

FCC Exam Element 3 Question Pool for General Class
Effective 7/1/2019 – 6/30/2023

SUBELEMENT G4 – AMATEUR RADIO PRACTICES [5 Exam Questions – 5 groups]

G4A – Station operation and setup

G4A01

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

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G4A02

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

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G4A03

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

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G4A04

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

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G4A05

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

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G4A06

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

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G4A07

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

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G4A08

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

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G4A09

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

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G4A10

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

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G4A11

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

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G4A12

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

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G4A13

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

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G4A14

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 these choices are correct

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G4A15

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 these choices are correct

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G4A16

How does a noise blanker work?

- A. By temporarily increasing received bandwidth
- B. By redirecting noise pulses into a filter capacitor
- C. By reducing receiver gain during a noise pulse
- D. By clipping noise peaks

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G4A17

What happens as the noise reduction control level in a receiver is increased?

- A. Received signals may become distorted
- B. Received frequency may become unstable
- C. CW signals may become severely attenuated
- D. Received frequency may shift several kHz

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G4B – Test and monitoring equipment; two-tone test

G4B01

What item of test equipment contains horizontal and vertical channel amplifiers?

- A. An ohmmeter
- B. A signal generator
- C. An ammeter
- D. An oscilloscope

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G4B02

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

G4B03

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

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G4B04

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

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G4B05

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

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G4B06

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

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G4B07

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

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G4B08

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

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G4B09

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

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G4B10

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

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G4B11

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 these choices are correct

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G4B12

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

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G4B13

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 coaxial cable
- D. Determining the gain of a directional antenna

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G4B14

What is an instance in which the use of an instrument with analog readout may be preferred over an instrument with 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

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G4B15

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

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G4C – Interference to consumer electronics; grounding; DSP

G4C01

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

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G4C02

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

G4C03

What sound is heard from an audio device or telephone if there is interference from a nearby single sideband phone transmitter?

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

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G4C04

What is the effect on an audio device when 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

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G4C05

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

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G4C06

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

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G4C07

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

G4C08

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

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G4C09

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

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G4C10

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

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G4C11

What technique helps to minimize RF “hot spots” in an amateur station?

- A. Building all equipment in a metal enclosure
- B. Using surge suppressor power outlets
- C. Bonding all equipment enclosures together
- D. Low-pass filters on all feed lines

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G4C12

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

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G4C13

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

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

G4D01

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

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G4D02

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

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G4D03

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 these choices are correct

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G4D04

What does an S meter measure?

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

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G4D05

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

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G4D06

Where is an S meter found?

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

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G4D07

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

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G4D08

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

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G4D09

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

G4D10

How close to the lower edge of the 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. At least 1 kHz below the edge of the segment
- D. At least 1 kHz above the edge of the segment

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G4D11

How close to the upper edge of the phone segment 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. At least 1 kHz above the edge of the segment
- D. At least 1 kHz below the edge of the segment

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G4E – HF mobile radio installations; alternative energy source operation

G4E01

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

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G4E02

What is the purpose of a corona ball on an HF mobile antenna?

- A. To narrow the operating bandwidth of the antenna
- B. To increase the “Q” of the antenna
- C. To reduce the chance of damage if the antenna should strike an object
- D. To reduce RF voltage discharge from the tip of the antenna while transmitting

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G4E03

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

G4E04

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

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G4E05

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

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G4E06

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

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G4E07

Which of the following may cause receive interference in a radio installed in a vehicle?

- A. The battery charging system
- B. The fuel delivery system
- C. The vehicle control computer
- D. All these choices are correct

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G4E08

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

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G4E09

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

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G4E10

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 through 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

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G4E11

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 these choices are correct

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