑ (B) Only at the maximum point of the solar cycle
- ❑ (C) Only at the minimum point of the solar cycle
- ❑ (D) At any point in the solar cycle

(G3A-08) Which of the following effects can a geomagnetic storm have on radio propagation?

- ❑ (A) Improved high-latitude HF propagation
- ❑ (B) Degraded high-latitude HF propagation
- ❑ (C) Improved ground-wave propagation
- ❑ (D) Improved chances of UHF ducting

(G3A-09) What effect does a high sunspot number have on radio communications?

- ❑ (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) Microwave communications become unstable

(G3A-10) What causes HF propagation conditions to vary periodically in a 28 day cycle?

- ❑ (A) Long term oscillations in the upper atmosphere
- ❑ (B) Cyclic variation in the Earth's radiation belts
- ❑ (C) The Sun's rotation on its axis
- ❑ (D) The position of the Moon in its orbit

(G3A-11) How long does it take charged particles from coronal mass ejections to affect radio propagation on the Earth?

- ❑ (A) 28 days
- ❑ (B) 14 days
- ❑ (C) 4 to 8 minutes
- ❑ (D) 20 to 40 hours

(G3A-12) What does the K-index indicate?

- ❑ (A) The relative position of sunspots on the surface of the Sun
- ❑ (B) The short term stability of the Earth's magnetic field
- ❑ (C) The stability of the Sun's magnetic field
- ❑ (D) The solar radio flux at Boulder, Colorado

(G3A-13) What does the A-index indicate?

- ❑ (A) The relative position of sunspots on the surface of the Sun
- ❑ (B) The amount of polarization of the Sun's electric field
- ❑ (C) The long term stability of the Earth's geomagnetic field
- ❑ (D) The solar radio flux at Boulder, Colorado

(G3A-14) 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

(G3A-15) What is a possible benefit to radio communications resulting from periods of high geomagnetic activity?

- ❑ (A) Auroras 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

G3B - Maximum Usable Frequency; Lowest Usable Frequency; propagation

(G3B-01) 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 might be cancelled causing severe attenuation
- ❑ (D) A well-defined echo might be heard

(G3B-02) What factor or factors affect the MUF?

- ❑ (A) Path distance and location
- ❑ (B) Time of day and season
- ❑ (C) Solar radiation and ionospheric disturbances
- ❑ (D) All of these choices are correct

(G3B-03) Which of the following applies when selecting a frequency for lowest attenuation when transmitting on HF?

- ❑ (A) Select a frequency just below the MUF
- ❑ (B) Select a frequency just above the LUF
- ❑ (C) Select a frequency just below the critical frequency
- ❑ (D) Select a frequency just above the critical frequency

(G3B-04) What is a reliable way to determine if the MUF is high enough to support skip propagation between your station and a distant location on frequencies between 14 and 30 MHz?

- ❑ (A) Listen for signals from an international beacon in the frequency range you plan to use
- ❑ (B) Send a series of dots on the band and listen for echoes from your signal
- ❑ (C) Check the strength of TV signals from Western Europe
- ❑ (D) Check the strength of signals in the MF AM broadcast band

(G3B-05) What usually happens to radio waves with frequencies below the MUF and above the LUF when they are sent into the ionosphere?

- ❑ (A) They are bent back to the Earth
- ❑ (B) They pass through the ionosphere
- ❑ (C) They are amplified by interaction with the ionosphere
- ❑ (D) They are bent and trapped in the ionosphere to circle the Earth

(G3B-06) What usually happens to radio waves with frequencies below the LUF?

- ❑ (A) They are bent back to the Earth
- ❑ (B) They pass through the ionosphere
- ❑ (C) They are completely absorbed by the ionosphere
- ❑ (D) They are bent and trapped in the ionosphere to circle the Earth

(G3B-07) What does LUF stand for?

- ❑ (A) The Lowest Usable Frequency for communications between two points
- ❑ (B) The Longest Universal Function for communications between two points
- ❑ (C) The Lowest Usable Frequency during a 24 hour period
- ❑ (D) The Longest Universal Function during a 24 hour period

(G3B-08) What does MUF stand for?

- ❑ (A) The Minimum Usable Frequency for communications between two points
- ❑ (B) The Maximum Usable Frequency for communications between two points
- ❑ (C) The Minimum Usable Frequency during a 24 hour period
- ❑ (D) The Maximum Usable Frequency during a 24 hour period

(G3B-09) What is the approximate 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

(G3B-10) What is the approximate 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

(G3B-11) What happens to HF propagation when the LUF exceeds the MUF?

- ❑ (A) No HF radio frequency will support ordinary sky-wave communications over the path
- ❑ (B) HF communications over the path are enhanced
- ❑ (C) Double hop propagation along the path is more common
- ❑ (D) Propagation over the path on all HF frequencies is enhanced

G3C - Ionospheric layers; critical angle and frequency; HF scatter; Near Vertical Incidence Sky-wave

(G3C-01) Which ionospheric layer is closest to the surface of the Earth?

- ❑ (A) The D layer
- ❑ (B) The E layer
- ❑ (C) The F1 layer
- ❑ (D) The F2 layer

(G3C-02) Where on the Earth do ionospheric layers reach their maximum height?

- ❑ (A) Where the Sun is overhead
- ❑ (B) Where the Sun is on the opposite side of the Earth
- ❑ (C) Where the Sun is rising
- ❑ (D) Where the Sun has just set

(G3C-03) 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

(G3C-04) 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.

(G3C-05) Why is long distance communication on the 40-meter, 60-meter, 80-meter and 160-meter bands more difficult during the day?

- ❑ (A) The F layer absorbs signals at these frequencies during daylight hours
- ❑ (B) The F layer is unstable during daylight hours
- ❑ (C) The D layer absorbs signals at these frequencies during daylight hours
- ❑ (D) The E layer is unstable during daylight hours

(G3C-06) 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

(G3C-07) 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 different radio wave paths

(G3C-08) 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 magnetosphere which is not a good reflector
- ☐ (C) Propagation is through ground waves which absorb most of the signal energy
- ☐ (D) Propagations is through ducts in F region which absorb most of the energy

(G3C-09) 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) Faraday rotation
- ☐ (B) Scatter
- ☐ (C) Sporadic-E skip
- ☐ (D) Short-path skip

(G3C-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

(G3C-11) Which of the following antenna types 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

(G3C-12) 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

(G3C-13) What is Near Vertical Incidence Sky-wave (NVIS) propagation?

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

SUBELEMENT G4 - AMATEUR RADIO PRACTICES

G4A – Station Operation and set up

(G4A-01) What is the purpose of the "notch filter" found on many HF transceivers?

- ❑ (A) To restrict the transmitter voice bandwidth
- ❑ (B) To reduce interference from carriers in the receiver passband
- ❑ (C) To eliminate receiver interference from impulse noise sources
- ❑ (D) To enhance the reception of a specific frequency on a crowded band

(G4A-02) What is one advantage of selecting the opposite or "reverse" sideband when receiving CW signals on a typical HF transceiver?

- ❑ (A) Interference from impulse noise will be eliminated
- ❑ (B) More stations can be accommodated within a given signal passband
- ❑ (C) It may be possible to reduce or eliminate interference from other signals
- ❑ (D) Accidental out of band operation can be prevented

(G4A-03) What is normally meant by operating a transceiver in "split" mode?

- ❑ (A) The radio is operating at half power
- ❑ (B) The transceiver is operating from an external power source
- ❑ (C) The transceiver is set to different transmit and receive frequencies
- ❑ (D) The transmitter is emitting an SSB signal, as opposed to DSB operation

(G4A-04) What reading on the plate current meter of a vacuum tube RF power amplifier indicates correct adjustment of the plate tuning control?

- ❑ (A) A pronounced peak
- ❑ (B) A pronounced dip
- ❑ (C) No change will be observed
- ❑ (D) A slow, rhythmic oscillation

(G4A-05) What is a reason to use Automatic Level Control (ALC) with an RF power amplifier?

- ❑ (A) To balance the transmitter audio frequency response
- ❑ (B) To reduce harmonic radiation
- ❑ (C) To reduce distortion due to excessive drive
- ❑ (D) To increase overall efficiency

(G4A-06) What type of device is often used to match transmitter output impedance to an impedance not equal to 50 ohms?

- ❑ (A) Balanced modulator
- ❑ (B) SWR Bridge
- ❑ (C) Antenna coupler or antenna tuner
- ❑ (D) Q Multiplier

(G4A-07) What condition can lead to permanent damage to a solid-state RF power amplifier?

- ❑ (A) Insufficient drive power
- ❑ (B) Low input SWR
- ❑ (C) Shorting the input signal to ground
- ❑ (D) Excessive drive power

(G4A-08) What is the correct adjustment for the load or coupling control of a vacuum tube RF power amplifier?

- ❑ (A) Minimum SWR on the antenna
- ❑ (B) Minimum plate current without exceeding maximum allowable grid current
- ❑ (C) Highest plate voltage while minimizing grid current
- ❑ (D) Maximum power output without exceeding maximum allowable plate current

(G4A-09) Why is a time delay sometimes included in a transmitter keying circuit?

- ❑ (A) To prevent stations from interfering with one another
- ❑ (B) To allow the transmitter power regulators to charge properly
- ❑ (C) To allow time for transmit-receive changeover operations to complete properly before RF output is allowed
- ❑ (D) To allow time for a warning signal to be sent to other stations

(G4A-10) What is the purpose of an electronic keyer?

- ❑ (A) Automatic transmit/receive switching
- ❑ (B) Automatic generation of strings of dots and dashes for CW operation
- ❑ (C) VOX operation
- ❑ (D) Computer interface for PSK and RTTY operation

(G4A-11) Which of the following is a use for the IF shift control on a receiver?

- ❑ (A) To avoid interference from stations very close to the receive frequency
- ❑ (B) To change frequency rapidly
- ❑ (C) To permit listening on a different frequency from that on which you are transmitting
- ❑ (D) To tune in stations that are slightly off frequency without changing your transmit frequency

(G4A-12) Which of the following is a common use for the dual VFO feature on a transceiver?

- ❑ (A) To allow transmitting on two frequencies at once
- ❑ (B) To permit full duplex operation, that is transmitting and receiving at the same time
- ❑ (C) To permit monitoring of two different frequencies
- ❑ (D) To facilitate computer interface

(G4A-13) What is one reason to use the attenuator function that is present on many HF transceivers?

- ❑ (A) To reduce signal overload due to strong incoming signals
- ❑ (B) To reduce the transmitter power when driving a linear amplifier
- ❑ (C) To reduce power consumption when operating from batteries
- ❑ (D) To slow down received CW signals for better copy

(G4A-14) What is likely to happen if a transceiver's ALC system is not set properly when transmitting AFSK signals with the radio using single sideband mode?

- ❑ (A) ALC will invert the modulation of the AFSK mode
- ❑ (B) Improper action of ALC distorts the signal and can cause spurious emissions
- ❑ (C) When using digital modes, too much ALC activity can cause the transmitter to overheat
- ❑ (D) All of these choices are correct

(G4A-15) Which of the following can be a symptom of transmitted RF being picked up by an audio cable carrying AFSK data signals between a computer and a transceiver?

- ❑ (A) The VOX circuit does not un-key the transmitter
- ❑ (B) The transmitter signal is distorted
- ❑ (C) Frequent connection timeouts
- ❑ (D) All of these choices are correct

G4B - Test and monitoring equipment; two-tone test

(G4B-01) What item of test equipment contains horizontal and vertical channel amplifiers?

- ❑ (A) An ohmmeter
- ❑ (B) A signal generator
- ❑ (C) An ammeter
- ❑ (D) An oscilloscope

(G4B-02) Which of the following is an advantage of an oscilloscope versus a digital voltmeter?

- ❑ (A) An oscilloscope uses less power
- ❑ (B) Complex impedances can be easily measured
- ❑ (C) Input impedance is much lower
- ❑ **(D) Complex waveforms can be measured**

(G4B-03) Which of the following is the best instrument to use when checking the keying waveform of a CW transmitter?

- ☐ (A) An oscilloscope
- ☐ (B) A field strength meter
- ☐ (C) A sidetone monitor
- ☐ (D) A wavemeter

(G4B-04) What signal source is connected to the vertical input of an oscilloscope when checking the RF envelope pattern of a transmitted signal?

- ☐ (A) The local oscillator of the transmitter
- ☐ (B) An external RF oscillator
- ☐ (C) The transmitter balanced mixer output
- ☐ (D) The attenuated RF output of the transmitter

(G4B-05) Why is high input impedance desirable for a voltmeter?

- ☐ (A) It improves the frequency response
- ☐ (B) It decreases battery consumption in the meter
- ☐ (C) It improves the resolution of the readings
- ☐ (D) It decreases the loading on circuits being measured

(G4B-06) 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) Better precision for most uses
- ☐ (D) Faster response

(G4B-07) What 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

(G4B-08) Which of the following instruments 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

(G4B-09) 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

(G4B-10) Which of the following can be determined with a directional wattmeter?

- ❑ (A) Standing wave ratio
- ❑ (B) Antenna front-to-back ratio
- ❑ (C) RF interference
- ❑ (D) Radio wave propagation

(G4B-11) 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 feed line
- ❑ (D) All of these choices are correct

(G4B-12) What problem can occur when making measurements on an antenna system with an antenna analyzer?

- ❑ (A) Permanent damage to the analyzer may occur if it is operated into a high SWR
- ❑ (B) Strong signals from nearby transmitters can affect the accuracy of measurements
- ❑ (C) The analyzer can be damaged if measurements outside the ham bands are attempted
- ❑ (D) Connecting the analyzer to an antenna can cause it to absorb harmonics

(G4B-13) What is a use for an antenna analyzer other than measuring the SWR of an antenna system?

- ❑ (A) Measuring the front to back ratio of an antenna
- ❑ (B) Measuring the turns ratio of a power transformer
- ❑ (C) Determining the impedance of an unknown or unmarked coaxial cable
- ❑ (D) Determining the gain of a directional antenna

(G4B-14) What is an instance in which the use of an instrument with analog readout may be preferred over an instrument with a digital readout?

- ❑ (A) When testing logic circuits
- ❑ (B) When high precision is desired
- ❑ (C) When measuring the frequency of an oscillator
- ❑ (D) When adjusting tuned circuits

(G4B-15) What type of transmitter performance does a two-tone test analyze?

- ❑ (A) Linearity
- ❑ (B) Percentage of suppression of carrier and undesired sideband for SSB
- ❑ (C) Percentage of frequency modulation
- ❑ (D) Percentage of carrier phase shift

G4C - Interference with consumer electronics; grounding; DSP

(G4C-01) 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

(G4C-02) Which of the following could be a cause of interference covering a wide range of frequencies?

- ❑ (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) Using a balun to feed an unbalanced antenna

(G4C-03) What sound is heard from an audio device or telephone if there is interference from a nearby single sideband phone 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

(G4C-04) What is the effect on an audio device or telephone system if there is interference from a 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

(G4C-05) What might be the problem if you receive an RF burn when touching your equipment while transmitting on an HF band, assuming the equipment is connected to a ground rod?

- ❑ (A) Flat braid rather than round wire has been used for the ground wire
- ❑ (B) Insulated wire has been used for the ground wire
- ❑ (C) The ground rod is resonant
- ❑ (D) The ground wire has high impedance on that frequency

(G4C-06) What effect can be caused by a resonant ground connection?

- ❑ (A) Overheating of ground straps
- ❑ (B) Corrosion of the ground rod
- ❑ (C) High RF voltages on the enclosures of station equipment
- ❑ (D) A ground loop

(G4C-07) What is one good way to avoid unwanted effects of stray RF energy in an amateur

- ❑ (A) Connect all equipment grounds together
- ❑ (B) Install an RF filter in series with the ground wire
- ❑ (C) Use a ground loop for best conductivity
- ❑ (D) Install a few ferrite beads on the ground wire where it connects to your station

(G4C-08) Which of the following would reduce RF interference caused by common-mode current on an audio cable?

- ❑ (A) Placing a ferrite choke around the cable
- ❑ (B) Adding series capacitors to the conductors
- ❑ (C) Adding shunt inductors to the conductors
- ❑ (D) Adding an additional insulating jacket to the cable

(G4C-09) How can a ground loop be avoided?

- ❑ (A) Connect all ground conductors in series
- ❑ (B) Connect the AC neutral conductor to the ground wire
- ❑ (C) Avoid using lock washers and star washers when making ground connections
- ❑ (D) Connect all ground conductors to a single point

(G4C-10) What could be a symptom of a ground loop somewhere in your station?

- ❑ (A) You receive reports of "hum" on your station's transmitted signal
- ❑ (B) The SWR reading for one or more antennas is suddenly very high
- ❑ (C) An item of station equipment starts to draw excessive amounts of current
- ❑ (D) You receive reports of harmonic interference from your station

(G4C-11) Which of the following is a function of a digital signal processor?

- ❑ (A) To provide adequate grounding
- ❑ (B) To remove noise from received signals
- ❑ (C) To increase antenna gain
- ❑ (D) To increase antenna bandwidth

(G4C-12) Which of the following is an advantage of a receiver DSP IF filter as compared to an analog filter?

- ❑ (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

(G4C-13) Which of the following can perform automatic notching of interfering carriers?

- ❑ (A) Bandpass tuning
- ❑ (B) A Digital Signal Processor (DSP) filter
- ❑ (C) Balanced mixing
- ❑ (D) A noise limiter

G4D - Speech processors; S meters; sideband operation near band edges

(G4D-01) What is the purpose of a speech processor as used in a modern transceiver?

- ❑ (A) Increase the intelligibility of transmitted phone signals during poor conditions
- ❑ (B) Increase transmitter bass response for more natural sounding SSB signals
- ❑ (C) Prevent distortion of voice signals
- ❑ (D) Decrease high-frequency voice output to prevent out of band operation

(G4D-02) Which of the following describes how a speech processor affects a transmitted single sideband phone signal?

- ❑ (A) It increases peak power
- ❑ (B) It increases average power
- ❑ (C) It reduces harmonic distortion
- ❑ (D) It reduces intermodulation distortion

(G4D-03) 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 choices are correct

(G4D-04) What does an S meter measure?

- ❑ (A) Conductance
- ❑ (B) Impedance
- ❑ (C) Received signal strength
- ❑ (D) Transmitter power output

(G4D-05) How does a signal that reads 20 dB over S9 compare to one that reads S9 on a receiver, assuming a properly calibrated S meter?

- ❑ (A) It is 10 times less powerful
- ❑ (B) It is 20 times less powerful
- ❑ (C) It is 20 times more powerful
- ❑ (D) It is 100 times more powerful

(G4D-06) Where is an S meter found?

- ❑ (A) In a receiver
- ❑ (B) In an SWR bridge
- ❑ (C) In a transmitter
- ❑ (D) In a conductance bridge

(G4D-07) 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 1.5 times
- ❑ (B) Approximately 2 times
- ❑ (C) Approximately 4 times
- ❑ (D) Approximately 8 times

(G4D-08) What frequency range is occupied by a 3 kHz LSB signal when the displayed carrier frequency is set to 7.178 MHz?

- ❑ (A) 7.178 to 7.181 MHz
- ❑ (B) 7.178 to 7.184 MHz
- ❑ (C) 7.175 to 7.178 MHz
- ❑ (D) 7.1765 to 7.1795 MHz

(G4D-09) What frequency range is occupied by a 3 kHz USB signal with the displayed carrier frequency set to 14.347 MHz?

- ❑ (A) 14.347 to 14.647 MHz
- ❑ (B) 14.347 to 14.350 MHz
- ❑ (C) 14.344 to 14.347 MHz
- ❑ (D) 14.3455 to 14.3485 MHz

(G4D-10) How close to the lower edge of the 40-meter General Class phone segment should your displayed carrier frequency be when using 3 kHz wide LSB?

- ❑ (A) At least 3 kHz above the edge of the segment
- ❑ (B) At least 3 kHz below the edge of the segment
- ❑ (C) Your displayed carrier frequency may be set at the edge of the segment
- ❑ (D) At least 1 kHz above the edge of the segment

(G4D-11) How close to the upper edge of the 20-meter Cass B band should your displayed carrier frequency be when using 3 kHz wide USB?

- ❑ (A) At least 3 kHz above the edge of the band
- ❑ (B) At least 3 kHz below the edge of the band
- ❑ (C) Your displayed carrier frequency may be set at the edge of the band
- ❑ (D) At least 1 kHz below the edge of the segment

G4E - HF mobile radio installations; emergency and battery powered operation

(G4E-01) What is the purpose of a capacitance hat on a mobile antenna?

- ❑ (A) To increase the power handling capacity of a whip antenna
- ❑ (B) To allow automatic band changing
- ❑ (C) To electrically lengthen a physically short antenna
- ❑ (D) To allow remote tuning

(G4E-02) What is the purpose of a corona ball on a HF mobile antenna?

- ❑ (A) To narrow the operating bandwidth of the antenna
- ❑ (B) To increase the "Q" of the antenna 29
- ❑ (C) To reduce the chance of damage if the antenna should strike an object
- ❑ (D). To reduce high voltage discharge from the tip of the antenna

(G4E-03) Which of the following direct, fused power connections would be the best for a 100 watt HF mobile installation?

- ☐ (A) To the battery using heavy gauge wire
- ☐ (B) To the alternator or generator using heavy gauge wire
- ☐ (C) To the battery using resistor wire
- ☐ (D) To the alternator or generator using resistor wire

(G4E-04) Why is it best NOT to draw the DC power for a 100 watt HF transceiver from a vehicle's auxiliary power socket?

- ☐ (A) The socket is not wired with an RF-shielded power cable
- ☐ (B) The socket's wiring may be inadequate for the current drawn by the transceiver
- ☐ (C) The DC polarity of the socket is reversed from the polarity of modern HF transceivers
- ☐ (D) Drawing more than 50 watts from this socket could cause the engine to overheat

(G4E-05) Which of the following most limits an HF mobile installation?

(A) "Picket fencing"
(B) The wire gauge of the DC power line to the transceiver
(C) Efficiency of the electrically short antenna
(D) FCC rules limiting mobile output power on the 75-meter band

(G4E-06) What is one disadvantage of using a shortened mobile antenna as opposed to a full size antenna?

- ☐ (A) Short antennas are more likely to cause distortion of transmitted signals
- ☐ (B) Short antennas can only receive circularly polarized signals
- ☐ (C) Operating bandwidth may be very limited
- ☐ (D) Harmonic radiation may increase

(G4E-07) Which of the following may cause interference to be heard in the receiver of an HF radio installed in a recent model vehicle?

- ☐ (A) The battery charging system
- ☐ (B) The fuel delivery system
- ☐ (C) The vehicle control computer
- ☐ (D) All of these choices are correct

(G4E-08) 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**

(G4E-09) What is the approximate open-circuit voltage from a fully illuminated silicon photovoltaic cell?

- ❑ (A) 0.02 VDC
- ❑ (B) 0.5 VDC
- ❑ (C) 0.2 VDC
- ❑ (D) 1.38 VDC

(G4E-10) What is the reason that a series diode is connected between a solar panel and a storage battery that is being charged by the panel?

- ❑ (A) The diode serves to regulate the charging voltage to prevent overcharge
- ❑ (B) The diode prevents self-discharge of the battery though the panel during times of low or no illumination
- ❑ (C) The diode limits the current flowing from the panel to a safe value
- ❑ (D) The diode greatly increases the efficiency during times of high illumination

(G4E-11) Which of the following is a disadvantage of using wind 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

SUBELEMENT G5 – ELECTRICAL PRINCIPLES

G5A – Reactance; inductance; capacitance; impedance; impedance matching

(G5A-01) 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

(G5A-02) What is reactance?

- ❑ (A) Opposition to the flow of direct current caused by resistance 31
- ❑ (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 de-energized

(G5A-03) Which of the following causes opposition to the flow of alternating current in an inductor?

- ❑ (A) Conductance
- ❑ (B) Reluctance
- ❑ (C) Admittance
- ❑ (D) Reactance

(G5A-04) Which of the following causes opposition to the flow of alternating current in a capacitor?

- ❑ (A) Conductance
- ❑ (B) Reluctance
- ❑ (C) Reactance
- ❑ (D) Admittance

(G5A-05) How does an inductor 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 frequency of the applied AC increases, the reactance increases
- ❑ (D)As the frequency of the applied AC increases, the reactance increases

(G5A-06) 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

(G5A-07) What happens when the impedance of an electrical load is equal to the output impedance of a power source, assuming both impedances are resistive?

- ❑ (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

(G5A-08) 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

(G5A-09) What unit is used to measure reactance?

- (A) Farad
- (B) Ohm
- (C) Ampere
- (D) Siemens

(G5A-10) What unit is used to measure impedance?

- (A) Volt
- (B) Ohm
- (C) Ampere
- (D) Watt

(G5A-11) 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

(G5A-12) What is one reason to use an impedance matching transformer?

- (A) To minimize transmitter power output
- (B) To maximize the transfer of power
- (C) To reduce power supply ripple
- (D) To minimize radiation resistance

(G5A-13) 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 the choices are correct

G5B - The Decibel; current and voltage dividers; electrical power calculations; sine wave root-mean-square (RMS) values; PEP calculations

(G5B-01) What dB change represents a two-times increase or decrease in power?

- ☐ (A) Approximately 2 dB
- ☐ (B) Approximately 3 dB
- ☐ (C) Approximately 6 dB
- ☐ (D) Approximately 12 dB

(G5B-02) How does the total current relate to the individual currents in each branch of a purely resistive 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

(G5B-03) 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

(G5B-04) 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

(G5B-05) How many watts are dissipated when a current of 7.0 milliamperes flows through 1.25 kilohms resistance?

- ☐ (A) Approximately 61 milliwatts
- ☐ (B) Approximately 61 watts
- ☐ (C) Approximately 11 milliwatts
- ☐ (D) Approximately 11 watts

(G5B-06) 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 34

(G5B-07) What value of an AC signal produces the same power dissipation in a resistor as 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

(G5B-09) What is the RMS voltage of a sine wave with a value of 17 volts peak?

- ❑ (A) 8.5 volts
- ❑ (B) 12 volts
- ❑ (C) 24 volts
- ❑ (D) 34 volts

(G5B-10) What percentage of power loss would result from a transmission line loss of 1 dB?

- ❑ (A) 10.9 percent
- ❑ (B) 12.2 percent
- ❑ (C) 20.5 percent
- ❑ (D) 25.9 percent

(G5B-11) What is the ratio of peak envelope power to average power for an unmodulated carrier?

- ❑ (A) 0.707
- ❑ (B) 1.00
- ❑ (C) 1.414
- ❑ (D) 2.00

(G5B-12) What would be the RMS voltage across a 50 ohm dummy load dissipating 1200 watts?

- ❑ (A) 173 volts
- ❑ (B) 245 volts
- ❑ (C) 346 volts
- ❑ (D) 692 volts

(G5B-13) What is the output PEP of an unmodulated carrier if an average reading wattmeter connected to the ransmitter output indicates 1060 watts?

- ❑ (A) 530 watts
- ❑ (B) 1060 watts
- ❑ (C) 1500 watts
- ❑ (D) 2120 watts 35

(G5B-14) What is the output PEP from a transmitter if an oscilloscope measures 500 volts peak-to-peak across a 50 ohm resistive load connected to the transmitter output?

- ❑ (A) 8.75 watts
- ❑ (B) 625 watts
- ❑ (C) 2500 watts
- ❑ (D) 5000 watts

G5C – Resistors, capacitors, and inductors in series and parallel; transformers

(G5C-01) 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

(G5C-02) What happens if you reverse the primary and secondary windings of a 4:1 voltage step down transformer?

- ❑ (A) The secondary voltage becomes 4 times the primary voltage
- ❑ (B) The transformer no longer functions as it is a unidirectional device
- ❑ (C) Additional resistance must be added in series with the primary to prevent overload
- ❑ (D) Additional resistance must be added in parallel with the secondary to prevent overload

(G5C-03) Which of the following components should be added to an existing resistor to increase the resistance?

- ❑ (A) A resistor in parallel
- ❑ (B) A resistor in series
- ❑ (C) A capacitor in series
- ❑ (D) A capacitor in parallel

(G5C-04) What is the total resistance of three 100 ohm resistors in parallel?

- ❑ (A) 0.30 ohms
- ❑ (B) 0.33 ohms
- ❑ (C) 33.3 ohms
- ❑ (D) 300 ohms

(G5C-05) If three equal value resistors in series produce 450 ohms, what is the value of each resistor?

- ❑ (A) 1500 ohms
- ❑ (B) 90 ohms
- ❑ (C) 150 ohms
- ❑ (D) 175 ohms

(G5C-06) What is the RMS 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

(G5C-07) What is the turns ratio of a transformer used to match an audio amplifier having 600 ohm output impedance to a speaker having 4 ohm impedance?

- ❑ (A) 12.2 to 1
- ❑ (B) 24.4 to 1
- ❑ (C) 150 to 1
- ❑ (D) 300 to 1

(G5C-08) What is the equivalent capacitance of two 5.0 nanofarad capacitors and one 750 picofarad capacitor connected in parallel?

- ❑ (A) 576.9 nanofarads
- ❑ (B) 1733 picofarads
- ❑ (C) 3583 picofarads
- ❑ (D) 10.750 nanofarads

(G5C-09) What is the capacitance of three 100 microfarad capacitors connected in series?

- ❑ (A) 0.30 microfarads
- ❑ (B) 0.33 microfarads
- ❑ (C) 33.3 microfarads
- ❑ (D) 300 microfarads

(G5C-10) What is the inductance of three 10 millihenry inductors connected in parallel?

- ❑ (A) 0.30 henrys
- ❑ (B) 3.3 henrys
- ❑ (C) 3.3 millihenrys
- ❑ (D) 30 millihenrys

(G5C-11) What is the inductance of a 20 millihenry inductor connected in series with a 50 millihenry inductor?

- ❑ (A) 0.07 millihenrys
- ❑ (B) 14.3 millihenrys
- ❑ (C) 70 millihenrys
- ❑ (D) 1000 millihenrys

(G5B-12) What is the capacitance of a 20 microfarad capacitor connected in series with a 50 microfarad capacitor?

- ❑ (A) 0.07 microfarads
- ❑ (B) 14.3 microfarads
- ❑ (C) 70 microfarads
- ❑ (D) 1000 microfarads

(G5B-13) Which of the following components should be added to a capacitor to increase the capacitance?

- ❑ (A) An inductor in series
- ❑ (B) A resistor in series
- ❑ (C) A capacitor in parallel
- ❑ (D) A capacitor in series

(G5B-14) Which of the following components should be added to an inductor to increase the inductance?

- ❑ (A) A capacitor in series
- ❑ (B) A resistor in parallel
- ❑ (C) An inductor in parallel
- ❑ (D) An inductor in series

(G5B-15) What is the total resistance of a 10 ohm, a 20 ohm, and a 50 ohm resistor connected in parallel?

- ❑ (A) 5.9 ohms
- ❑ (B) 0.17 ohms
- ❑ (C) 10000 ohms
- ❑ (D) 80 ohms

(G5B-16) Why is the conductor of the primary winding of many voltage step up transformers larger in diameter than the conductor of the secondary winding?

- ❑ (A) To improve the coupling between the primary and secondary
- ❑ (B) To accommodate the higher current of the primary
- ❑ (C) To prevent parasitic oscillations due to resistive losses in the primary
- ❑ (D) To insure that the volume of the primary winding is equal to the volume of the secondary winding

(G5B-17) What is the value in nanofarads (nF) of a 22,000 pF capacitor?

- ❑ (A) 0.22 nF
- ❑ (B) 2.2 nF
- ❑ (C) 22 nF
- ❑ (D) 220 nF

(G5B-18) What is the value in microfarads of a 4700 nanofarad (nF) capacitor?

- ❑ (A) 47 µF
- ❑ (B) 0.47 µF
- ❑ (C) 47,000 µF
- ❑ (D) 4.7 µF

SUBELEMENT G6 – CIRCUIT COMPONENTS

G6A – Resistors; Capacitors; Inductors; Rectifiers; solid state diodes and transistors; vacuum tubes; batteries

(G6A-01) 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

(G6A-02) 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

(G6A-03) 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 39

(G6A-04) 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

(G6A-05) What is the approximate junction threshold voltage of a conventional silicon diode?

- ❑ (A) 0.1 volt
- ❑ (B) 0.3 volts
- ❑ (C) 0.7 volts
- ❑ (D) 0 volts

(G6A-06) Which of the following is an advantage of using a Schottky diode in an RF switching circuit rather than a standard silicon diode?

- ❑ (A) Lower capacitance
- ❑ (B) Lower inductance
- ❑ (C) Longer switching times
- ❑ (D) Higher breakdown voltage

(G6A-07) What are the stable operating points for a bipolar transistor used as a switch in a logic circuit?

- ❑ (A) Its saturation and cutoff regions
- ❑ (B) Its active region (between the cutoff and saturation regions)
- ❑ (C) Its peak and valley current points
- ❑ (D) Its enhancement and depletion modes

(G6A-08) Why must the cases of some large power transistors be insulated from ground?

- ❑ (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

(G6A-09) 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 40

(G6A-10) 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) Trigger electrode

(G6A-11) Which of the following solid state devices is most like a vacuum tube in its general operating characteristics?

- ❑ (A) A bipolar transistor
- ❑ (B) A field effect transistor
- ❑ (C) A tunnel diode
- ❑ (D) A varistor

(G6A-12) 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 control grid resistance
- ❑ (D) To decrease plate resistance

(G6A-13) Why is the polarity of applied voltages important for polarized capacitors?

- ❑ (A) Incorrect polarity can cause the capacitor to short-circuit
- ❑ (B) Reverse voltages can destroy the dielectric layer of an electrolytic capacitor
- ❑ (C) The capacitor could overheat and explode
- ❑ (D) All of these choices are correct

(G6A-14) Which of the following is an advantage of ceramic capacitors as compared to other types of capacitors?

- ❑ (A) Tight tolerance
- ❑ (B) High stability
- ❑ (C) High capacitance for given volume
- ❑ (D) Comparatively low cost

(G6A-15) Which of the following is an advantage of an electrolytic capacitor?

- ❑ (A) Tight tolerance
- ❑ (B) Much less leakage than any other type
- ❑ (C) High capacitance for a given volume
- ❑ (D) Inexpensive RF capacitor

(G6A-16) What will happen to the resistance if the temperature of a resistor is increased?

- ❑ (A) It will change depending on the resistor's reactance coefficient
- ❑ (B) It will stay the same
- ❑ (C) It will change depending on the resistor's temperature coefficient
- ❑ (D) It will become time dependent

(G6A-17) Which of the following is a reason not to use wire-wound resistors in an RF circuit?

- ❑ (A) The resistor's tolerance value would not be adequate for such a circuit
- ❑ (B) The resistor's inductance could make circuit performance unpredictable
- ❑ (C) The resistor could overheat
- ❑ (D) The resistor's internal capacitance would detune the circuit

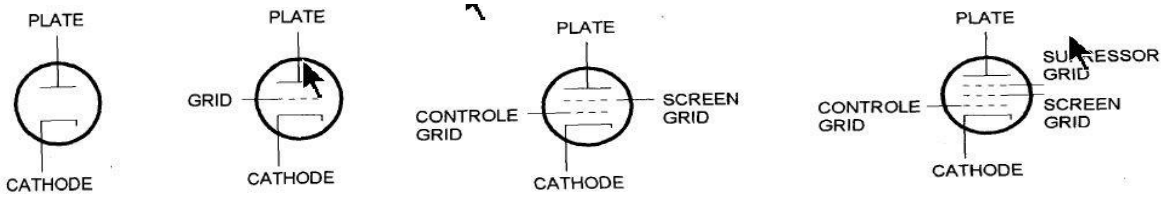
(G6A-18) What is an advantage of using a ferrite core toroidal inductor?

- ❑ (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

(G6A-19) How should the winding axes of two solenoid inductors be oriented to minimize their mutual inductance?

- ❑ (A) In line
- ❑ (B) Parallel to each other
- ❑ (C) At right angles to each other
- ❑ (D) Interleaved

(G6A-20) Which of the tubes shown below is a triode?



❑ (A) ❑ (B) ❑ (C) ❑ (D)

G6B - Analog and digital integrated circuits (ICs); microprocessors; memory; I/O devices; microwave ICs (MMICs); display devices

(G6B-01) Which of the following is an analog integrated circuit?

- ❑ (A) NAND Gate
- ❑ (B) Microprocessor
- ❑ (C) Frequency Counter
- ❑ (D) Linear voltage regulator

(G6B-02) What is meant by the term MMIC?

- ❑ (A) Multi Megabyte Integrated Circuit
- ❑ (B) Monolithic Microwave Integrated Circuit
- ❑ (C) Military Manufactured Integrated Circuit
- ❑ (D) Mode Modulated Integrated Circuit

(G6B-03) Which of the following is an advantage of CMOS integrated circuits compared to TTL integrate circuits?

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

(G6B-04) What is meant by the term ROM?

- ❑ (A) Resistor Operated Memory
- ❑ (B) Read Only Memory
- ❑ (C) Random Operational Memory
- ❑ (D) Resistant to Overload Memory

(G6B-05) 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

(G6B-06) What kind of device is an integrated circuit operational amplifier?

- ❑ (A) Digital
- ❑ (B) MMIC
- ❑ (C) Programmable Logic
- ❑ (D) Analog

(G6B-07) Which of the following is an advantage of an LED indicator compared to an incandescent indicator?

- ❑ (A) Lower power consumption
- ❑ (B) Faster response time
- ❑ (C) Longer life
- ❑ (D) All of these choices are correct

(G6B-08) How is an LED biased when emitting light?

- ❑ (A) Beyond cutoff
- ❑ (B) At the Zener voltage
- ❑ (C) Reverse Biased
- ❑ (D) Forward Biased

(G6B-09) 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

(G6B-10) 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

(G6B-11) What is a microprocessor?

- ☐ (A) A low power analog signal processor used as a microwave detector
- ☐ (B) A computer on a single integrated circuit
- ☐ (C) A microwave detector, amplifier, and local oscillator on a single integrated circuit
- ☐ (D) A low voltage amplifier used in a microwave transmitter modulator stage

(G6B-12) 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) DE-9

(G6B-13) Which of these connector types is commonly used for RF connections at frequencies up to 150 MHz?

- ☐ (A) Octal
- ☐ (B) RJ-11
- ☐ (C) PL-259
- ☐ (D) DB-25

(G6B-14) 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 44

(G6B-15) What is the main reason to use keyed connectors instead of non-keyed types?

- ☐ (A) Prevention of use by unauthorized persons
- ☐ (B) Reduced chance of incorrect mating
- ☐ (C) Higher current carrying capacity
- ☐ (D) All of these choices are correct

(G6B-16) 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

(G6B-17) What is the general description of a DIN type connector?

- ❑ (A) A special connector for microwave interfacing
- ❑ (B) A DC power connector rated for currents between 30 and 50 amperes
- ❑ (C) A family of multiple circuit connectors suitable for audio and control signals
- ❑ (D) A special watertight connector for use in marine applications

(G6B-18) What is a type SMA connector?

- ❑ (A) A large bayonet connector usable at power levels in excess of 1 KW
- ❑ (B) A small threaded connector suitable for signals up to several GHz
- ❑ (C) A connector designed for serial multiple access signals
- ❑ (D) Type of push-on connector intended for high voltage applications

G7 – PRACTICAL CIRCUITS

G7A Power supplies; and schematic symbols

(G7A-01) What useful feature does a power supply bleeder resistor provide?

- ❑ (A) It acts as a fuse for excess voltage
- ❑ (B) It ensures that the filter capacitors are discharged when power is removed
- ❑ (C) It removes shock hazards from the induction coils
- ❑ (D) It eliminates ground loop current

(G7A-02) Which of the following components are used in a power supply filter network?

- ❑ (A) Diodes
- ❑ (B) Transformers and transducers
- ❑ (C) Quartz crystals
- ❑ (D) Capacitors and inductors

(G7A-03) What is the peak-inverse-voltage across the rectifiers in a full-wave bridge power supply?

- ❑ (A) One-quarter the normal output voltage of the power supply
- ❑ (B) Half the normal output voltage of the power supply
- ❑ (C) Double the normal peak output voltage of the power supply
- ❑ (D) Equal to the normal peak output voltage of the power supply

(G7A-04) What is the peak-inverse-voltage across the rectifier in a half-wave power supply?

- ☐ (A) One-half the normal peak output voltage of the power supply
- ☐ (B) One-half the normal output voltage of the power supply
- ☐ (C) Equal to the normal output voltage of the power supply
- ☐ (D) Two times the normal peak output voltage of the power supply

(G7A-05) What portion of the AC cycle is converted to DC by a half-wave rectifier?

- ☐ (A) 90 degrees
- ☐ (B) 180 degrees
- ☐ (C) 270 degrees
- ☐ (D) 360 degrees

(G7A-06) What portion of the AC cycle is converted to DC by a full-wave rectifier?

- ☐ (A) 90 degrees
- ☐ (B) 180 degrees
- ☐ (C) 270 degrees
- ☐ (D) 360 degrees

(G7A-07) What is the output waveform of an unfiltered full-wave rectifier connected to a resistive load?

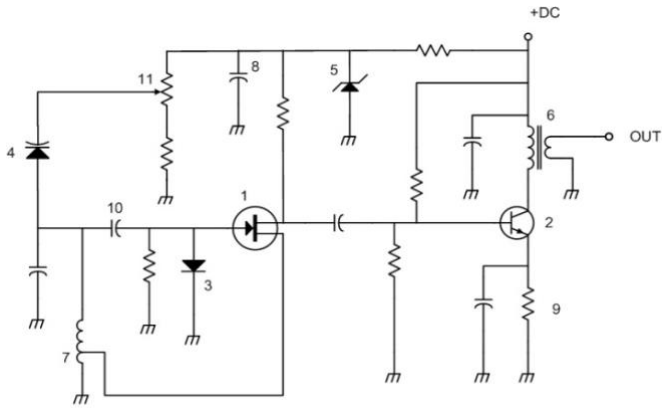
- ☐ (A) A series of DC pulses at twice the frequency of the AC input
- ☐ (B) A series of DC pulses at the same frequency as the AC input
- ☐ (C) A sine wave at half the frequency of the AC input
- ☐ (D) A steady DC voltage

(G7A-08) Which of the following is an advantage of a switchmode power supply as compared to a linear power supply?

- ☐ (A) Faster switching time makes higher output voltage possible
- ☐ (B) Fewer circuit components are required
- ☐ (C) High frequency operation allows the use of smaller components
- ☐ (D) All of these choices are correct

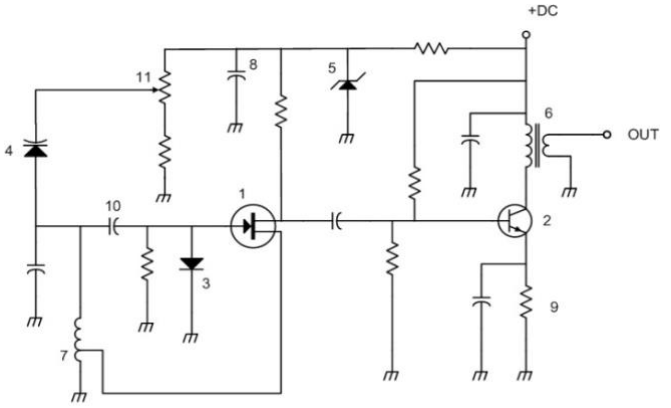
(G7A-09) Which symbol in figure below represents a field effect transistor?

- ❑ (A) Symbol 2
- ❑ (B) Symbol 5
- ❑ (C) Symbol 1
- ❑ (D) Symbol 4



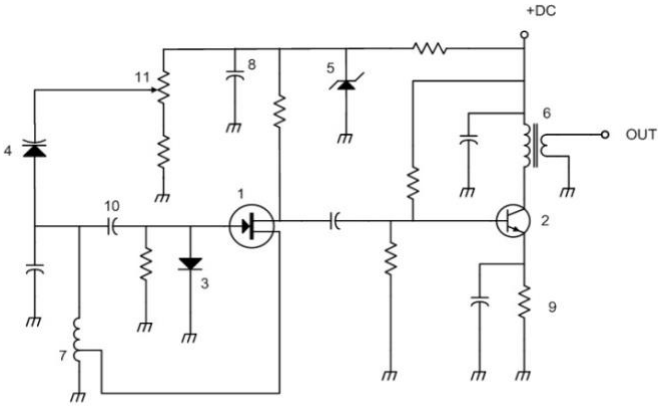
(G7A-10) Which symbol in figure below represents a Zener diode?

- ❑ (A) Symbol 2
- ❑ (B) Symbol 5
- ❑ (C) Symbol 1
- ❑ (D) Symbol 4



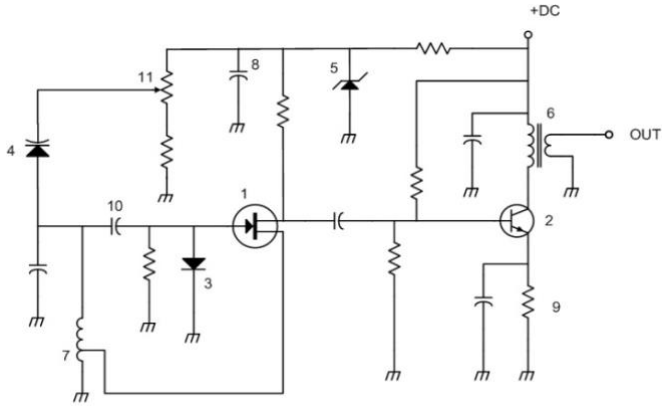
(G7A-11) Which symbol in figure below represents an NPN junction transistor?

- ❑ (A) Symbol 2
- ❑ (B) Symbol 5
- ❑ (C) Symbol 1
- ❑ (D) Symbol 4



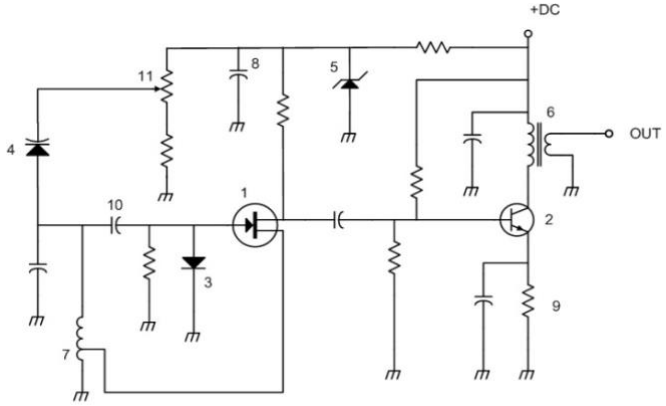
(G7A-12) Which symbol in Figure below represents a multiple-winding transformer?

- ❑ (A) Symbol 2
- ❑ (B) Symbol 6
- ❑ (C) Symbol 1
- ❑ (D) Symbol 4



(G7A-13) Which symbol in Figure below represents a tapped inductor?

- ❑ (A) Symbol 2
- ❑ (B) Symbol 5
- ❑ (C) Symbol 1
- ❑ (D) Symbol 7



G7B - Digital circuits; amplifiers and oscillators

(G7B-01) Complex digital circuitry can often be replaced by what type of integrated circuit?

- ❑ (A) Microcontroller
- ❑ (B) Charge-coupled device
- ❑ (C) Phase detector
- ❑ (D) Window comparator

(G7B-02) Which of the following is an advantage of using the binary system when processing digital signals?

- ❑ (A) Binary "ones" and "zeros" are easy to represent by 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 choices are correct

(G7B-03) Which of the following describes the function of a two input AND gate?

- ❑ (A) Output is high when either or both inputs are low
- ❑ (B) Output is high only when both inputs are high
- ❑ (C) Output is low when either or both inputs are high
- ❑ (D) Output is low only when both inputs are high

(G7B-04) Which of the following describes the function of a two input NOR gate?

- ❑ (A) Output is high when either or both inputs are low
- ❑ (B) Output is high only when both inputs are high
- ❑ (C) Output is low when either or both inputs are high
- ❑ (D) Output is low only when both inputs are high

(G7B-05) How many states does a 3-bit binary counter have?

- ❑ (A) 3
- ❑ (B) 6
- ❑ (C) 8
- ❑ (D) 16

(G7B-06) 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

(G7B-07) What are the basic components of virtually all sine wave 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

(G7B-08) 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

(G7B-09) 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

(G7B-10) 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

(G7B-11) 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 choices are correct

(G7B-12) Which of these classes of amplifiers has the highest efficiency?

- ❑ (A) Class A
- ❑ (B) Class B
- ❑ (C) Class AB
- ❑ (D) Class C

(G7B-13) What is the reason for neutralizing the final amplifier stage of a transmitter?

- ❑ (A) To limit the modulation index
- ❑ (B) To eliminate self-oscillations
- ❑ (C) To cut off the final amplifier during standby periods
- ❑ (D) To keep the carrier on frequency

(G7B-14) Which of the following describes a linear amplifier?

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

G7C - Receivers and transmitters; filters, oscillators

(G7C-01) Which of the following is used to process signals from the balanced modulator then send them to the mixer in some single sideband phone transmitters?

- ❑ (A) Carrier oscillator
- ❑ (B) Filter
- ❑ (C) IF amplifier
- ❑ (D) RF amplifier

(G7C-02) Which circuit is used to combine signals from the carrier oscillator and speech amplifier then send the result to the filter in some single sideband phone transmitters?

- ❑ (A) Discriminator
- ❑ (B) Detector
- ❑ (C) IF amplifier
- ❑ (B) Balanced modulator

(G7C-03) What circuit is used to process signals from the RF amplifier and local oscillator then send the result to the IF filter in a superheterodyne receiver?

- ❑ (A) Balanced modulator
- ❑ (B) IF amplifier
- ❑ (C) Mixer
- ❑ (D) Detector

(G7C-04) What circuit is used to combine signals from the IF amplifier and BFO and send the result to the AF amplifier in some single sideband receivers?

- ❑ (A) RF oscillator
- ❑ (B) IF filter
- ❑ (C) Balanced modulator
- ❑ (D) Product detector

(G7C-05) Which of the following is an advantage of a transceiver controlled by a direct digital synthesizer (DDS)?

- ❑ (A) Wide tuning range and no need for band switching
- ❑ (B) Relatively high power output
- ❑ (C) Relatively low power consumption
- ❑ (D) Variable frequency with the stability of a crystal oscillator

(G7C-06) 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

(G7C-07) What is the simplest combination of stages that implement a superheterodyne receiver?

- ❑ (A) RF amplifier, detector, audio amplifier
- ❑ (B) RF amplifier, mixer, IF discriminator
- ❑ (C) HF oscillator, mixer, detector
- ❑ (D) HF oscillator, prescaler, audio amplifier

(G7C-08) What type of circuit is used in many FM receivers to convert signals coming from the IF amplifier to audio?

- ❑ (A) Product detector
- ❑ (B) Phase inverter
- ❑ (C) Mixer
- ❑ (D) Discriminator

(G7C-09) Which of the following is needed for a Digital Signal Processor IF filter?

- ❑ (A) An analog to digital converter
- ❑ (B) A digital to analog converter
- ❑ (C) A digital processor chip
- ❑ (D) All of the these choices are correct

(G7C-10) How is Digital Signal Processor filtering accomplished?

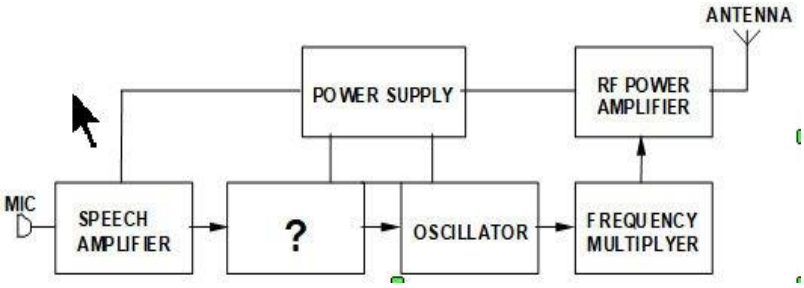
- ❑ (A) By using direct signal phasing
- ❑ (B) By converting the signal from analog to digital and using digital processing
- ❑ (C) By differential spurious phasing
- ❑ (D) By converting the signal from digital to analog and taking the difference of mixing products

(G7C-11) What is meant by the term "software defined radio" (SDR)?

- ❑ (A) A radio in which most major signal processing functions are performed by software
- ❑ (B) A radio that provides computer interface for automatic logging of band and frequency
- ❑ (C) A radio that uses crystal filters designed using software
- ❑ (D) A computer model that can simulate performance of a radio to aid in the design process

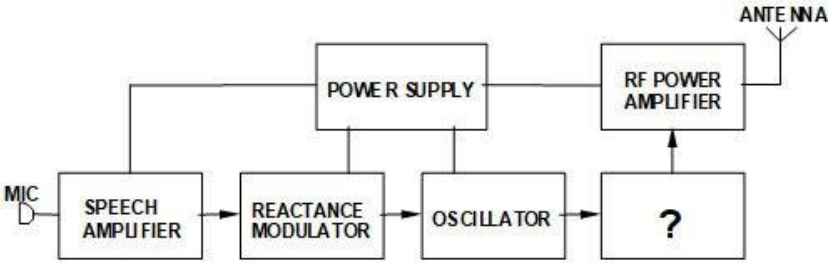
(G7C-12) What is the unlabeled block in the FM transmitter diagram below ?

- ❑ (A) Band-pass filter.
- ❑ (B) A crystal oscillator.
- ❑ (C) A reactance modulator.
- ❑ (D) A rectifier modulator



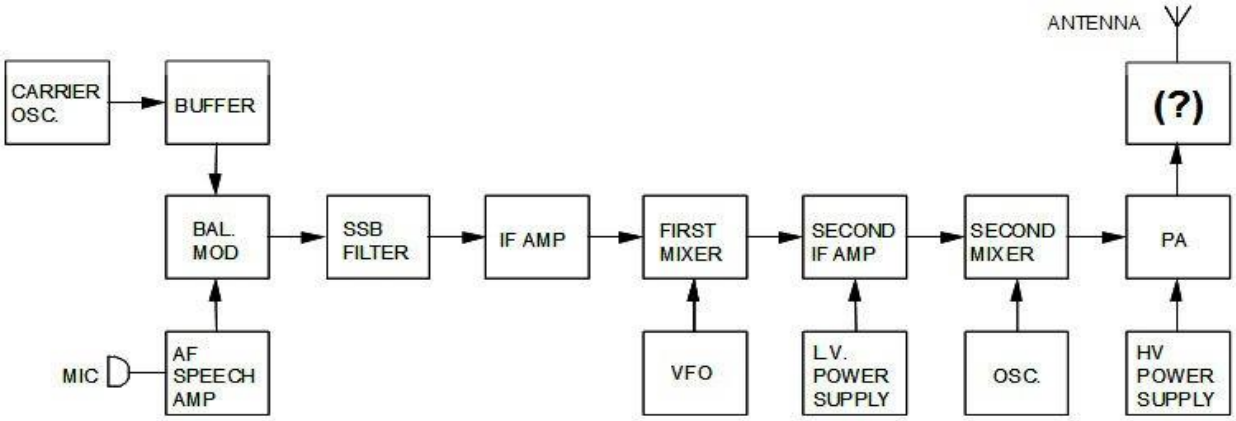
(G7C-13) What is the unlabeled block in the FM transmitter diagram below ?

- ❑ (A) Band-pass filter.
- ❑ (B) A crystal oscillator.
- ❑ (C) Frequency multiplyer
- ❑ (D) A rectifier modulator



(G7C-14) What is the unlabeled block in the SSB transmitter diagram below ?

❑ (A) A low-pass filter ❑ (B) A SSB filter ❑ (C) A buffer ❑ (D) IF amplifier.



SUBELEMENT G8 – SIGNALS AND EMISSIONS

G8A - Carriers and modulation: AM; FM; single sideband; modulation envelope; digital modulation; overmodulation

(G8A-01) How is an FSK signal generated?

- ☐ (A) By keying an FM transmitter with a sub-audible tone
- ☐ (B) By changing an oscillator's frequency directly with a digital control signal
- ☐ (C) By using a transceiver's computer data interface protocol to change frequencies
- ☐ (D) By reconfiguring the CW keying input to act as a tone generator

(G8A-02) 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

(G8A-03) What is the name of the process that changes the instantaneous frequency of an RF wave to convey information?

- ☐ (A) Frequency convolution
- ☐ (B) Frequency transformation
- ☐ (C) Frequency conversion
- ☐ (D) Frequency modulation

(G8A-04) What emission is produced by a reactance modulator connected to a transmitter RF amplifier stage?

- ☐ (A) Multiplex modulation
- ☐ (B) Phase modulation
- ☐ (C) Amplitude modulation
- ☐ (D) Pulse modulation

(G8A-05) What type of modulation varies the instantaneous power level of the RF signal?

- ☐ (A) Frequency shift keying
- ☐ (B) Phase modulation
- ☐ (C) Frequency modulation
- ☐ (D) Amplitude modulation

(G8A-06) What is one advantage of carrier suppression in a single sideband phone transmission versus full carrier amplitude modulation?

- ❑ (A) Audio fidelity is improved
- ❑ (B) Greater modulation percentage is obtainable with lower distortion
- ❑ (C) Available transmitter power can be used more effectively
- ❑ (D) Simpler receiving equipment can be used

(G8A-07) Which of the following phone emissions uses the narrowest bandwidth?

- ❑ (A) Single sideband
- ❑ (B) Double sideband
- ❑ (C) Phase modulation
- ❑ (D) Frequency modulation

(G8A-08) Which of the following is an effect of overmodulation?

- ❑ (A) Insufficient audio
- ❑ (B) Insufficient bandwidth
- ❑ (C) Frequency drift
- ❑ (D) Excessive bandwidth

(G8A-09) What control is typically adjusted for proper ALC setting on an amateur single sideband transceiver?

- ❑ (A) The RF clipping level
- ❑ (B) Transmit audio or microphone gain
- ❑ (C) Antenna inductance or capacitance
- ❑ (D) Attenuator level

(G8A-10) What is meant by the term flat-topping when referring to a single sideband phone transmission?

- ❑ (A) Signal distortion caused by insufficient collector current
- ❑ (B) The transmitter's automatic level control (ALC) is properly adjusted
- ❑ (C) Signal distortion caused by excessive drive
- ❑ (D) The transmitter's carrier is properly suppressed

(G8A-11) What is the modulation envelope of an AM signal?

- ❑ (A) The waveform created by connecting the peak values of the modulated signal
- ❑ (B) The carrier frequency that contains the signal
- ❑ (C) Spurious signals that envelop nearby frequencies
- ❑ (D) The bandwidth of the modulated signal

G8B - Frequency mixing; multiplication; bandwidths of various modes; deviation; duty cycle

(G8B-01) 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?

- ❑ (A) Mixer
- ❑ (B) BFO
- ❑ (C) VFO
- ❑ (D) Discriminator

(G8B-02) 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?

- ❑ (A) Quadrature noise
- ❑ (B) Image response
- ❑ (C) Mixer interference
- ❑ (D) Intermediate interference

(G8B-03) What is another term for the mixing of two RF signals?

- ❑ (A) Heterodyning
- ❑ (B) Synthesizing
- ❑ (C) Cancellation
- ❑ (D) Phase inverting

(G8B-04) What is the stage in a VHF FM transmitter that generates a harmonic of a lower frequency signal to reach the desired operating frequency?

- ❑ (A) Mixer
- ❑ (B) Reactance modulator
- ❑ (C) Pre-emphasis network
- ❑ (D) Multiplier

(G8B-05) What is the approximate bandwidth of a PACTOR3 signal at maximum data rate?

- ❑ (A) 31.5 Hz
- ❑ (B) 500 Hz 54
- ❑ (C) 1800 Hz
- ❑ (D) 2300 Hz

(G8B-06) What is the total bandwidth of an FM phone transmission having 5 kHz deviation and 3 kHz modulating frequency?

- ❑ (A) 3 kHz
- ❑ (B) 5 kHz
- ❑ (C) 8 kHz
- ❑ (D) 16 kHz

(G8B-07) 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

(G8B-08) Why is it important to know the duty cycle of the mode you are using when transmitting?

- ❑ (A) To aid in tuning your transmitter
- ❑ (B) Some modes have high duty cycles which could exceed the transmitter's average power rating
- ❑ (C) To allow time for the other station to break in during a transmission
- ❑ (D) All of these choices are correct

(G8B-09) Why is it good to match receiver bandwidth to the bandwidth of the operating mode?

- ❑ (A) It is required by FCC rules
- ❑ (B) It minimizes power consumption in the receiver
- ❑ (C) It improves impedance matching of the antenna
- ❑ (D) It results in the best signal to noise ratio

(G8B-10) What is the relationship between transmitted symbol rate and bandwidth?

- ❑ (A) Symbol rate and bandwidth are not related
- ❑ (B) Higher symbol rates require wider bandwidth
- ❑ (C) Lower symbol rates require wider bandwidth
- ❑ (D) Bandwidth is always half the symbol rate

G8C – Digital emission modes

(G8C-01) Which of the following digital modes is designed to operate at extremely low signal strength on the HF bands?

- ☐ (A) FSK441 and Hellschreiber
- ☐ (B) JT9 and JT65
- ☐ (C) Clover
- ☐ (D) RTTY

(G8C-02) How many data bits are sent in a single PSK31 character?

- ☐ (A) The number varies
- ☐ (B) 5
- ☐ (C) 7
- ☐ (D) 8

(G8C-03) What part of a data packet contains the routing and handling information?

- ☐ (A) Directory
- ☐ (B) Preamble
- ☐ (C) Header
- ☐ (D) Footer

(G8C-04) Which of the following describes Baudot code?

- ☐ (A) A 7-bit code with start, stop and parity bits
- ☐ (B) A code using error detection and correction
- ☐ (C) A 5-bit code with additional start and stop bits
- ☐ (D) A code using SELCAL and LISTEN

(G8C-05) In the PACTOR protocol, what is meant by an NAK response to a transmitted packet?

- ☐ (A) The receiver is requesting the packet be retransmitted
- ☐ (B) The receiver is reporting the packet was received without error
- ☐ (C) The receiver is busy decoding the packet
- ☐ (D) The entire file has been received correctly

(G8C-06) What action results from a failure to exchange information due to excessive transmission attempts when using PACTOR or WINMOR?

- ❑ (A) The checksum overflows
- ❑ (B) The connection is dropped
- ❑ (C) Packets will be routed incorrectly
- ❑ (D) Encoding reverts to the default character set

(G8C-07) How does the receiving station respond to an ARQ data mode packet containing errors?

- ❑ (A) It terminates the contact
- ❑ (B) It requests the packet be retransmitted
- ❑ (C) It sends the packet back to the transmitting station
- ❑ (D) It requests a change in transmitting protocol

(G8C-08) Which of the following statements is true about PSK31?

- ❑ (A) Upper case letters make the signal stronger
- ❑ (B) Upper case letters use longer Varicode signals and thus slow down transmission
- ❑ (C) Varicode Error Correction is used to ensure accurate message reception
- ❑ (D) Higher power is needed as compared to RTTY for similar error rates

(G8C-09) What does the number 31 represent in "PSK31"?

- ❑ (A) The approximate transmitted symbol rate
- ❑ (B) The version of the PSK protocol
- ❑ (C) The year in which PS was invented
- ❑ (D) The number of characters that can be represented by PSK31

(G8C-10) How does forward error correction (FEC) allow the receiver to correct errors in received data packets?

- ❑ (A) By controlling transmitter output power for optimum signal strength
- ❑ (B) By using the varicode character set
- ❑ (C) By transmitting redundant information with the data
- ❑ (D) By using a parity bit with each character

(G8C-11) How are the two separate frequencies of a Frequency Shift Keyed (FSK) signal identified?

- ❑ (A) Dot and Dash
- ❑ (B) On and Off
- ❑ (C) High and Low
- ❑ (D) Mark and Space

(G8C-12) Which type of code is used for sending characters in a PSK31 signal?

- ☑ (B) Vericode
- ☐ (B) Viterbi
- ☐ (C) Volumetric
- ☐ (D) Binary

SUBELEMENT G9 – ANTENNAS AND FEED LINES

G9A - Antenna feed lines: characteristic impedance, and attenuation; SWR calculation, measurement and effects; matching networks

(G9A-01) Which of the following factors determine the characteristic impedance of a parallel conductor antenna feed line?

- ☑ (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

(G9A-02) What are the typical characteristic impedances of coaxial cables used for antenna feed lines at amateur stations?

- ☐ (A) 25 and 30 ohms
- ☑ (B) 50 and 75 ohms
- ☐ (C) 80 and 100 ohms
- ☐ (D) 500 and 750 ohms

(G9A-03) What is the characteristic impedance of flat ribbon TV type twinlead?

- ☐ (A) 50 ohms
- ☐ (B) 75 ohms
- ☐ (C) 100 ohms
- ☑ (D) 300 ohms

(G9A-04) What might cause reflected power at the point where a feed line 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 feed line impedance and antenna feed point impedance
- ☐ (D) Feeding the antenna with unbalanced feed line

(G9A-05) How does the attenuation of coaxial cable change as the frequency of the signal it is carrying increases?

- ❑ (A) Attenuation is independent of frequency
- ❑ (B) Attenuation increases
- ❑ (C) Attenuation decreases
- ❑ (D) Attenuation reaches a maximum at approximately 18 MHz 58

(G9A-06) In what units is RF feed line loss usually expressed?

- ❑ (A) Ohms per 1000 feet
- ❑ (B) Decibels per 1000 feet
- ❑ (C) Ohms per 100 feet
- ❑ (D) Decibels per 100 feet

(G9A-07) What must be done to prevent standing waves on an antenna feed line?

- ❑ (A) The antenna feed point must be at DC ground potential
- ❑ (B) The feed line must be cut to a length equal to an odd number of electrical quarter wavelengths
- ❑ (C) The feed line must be cut to a length equal to an even number of physical half wavelengths
- ❑ (D) T he antenna feed point impedance must be matched to the characteristic impedance of the feed line

(G9A-08) If the SWR on an antenna feed line is 5 to 1, and a matching network at the transmitter end of the feed line is adjusted to 1 to 1 SWR, what is the resulting SWR on the feed line?

- ❑ (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

(G9A-09) What standing wave ratio will result when connecting a 50 ohm feed line to a non-reactive load having 200 ohm impedance?

- ❑ (A) 4:1
- ❑ (B) 1:4
- ❑ (C) 2:1
- ❑ (D) 1:2

(G9A-10) What standing wave ratio will result when connecting a 50 ohm feed line to a non-reactive load having 10 ohm impedance?

- ❑ (A) 2:1
- ❑ (B) 50:1
- ❑ (C) 1:5
- ❑ (D) 5:1

(G9A-11) What standing wave ratio will result when connecting a 50 ohm feed line to a non-reactive load having 50 ohm impedance?

- ❑ (A) 2:1
- ❑ (B) 1:1
- ❑ (C) 50:50
- ❑ (D) 0:0 59

(G9A-12) What standing wave ratio will result when connecting a 50 ohm feed line to a non-reactive load having 25 ohm impedance?

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

(G9A-13) What standing wave ratio will result when connecting a 50 ohm feed line to an antenna that has a purely resistive 300 ohm feed point impedance?

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

(G9A-14) What is the interaction between high standing wave ratio (SWR) and transmission line loss?

- ❑ (A) There is no interaction between transmission line loss and SWR
- ❑ (B) If a transmission line is lossy, high SWR will increase the loss
- ❑ (C) High SWR makes it difficult to measure transmission line loss
- ❑ (D) High SWR reduces the relative effect of transmission line loss

(G9A-15) What is the effect of transmission line loss on SWR measured at the input to the line?

- ❑ (A) The higher the transmission line loss, the more the SWR will read artificially low
- ❑ (B) The higher the transmission line loss, the more the SWR will read artificially high
- ❑ (C) The higher the transmission line loss, the more accurate the SWR measurement will be
- ❑ (D) Transmission line loss does not affect the SWR measurement

G9B - Basic Antennas and Feed Lines

(G9B-01) What is one disadvantage of a directly fed random-wire HF 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 more effective on the lower HF bands than on the higher bands

(G9B-02) Which of the following is a common way to adjust the feed point impedance of a quarter wave ground plane vertical antenna to be approximately 50 ohms?

- ❑ (A) Slope the radials upward
- ❑ (B) Slope the radials downward
- ❑ (C) Lengthen the radials
- ❑ (D) Shorten the radials

(G9B-03) Which of the following best describes the radiation pattern of a quarter-wave, ground-plane vertical antenna?

- ❑ (A) Bi-directional in azimuth
- ❑ (B) Isotropic
- ❑ (C) Hemispherical
- ❑ (D) Omnidirectional in azimuth

(G9B-04) What is the radiation pattern of a dipole antenna in free space in the plane of the conductor?

- ❑ (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

(G9B-05) 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

(G9B-06) 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 of the Earth or buried a few inches below the ground
- ❑ (D) At the center of the antenna

(G9B-07) How does the feed point impedance of a 1/2 wave dipole antenna change as the antenna is lowered below 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

(G9B-08) How does the feed point impedance of a 1/2 wave dipole change as the feed point 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

(G9B-09) Which of the following is an advantage of a horizontally polarized as compared to a vertically polarized HF antenna?

- ❑ (A) Lower ground reflection losses
- ❑ (B) Lower feed point impedance
- ❑ (C) Shorter Radials
- ❑ (D) Lower radiation resistance

(G9B-10) What is the approximate length for a 1/2 wave dipole antenna cut for 14.250 MHz in meters?

- ❑ (A) 8 feet
- ❑ (B) 16 feet
- ❑ (C) 6.71 meters
- ❑ (D) 10.01 meters

(G9B-11) What is the approximate length for a 1/2 wave dipole antenna cut for 3.550 MHz in meters?

- ❑ (A) 42 feet
- ❑ (B) 84 feet
- ❑ (C) 132 feet
- ❑ (D) 263 feet

(G9B-12) What is the approximate length for a 1/4 wave vertical antenna cut for 28.5 MHz?

- ❑ (A) 8 feet
- ❑ (B) 11 feet
- ❑ (C) 16 feet
- ❑ (D) 21 feet

G9C - Directional antennas

(G9C-01) Which of the following would increase the bandwidth of a Yagi antenna?

- ❑ (A) Larger diameter elements
- ❑ (B) Closer element spacing
- ❑ (C) Loading coils in series with the element
- ❑ (D) Tapered-diameter elements

- ❑ (A) 1/4 wavelength
- ❑ (B) 1/2 wavelength
- ❑ (C) 3/4 wavelength
- ❑ (D) 1 wavelength

(G9C-02) What is the approximate length of the driven element of a Yagi antenna?

- ❑ (A) 1/4 wavelength
- ❑ (B) 1/2 wavelength
- ❑ (C) 3/4 wavelength
- ❑ (D) 1 wavelength

(G9C-03) How do the lengths of a three-element Yagi reflector and director compare to that of the driven element?

- ☐ (A) The reflector is longer, and the director is shorter
- ☐ (B) The reflector is shorter, and the director is longer
- ☐ (C) They are all the same length
- ☐ (D) Relative length depends on the frequency of operation

(G9C-04) How does antenna gain stated in dBi compare to gain stated in dBd for the same antenna?

- ☐ (A) dBi gain figures are 2.15 dB lower than dBd gain figures
- ☐ (B) dBi gain figures are 2.15 dB higher than dBd gain figures
- ☐ (C) dBi gain figures are the same as the square root of dBd gain figures multiplied by 2.15
- ☐ (D) dBi gain figures are the reciprocal of dBd gain figures + 2.15 dB

(G9C-05) How does increasing boom length and adding directors affect a Yagi antenna?

- ☐ (A) Gain increases
- ☐ (B) Beamwidth increases
- ☐ (C) Front to back ratio decreases
- ☐ (D) Front to side ratio decreases

(G9C-06) What configuration of the loops of a two-element 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) There must be an open circuit in the driven element at the point opposite the feed point
- ☐ (C) The reflector element must be approximately 5 percent shorter than the driven element
- ☐ (D) The reflector element must be approximately 5 percent longer than the driven element

(G9C-07) What does "front-to-back ratio" mean in reference to a Yagi antenna?

- ☐ (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

(G9C-08) What is meant by the "main lobe" of a directive antenna?

- ☐ (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

(G9C-09) How does the gain of two 3-element horizontally polarized Yagi antennas spaced vertically ½ wavelength apart 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

(G9C-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

(G9C-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

(G9C-12) Which of the following is an advantage of using a gamma match for impedance matching of a Yagi antenna to 50 ohm coax feed line?

- ❑ (A) It does not require that the elements be insulated from the boom
- ❑ (B) It does not require any inductors or capacitors
- ❑ (C) It is useful for matching multiband antennas
- ❑ (D) All of these choices are correct

(G9C-13) Approximately how long is each side of the driven element of a quad antenna?

- ❑ (A) 1/4 wavelength
- ❑ (B) 1/2 wavelength
- ❑ (C) 3/4 wavelength
- ❑ (D) 1 wavelength

(G9C-14) How does the forward gain of a two-element quad antenna compare to the forward gain of a three-element Yagi antenna?

- ❑ (A) About the same
- ❑ (B) About 2/3 as much
- ❑ (C) About 1.5 times as much
- ❑ (D) About twice as much

(G9C-15) What is meant by the terms dBi and dBd when referring to antenna gain?

- ❑ (A) dBi refers to an isotropic antenna, dBd refers to a dipole antenna
- ❑ (B) dBi refers to an ionospheric reflecting antenna, dBd refers to a dissipative antenna
- ❑ (C) dBi refers to an inverted-vee antenna, dBd refers to a downward reflecting antenna
- ❑ **(D) dBi refers to an isometric antenna, dBd refers to a discone antenna**

(G9C-16) What is a beta or hairpin match?

- ❑ (A) It is a shorted transmission line stub placed at the feed point of a Yagi antenna to provide impedance matching
- ❑ (B) It is a 1/4 wavelength section of 75 ohm coax in series with the feed point of a Yagi to provide impedance matching
- ❑ (C) It is a series capacitor selected to cancel the inductive reactance of a folded dipole antenna
- ❑ (D) It is a section of 300 ohm twinlead used to match a folded dipole antenna

G9D - Specialized antennas

(G9D-01) Which of the following antenna types will be most effective as a Near Vertical Incidence Skywave (NVIS) antenna for short-skip communications on 40 meters during the day?

- ❑ (A) A horizontal dipole placed between 1/10 and 1/4 wavelength above the ground
- ❑ (B) A vertical antenna placed between 1/4 and 1/2 wavelength above the ground
- ❑ (C) A left-hand circularly polarized antenna
- ❑ (D) A right-hand circularly polarized antenna

(G9D-02) What is the feed-point impedance of an end-fed half-wave antenna?

- ❑ (A) Very low
- ❑ (B) Approximately 50 ohms
- ❑ (C) Approximately 300 ohms
- ❑ (D) Very high

(G9D-03) In which direction is the maximum radiation from a portable VHF/UHF "halo" antenna?

- ❑ (A) Broadside to the plane of the halo
- ❑ (B) Opposite the feed point
- ❑ (C) Omnidirectional in the plane of the halo
- ❑ (D) Toward the halo's supporting mast

(G9D-04) What is the primary purpose of antenna traps?

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

(G9D-05) What is an advantage of vertical stacking of horizontally polarized Yagi antennas?

- ❑ (A) It allows quick selection of vertical or horizontal polarization
- ❑ (B) It allows simultaneous vertical and horizontal polarization
- ❑ (C) It narrows the main lobe in azimuth
- ❑ (D) It narrows the main lobe in elevation

(G9D-06) 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

(G9D-07) Which of the following describes a log periodic antenna?

- ❑ (A) Length and spacing of the elements increase 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

(G9D-08) Why is a Beverage antenna 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

(G9D-09) 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

(G9D-10) Which of the following describes a Beverage antenna?

- ❑ (A) A vertical antenna
- ❑ (B) A broad-band mobile antenna
- ❑ (C) A helical antenna for space reception
- ❑ (D) A very long and low directional receiving antenna

(G9D-11) 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

SUBELEMENT G0 – ELECTRICAL AND RF SAFETY

G0A - RF safety principles, rules and guidelines; routine station evaluation

(G0A-01) 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

(G0A-02) Which of the following properties is important in estimating whether an RF signal exceeds the maximum permissible exposure (MPE)?

- ❑ (A) Its duty cycle
- ❑ (B) Its frequency
- ❑ (C) Its power density
- ❑ (D) All of these choices are correct

(G0A-04) What does "time averaging" mean in reference to RF radiation exposure?

- ❑ (A) The average amount of power developed by the transmitter over a specific 24 hour period
- ❑ (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

(G0A-05) 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 choices are correct

(G0A-06) 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 limited to 10 feet in height
- ☐ (D) It should be installed such that it is protected against unauthorized access

(G0A-07) 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) High duty cycle transmitters are exempt from RF exposure requirements

(G0A-08) 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

(G0A-09) 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 in their direction

(G0A-10) 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) Make sure the antenna is properly shielded

(G0A-11) 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 feed line
- ☐ (C) Wear a radiation badge
- ☐ (D) All of these choices are correct

(G0A-12) 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 limited to 10 feet in height
- ☐ (D) It should be installed so no one can be exposed to RF radiation in excess of maximum permissible limits

G0B - Safety in the ham shack: electrical shock and treatment, safety grounding, fusing, interlocks, wiring, antenna and tower safety

(G0B-01) Which wire or wires in a four-conductor connection should be attached to fuses or circuit breakers in a device operated from a 240 VAC single phase source?

- ☐ (A) Only the two wires carrying voltage
- ☐ (B) Only the neutral wire
- ☐ (C) Only the ground wire
- ☐ (D) All wires

(G0B-02) 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

(G0B-03) 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

(G0B-04) 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

(G0B-05) 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 one or more of the voltage-carrying wires to the neutral wire
- ❑ (B) Current flowing from one or more of the voltage-carrying wires directly to ground
- ❑ (C) Overvoltage on the voltage-carrying wires
- ❑ (D) All of these choices are correct

(G0B-06) Why must the metal enclosure of every item of station equipment be grounded?

- ❑ (A) It prevents a blown fuse in the event of an internal short circuit
- ❑ (B) It prevents signal overload
- ❑ (C) It ensures that the neutral wire is grounded
- ❑ (D) It ensures that hazardous voltages cannot appear on the chassis

(G0B-07) 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

(G0B-08) 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) Unground the base of the tower
- ❑ (D) All of these choices are correct

(G0B-09) Why should soldered joints not be used 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

(G0B-10) Which of the following is a danger from lead-tin solder?

- ❑ (A) Lead can contaminate food if hands are not washed carefully after handling the solder
- ❑ (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

(G0B-11) Which of the following is good 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

(G0B-12) What is the purpose of a power supply interlock?

- ❑ (A) To prevent unauthorized changes to the circuit that would void the manufacturer's warranty
- ❑ (B) To shut down the unit if it becomes too hot
- ❑ (C) To ensure that dangerous voltages are removed if the cabinet is opened
- ❑ (D) To shut off the power supply if too much voltage is produced

(G0B-13) What must you do when powering your house from an emergency generator?

- ❑ (A) Disconnect the incoming utility power feed
- ❑ (B) Ensure that the generator is not grounded
- ❑ (C) Ensure that all lightning grounds are disconnected
- ❑ (D) All of these choices are correct

(G0B-14) Which of the following is covered by 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

(G0B-15) 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 must 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

(G0B-16) 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